New approaches to compute TiVA indicators for the United Kingdom

OECD

Acknowledgements

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Executive summary

The COVID-19 crisis has raised questions about supply-chains resilience and where to draw the line between dependency on foreign products given national security concerns and the benefits that integration into global value chains (GVCs) provides. This calls for a better understanding of how production is organised through domestic integration (i.e. suppliers are domestic firms) or international integration (i.e. the suppliers are abroad).

Nowadays, the goods and services produced and exported by a country use inputs from many countries around the world. These phenomena are not always reflected in conventional statistics of international trade, which measure the value of 'gross' trade flows (the factory-gate value of a good or service traded) rather than the flows of value added created by the countries exporting the goods or services. With goods and services undergoing transformations in many different countries, and crossing borders several times, differences between 'gross trade' and 'trade in value added' can be substantial. Trade in value added (TiVA) addresses the limitations of conventional trade data by considering the value added by each country in the production of goods and services that are consumed worldwide.

TiVA indicators can be measured from either an international or a national perspective. The international perspective has been adopted by various Multi-Regional Input-Output (MRIO) initiatives. International organisations and research institutions have mapped out the global production network by integrating many countries' Supply and Use Tables (SUTs – which show production linkages *within* countries) with trade statistics (which show exchanges *between* countries). Examples include the OECD's Trade in Value-Added (TiVA) database, ADB's Multi-Regional Input-Output Tables, Eurostat's FIGARO and Groningen University's World Input-Output Tables. TiVA indicators derived under the international perspective thus account for the distribution of value added across the entire GVCs capturing all direct and indirect effects. By its very nature, the international approach is data intensive and requires a series of adjustments and estimates to set up comprehensive and consistent accounts for global trade and production.

Alternatively, TiVA indicators can be derived using only information available at a national level. The advantage is to rely on information that is often richer, providing more detail on inter-industry flows and their links with imports and exports. Another advantage is that this approach does not require data adjustments nor strong assumptions to derive a set of relevant TiVA indicators. But this also means that the analysis cannot capture trade inter-dependencies in an international setting, for example how dependent UK exporters and consumers are on intermediate and final products supplied by individual foreign countries.

This report examines UK engagement in GVCs from a national perspective, with the objective of complementing existing indicators of trade integration. It departs from previous work in three main ways:

- Firstly, it provides a more granular picture of UK supply chains by leveraging data from detailed SUTs covering 105 industries/products, published by the Office for National Statistics (ONS), for the period 2005-2018.
- Secondly, the work adopts a 'consumer approach', thereby extending the analysis beyond the traditional producer approach as follows: the value that is added by distribution sectors (wholesale or resale activity) is added to the production chain of a particular sector, giving rise to a valuation as seen by the final purchaser

(Ahmad, 2019). This consumer approach thus complements the traditional, producer-based measures of TiVA.

- Thirdly, it adds to the timeliness of TiVA indicators based on the national approach with estimates for 2019 by exploiting quarterly and annual National Accounts data.

At the economy-wide level and despite important methodological differences, the national, more granular, approach points to similar developments in firm engagement in GVCs as the international OECD TiVA measures as long as both use a producer perspective. Differences are much more pronounced at the sectoral level.

Evidence from the granular approach suggests that UK exporters' reliance on imported inputs for export production was broadly stable between 2005 and 2018. The foreign value-added (or import) content of exports - a key indicator of UK's participation in GVCs as a buyer of inputs ('backward participation') – ranged between 18% and 20% in the United Kingdom over this period. After declining during 2011-15, the indicator rebounded after 2015, reaching 19.2% in 2018. The 2019 estimate points to a slight decrease to around 18.7%.

A similar profile over time is observed for UK's export intensity, defined as the domestic value-added content of exports as a share of UK gross value added. According to the granular estimates, UK export intensity was 22.9% in 2018, up from 18.7% in 2005.

At the economy-wide level, and sticking with a producer perspective, these estimates are very close to the TiVA indicators as published by the OECD in December 2021. More specifically, the import content of UK exports derived from the granular approach exceeds the OECD TiVA measure by an average of just 2 percentage points over the period 2005-18. Differences in terms of export intensity are even smaller, around 1 percentage point on average.

Differences are larger when comparing the consumer approach with the producer (OECD TiVA) approach. Of particular note here is that the consumer approach entails a different treatment of re-exports to achieve internal consistency – the producer, unlike the consumer, approach, excludes re-exports: for example, in OECD TIVA, the value of storage services in the port of Rotterdam prior to re-exporting goods cannot be allocated to the Dutch consumers and therefore has to be netted out. This affects bilateral trade data and in turn TiVA indicators. Indeed, if the issue of re-exports were (wrongly) ignored, the consumer approach (then limited to a reallocation of distribution margins across sectors) would yield very similar information to OECD TiVA estimates at the economy-wide level.

While at the economy-wide level, differences between OECD TiVA and the consumer approach are small after correcting for re-exports, sizeable differences are visible for some manufacturing industries. These reflect large discrepancies in 'Computer and electronics', 'Textiles' and 'Basic metals' industries and stem to a large extent from the specificity of the UK economy and the availability of detailed information published by the ONS. The analysis would need to be extended to other countries, before drawing general conclusions.

Although the analysis is still at an experimental phase, it highlights a few preliminary insights on the UK's integration into GVCs in recent years.

The foreign content of manufacturing remains higher than those of services

UK manufacturing as a whole is much more dependent on imports to satisfy domestic demand, compared to services. This trend has not changed much since 2005. With the exception of 'Other transport equipment', none of the UK manufacturing industries are self-sufficient i.e. their own production is not sufficient to meet UK demand and, therefore, they need to rely on imports. Within manufacturing, self-sufficiency is lowest for the 'Petroleum' and 'Basic metals' industries.

Conversely, most UK services sectors are self-sufficient. This is especially the case for 'Water transport', 'Computer and information services' and 'Finance and insurance' services. In contrast, 'Land transport',

‘Air transport’, ‘Real estate’, ‘Human health and social work’ and ‘Arts, entertainment and recreation’ services are not self-sufficient.

Engagement in global value chains varies widely across industries

The services content of UK manufacturing exports varies widely across industries within the United Kingdom, according to the granular and the OECD TiVA approaches. Servicification, the extent to which services are embodied in industries, intensified from 2005 to 2018 in a number of industries, in particular ‘Food’, ‘Other transport equipment’, and, to a lesser extent, ‘Non-metallic minerals’ and ‘Basic metals’. But there was little movement in many other industries, and even a reversal in some, such as ‘Textiles’ and ‘Computers and electronics’.

Descriptive analysis highlights that there is a positive link between the indirect content of UK exports and import content of UK exports, suggesting that domestic and imported intermediates are complements in UK exporting. However, this relationship is relatively weak and further tests are needed to assess its extent and causality.

At an aggregate level, no evidence is found that increasing imports for UK export production are correlated with a fall in wages. However, additional empirical analyses will be required to examine the strength and causality of this relationship.

Non-EU countries have become important markets for UK trade in goods over time. UK value added goods exports to non-EU markets grew at a much faster pace than to EU markets during the period 2005-18. Similarly, imports of intermediate goods and services from non-EU markets used in UK goods exports grew faster than imports from EU partners.

Key insights

- The analysis undertaken in this report suggests that TiVA indicators based on granular and consumer approaches are promising complementary sources of information to OECD TiVA indicators. Differences between the alternative approaches are generally small at an aggregate level. However significant differences exist in a few industries, warranting further investigation, for instance by extending the scope of the analysis to other countries, data permitting.
- It would be also useful to explore to what extent the introduction of firm heterogeneity can induce more difference in the various approaches as was found in the case of Finland (OECD and Statistics Finland, 2021). A pre-requisite for such an analysis would be the development of extended SUTs by the Office of National Statistics.

1. Introduction

The COVID-19 crisis has sparked a debate around the resilience of global supply chains and their associated risks and has underlined the need to better grasp how production is organised through domestic integration (i.e. suppliers are domestic firms) or international integration (i.e. the suppliers are abroad). Nowadays, the goods and services produced and exported by a country use inputs from many countries around the world, and these phenomena are not always well captured in conventional measures of international trade. The availability of estimates in Trade in Value Added (TiVA) terms has transformed our ability to understand the scale, complexity and the impact of global value chains (GVCs). Unlike conventional trade statistics, TiVA decomposes gross exports into domestic and foreign value-added content.

There are two alternative and complementary ways to derive TiVA indicators. The first one, which is the most common and has developed rapidly in the last decade, is to adopt an international perspective and construct Multi-Regional Input-Output (MRIO) tables. The second one is to examine integration in supply chains from a national perspective and to rely exclusively on information available at the country level. While the latter approach can bring a richer, country-specific dimension, and does not require adjustments to ensure global consistency, it cannot provide insights on trade interdependencies in an international setting.

This report presents TiVA indicators derived from a national perspective. The first objective is to assess whether better capturing sectoral heterogeneity can significantly alter the magnitude of TiVA estimates in the case of the United Kingdom. The accurate measurement of TiVA largely depends on the ability of a country's statistical infrastructure to produce Supply and Use Tables (SUTs) and bilateral trade statistics of sufficient quality. TiVA indicators are typically only available at a relatively aggregated industry-level, somewhere between 30 and 60 industries for a given country. Due to the way the underlying SUTs are constructed, TiVA cannot generally capture heterogeneity within sectors, stemming from the fact that industry groupings sometimes contain very different activities.

The second objective is to assess the feasibility of deriving TiVA measures for the United Kingdom from a consumer perspective. Standard measures of GVCs in TiVA are based on a 'producer perspective' and follow international National Accounts standards to allocate the value that is added at the end of the chain (such as marketing in distribution sectors) and the margins related to the transportation from the factory gate to the consumer. Ahmad (2019) estimates that these margins "*can be significant, ranging at around 10-15% across countries… with significant differences by product…*". Not taking account of the important role played by distributors in the value chain may distort the sectoral breakdown of key indicators of globalisation (such as the domestic and foreign value added of a country's exports) and revealed comparative advantage, as well as estimates of jobs supported by trade at the sectoral level.

The third objective is to improve the timeliness of TiVA estimates that are typically available with a long delay, as one of their key inputs, the Supply and Use Tables, are usually published with a few years lag. A simple method to nowcast TiVA indicators from a national perspective is presented here, using information provided in quarterly national accounts and prolonging trends.

Against this background, this report attempts to complement existing TiVA measures in three main ways:

- It provides a more granular description of supply chains, building on the fine-grained ONS SUTs data containing information for 105 industries/products for the period 2005 to 2018;
- It provides an alternative picture of supply chains by fully integrating the value created at the end of the production line by distribution sectors. SUTs and TiVA indicators are recomputed assuming a different treatment of distribution sectors and a reallocation of margins across industries;
- It produces a nowcast of TiVA indicators, derived from the granular approach for 2019, by exploiting information from quarterly and annual UK National Accounts.

The report is structured as follows. The next section summarises the different approaches to estimate TiVA indicators for the United Kingdom. Section 3 describes the key developments in UK supply chains over the period 2005-19. Section 4 concludes. A complete methodological description is available upon request.

2. Approaches to derive TiVA indicators

This section briefly describes the main approaches to construct more granular and timely TiVA indicators, along with indicators derived from a consumer perspective. It gives a summary of the methods and reviews their main advantages and limitations. More technical information, together with simple numerical examples, are available upon request.

Towards more granular data

Why is it useful to look at more granular data?

Using data at a high level of disaggregation can serve several purposes. Firstly, it can provide valuable insights on developments in specific industries. Secondly, it can help to understand which sectors are driving developments at the aggregate level. Finally, in terms of measurement, using fine-grained data can help to address the issue of heterogeneity within sectors that is often masked in aggregate measures, which group very different activities. Currently, the industry breakdown used in the computation of TiVA data groups firms whose production processes can vary widely. For example, the heading 'Food, beverages and tobacco' includes the industries of 'Preserved meat and meat products' and that of 'Soft drinks'. Each requires different inputs, capital goods and skills to produce and sell their goods in the market. Developing more granular data requires a number of assumptions in the computation. Ultimately, whether moving to more granular data increases reliability is an empirical question.

Firm heterogeneity can also alter GVC measures. Recent analysis on Finland explores how firms' characteristics can influence their engagements in GVCs, relying on microdata and on Finnish SUTs available at 88 industry and product levels (OECD and Statistics Finland, 2021). The recomputed foreign value added share of exports – a standard indicator of globalisation – points to a much higher dependency on GVCs in Finland than the OECD TiVA (2018 version) suggested, with a 10 percentage points difference between the two methodologies. Lack of data availability prevents similar analysis for the United Kingdom.

Main steps

The methodology behind the granular approach is essentially to reconstruct a SUT at a finer degree of aggregation (105 industry and product level) over the period 2005-2018. This requires estimating some information gaps and addressing inconsistencies between existing data. The procedure combines information from the most recent ONS SUTs, which are available on an annual basis until 2018, OECD data and the import matrix for 2015-17. In addition to filling in information gaps in specific years, the procedure also needs to reconcile differences in the degree of details between the various sources: for instance, the UK SUTs are broken down by 105 industries/products while the OECD matrix displays a 64 industries/products breakdown. The steps and assumptions required are available upon request. Box 2.1 provides a short description of SUTs and IOTs.

Box 2.1. Supply and Use Tables (SUTs) and Input-Output Tables (IOTs)

Supply and Use Tables

SUTs describe the whole economy by industry and by product. The tables show links between components of gross value added, industry inputs and outputs, and product supply and use. SUTs link sectors of the economy but also provide details of imports and exports of goods and services, final consumption, expenditure of government, household and non-profit institutions serving households and capital formation.

SUTs combine a Supply and a Use Table (Figure 2.1). They bring together the components of each of the three approaches to measuring GDP (the production, income and expenditure approaches). When balanced, SUTs show, by definition, a single estimate of GDP. Those can be expressed in either value or in volume terms.

Figure 2.1. Supply and Use Table

A – Supply table

Industries / Products	Industries				Imports	Total
	Agriculture, forestry, etc.	Mining and quarrying	...	Services		
Agriculture, forestry, etc. Ores and minerals, etc. ... Services	Output by product by industry				Imports by product	Total supply by product
Total	Total output by industry				Total imports	Total supply

B – Use table

Industries / Products	Industries				Final uses			Total
	Agriculture, forestry, etc.	Mining and quarrying	...	Services	Final consumption	Gross capital formation	Exports	
Agriculture, forestry, etc. Ores and minerals, etc. ... Services	Intermediate consumption by product and by industry				Final uses by product and by category			Total use by product
Value added	Value added by component and by industry							Value added
Total	Total output by industry				Total final uses by category			

Empty cells by definition

Source: https://unstats.un.org/unsd/nationalaccount/docs/SUT_IOT_HB_Final_Cover.pdf.

The Supply Table provides information on the output (by product) generated by domestic economic activities and imports (by product). The totals in the last column represent the total supply by products and the totals in the bottom row represent the total output by domestic economic activity and imports.

The Use Table shows the use of goods and services by type of product and by type of use. In addition, the table shows the components of gross value added by industry. While the totals by row represent the total uses by product, the totals by column represent the total output by economic activity, final consumption, gross fixed capital formation and exports.

Input Output Tables (IOT)

An Input-Output Table is essentially derived from the Use Table, where either the columns representing industries are replaced by products or where the rows representing the products are replaced by industries (Figure 2.2). The resulting intermediate consumption matrix is then squared, showing products in both rows and columns or industries in both. In both cases, the row totals match the column totals, resulting in a product-by-product matrix or industry-by-industry matrix.

The transformation of SUTs into IOTs requires various assumptions. To compute industry-by-industry IOTs, this report assumes that each product has its own specific sales structure, irrespective of the industry where it is produced (*fixed product sales structure assumption).*

Figure 2.2. Product by product Input-Output Table

Products / Products	Products				Final uses			Total
	Agriculture, forestry, etc.	Ores and minerals; etc.	...	Services	Final consumption	Gross capital formation	Exports	
Agriculture, forestry, etc. Ores and minerals; etc. ... Services	Intermediate consumption by product				Final uses by product and by category			Total use by product
Imports	Intermediate consumption of imported products				Final use of imported products			
Value added	Value added by component							Value added
Total	Total supply				Total final uses by category			

Empty cells by definition

Source: https://unstats.un.org/unsd/nationalaccount/docs/SUT_IOT_HB_Final_Cover.pdf.

IOTs are particularly suitable to estimate the effects of changing relative prices, labour and capital requirements in the face of changing output levels, or, for instance, the consequences of changing patterns of demand. They are the core structure that is used to derive TiVA indicators.

Source: https://unstats.un.org/unsd/nationalaccount/docs/SUT_IOT_HB_Final_Cover.pdf.

