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Digital Trade and Labour Markets in the United Kingdom

Sebastian Benz, Alexander Jaax, and Elisabeth van Lieshout

The contribution of services in the United Kingdom (UK) to exports, value added, and employment is one of the highest amongst OECD countries. UK employment also depends strongly on exports of digital services: in 2019 the jobs of around 3.2 million domestic workers in digital services sectors were embodied in UK exports. Median wages in these services are considerable higher than wages in other sectors of the UK economy. Econometric analysis shows that strong growth of employment in digital services generates multiplier effects benefitting local economies in the United Kingdom, with each additional digital services job creating around 0.3 jobs in the local non-tradable sector. Continued support for plurilateral and multilateral initiatives to dismantle barriers to services trade, including via the WTO Joint Initiative on Services Domestic Regulation, can help to enable more UK firms to take advantage of the potential for further growth in digital services trade. Improving the availability of training programmes and aligning curricula with the rapidly evolving needs of exporters of digital services is crucial to enable for workers to shift into sectors with growing labour demand.

Keywords: E-commerce, Services trade, Wages, Multipliers

JEL codes: E4, F13, F15, F16, J21, L86, R11

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Key messages

- **The United Kingdom economy relies on services more than most of its peers.** The contribution of services to exports, value added, and employment is one of the highest amongst OECD countries.
- **Services exporters in the United Kingdom are well positioned to benefit from the dynamism of digital trade.** At 42.5%, the United Kingdom's share of services exports that can be potentially delivered digitally is significantly higher than the OECD average (33%).
- **UK employment depends strongly on exports of digital services**. In 2019, the jobs of around 3.2 million domestic workers in digital services sectors were embodied in UK exports. Median wages in these services are considerable higher than wages in other sectors of the UK economy.
- **While financial services continue to be of paramount importance to UK exports, the recent dynamism of the UK's trade in other business services is noteworthy.** Activities under this grouping constitute the largest category of UK services exports.
- **Services jobs are of pivotal importance to women.** In 2018, women made up 43% of UK employment in business services, nearly 7.3 million employees.
- **Professional, scientific and technical services are increasingly important to UK employment.** Encompassing activities such as engineering services, legal services, and management consulting, the number of jobs in this category has grown by around 10% between 2015 and 2021.
- **Strong growth of employment in digital services generates multiplier effects benefitting local economies in the United Kingdom.** The results of the analysis imply that each additional digital services job creates around 0.3 jobs in the local non tradable sector.
- **UK digital services employment is relatively concentrated in the largest labour markets.** While around 37% of total employment is in the ten largest travel to work areas in the United Kingdom, the contribution of the ten largest TTWAs to total employment in digital services is around 45%.
- **Access to foreign markets is of crucial importance to labour markets in the United Kingdom.** Very high employment shares in services sectors and an important role of direct and indirect exports of digitally-deliverable services provide a strong rationale for continued efforts to reduce barriers to digital services trade.
- The analysis provides support for the following **policy recommendations**:
  - **Continue to encourage the growth of digital trade given its overall positive employment impact in the United Kingdom.** Ambitious digital trade chapters in trade agreements and continued support for plurilateral and multilateral initiatives to dismantle barriers to services trade, e.g. via the WTO joint initiative on services domestic regulation, can help enable more UK firms to benefit from the dynamism of digital services trade.
  - **Ensure the development of key skills needed for digital trade.** Aligning curricula and training programmes with the rapidly evolving needs of exporters of digital services is crucial.
  - **Support SMEs in their participation in digital trade, given the wage and productivity benefits that importing and exporting can provide.** This requires continued efforts to enhance digital trade facilitation and address sources of policy uncertainty affecting exporters of services.
  - **Monitor concentration patterns in digital services**. The tendency for digital services jobs to be clustered in large local labour markets warrants efforts to explore how these services can be a source of comparative advantage in other regions and sectors through supply chain linkages.
  - **Explore innovative ways of improving the availability of information on UK digital services trade**. Further efforts to facilitate the joint consideration of existing datasets across different policy areas can contribute to a more comprehensive picture of the UK's participation in digital trade.

1. Setting the scene

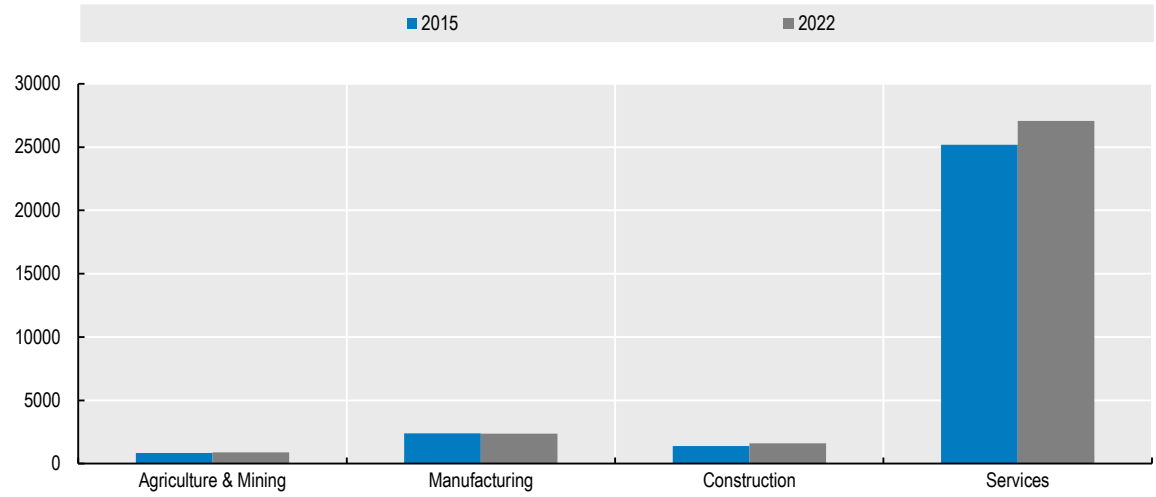
The United Kingdom is one of the global champions of international trade and open markets. Economic growth and rising living standards have been bolstered by a regulatory regime that prioritized export opportunities and easy access to imported goods and services. The UK economy relies on services more than most of its peers. The contributions of services to exports, domestic value added and employment are among the highest compared to other OECD countries. Many of the services in which the United Kingdom enjoys a comparative advantage can be exported digitally. Already today, digital trade is of major importance for the United Kingdom and its economic relevance is expected to grow further.

This section sets the scene for a comprehensive assessment of the importance of digital trade for UK labour market outcomes. The section provides a brief description of relevant labour market developments and underlines the importance of digital trade for the United Kingdom.

1.1. Services are key for UK employment and value added

Most employment in the United Kingdom is in the services sectors. In 2022, more than 27 million persons worked in services, either as employees or as self-employed workers, accounting for around 85% of total UK employment. The number has slightly increased from around 25 million since 2015 (Figure 1.1).

Figure 1.1. Employment by broad economic sector

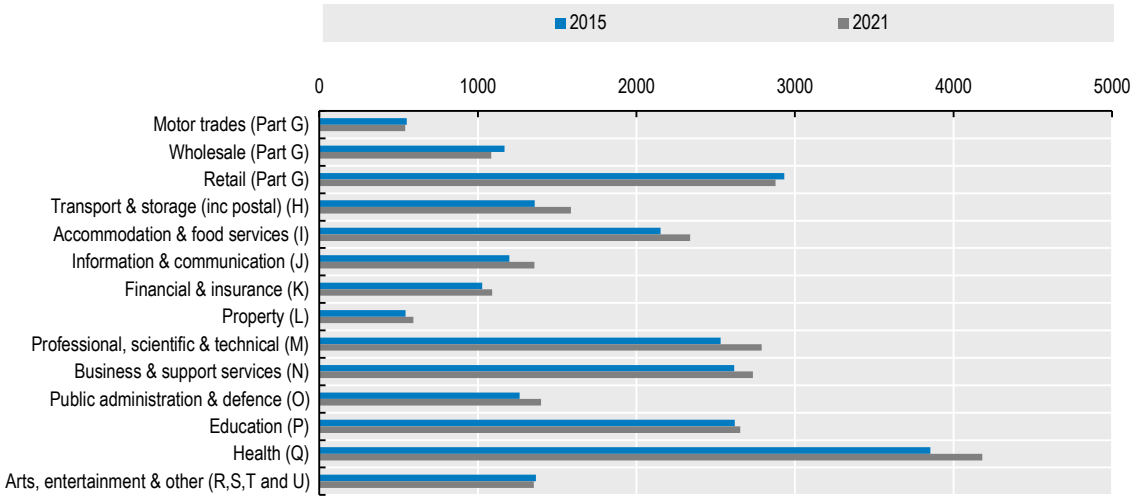


Note: Employment in thousands. Employment measures employees plus the number of working owners. This includes self-employed workers as long as they are registered for VAT or Pay-As-You-Earn (PAYE) schemes. Self-employed people not registered for these, along with HM Forces and Government Supported trainees are excluded.
Source: ONS Business Register and Employment Survey.

Employment in other economic sectors is far less prevalent. Manufacturing, construction, agriculture, and mining jointly employed less than 5 million workers. Out of the three sectors, manufacturing is largest with around 2.4 million workers. The construction sector employs around 1.6 million workers, while roughly 880 000 work in agriculture and mining. Employment in these sectors has remained relatively stable since 2015.

A closer look at the distribution of services employment shows that there are several large services sectors that employ the majority of workers in the United Kingdom. Each of them individually is comparable in terms of employment to manufacturing, employing more than 2 million workers in 2021. These sectors include the health sector, retail distribution, professional, scientific & technical services, business & support services, education, as well as accommodation & food services (Figure 1.2)

Figure 1.2. Detailed distribution of services employment



Note: Employment in thousands. Employment includes employees plus the number of working owners. BRES therefore includes self-employed workers as long as they are registered for VAT or Pay-As-You-Earn (PAYE) schemes. Self-employed people not registered for these, along with HM Forces and Government Supported trainees are excluded.
Source: ONS Business Register and Employment Survey.