Caveats

The process of constructing a 'granular' SUT is data-intensive and relies extensively on very detailed industry breakdowns published by the ONS. As a consequence, the calculation can be extended only to a limited number of countries (e.g. the United States).

While the computation requires fewer assumptions and adjustments than is typically the case with the derivation of global IOTs, the resulting IOT will reflect by definition a national rather than a global perspective. This means that the analysis cannot capture trade inter-dependencies in an international setting, for example how dependent UK exporters and consumers are on intermediate and final products supplied by individual foreign countries/sectors for the production of UK exports and final demand. This differs from international accounting frameworks, such as OECD TiVA. As a result, not all GVC indicators available from OECD TiVA can be produced with the 'granular approach'. Instead, this report focuses on Domestic and Foreign Value Added indicators only. Definitions are provided in Box 2.2.

Box 2.2. TiVA indicators used in this report

This box describes the main indicators used in this report. Mathematical formulae are provided in Annex A.

Domestic value added content (or share) of gross exports by industry i to partner region p, represents the exported value added that has been generated anywhere in the domestic economy. This is an 'intensity measure' and reflects how much value added, generated anywhere in the domestic economy, is embodied in total gross exports by industry.

The domestic value added content of gross exports can be split further into:

- **Direct domestic industry value added content,** which measures the direct value added contribution made by industry i to the production of goods and services exported by industry i; and
- **Indirect domestic content,** which corresponds to the value added originating from other, upstream, domestic industries (different from industry i) that are incorporated in the exports of industry i.

Foreign value added content (or share) of gross exports captures the value of imported intermediate goods and services that are embodied in a domestic industry's exports. The value added can come from any foreign industry upstream in the production chain. This is an 'intensity measure', often referred to as 'import content of exports' and considered as a measure of 'backward linkages' in analyses of GVCs. It reflects how much value added, generated abroad, is embodied in total gross exports by industry.

Domestic services content (or share) of gross exports can be regarded as a sub-component of indirect domestic content of gross exports, but with intermediate inputs coming from upstream domestic services industries only. This indicator is often used to measure services content embodied in manufacturing exports, to capture the rising importance of services integration in manufacturing production and exports.

Domestic demand-induced output (1) and **export-induced output** (2) capture the demand for domestic products from domestic and foreign customers, respectively. **Import-induced output** (3) relates to products imported from other countries that are used for domestic production. The **self-sufficiency ratio,** (1)+(2)-(3), measures the extent to which domestic production can satisfy domestic demand.

Source: http://www.oecd.org/industry/ind/oecd-trade-in-value-added-indicators-2021-guide.pdf.

Towards a consumer perspective

Why is it useful to derive TiVA indicators from a consumer perspective?

Existing TiVA indicators capture the production cycle from the production to the 'factory gate' and do not properly measure transformation occurring at the end of the chain, from the factory gate to the final consumer. Indeed, IOTs are measured in basic ('factory gate') prices, as recommended in the System of National Accounts, providing insights from the producer's perspective. The value that is added by distribution sectors, in particular retail and wholesale, which often includes the value associated with

marketing activities and brands, is considered as final consumption and not intermediary services to other services. This is also the case for trade and transport margins applied on any given good from the factory gate to the consumer. Ahmad (2019) shows that those margins vary considerably across sectors and countries.

An alternative and complementary approach is to construct SUTs and IOTs using consumption prices. This report considers such an approach in the case of the United Kingdom, relying on the methodology set out by Ahmad (2019). Given the data availability, estimates presented in this report include only margins from the retail and the wholesale sectors.

The main advantage of this approach is to fully account for the role of distribution sectors in the production cycle; the influence of these sectors may be under-estimated in the production-based approach. Conceptually, the consumer-based approach essentially reallocates distribution margins across industries, with no change at the economy-wide level. In practice however, the different focus means that re-exports need to be treated differently: they are not included in the calculation of the production-based estimates, but are implicitly included in the consumer approach. For example, under the production approach, the value of storage services in the port of Rotterdam prior to re-exporting goods cannot be allocated to the Dutch consumers and therefore has to be netted out. By altering bilateral trade flows, this results in potential differences in the level of TiVA measures at the economy-wide level.

Main steps

Computing SUTs consistent with the consumer view does not require additional data, but rather utilising the information in SUTs differently. It changes the role of distributors in the accounting framework, which are now assumed to provide intermediate services to other sectors.

The first step is to increase the dimension of SUTs by increasing details on distribution (wholesale and retail) sectors which, in standard SUTs, are assumed to not provide any intermediary output to other sectors. In practice, this means adding columns and rows to explicitly introduce margins in the different sectors. This results in SUTs containing information on 630 industries-products, as compared to 105 using the basic prices approach.

The next step is to fill-in the missing cells, resulting from the first step. This is done by re-allocating sales and margins in the SUTs. The reallocation is only made for agriculture and manufacturing products for which margins are positive. In the Supply Table margins of the distribution sectors are allocated according to their share of total use at basic prices, as reported in existing SUTs. In the Use Table, total margins are distributed proportionally among all products, using the existing product share of distributors' intermediate consumption in gross output. Adjustments are made to ensure SUTs are balanced.

The final step involves re-calculating TiVA indicators using the standard formula (see Annex A for details). Because of the influence of re-exports, these indicators are compared with two different measures: the standard OECD TiVA measure, and an "adjusted" measure which includes re-exports in imports.

Caveats

While this approach provides a useful complement to existing TiVA indicators, the computation is not trivial, it requires a number of assumptions and poses compilation challenges, not least because it increases the dimensions of SUTs significantly. The approach is also less relevant for services sectors, which in National Accounts, do not have margins. As the framework is different, the relevance of standard TiVA indicators (e.g. the self-sufficiency ratio) needs to be checked carefully.

Towards more timely TiVA indicators

Why is it useful to derive more timely measures?

The COVID-19 crisis has underlined the importance of timely data to inform policymaking on supply-chain resilience. However, SUTs (the main building block for constructing TiVA and analysing GVCs), are usually published with a significant time lag reflecting data collection and compilation challenges faced by national statistical agencies. For example, UK SUTs at the end of 2021 contained estimates up to 2019 only. As a result, derived TiVA indicators lack timeliness.

In this context, recent efforts have concentrated on providing up-to-date estimates of those indicators, either by nowcasting the indicators themselves, or the IOTs or SUTs. For example, Haugh et al. (2016) derived a timely measure of structural GVCs by relating each country's import value of intermediate goods to the value of its final domestic demand, using data from the OECD STAN and the Economic Outlook Databases.

Alternatively, OECD (2017) put forward a method to nowcast IOTs. This required collecting and harmonising a large set of data, including National Accounts estimates and data on international trade prices.

Given the focus of this report on the United Kingdom, a simpler approach was preferred using solely national SUTs and ensuring their consistency with National Accounts. In order to derive more timely data, quarterly, rather than annual, National Accounts data were used.

Main steps

The computation is performed on the granular approach, which provides information for the 105 industries/products. For the years 2005-18, quarterly SUTs are derived using the structure of the corresponding annual SUTs with the addition of information on value added from ONS quarterly National Accounts data. As a last step, consistency between annual and re-computed quarterly SUTs is ensured by imposing restrictions on imports, distribution margins and net taxes on products.

Nowcasting is then performed for 2019 for which SUTs are not available using a recursive procedure. The last quarter for which quarterly SUTs have been recomputed (2018 Q4) is used as a starting point to get information on the structure of SUTs. Subsequently, information from quarterly National Accounts (in particular aggregate variables and value added by industries) and past evolutions of the value added to output ratios are used to refine the information in quarterly SUTs. Annual SUTs are computed by aggregating quarterly data.

Caveats

While quarterly National Accounts data provide timely information, they are also prone to revisions and volatility. As such, they may introduce some noise into the nowcasting exercise. In addition, although the approach is relatively simple and impose only limited restrictions, it assumes a relatively stable structure of the economy. While this assumption is acceptable in normal times, it is hard to justify in times of very large economic shocks, such as in 2020 when the pandemic and the resulting lockdowns closed down several activities and markedly altered production processes. Estimates in this report are thus presented up to 2019, both on an annual and quarterly basis.

3. Key developments in UK global value chains

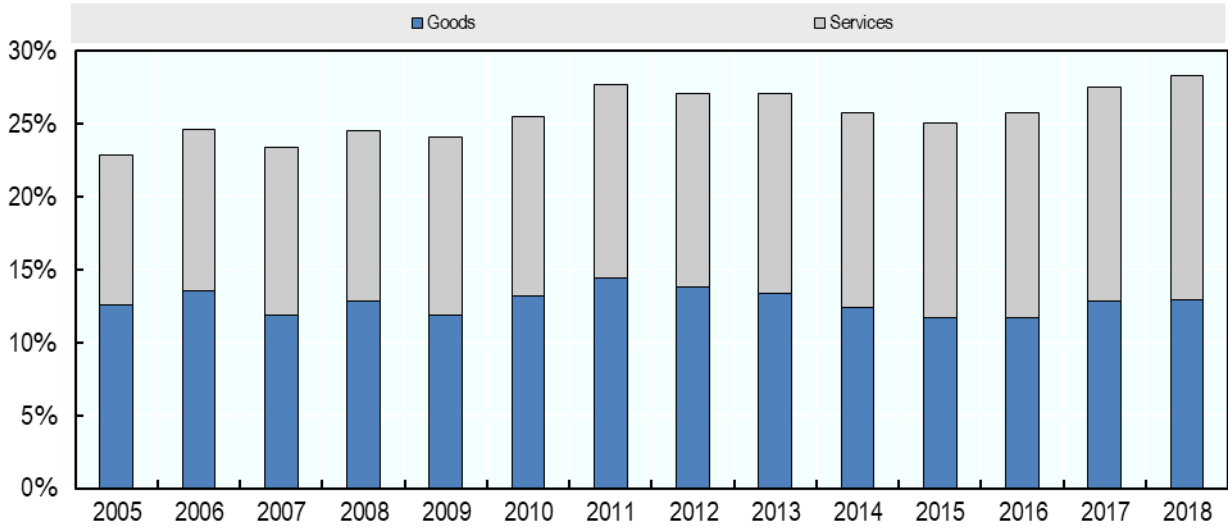
This section examines key developments in global value chains (GVCs) in the United Kingdom over the past decade, relying on the TiVA indicators derived from the granular, timely and consumer-based approaches presented in the previous section. It first examines UK engagement in GVCs before assessing the main changes in self-sufficiency to meet UK (domestic) demand since 2005. It also presents insights on the link between globalisation and performance, touching upon issues such as servicification and discussing the main shifts in the sectoral composition of exports and changes in the direction of trade. Finally, it presents nowcast estimates for 2019 and assesses the accuracy of this nowcast.

A comparison of different approaches to measure UK engagement in global value chains

The share of services exports in gross value added has gradually increased in the years prior to the COVID-19 crisis

The United Kingdom is a services-based economy, with the share of gross services exports in gross value added (GVA) increasing gradually over time from 13.3% in 2005 to 15.3% in 2018 (Figure 3.1). Exports of goods represented 13.0% of GVA in 2018, of which manufacturing exports accounted for 8.4% of GVA. Exports of motor vehicles represented 2.1% of GVA.

Figure 3.1. UK exports as a share of gross value added



Source: ONS SUTs.

Alternative TiVA measures point to broadly stable foreign content of exports, with a slight increase in the most recent period

Conventional trade statistics are not well equipped to measure trade accurately and comprehensively. Indeed, they measure the value of 'gross' trade flows (the factory-gate value of a good or service traded) rather than the flows of value added created by the countries exporting the goods or services. With goods and services undergoing transformations in many different countries, and crossing borders several times, differences between 'gross trade' and 'trade in value added' can be substantial.

TiVA addresses the limitations of traditional trade data by considering the value added by each country in the production of goods and services that are consumed worldwide. Unlike conventional trade statistics, TiVA decomposes gross exports into domestic and foreign value-added content. The latter is also known as the import content of exports and measures the degree of a country's participation in GVCs as a buyer of inputs ('backward linkages') i.e. how dependent exporters in one country are on inputs imported from other countries for the production of their exports. Another measure often used in the literature is the domestic value-added content as a share of value added, defined in this report as 'export intensity'. Box 2.2 provides the definitions of the main TiVA indicators and Annex A includes the corresponding mathematic formulae.

This report first re-computes TiVA indicators using granular SUTs published by the ONS at the 105 industry and product level for 2005-18 (labelled 'granular approach' in the remaining of the report). Second, the report re-computes TiVA indicators from the consumer side ('consumer approach') by fully integrating distribution sectors into the framework.

Granular approach

At the economy-wide level, the foreign value-added content of exports has been broadly constant in the United Kingdom, ranging from 18% to 20% of exports since 2005, according to the granular measure (Figure 3.2, Panel A). In other words, UK exporters' reliance on foreign inputs has remained broadly unchanged over the last decade or so. Export intensity displays a similar pattern, although a more pronounced increase is visible since 2016 (Figure 3.2, Panel B). The indicator reached 23% in 2018, its highest level in 13 years, reflecting a faster increase in domestic value added relative to gross value added.

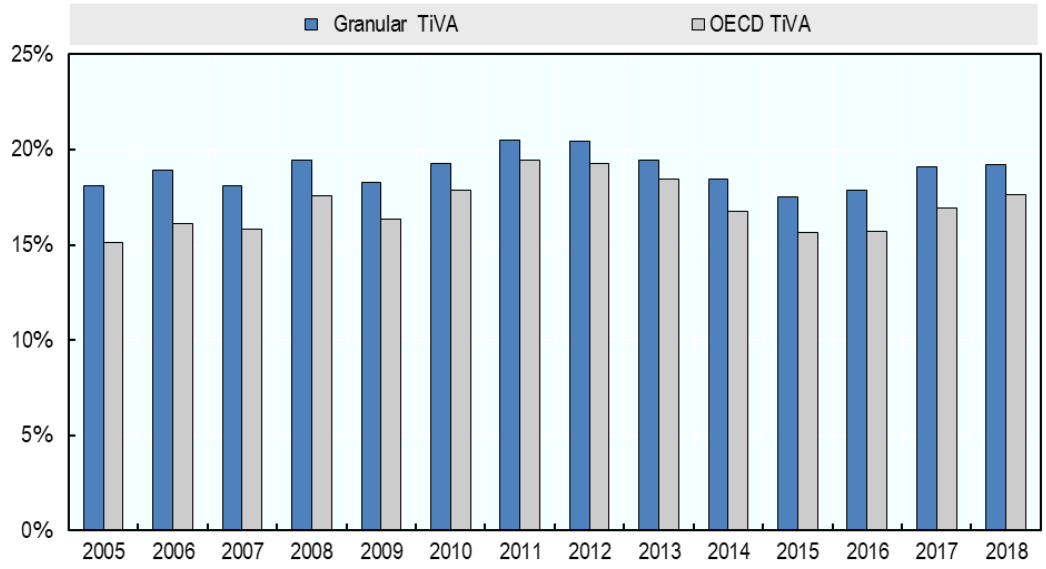
Granular estimates suggest that UK exporters' dependence on foreign inputs is slightly higher than suggested by OECD TiVA. The difference between the granular and the OECD TiVA measures of import content of exports is generally small, amounting to a maximum of 3 percentage points and an average of 2 percentage points from 2005 to 2018.

UK export intensity is also slightly higher than suggested by OECD TiVA. The difference in the estimate of export intensity between the granular and OECD TiVA is very small, amounting to 1 percentage point on average during the period 2005 to 2018 (Figure 3.2, Panel B).