Employment in health services is on an upward trend since 2015, adding more than 300,000 additional jobs. Employment growth further accelerated since 2020, potentially due to the increase in demand for health services during the COVID-19 pandemic. Conversely, the retail sector has lost importance since 2015 for UK employment. Most of the decline has happened before 2015, suggesting that this development is not driven by the containment measures implemented in the wake of the COVID-19 pandemic and the resulting shift from high street shopping to online retail.

Employment in the accommodation and food services sector and the professional, scientific and technical services sector has grown by around 10% between 2015 and 2021. Employment is also on the rise in the business and support services sector with more than 100,000 additional jobs, corresponding to a growth of around 5% over six years.

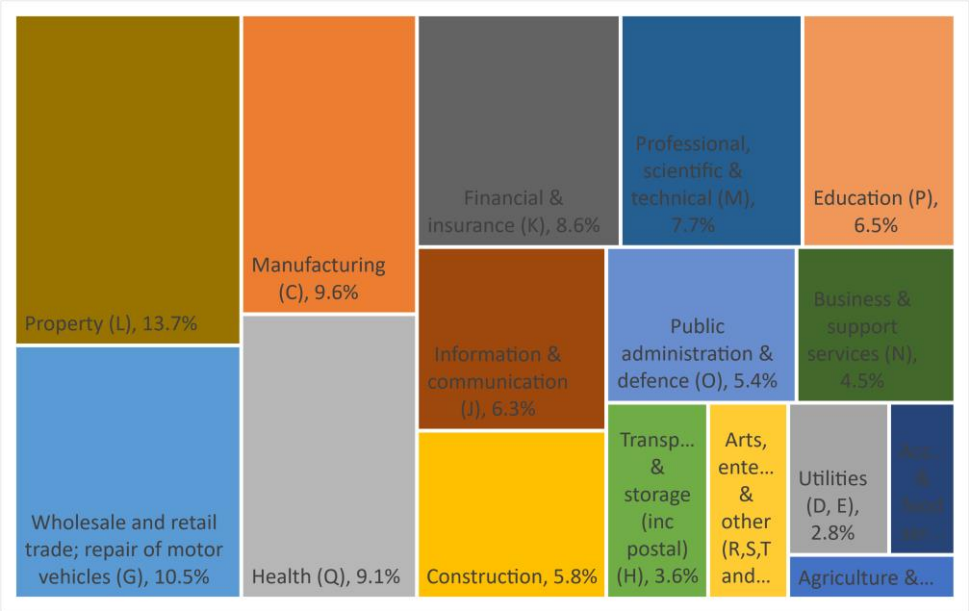
Smaller services sectors measured by their employment numbers include transportation and storage, including postal services, public administration & defence, information & communication services, arts, entertainment & other services, financial & insurance services, wholesale distribution, property services and motor trades. Employment declined since 2015 in three sectors from this group: arts, entertainment & others, wholesale distribution and motor trades. The drop in the former could potentially be explained by some of the measures implemented to introduce social distancing and contain the spread of the COVID-19 pandemic. By contrast, a reduction of employment in wholesale distribution and motor trades is more likely to be due to a tendency towards automation and technology-based business models in these sectors.

The services sector is of pivotal importance to the employment prospects of women: Business services accounted for nearly half (48%) of all jobs of women in the UK in 2018. At the same time, women made up 43% of employment in business services, nearly 7.3 million employees, in 2018.[1]

The distribution of value added confirms the high importance of services for the United Kingdom. Real estate is the largest sector of the UK economy measured by its contribution to value added in 2021, followed by wholesale and retail trade and the manufacturing sector. The health sector, as well as financial services and insurance contribute heavily to value added in the United Kingdom. Other important sectors are professional, scientific & technical services, education, information & communication services, construction, public administration, business support services and transportation.

[1] These figures rely on the 2021 edition of the OECD Trade in Employment database. Business services encompass ISIC 4 sectors 45 to 82.

Figure 1.3. Distribution of value added by sector in 2021



Note: Data for 2021.
Source: ONS Regional gross value added (balanced) by industry.

1.2. The United Kingdom relies extensively on international trade

The United Kingdom's total value of exports and imports is large and continuously growing, despite a recent dip during the COVID-19 pandemic in 2020 and 2021 (Figure 1.4). Most recently, the sum of monthly exports and imports was close to GBP 80 billion, while annual flows were between GBP 800 billion and 900 billion. Trade integration, measured by the sum of exports and imports over GDP, stands at around 50%. Overall, the value of nominal trade flows has almost doubled during the last decade.