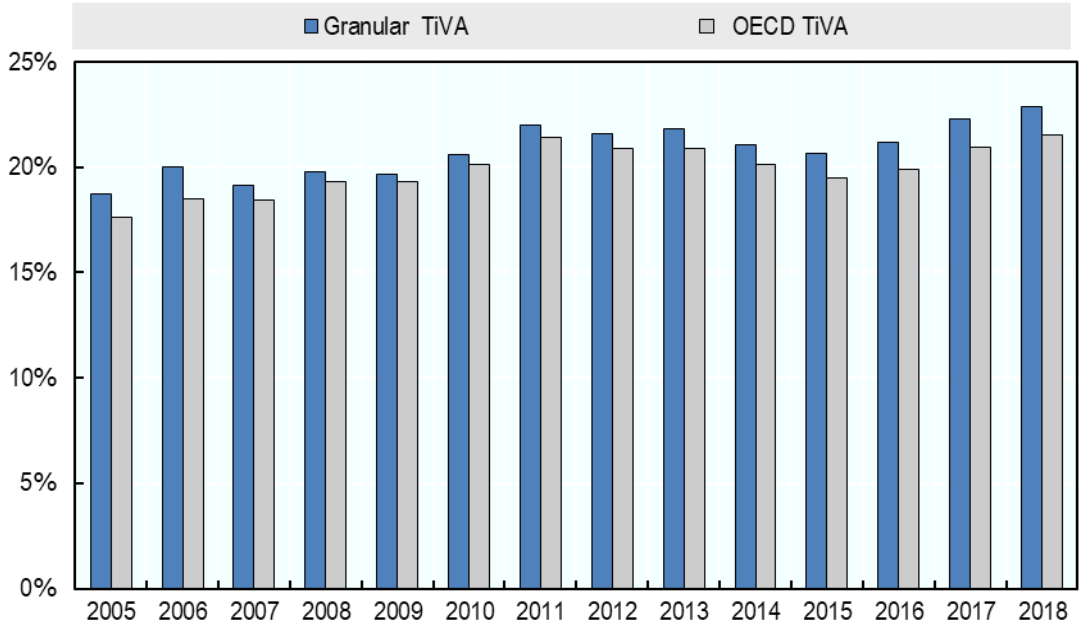
At first glance, it does not seem intuitive that both foreign value-added content share of exports and export intensity are higher in the granular approach than in OECD TiVA. This is due to methodological differences, including the imposition of constraints to balance bilateral trade in the OECD TiVA approach and a different treatment of tax net of subsidies. Another important factor is the treatment of double-counting in gross exports. A double counting element is included in the OECD TiVA data to correct from cases where value added crosses the same border several times, while there is no correction in the granular approach.

Figure 3.2. Comparison between granular TiVA and OECD TiVA, United Kingdom

Panel A - Foreign value-added share of UK gross exports



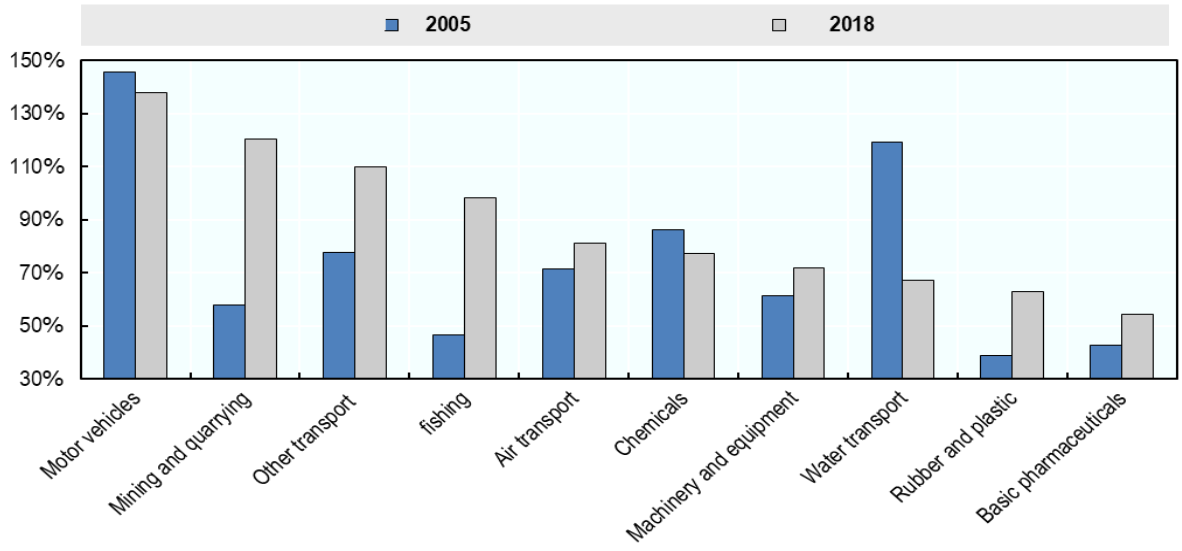
Panel B - Export intensity



Note: Export intensity is the domestic value added of UK gross exports to GVA ratio in the United Kingdom.
Source: Authors' estimates based on detailed ONS SUTs and OECD TiVA.

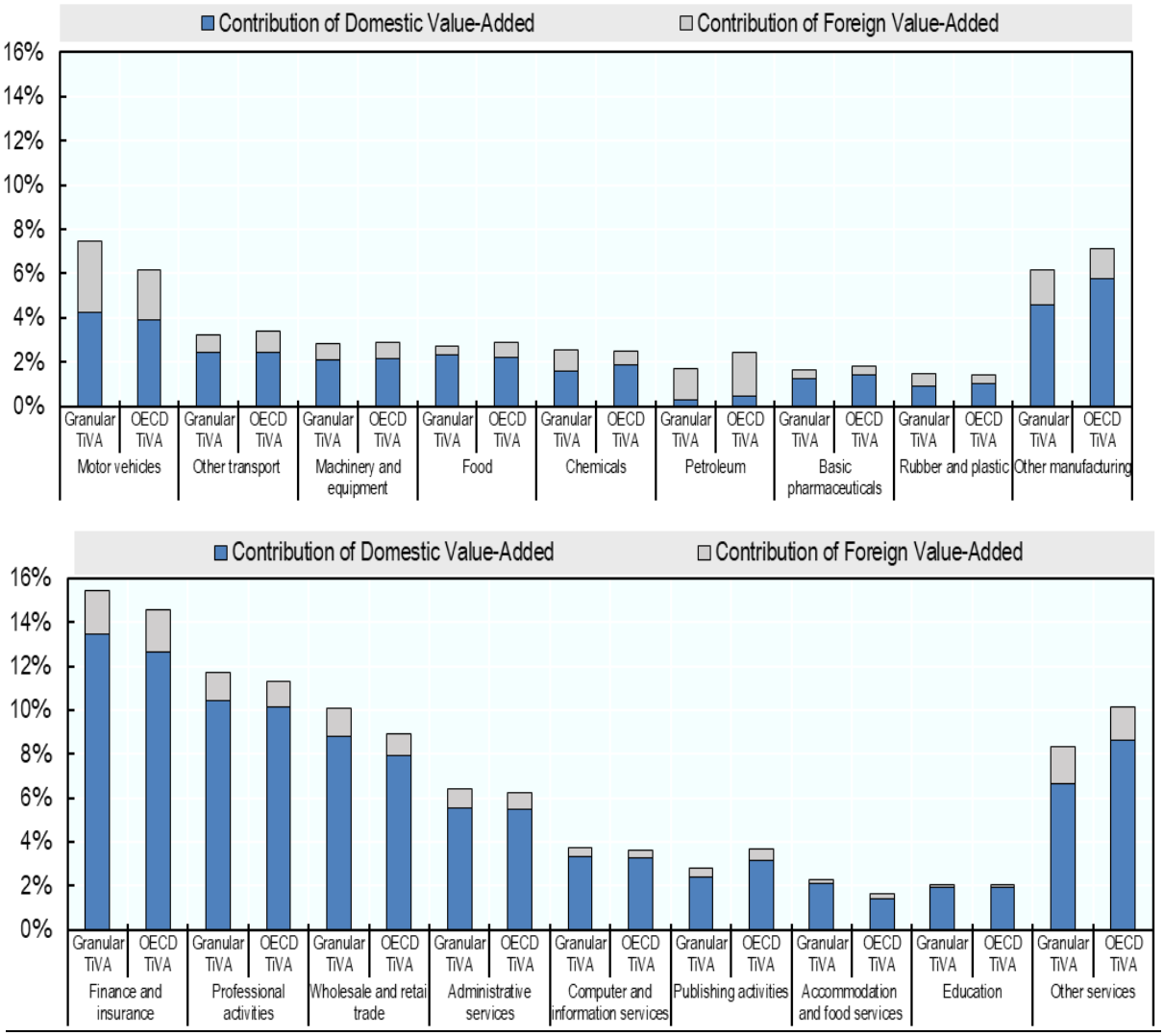
Looking at more disaggregated data by sectors, export intensity varies widely across sectors in the granular approach (Figure 3.3). However, estimates of foreign and domestic value-added contributions of exports are very similar in the granular and the OECD TiVA approaches (Figure 3.4). The largest differences are for 'Petroleum' and other manufacturing industries that are not amongst the eight largest manufacturing industries, but are relatively small. Differences for services industries are also marginal, with the exception of 'Other services' which group very heterogeneous activities.

Figure 3.3. Export intensity in the eight largest manufacturing industries using the granular approach



Source: ONS SUTs.

Figure 3.4. Contributions of domestic and foreign value added to UK exports, by industry, 2018



Note: Other manufacturing means manufacturing industries excluding the eight largest manufacturing industries.
Source: Authors' estimates based on detailed ONS SUTs and OECD TiVA.

Consumer-based approach

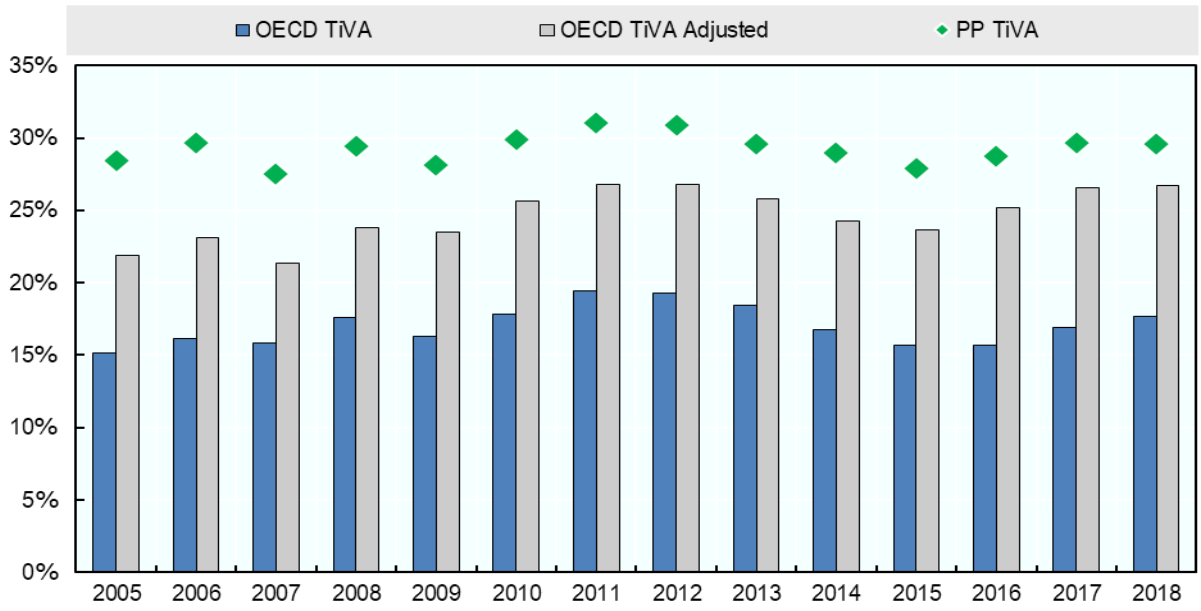
Computing the foreign value-added content of exports using purchaser prices (PP) to capture a consumer point of view also leads to profiles that are very similar to the OECD TiVA. Estimates of export intensity are similar in the two approaches, with only negligible differences over time. By contrast, the difference in levels between the OECD TiVA estimates and the consumer approach is much larger, amounting to 10 percentage points on average from 2005 to 2018 (Figure 3.5). This gap is relatively constant over time and reflects fundamental differences in the two methodologies: to be consistent with the producer perspective, re-exports are not included in the OECD TiVA estimates, but are endogenised in the consumer approach.

To examine the impact of re-exports, estimates from the consumer approach are also compared to an "adjusted" OECD TiVA indicator, which includes re-exported imports. Correcting for re-exports markedly

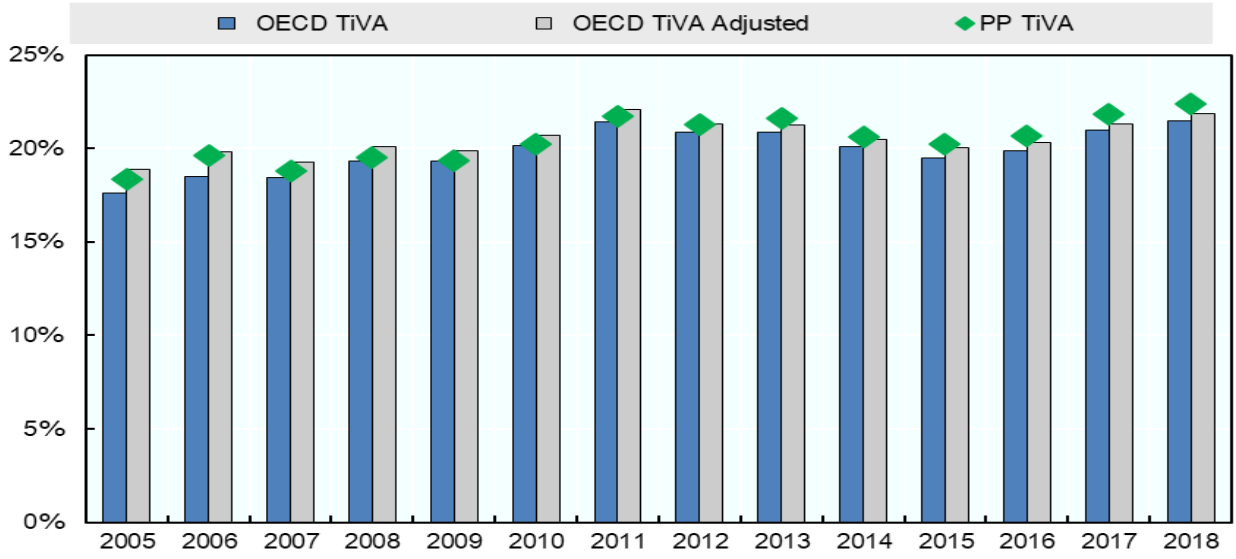
lowers the difference between consumer based and OECD TiVA measures. It should be noted that this correction is partial, as the Leontief matrix used to derive TiVA indicators was not adjusted for re-exports.

Figure 3.5. Comparison among OECD TiVA, OECD TiVA adjusted for re-export and consumer approach, United Kingdom

Panel A - Foreign value-added share of UK gross exports



Panel B - Export intensity



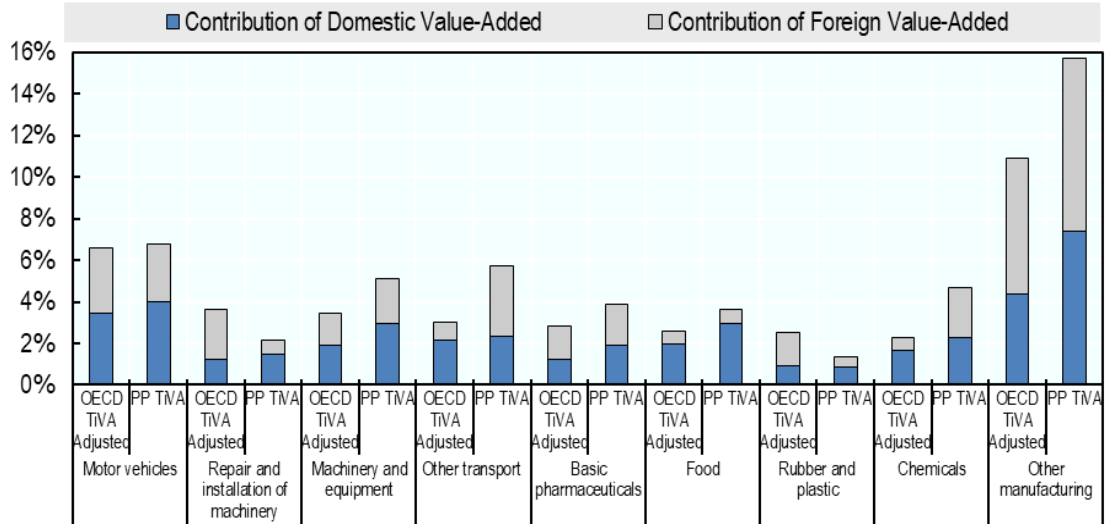
Note: PP TiVA means purchaser prices and is derived from the consumer approach. OECD TiVA Adjusted includes re-exported imports.
Source: Authors' estimates based on detailed ONS SUTs and OECD TiVA.