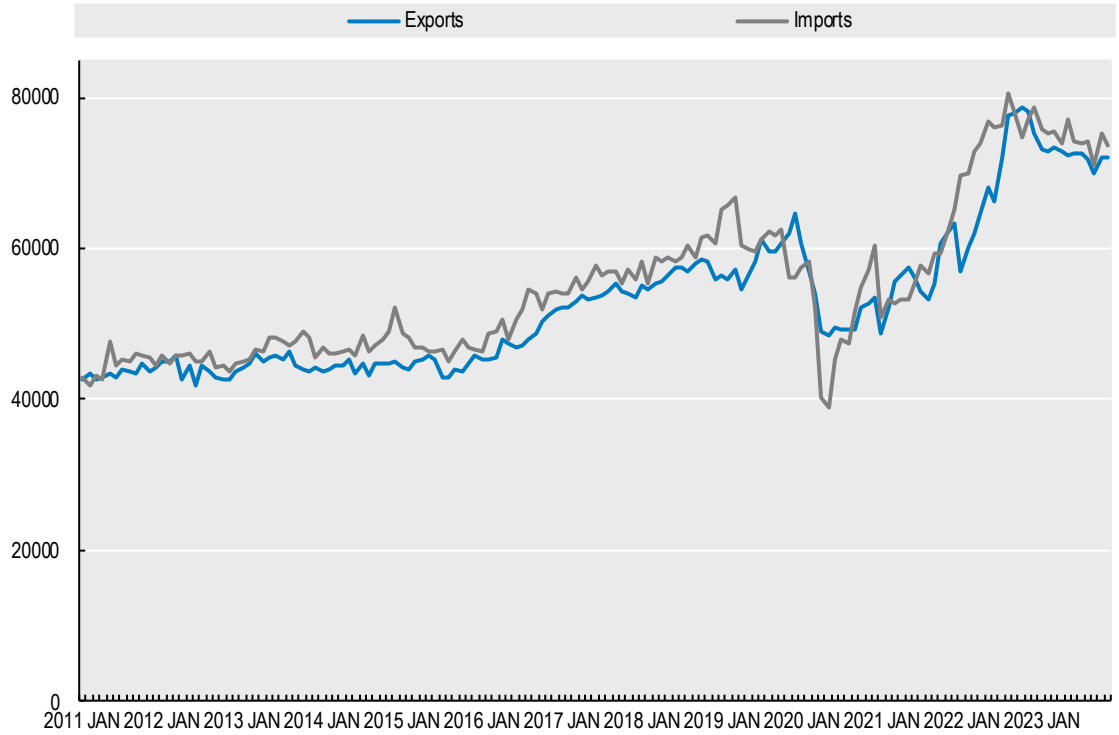
The movement of exports and imports was relatively parallel since 2011. The United Kingdom had a trade deficit during most of these years. The years of the COVID-19 pandemic, 2020 and 2021, seem to be the only exception from this pattern. This is not surprising, given that the United Kingdom is a net importer of travel services so that the disruption of cross-border travel during the pandemic has benefited the trade balance.

Goods and services are both of high importance for the United Kingdom's international trade integration. On the export side, services accounted for slightly more than half of all trade flows in 2022, indicating the high importance and strong comparative advantage of the United Kingdom in services. 11% of all exports come from the financial services sector, while 40% of exports are related to other services sectors. Only 49% of total UK exports in 2022 are related to goods trade (Figure 1.5).

The importance of goods is somewhat higher for imports, where 72% of all trade is related to imports of goods. Services account for 28% of imports, with financial services being of minor importance.[2] The relatively higher importance of services for exports than for imports also is an indicator for the United Kingdom's strong comparative advantage in a number of large services sectors.

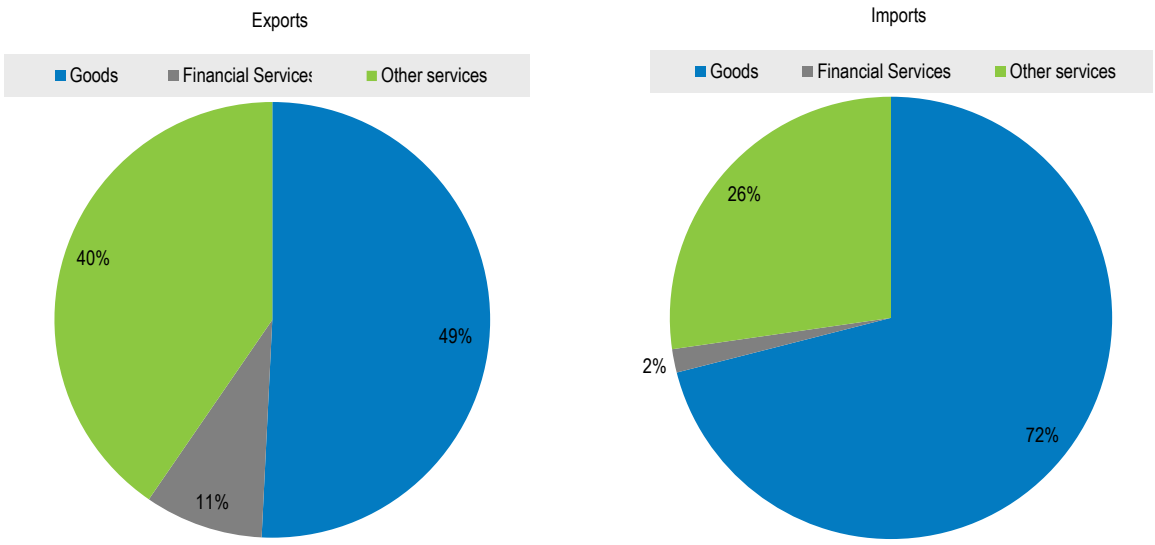
[2] This description of UK services exports is limited to cross-border services trade, according to the definition in the balance of payments. Services exports through the presence of foreign affiliates is not included.