At the sectoral level, differences between the consumer approach and the OECD TiVA indicators are relatively large, but stem essentially from the different treatment of re-exports in the two methodologies

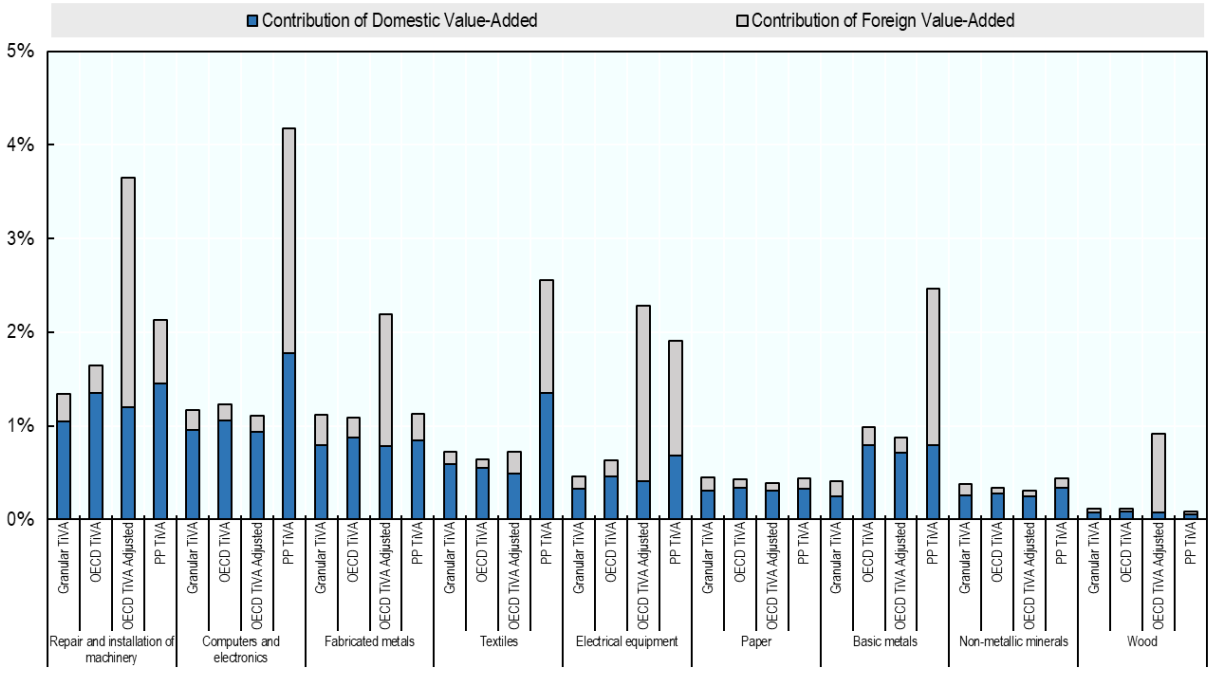
(Figure 3.6, Panel A). Correcting for re-exports, sizeable differences continue to be visible for 'Other manufacturing' (i.e. manufacturing industries excluding the 8 largest manufacturing industries), reflecting large discrepancies in 'Computers and electronics', 'Textiles' and 'Basic metals' (Figure 3.6, Panel B).

Figure 3.6. Contributions of domestic and foreign value added to UK exports, by industry, 2018

Panel A – OECD TiVA Adjusted and consumer approaches



Panel B – Several measures, Breakdown of 'Other manufacturing'



Note: PP TiVA means purchaser prices and is derived from the consumer approach. The consumer approach is not relevant for services. 'Other manufacturing' includes all the manufacturing industries than are not amongst the eight largest ones.
Source: Authors' estimates based on detailed SUTs and OECD TiVA.

UK sector 'self-sufficiency'

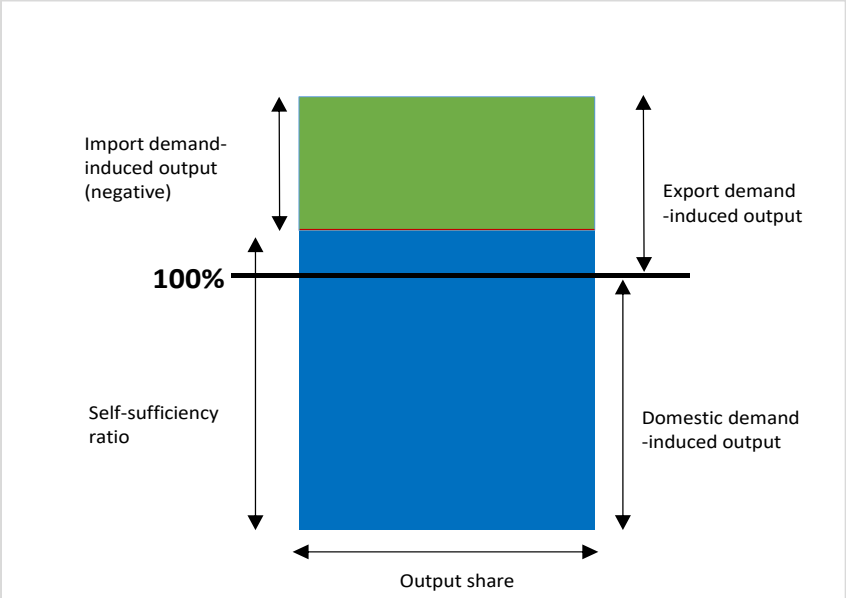
Recent supply-chain disruptions have put the question of dependency on foreign products and self-sufficiency at the centre of the debate. This section presents data from the granular approach to provide insights into the extent of UK sectors' 'self-sufficiency' i.e. the extent to which they can meet demand by domestic production or require imports from abroad. The methodology to construct these charts was initially developed by WTO (2011) and more recently presented in ADB (2021). Box 3.1 provides information on how to read these charts. For readability reasons, the analysis is presented at a more aggregated level than the 105 industry/product level used for the computation of granular TiVA. More detailed information by sector is available upon request.

Box 3.1. How to read a skyline chart?

Skyline charts depict self-sufficiency ratios, by sector, ranked according to their share in output (Figure 3.7). Each rectangle represents a sector, whose width is proportional to its share in output. The height represents output induced by domestic or foreign (export) demand, as a share of domestic demand. The green area corresponds to the reduction in output due to imports (this is a negative term).

The output induced by domestic demand is normalised to 100%. The area above 100% corresponds to the output induced by export demand. The red line represents the sector's self-sufficiency ratio and measures the extent to which domestic production can satisfy domestic demand. It is computed as the sum of domestic demand-induced output (1) and export-induced output (2) minus import-induced output. If the blue area below this line is above 100%, the sector it represents is self-sufficient, i.e. its own output is sufficient to meet domestic demand. If it is below 100%, domestic production needs to be complemented by imports to satisfy domestic demand.

Figure 3.7. Elements of a skyline chart

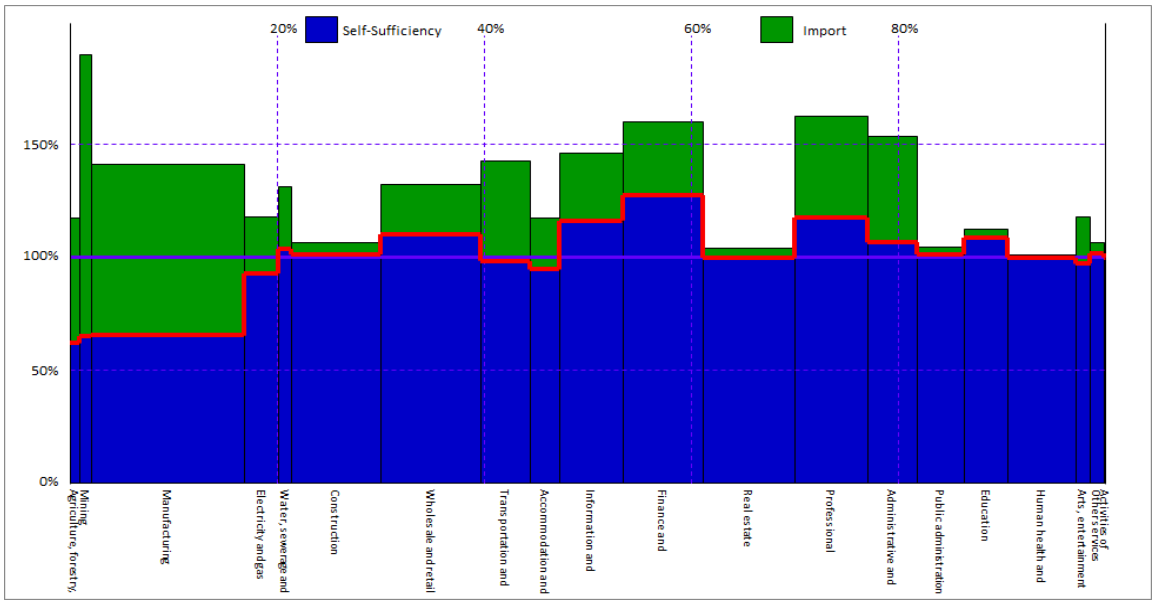


Source: ADB (2021).

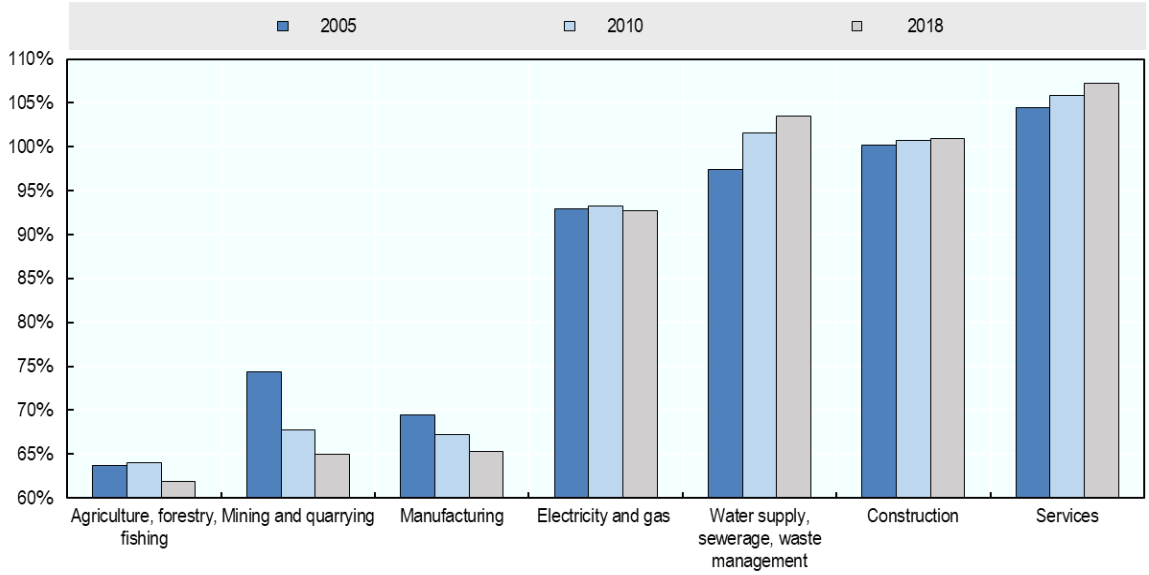
UK manufacturing is more dependent on imports to meet UK demand than services (Figure 3.8, Panel A). This trend has increased since 2005, as indicated by the falling self-sufficiency ratio in manufacturing and the rising ratio in services (Figure 3.8, Panel B). However, these changes are relatively small. More pronounced changes are observed in sectors such as 'Mining and quarrying' (where the self-sufficiency ratio declined since 2005) and 'Water supply, sewage and waste management' (where the self-sufficiency ratio increased).

Figure 3.8. Self-sufficiency of UK industries, 2018

Panel A – Granular approach



Panel B – Evolution of the self-sufficiency ratio over time

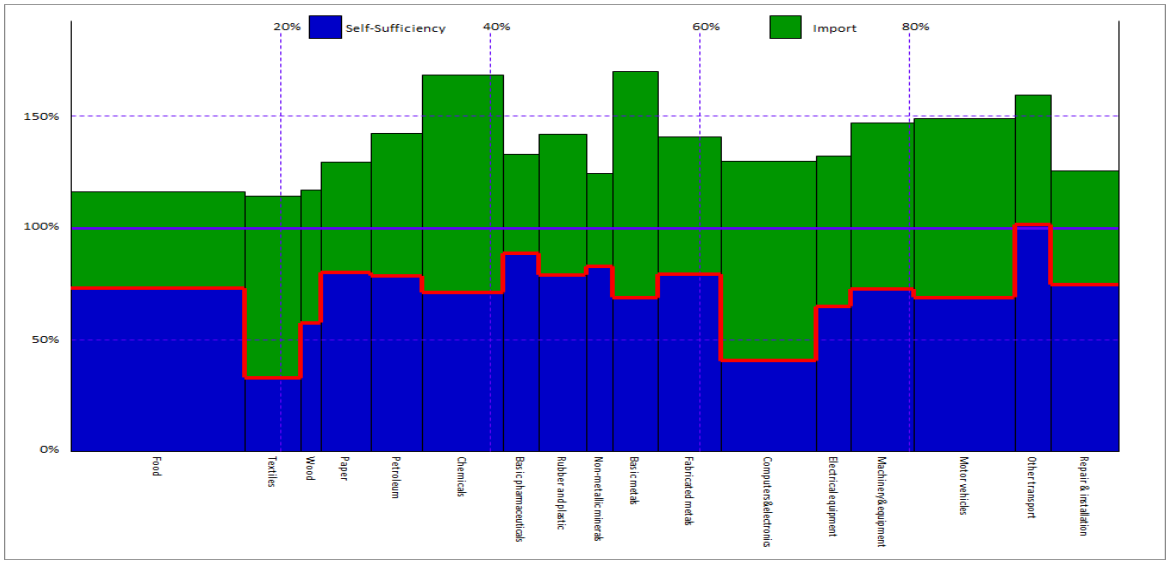


Note: see Box 3.1 for information on how to read the skyline chart. The red line depicts the self-sufficiency ratios. Industries have been aggregated into 20 categories so that the chart can be readable. More disaggregated information is available upon request.
Source: Authors' estimates based on detailed ONS SUTs.

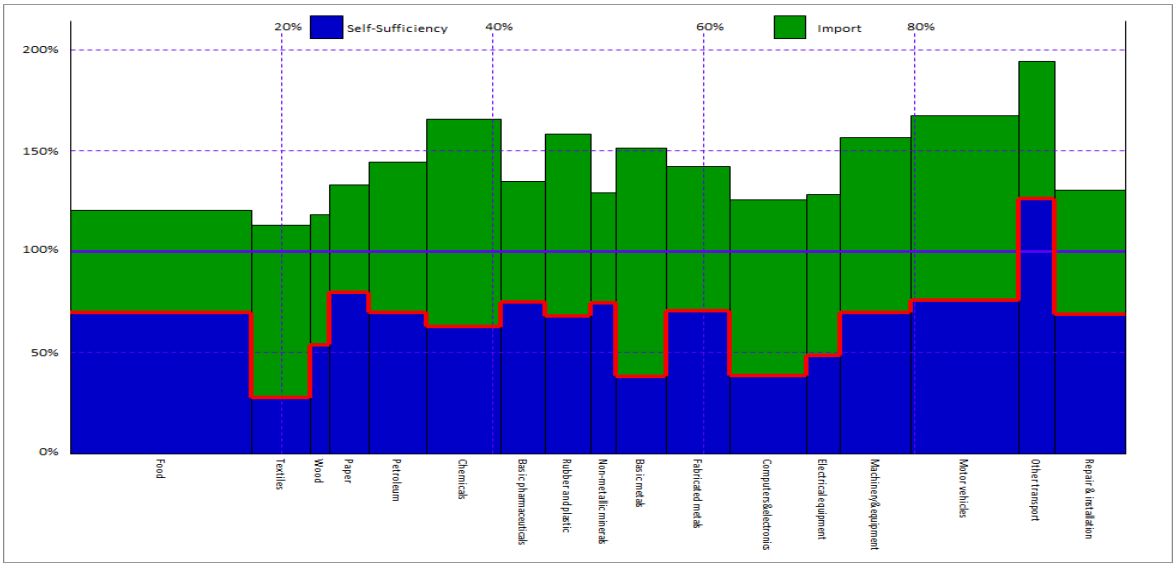
Overall, the pattern of self-sufficiency amongst manufacturing industries has not changed markedly since 2005 (Figure 3.9). None of the industries are self-sufficient, with the exception of 'Other transport' (led by 'Air and spacecraft') whose self-sufficiency even increased over the period 2005-18. In most other manufacturing industries, the self-sufficiency ratio amounts to 60-80%. The manufacturing industries that rely most on foreign suppliers (imports) to satisfy demand in the United Kingdom include 'Basic metals' and 'Computer and electronics'. 'Basic metals' and 'Electrical equipment' experienced a decline in self-sufficiency from 2005 to 2018 (Figure 3.10).

Figure 3.9. Self-sufficiency in UK manufacturing sectors

Panel A – 2005



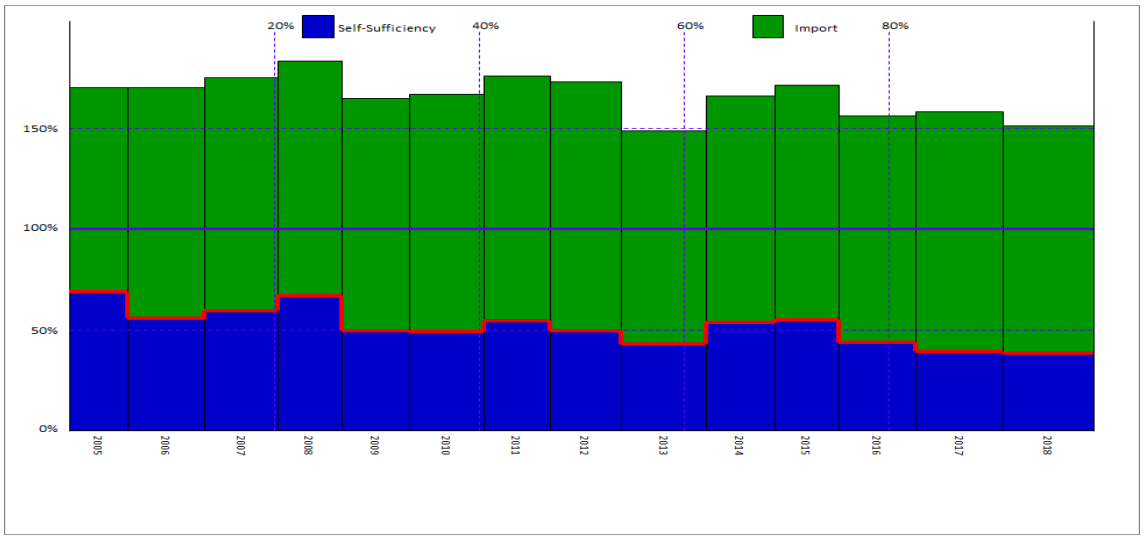
Panel B – 2018



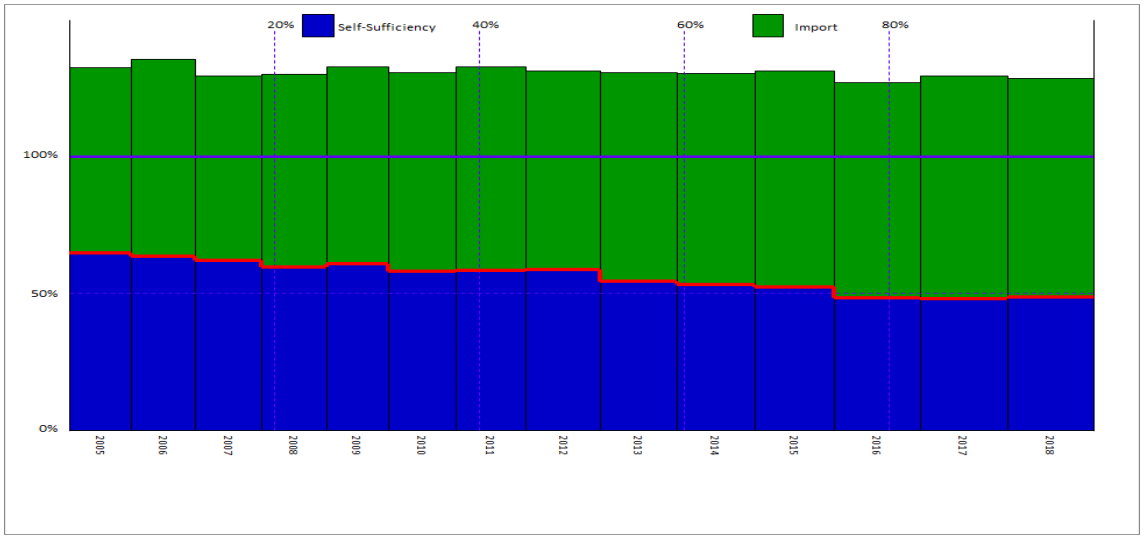
Note: see Box 3.1 for information on how to read the skyline chart. The red line depicts the self-sufficiency ratios. Industries have been aggregated into 20 categories so that the chart can be readable. More disaggregated information is available upon request.
Source: Authors' estimates based on detailed ONS SUTs.

Figure 3.10. Self-sufficiency in selected UK manufacturing industries over time

Panel A – Basic metals



Panel B – Electrical equipment



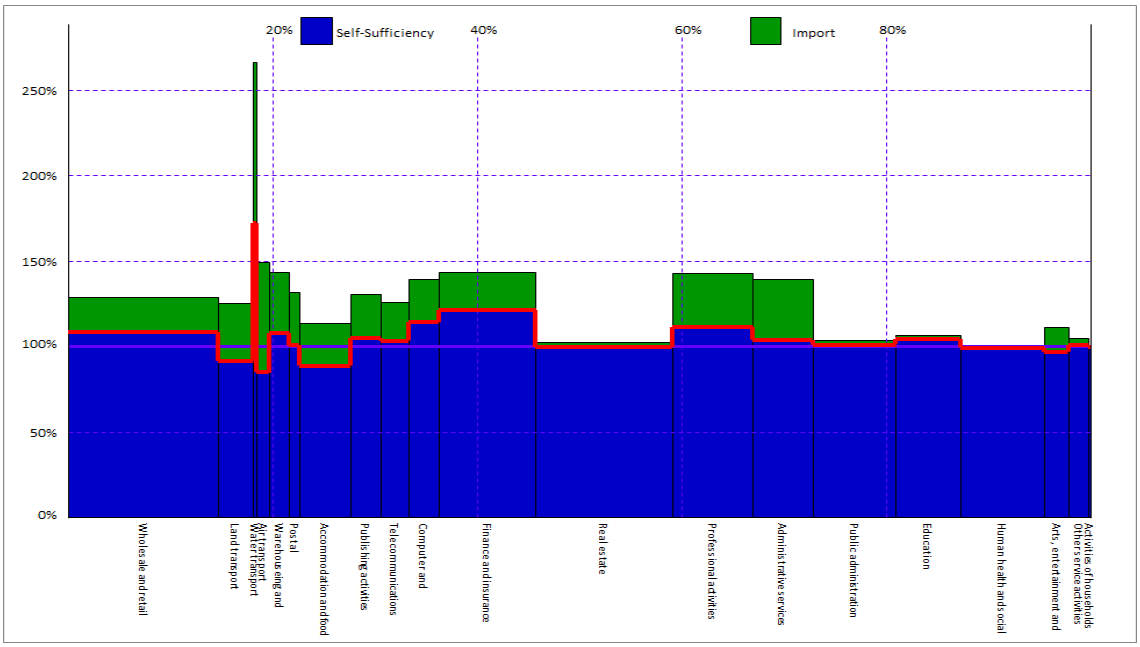
Note: see Box 3.1 for information on how to read the skyline chart. The red line depicts the self-sufficiency ratios. Industries have been aggregated into 20 categories so that the chart can be readable. More disaggregated information is available upon request.
Source: Authors' estimates based on detailed ONS SUTs.

Turning to services, most sectors are self-sufficient, with ratios above 100% (Figure 3.11). 'Water transport', 'Computer and information services' and 'Finance and insurance' are characterised by very high self-sufficiency ratios. By contrast, 'Land transport', 'Air transport' and 'Accommodation and food' had ratios below 100%.

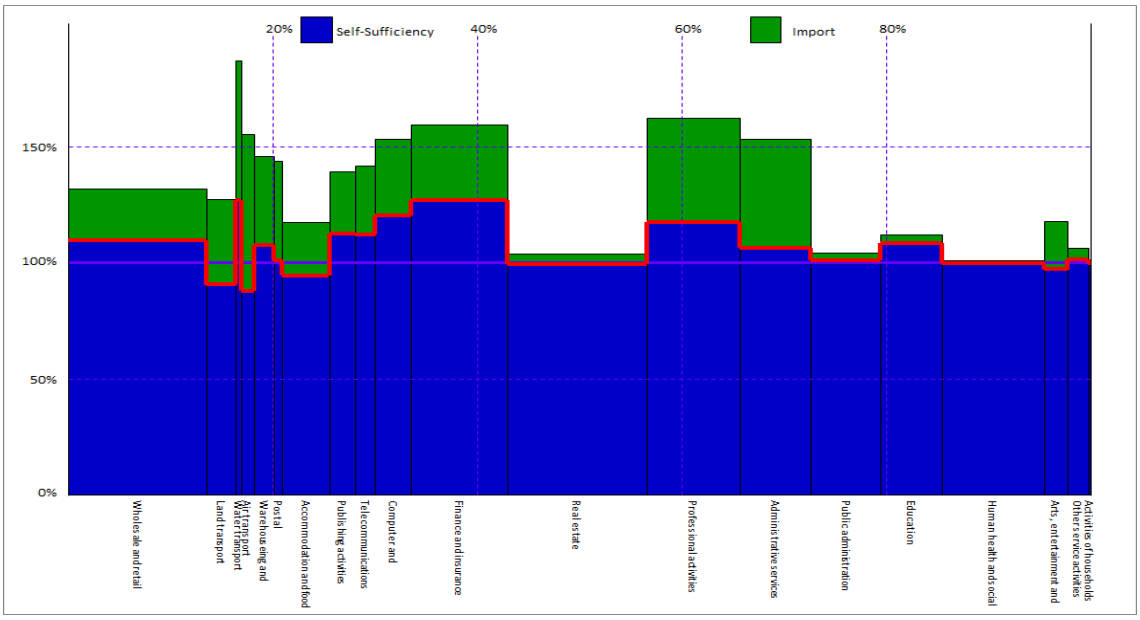
Overall, within services, no significant changes can be observed from 2005 to 2018. Two notable exceptions include 'Telecommunications' which has become more self-sufficient over time, and 'Water transport' which has followed an opposite trend. (Figure 3.12).

Figure 3.11. Self-sufficiency in UK services industries

Panel A – 2005



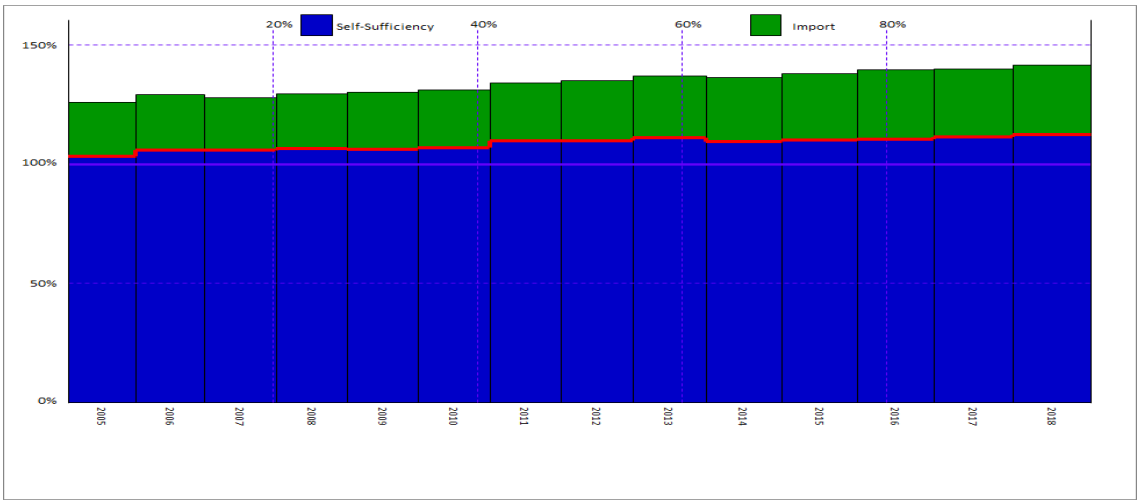
Panel B – 2018



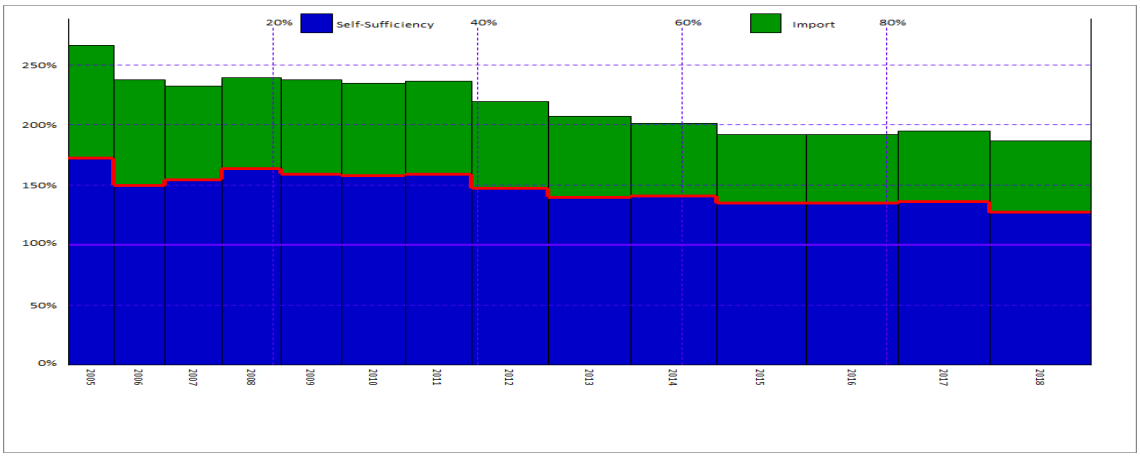
Note: see Box 3.1 for information on how to read the skyline chart. The red line depicts the self-sufficiency ratios. Industries have been aggregated into 20 categories so that the chart can be readable. More disaggregated information is available upon request.
Source: Authors' estimates based on detailed SUTs.

Figure 3.12. Self-sufficiency in selected UK services industries

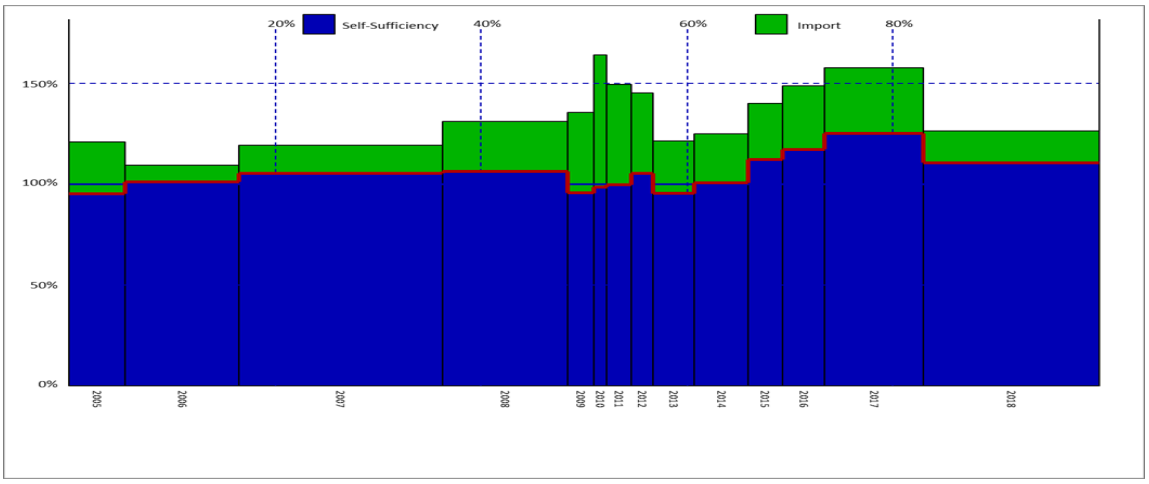
Panel A – Telecommunications



Panel B – Water transport



Panel C – Utility (Electricity + Water supply)



Note: the red line depicts the self-sufficiency ratios.
Source: Authors' estimates based on detailed ONS SUTs.