Figure 1.4. Evolution of UK exports and imports over time



Note: Monthly exports and imports of goods and services in GBP million. Data available until November 2023 at the time of writing. Services exports only include cross-border services trade.
Source: ONS UK trade time series

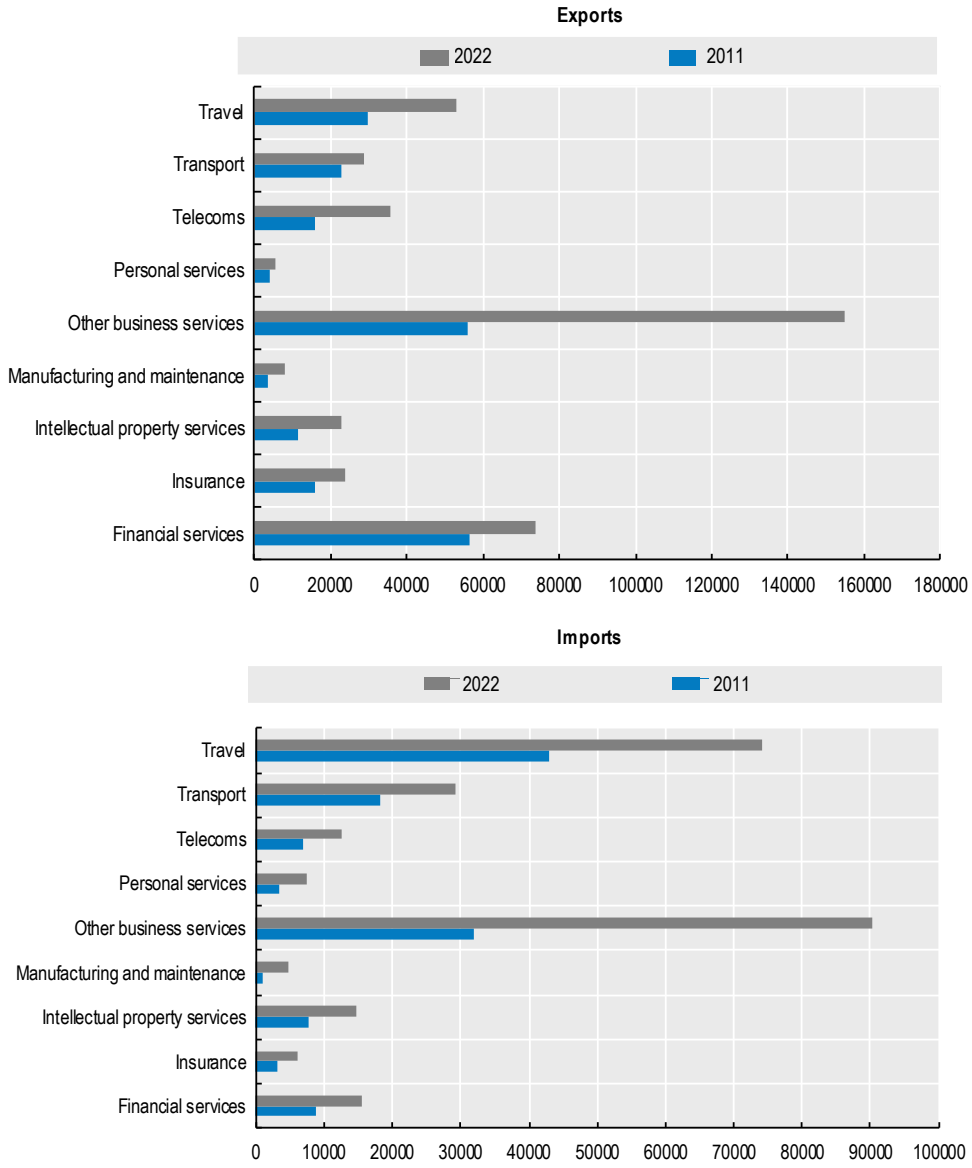
Figure 1.5. Distribution of UK exports and imports in 2022



Note: Data refer to the calendar year 2022. Services exports only include cross border services trade.
Source: ONS UK trade time series.