Insights on link between globalisation and trade performance

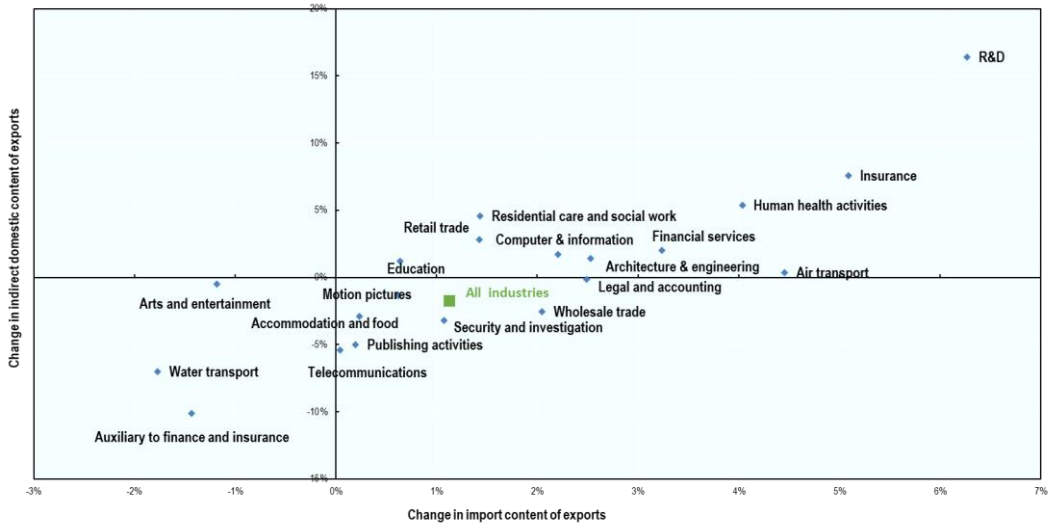
The descriptive analysis presented in this section provides some first insights on possible links between globalisation and macro-economic performance. Further analysis, in particular stripping out the effects of other potential drivers of performance, will be required to assess the strength of the links and infer any causal relation.

Are domestic and foreign intermediates complements or substitutes?

Concerns have risen in recent years that increased competition from other countries may have hampered the use of UK intermediates in exports. There is no clear pattern across sectors in changes over the period 2005-18 in the indirect domestic content of exports, i.e. the value added originating from upstream UK industries that is incorporated in the exports of a UK exporting industry. This indicator has increased considerably since 2005 in some sectors, such as R&D, but fell in others, notably 'Telecommunications' and 'Water transport' (Figure 3.13). Over the same period, the foreign value-added content of exports (i.e. the value of imported inputs embodied in exports) increased in most sectors.

If anything, evidence suggests that UK and foreign intermediate inputs are complements, as there seems to be a positive, albeit weak, relationship between the two measures. However, the relationship appears to be driven by a handful of sectors (in particular R&D) and further tests will be required to assess the extent and causality of this potential relationship.

Figure 3.13. Change in the indirect domestic content of exports and import content of exports in the United Kingdom, 2005-2018



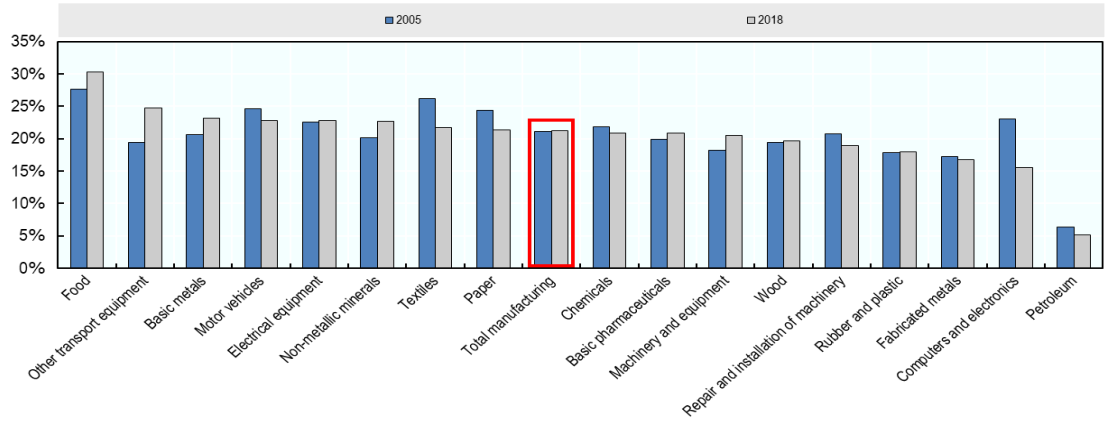
Source: Authors' estimates based on detailed SUTs.

What has been the extent of servicification?

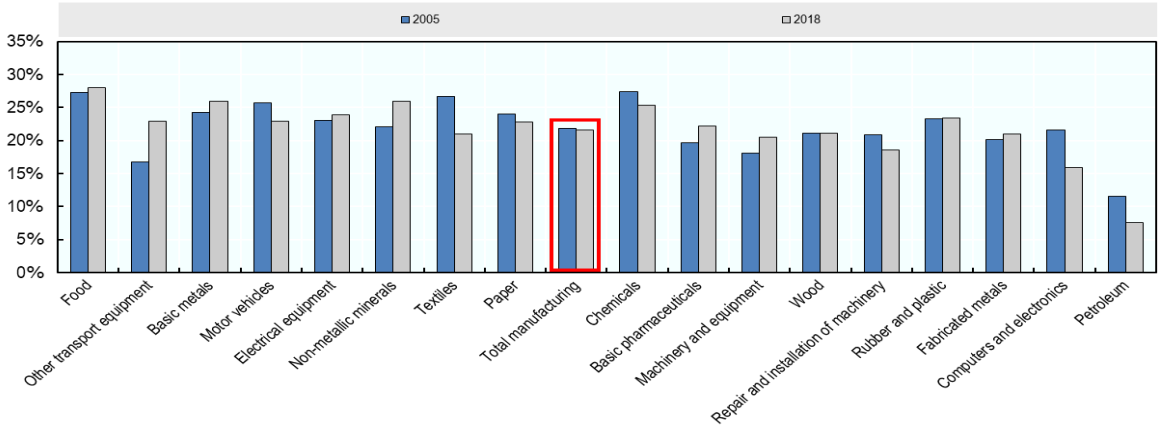
There is now a wide recognition that manufacturing and services are closely linked. Nowadays, many manufacturing exports contain value added created in the services sector, and this trend is reshaping the global merchandise trade network. Previous OECD analysis shows that this phenomenon, known as servicification, is broad-based but its extent varies across countries and sectors (Miroudot and Cadestin, 2017).

Figure 3.14. Services embodied in UK manufacturing exports

Panel A – Granular approach, 2005 and 2018



Panel B – OECD TiVA, 2005 and 2018



Source: Authors' estimates based on detailed ONS SUTs and OECD TiVA.

The analysis undertaken in this report is based on very granular data and allows to cast further light on the issue. It suggests that the services content of manufacturing exports varies widely across UK industries (Figure 3.14, Panel A).

The highest content is found in the 'Food' and 'Other transport equipment' industries, and the lowest in the 'Petroleum' industry where services value added accounts for less than 5% of the industry's exports. In most manufacturing industries, services embodied in manufacturing exports amount to 15-30%.

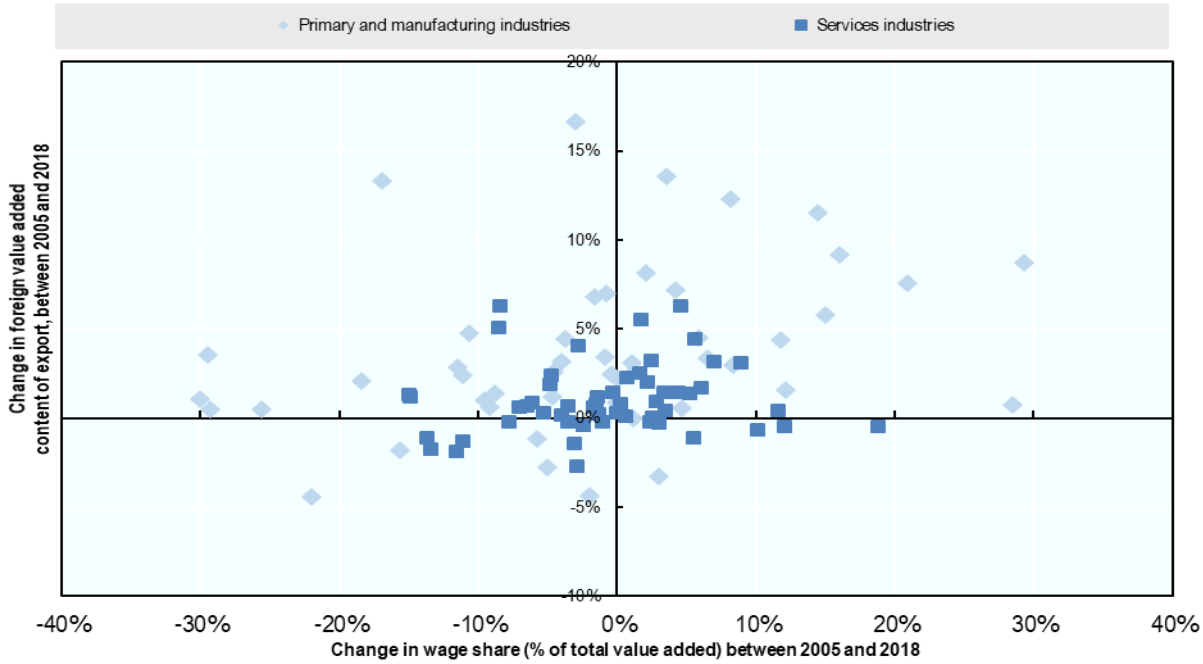
Servicification intensified from 2005 to 2018 in a number of industries, in particular 'Food', 'Other transport' and to a lesser extent 'Non-metallic minerals' and 'Basic metals'. But there has been little movement in many industries, and even a reversal in some, such as 'Textiles' and 'Computer and electronics'.

Differences with OECD TiVA measures are very small, close to zero on average in manufacturing industries (Figure 3.13, Panel B). The largest gaps can be observed for 'Rubber and plastics' and 'Chemicals' but their magnitude remains limited, below 6 percentage points.

Has the increasing share of foreign content been accompanied by a fall in wages?

Over the years, concerns have risen that outsourcing and an increased reliance on imported inputs for export production have enhanced competition and put downward pressure on domestic wages. Data from the granular TiVA measures do not support this view for the United Kingdom (Figure 3.15).

Figure 3.15. Correlation between changes in wages and changes in foreign value-added



Source: Authors' estimates based on detailed SUTs.

Compensation of employees as a share of total value-added, a standard measure of the wage share, remained stable between 2005 and 2018, at about 55%. However, this masks considerable variation at more detailed industry level. On average, the wage share was highest for manufacturing: about two-thirds of manufacturing valued-added was attributed to wages in 2005, and this share slowly declined in the past decade to 62% in 2018. In some manufacturing industries, such as 'Motor vehicles, Textiles, Printing and recorded media', the wage share declined by over 10% from 2005 to 2018. The Petroleum industry also experienced a significant decline in the wage share, but this is likely to be driven by fluctuations in petroleum prices. In the services sector, the sharpest decreases were observed in 'Postal and courier', and 'Travel agency and tour operator services'.

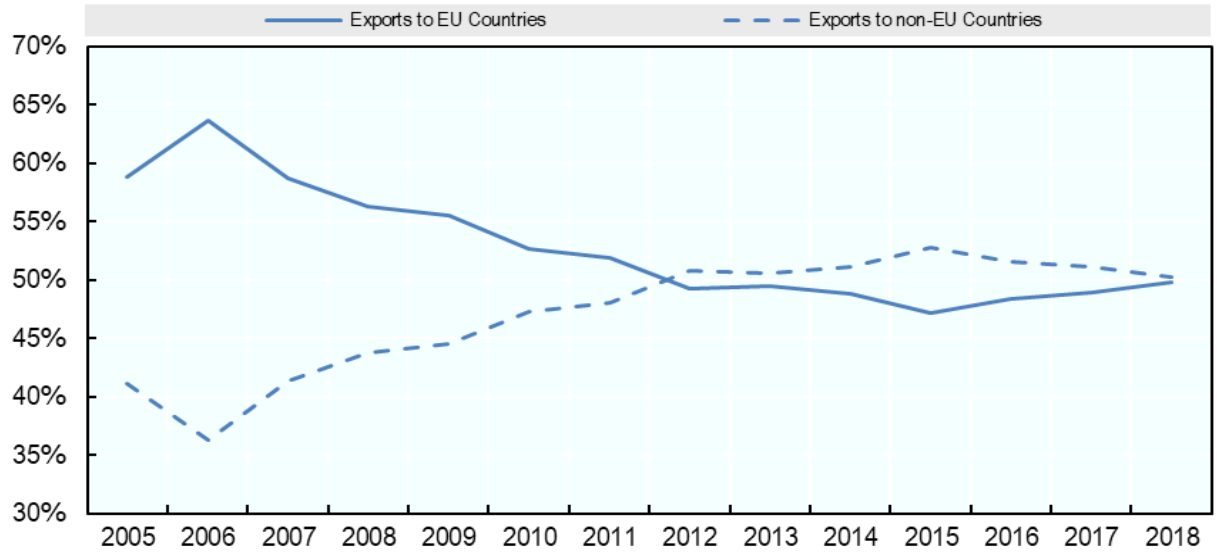
Very few of these industries saw increases in the foreign value-added content of their exports over 2005-18. If anything, the correlation between changes in the foreign value-added content of exports and changes in the wage share is close to zero (Figure 3.15), suggesting a negligible impact of rising imports on UK wages. These preliminary results will need to be confirmed by further empirical tests.

UK goods exports to the European Union and Non-EU countries

Using the granular SUT data, this section examines recent trends in UK exports of goods to the European Union (EU) and Non-EU countries, starting with a description of trends in gross exports before examining trends in its components (domestic and foreign value added). The analysis is restricted to goods only since a regional breakdown is not available for services trade in UK SUTs.

The United Kingdom is a very open economy, whose main trading partners are EU countries and the United States (ONS, 2021). Shifts in the destination of UK gross exports of goods have been visible over the years (Figure 3.16), with the share of UK exports of goods to EU countries declining steadily up until 2016, when it stabilised to around 50%. The mirror image is a gradual increase in the share of goods exported to Non-EU countries.

Figure 3.16. Share of UK gross exports of goods to EU and Non-EU, 2005-2018



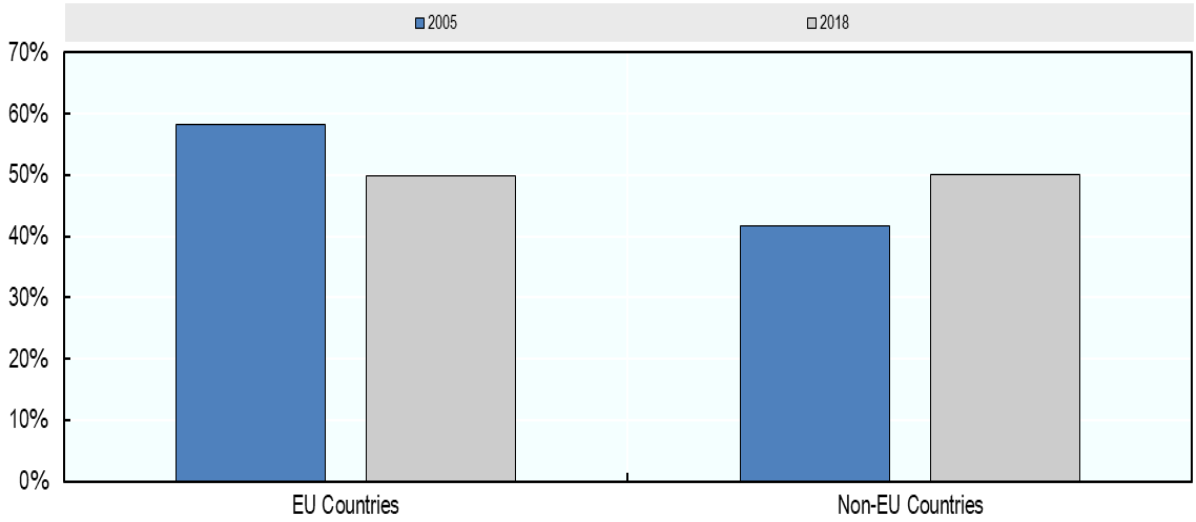
Source: Authors' estimates based on detailed ONS SUTs.

Over the 2005-18 period as a whole, the European Union has been a more important source of inputs for UK exporters of goods and a larger recipient of UK value added goods exports, compared to Non-EU countries. However, the importance of the latter group as an export market for the United Kingdom has increased over time. UK value added goods exports to Non-EU markets grew by 5% on average per year between 2005-2018, much faster than exports to EU markets (2%). 'Motor vehicles', 'Crude petroleum & gas', 'Air and spacecraft', Machinery and equipment' and 'Basic pharmaceuticals' contributed the most to this growth to Non-EU markets. As a result, the share of UK goods exports of value added going to Non-EU countries increased between 2005 and 2018. Correspondingly, the share of UK value added goods exports to the European Union fell (Figure 3.17).

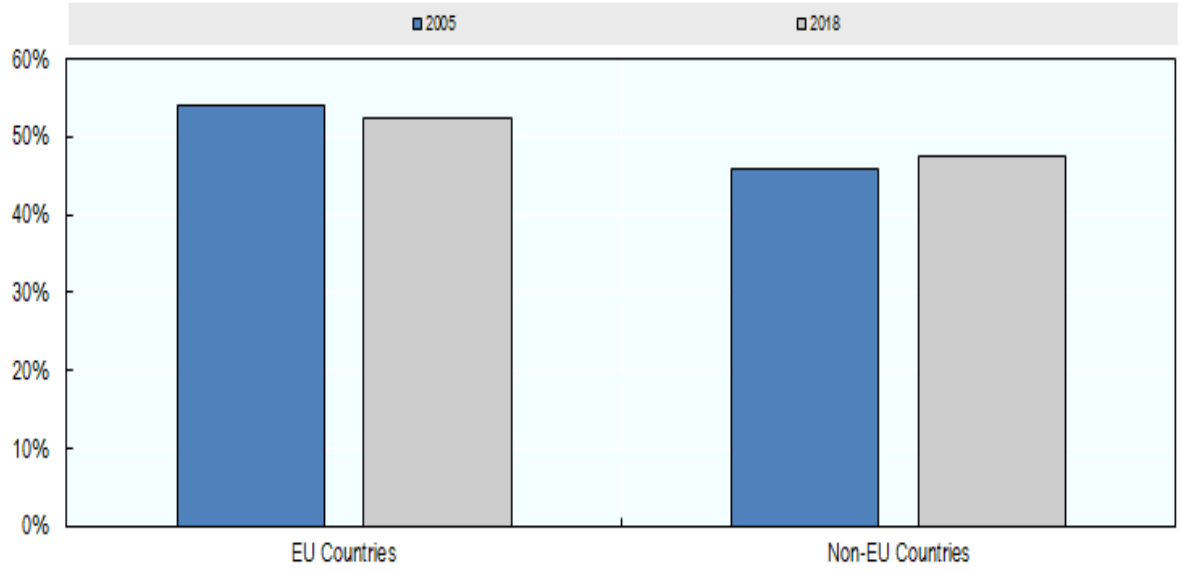
At the same time, imports of intermediate goods and services from Non-EU markets embodied in UK exports of goods grew faster (5%) than those from EU partners (4%). Crucial raw materials and energy products for manufacturing production, such as crude petroleum, refined petroleum, and basic metals are predominately imported from Non-EU markets (Figure 3.18).

Figure 3.17. Domestic and foreign value-added content of UK exports of goods by destination or origin

Panel A – Exports of UK value-added to EU and Non-EU countries

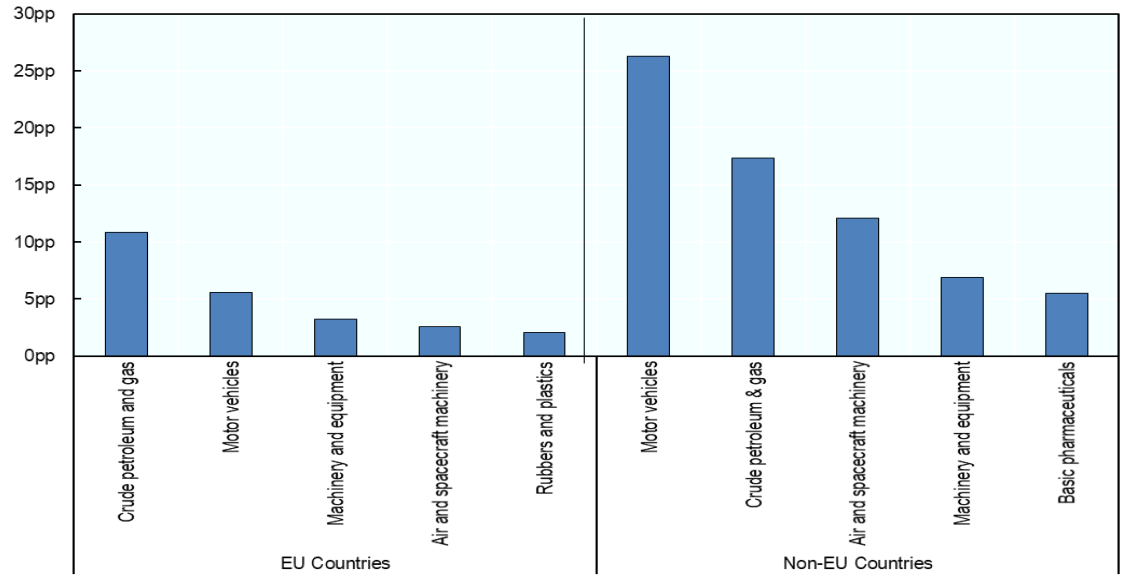


Panel B – Foreign value-added content of UK goods exports by EU and Non-EU origin



Note: Partner shares (EU and non-EU countries) add up to 100%.
Source: Authors' estimates based on detailed ONS SUTs.

Figure 3.18. Contributions to the increase in UK value added goods exports to EU and Non-EU from 2005 to 2018

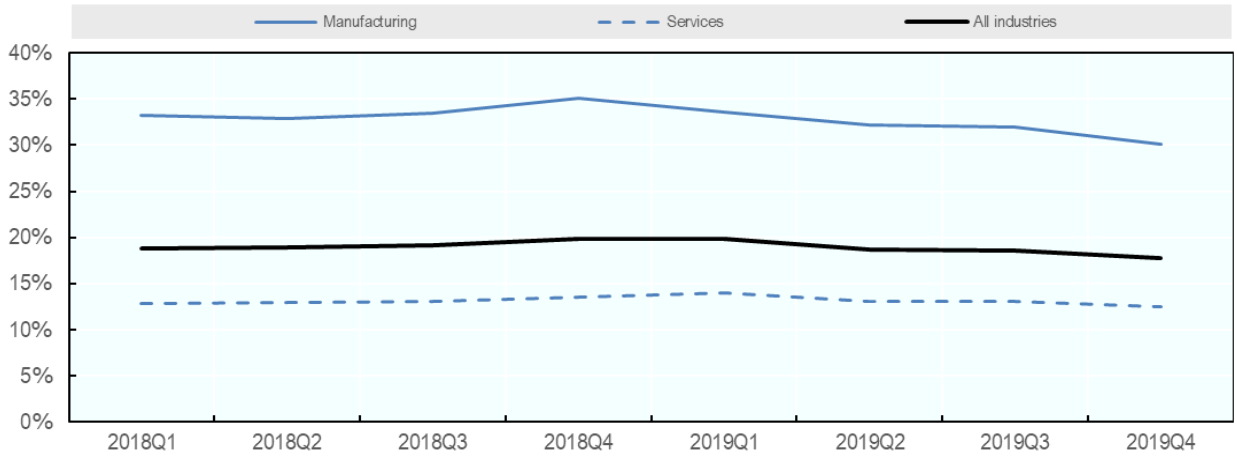


Source: Authors' estimates based on detailed ONS SUTs.

UK's backward participation in GVCs fell slightly in 2019

Using quarterly ONS data and nowcasting the granular approach, the import content of UK exports is estimated to have declined slightly in 2019 to 18.7% (Figure 3.19). The decline was broad-based, but much more pronounced in the manufacturing sector. However, as the United Kingdom is largely a service-based economy, developments at the economy-wide level followed closely those of the services sectors.

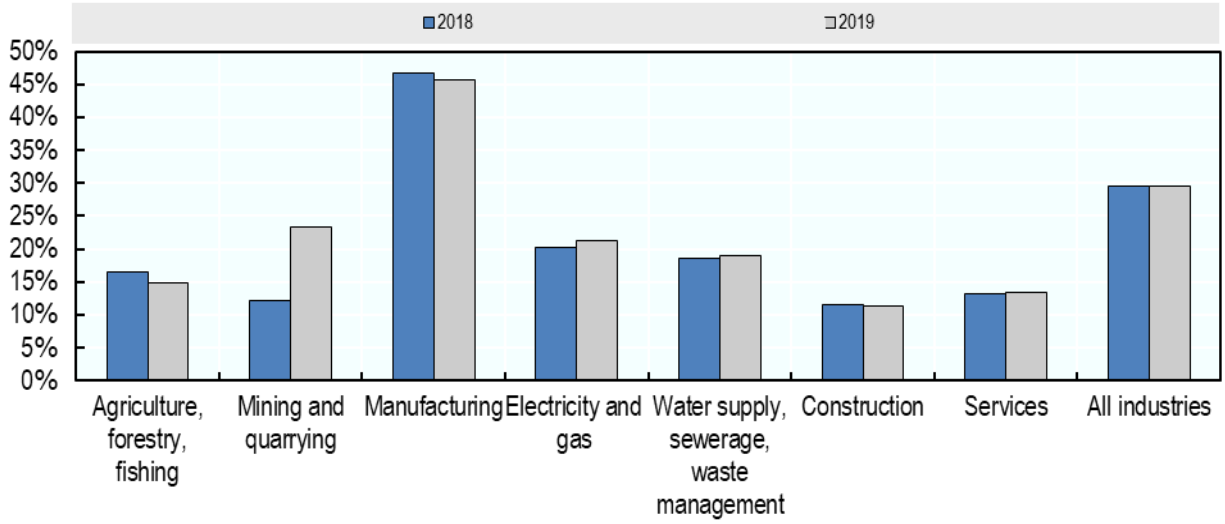
Figure 3.19. Foreign value-added share of UK exports, granular approach, 2018Q1-2019Q4



Source: Authors' estimates based on detailed ONS SUTs.

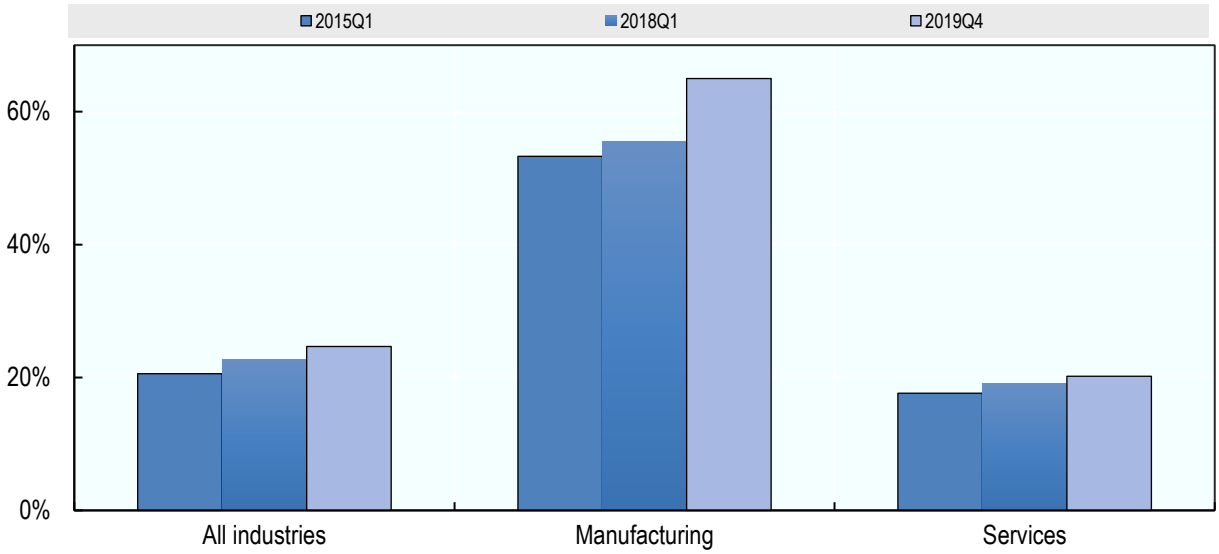
Estimates derived from a consumer approach suggest that the import content of exports remained unchanged between 2018 and 2019 across the whole economy (Figure 3.20).

Figure 3.20. Foreign value-added share of UK exports, consumer approach, 2018 and 2019



Source: Authors' estimates based on detailed ONS SUTs.

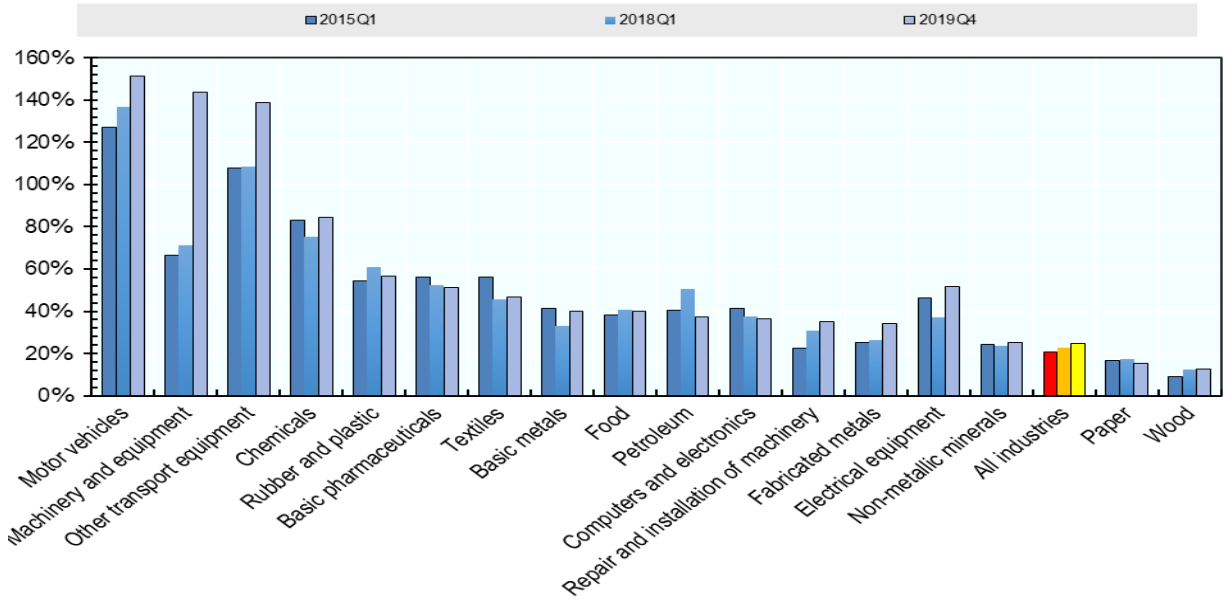
Figure 3.21. Domestic value-added share of UK exports, manufacturing and services, granular approach



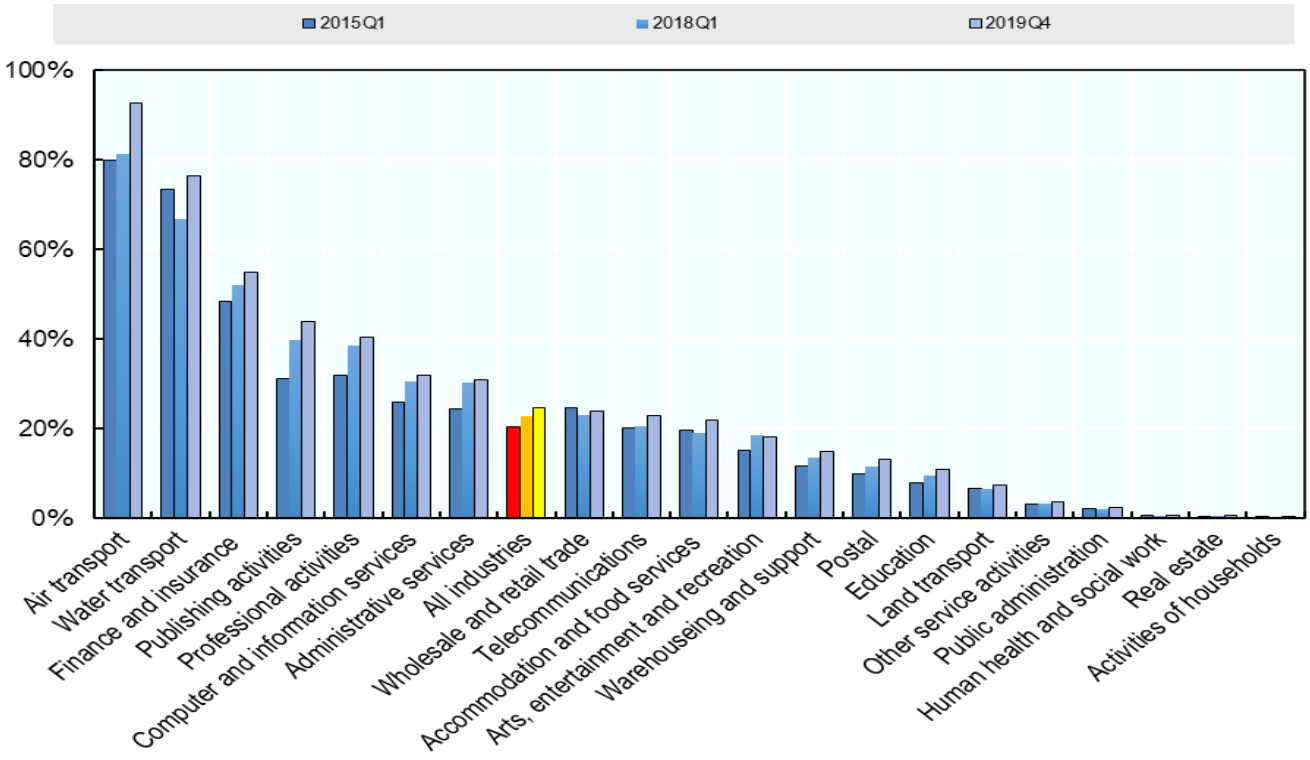
Source: Authors' estimates based on detailed SUTs.