The importance of financial services for total UK services exports has decreased over the last decade. In 2011, financial services and other business services[3] both accounted for around one quarter of total services exports. Since then, nominal exports of other business services have more than doubled, amounting to almost GBP 155 billion in 2022, while growth in the exports of financial services was relatively limited (Figure 1.6).

Figure 1.6. Distribution of services exports and imports



Note: Data refer to the calendar years 2022 and 2011; in GBP million. Services exports only include cross border services trade.
Source: ONS UK trade time series.

[3] Amongst others, this category includes research and development services, professional and management consulting services, architectural, engineering, scientific, and other technical service as well as waste treatment and de-pollution, agricultural and mining services.

Exports of telecommunications services have expanded strongly since 2011 and were the fourth most important category of services exports in 2022 with annual exports of GBP 35 billion. Other important services exports include travel services, transport, exports of intellectual property and insurance services.

Other business services are not only the largest category of services exports, but also account for the largest share of services imports to the United Kingdom, with an annual value of GBP 90 billion in 2022. Imports of travel services have steadily increased between 2011 and 2022from around GBP 40 billion to almost 75 billion. However, their value collapsed to only GBP 20 billion in 2020 due to the containment measures and travel restrictions implemented during the COVID-19 pandemic.

A less dramatic drop during the COVID-19 pandemic is observed for imports of transport services, which roughly declined by 50% between 2019 and 2021. Also, financial services, telecommunications services and imports of intellectual property account for sizeable shares of total UK services imports. Personal services as well as manufacturing and maintenance services are of relatively low importance for both, exports and imports.

Box 1.1. Services trade modes of supply

The definition of trade in services in GATS covers the four modes of supply. Distinctions among these modes are based on whether the service supplier and the consumer are present in the same country or different countries when the transaction occurs.

Mode 1: Cross-border supply (remote supply)

Cross-border supply takes place when a service is produced in one country but consumed in another one. Similar to traditional trade, when a good is delivered across a border both the supplier and the consumer remain in their respective countries. For example, a law firm may deliver legal advice by telephone or through the internet to a client overseas, or an individual from one country may purchase and download a computer game from a software firm residing in another country.

Mode 2: Consumption abroad

Consumption abroad takes place when services are consumed in the country where they are produced. The consumer or his/her property are abroad when the service is supplied. For example, a tourist may visit a museum while abroad or the property of a consumer, such as a ship, may be sent abroad to be repaired.

Mode 3: Commercial presence

Commercial presence takes place when a service supplier establishes a presence abroad in order to provide services. For example, a financial institution may open a branch in another country in order to provide financial services there.

Mode 4: Presence of natural persons

Presence of natural persons takes place when an individual is present abroad in order to provide a commercial service. The service is produced in the country where it is consumed. For example, an engineering consultant may travel abroad to oversee aspects of a building project or an employee of a software firm may be sent abroad to deliver information technology services.

According to experimental ONS data, Mode 1 made up 65% of total UK services exports and 55% of total services imports in 2019.

Source: Statistics Canada : https://www150.statcan.gc.ca/n1/pub/13-605-x/2018001/article/54966-eng, ONS (2020a), Trade in Services by Modes of Supply, UK: 2019.

1.3. Digital trade is increasingly important

Any discussion of the economic implications of growth in digital trade requires a definition that can be applied to relevant databases. The present report is based on the definition of digital-intensive sectors proposed by Calvino et al. (2018[1]). Two major databases used in this report are the OECD Trade in Value Added (TiVA) database and the OECD Trade in employment (TiM) database. Table 1.1 reports the sectors of the OECD TiVA and TiM databases that are considered to be digital-intensive services sectors (Calvino et al., 2018[1]).[4]

Table 1.1. Digital-intensive services sectors in the OECD TiVA and TiM databases

Sector denomination	ISIC rev.4
Telecommunications	61
Computer programming, consultancy and related activities; Information service activities	62-63
Financial service activities, except insurance and pension funding	64
Insurance, reinsurance and pension funding, except compulsory social security	65
Activities auxiliary to financial service and insurance activities	66
Legal and accounting activities; Activities of head offices; management consultancy activities	69-70
Architectural and engineering activities; technical testing and analysis	71
Scientific research and development	72
Advertising and market research	73
Other professional, scientific and technical activities; Veterinary activities	74-75
Rental and leasing activities	77
Employment activities	78
Travel agency, tour operator, reservation service and related activities	79
Security and investigation activities; Services to buildings and landscape activities; Office administrative, office support and other business support activities	80-82

Source: Authors' compilation based on OECD Trade in Employment (TiM) database and (Calvino et al., 2018[1]).