Figure 3.22. Domestic value-added share of UK exports in selected manufacturing and services sectors, granular approach

Panel A – Manufacturing industries



Panel B – Services industries

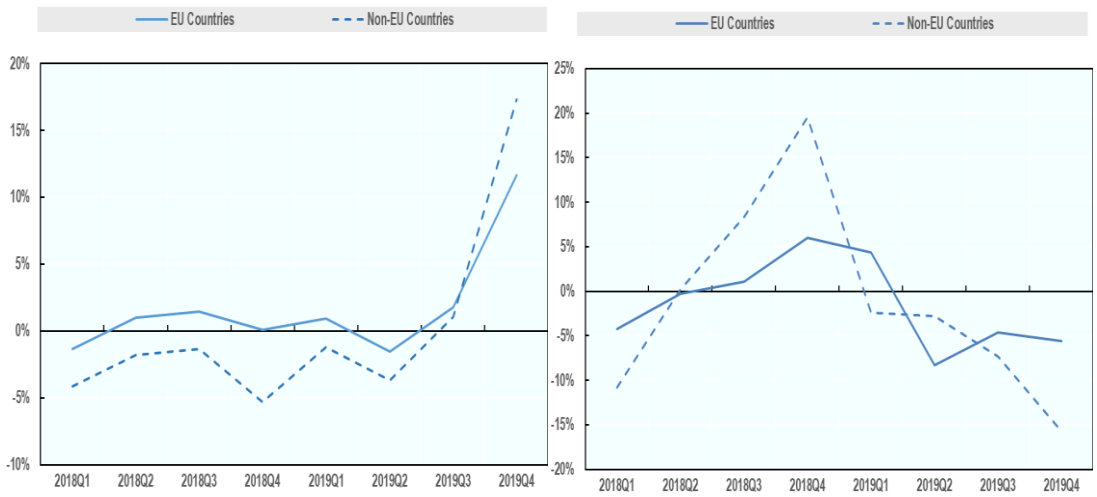


Source: Authors' estimates based on detailed ONS SUTs.

The counterpart of import content of exports - the domestic content of exports – continued to increase in 2019 (Figure 3.21), under the granular approach. Increases were particularly pronounced in manufacturing industries. This reflects essentially an increase in the domestic content of exports in 'Motor vehicles', 'Machinery and equipment' and 'Other transport equipment' (Figure 3.22). The rise was much more moderate in other manufacturing industries presented in the chart, and a decline was even observed in the 'Petroleum' industry. A small increase was also visible in most services, with the most significant rise occurring in 'Air transport', 'Water transport' and 'Finance and insurance'.

No marked difference is visible in the pattern for the domestic and foreign content of exports directed and sourced to EU and Non-EU countries (Figure 3.23). In all, 2019 was characterised by a marked increase in the domestic content of value added and a fall in the foreign content.

Figure 3.23. Domestic and foreign value-added content of manufacturing exports, quarter-on-quarter changes, granular approach



Source: Authors' estimates based on detailed ONS SUTs.

The quality of the nowcast in 2019 is found to be relatively good on average

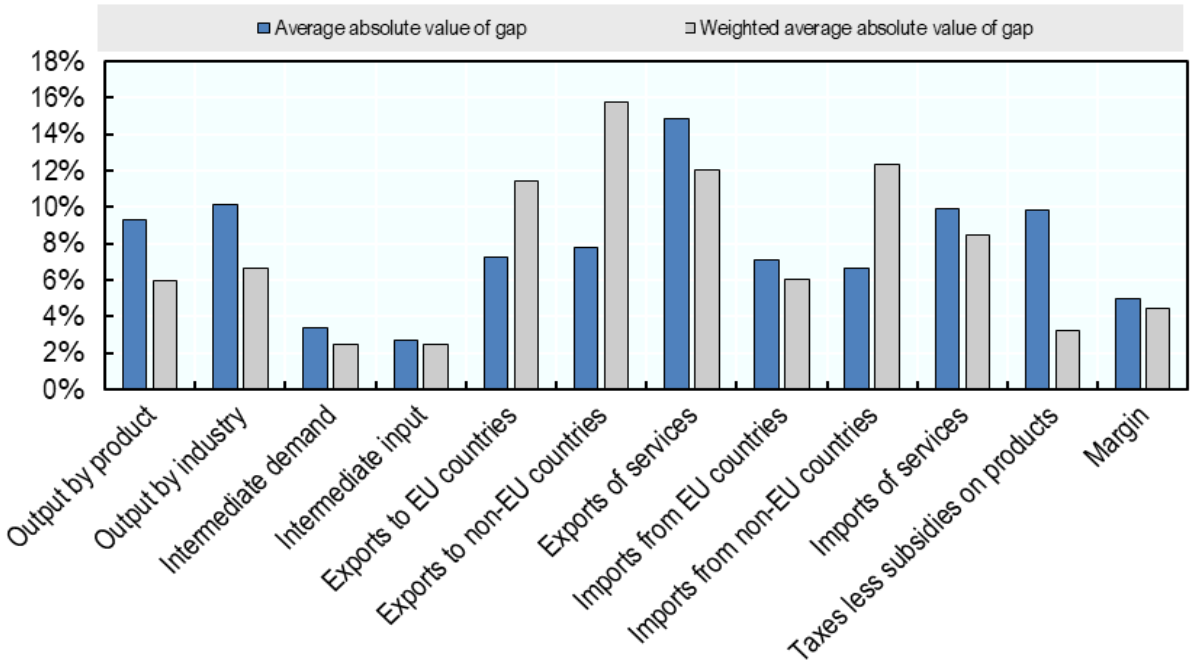
As the ONS published a SUT for 2019 in October 2021, it is possible to check the performance of the nowcasting procedure developed in this report for this specific year.

On average across the different components nowcasted, errors are relatively small, amounting to 8%, with the nowcast underestimating outturns most of the time. Out-of-sample performance varied widely across elements (Figure 3.24). Errors are found to be small for intermediate demand and output, around 2-3%, but are significantly higher for trade close or sometimes above 10%.

As expected, the quality of the nowcast also differs significantly across the 105 industries and products covered. As an illustration, the average absolute errors for the 26 nowcasts of output by product for which errors are the largest would amount to 36%, exceeding even 60% for some individual items. This suggests the existence of a trade-off between granularity and accuracy of the nowcast exercise.

Figure 3.24. Nowcasting performance in 2019

Difference between the 2019 SUTs released by ONS and 2019 nowcast



Source: Authors' estimates based on detailed ONS SUTs.

4. Conclusions

This report has explored three possible extensions of SUTs and resulting TiVA indicators in a national setting for the United Kingdom by using more granular and more timely statistics, or adopting a consumer perspective. The granular approach provides valuable insights on developments in specific industries, helps to understand which sectors are driving developments at the aggregated industry level and addresses the issue of heterogeneity within very aggregated sectors. The consumer approach brings a different perspective by allocating differently the value that is added at the end of the chain by distribution sectors, in particular retail and wholesale. It offers a useful addition when assessing the impact of globalisation at the industry level. Finally, more timely statistics are essential to inform policymaking. By construction, however, none of these approaches fully captures trade interdependency at the global level.

Overall, the analysis suggests that TiVA indicators based on granular and consumer approaches using national data are a promising complementary source of information to the OECD TiVA indicators. Differences between the alternative methodologies are generally small on economy-wide indicators of GVCs for the United Kingdom. Patterns of TiVA indicators are similar in all three approaches and there are relatively small differences in levels. The foreign value-added content of exports estimated with the granular approach exceeds the OECD TiVA measure by an average of 2 percentage points over the period 2005-18. Differences in terms of export intensity are even smaller, amounting to an average of about 1 percentage point. These gaps are explained by differences in methodology. However, aggregate numbers mask sizeable differences in a handful of industries, such as ‘Motor vehicles’ and small manufacturing industries. Indicators of globalisation derived from the consumer approach differ substantially from OECD TiVA measures for specific industries such as small manufacturing industries.

The analysis undertaken in the report is only a first step and calls for a more systematic comparison of the different approaches, over time and across countries. Although the new approaches inevitably require a number of assumptions, in particular to ensure consistency with National Accounts and other published statistics, the computation is relatively straight-forward and could be extended to other countries, pending data availability. In addition, it would be useful to explore the introduction of firm heterogeneity, which has been found to be the source of more measurement differences in previous analysis (OECD and Statistics Finland, 2021). A pre-requisite would be the development of extended SUTs by the Office of National Statistics.

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ONS (2021), *Balance of Payments*, Pink Book.

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Annex A. Data

This annex describes the data sources used in the three approaches and the mathematical formula used to compute TiVA indicators.

Data

Granular approach

The most recent national SUTs published by the ONS provide data from 1997 to 2018, broken down by 105 industries and products. These SUTs have the following characteristics:

- The Supply Tables summarise the domestic supply matrix in column vectors by products. They include the transformation into purchasers' prices;
- The Use Tables show the use of goods and services by type of products and types of use. They are available in purchaser's prices;
- Imports (and exports) are broken down as goods from (to) EU countries, goods from (to) Non-EU countries, and total services; and
- The ONS SUTs include data on net taxes on production, compensation of employees, gross operating surplus and mixed income.

To complement these, the UK SUT available in the OECD database includes the supply matrix and import matrices for 64 industries/products (Box A.1). Those matrices are available for 2015, 2016 and 2017 only. The correspondance between the 105 industries and 64 industries is provided in Annex B.

Constructing granular SUTs from 2005-2018 thus require consolidation of the information available from the ONS and the OECD data for the years 2015-17 and estimating the missing information for the other years.

Consumer approach

The derivation of SUTs at purchaser's prices does not require additional information than that already included in SUTs at basic prices.

Box A.1. OECD SUT database

The OECD SUTs, available by 64 industry-product disaggregation, consist of the following:

- Supply tables at basic prices including the domestic supply matrices and price transformations into purchaser's prices
- Use tables at purchaser's prices
- Use tables at basic prices
- Domestic Use tables at basic prices
- Imports Use tables, without a breakdown of goods imports from EU and Non-EU markets, and services imports
- Trade and transport margins matrices
- Taxes less subsidies on products matrices

See here the full data availability.

Nowcast for 2019

The data used to nowcast quarterly SUTs are:

- The ONS's QNA data, including gross value added (output approach) and GDP (expenditure and income approach) data; and
- The value-added data by industry in current prices from ONS output approach, low level aggregates (QVA).

QNA provides quarterly information for total GDP, total value added, total final demand by components (households, non-profit institutions serving households, government, gross fixed capital formation, changes in inventories, acquisitions less disposals of valuables, exports and imports), gross value added components (compensation of employees and gross operating surplus) and total net taxes (including both on products and on production). It also includes differences between the expenditure, income and output approaches (as annual SUTs are only available up to 2018, the approach for the period 2015 Q1 – 2018 Q4 differ from the following quarters (2019 Q1 – 2019 Q4).

Links to specific datasets

SUTs:

www.ons.gov.uk/economy/nationalaccounts/supplyandusetables/datasets/inputoutputsupplyandusetables/current, (published on 30 October 2020).

National Accounts:

www.ons.gov.uk/economy/grossdomesticproductgdp/datasets/uksecondestimateofgdpdatatables, "Quarter 2 (April to June 2021), first estimate edition of this dataset" (published on 12 August 2021).

https://www.ons.gov.uk/economy/grossdomesticproductgdp/datasets/ukgdpolowlevelaggregates "Quarter 2 (April to June 2021), first estimate edition of this dataset" (published on 12 August 2021).

OECD data:

https://stats.oecd.org/.

Computing TiVA indicators

In all three approaches, TiVA indicators are re-calculated, using the standard formula and the new SUTs.

In the formula below, v is a row vector of value-added to output ratio; u is a row vector of 1; Bd represents domestic Leontief inverse, and is calculated as Bd=$(\mathrm{I} - A_d)^{-1}$, and A_d is the matrix of domestic input coefficients; *Am* is the matrix of import coefficients, E represents a diagonal matrix for exports; and I is an identity matrix.

Domestic value-added content of gross exports (EXGR_DVA)

$$EXGR\_DVA=v^* B_d {}^*E$$

Direct domestic industry value added content (EXGR_DDC)

$$EXGR\_DDC=v^*E$$

Indirect domestic content (EXGR_IDC)

$$EXGR\_IDC=v^*(B_d -I)^*E$$

Foreign value added content of gross exports (EXGR_FVA)

$$EXGR\_FVA=u^* A_m * B_d{}^*E$$

Domestic value-added share of gross exports (EXGR_DVA_SH)

$$EXGR\_DVA\_SH= EXGR\_DVA/u^*E$$

Foreign value-added content of gross exports (EXGR_FVA_SH)

$$EXGR\_FVA\_SH= EXGR\_FVA/u^*E$$

Indirect domestic services content of gross exports (EXGR_IDCS), j: services sector

$$EXGR\_IDCS =v^*(B_d -I)^*E_j$$

The self-sufficiency ratio measures the extent to which domestic production can satisfy domestic demand, and formally expressed as domestic demand-induced output (1) plus export-induced output (2) minus imports-induced output (3):

$$x= B^*y \quad = B\ (yd + e - m) \quad = B^*yd\ (1) \quad + B^*e\ (2) \quad - B^*m\ (3)$$

Where x is vector of output; *B* represents total Leontief inverse and is calculated as $\mathrm{B} = (\mathrm{I} - \mathrm{A})^{-1}$, where *A* is total input coefficients (domestic inputs plus imports); e and m represent vectors for exports and imports respectively.

Annex B. Correspondence between 64 and 105 industries datasets

64 products	105 products
Mining and quarrying	Coal and lignite Crude Petroleum And Natural Gas & Metal Ores Other mining and quarrying products Mining support services
Food, beverages and tobacco	Preserved meat and meat products Processed and preserved fish, crustaceans, molluscs, fruit and vegetables Vegetable and animal oils and fats Dairy products Grain mill products, starches and starch products Bakery and farinaceous products Other food products Prepared animal feeds Alcoholic beverages & Tobacco products Soft drinks
Textiles, wearing apparel, leather and related	Textiles Wearing apparel Leather and related products
Chemicals and chemical products	Paints, varnishes and similar coatings, printing ink and mastics Soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations Other chemical products Industrial gases, inorganics and fertilisers (all inorganic chemicals) Petrochemicals Dyestuffs, agro-chemicals
Other non-metallic mineral products	Manufacture of cement, lime, plaster and articles of concrete, cement and plaster Glass, refractory, clay, other porcelain and ceramic, stone and abrasive products
Basic metals	Basic iron and steel Other basic metals and casting
Fabricated metal products, except machinery and equipment	Weapons and ammunition Fabricated metal products, excl. machinery and equipment and weapons & ammunition
Other transport equipment	Ships and boats Air and spacecraft and related machinery Other transport equipment
Furniture and other manufactured goods	Furniture Other manufactured goods
Repair and installation services of machinery and equipment	Repair and maintenance of ships and boats Repair and maintenance of aircraft and spacecraft Rest of repair; Installation
Electricity, gas, steam and air conditioning	Electricity, transmission and distribution Gas; distribution of gaseous fuels through mains; steam and air conditioning supply
Sewerage services, sewage sludge, waste collection & management serv.	Sewerage services; sewage sludge Waste collection, treatment and disposal services; materials recovery services Remediation services and other waste management services
Land transport services and transport services via pipelines	Rail transport services Land transport services and transport services via pipelines, excluding rail transport
Accommodation and food services	Accommodation services Food and beverage serving services

64 products	105 products
Computer programming, consultancy and related serv., Information serv.	Computer programming, consultancy and related services Information services
Real estate services excluding imputed rents	Real estate services, excluding on a fee or contract basis and excluding imputed rent Real estate activities on a fee or contract basis
Other professional, scientific and tech. services and veterinary services	Other professional, scientific and technical services Veterinary services
Security & investigation serv., serv. to buildings & other business support	Security and investigation services Services to buildings and landscape Office administrative, office support and other business support services
Creative, arts, entertainment, library, museum, other cult. serv., gambling serv.	Creative, arts and entertainment services Libraries, archives, museums and other cultural services Gambling and betting services