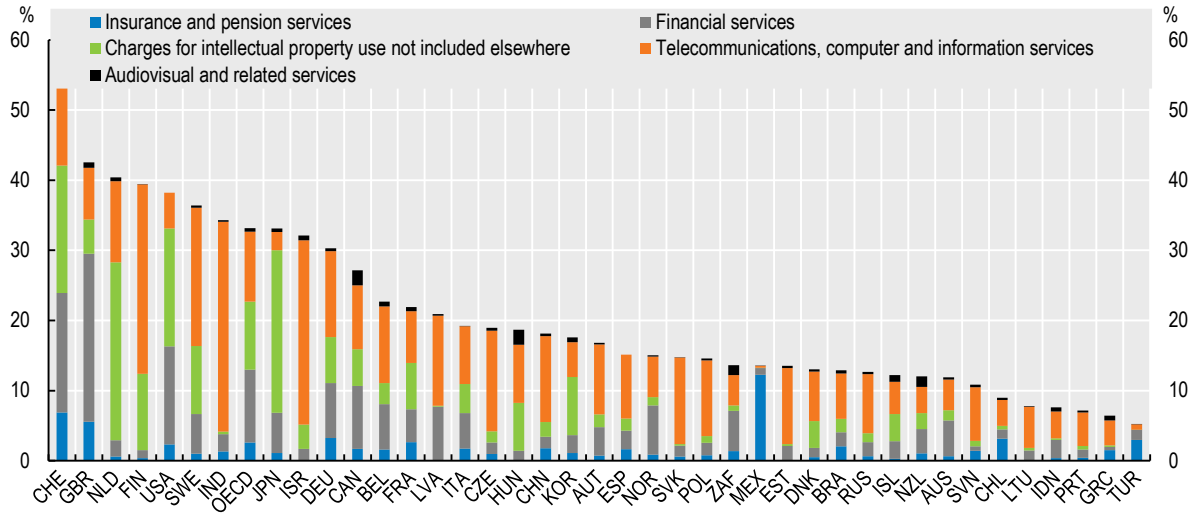
At 42.5%, the share of services export that can be potentially delivered digitally is one of the highest amongst OECD countries (Figure 1.7). It is significantly higher than the OECD average (33%). The share of digital exports of financial services is particularly high (24%), much larger than those of Switzerland (17%) and the United States (14%). On average the remaining OECD countries experience a rate close to 3%.

By contrast, the share of digital trade related to charges for intellectual property use not included elsewhere or telecommunications, computer and information services is relatively low in the United Kingdom. It is below the OECD average.

ONS experimental data on services that are *actually*, rather than *potentially,* digitally delivered provides complementary information (ONS, 2020aP). In particular, the data show that remote supply (mode 1) amounted to 65% for services exported via mode 1, 2 and 4 and 22% of services supplied through all modes. Approximately 55% of trade in services was estimated to be imported (excluding mode 3) by remote means. The three services that had the highest proportion of imports supplied remotely were intellectual property (95%), telecommunications (83%), and transportation (80%).

[4] The classification of digital-intensive sectors using the aggregation of Calvino et al. (2018[1]) is reported in the Annex.

Figure 1.7. Exports of potentially digitally-delivered services, percentage of total services exports, 2019



Source: OECD (2019), Going Digital: Shaping Policies, Improving Lives.

1.4. Measuring value added trade further highlights the importance of digital services

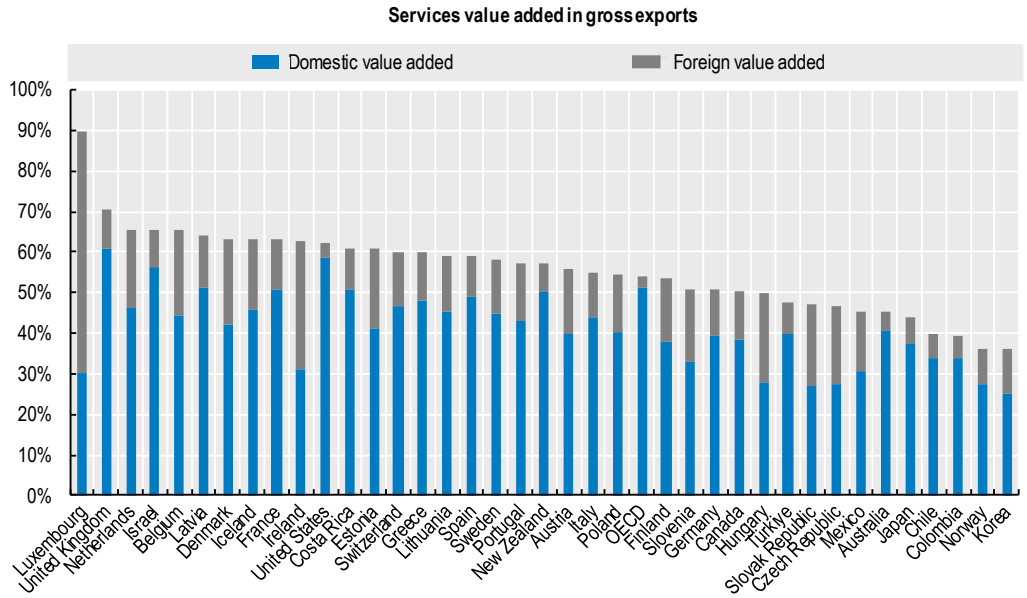
Services are not only exported directly and independently from manufactured products. Services and goods can form bundles that are exporter together and services value added can be embodied in the value of manufactured goods (Miroudot and Cadestin, 2017[2]). For this reason, a measure of services value added in gross exports is typically higher than the contribution of services to direct exports.

In the United Kingdom, services value added accounts for around 70% of gross exports. This is second-highest share in OECD countries (Figure 1.8). For the United Kingdom and most other OECD members, the share of domestic services value added is larger than the share of foreign services value added in gross exports.

The importance of services for the manufacturing sector can be assessed through their contribution to value added of manufacturing exports. Measuring value added from digitally-deliverable services in manufacturing exports complements the information presented above on direct exports of digitally deliverable services, where the United Kingdom is among the top performers (Figure 1.7).

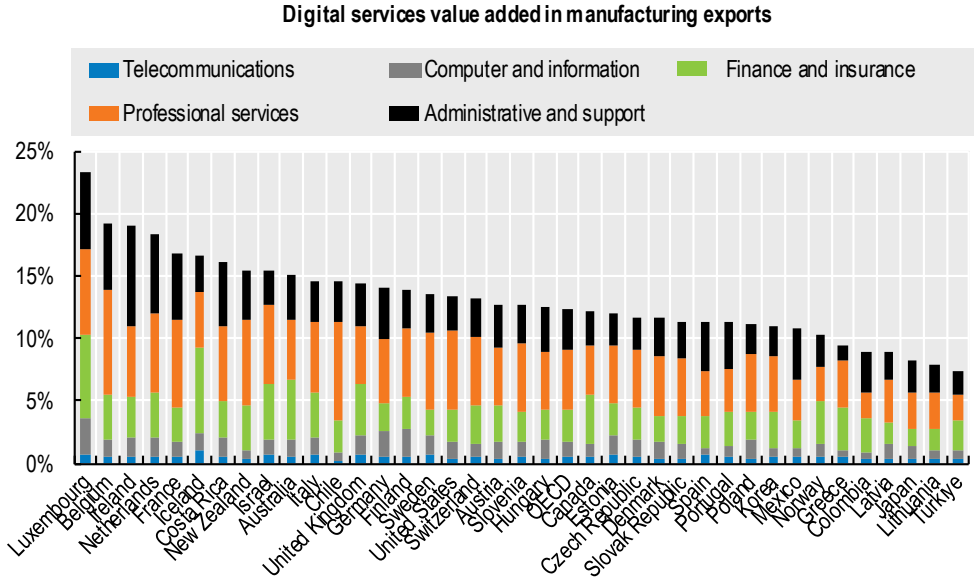
The contribution of value added from digitally-deliverable services to manufacturing exports in the United Kingdom is above the OECD average. However, digitally-deliverable services are more important for manufacturing exports in countries like Luxembourg, Belgium, Ireland or the Netherlands. In comparison to the top performers, professional services (including scientific and technical activities) as well as administrative and support services are of relatively low relevance for manufacturing exports in the United Kingdom. By contrast, only considering the contribution of telecommunications, computer and information services, as well as financial and insurance services, the United Kingdom is among the top five OECD countries with the highest contribution of these services to manufacturing exports.

Figure 1.8. Services value added share of gross exports in 2018



Note: Data for 2018.
Source: OECD TiVA database.

Figure 1.9. Digital-intensive services value added in manufacturing exports, 2018



Note: Data for 2018.
Source: OECD TiVA database.

Very large employment shares in services sectors and a high importance of direct and indirect exports of digitally-deliverable services indicate that access to foreign markets is of crucial importance for labour markets in the United Kingdom. This report aims to shed light on the relationship between digital trade and labour market developments in the United Kingdom, exploring different transmission mechanism, highlighting the high dependence of UK employment on foreign demand and evaluating the importance of spillover effects from employment in digital services to other sectors.

2. Transmission mechanisms between digital trade and labour markets

This section provides a framework for mapping different transmissions mechanisms through which digital trade affects employment outcomes. Placing the emphasis on services trade, it first presents an overview of potential theoretical channels between services trade and employment and provides examples of related empirical findings. It then discusses a set of questions related to the specific labour market implications of digital services trade.

2.1. Export and import of digital services create employment opportunities in the United Kingdom

Regarding exports, the capacity to tap into foreign demand enables firms to increase their sales and the scaling up of production creates demand for more workers. For example, a mid-sized engineering consultancy in a small economy that wins a bid for a large project for a foreign client may decide to recruit additional engineers to ensure the timely completion of all deliverables.[5]

Moreover, the opportunity to serve a bigger market through growth in exports may give rise to economies of scale at the firm-level. The cost advantages of increasing production may help the firm to expand its market share, supporting the creation of new jobs. Thus, in the case of a small asset management company that experiences sales growth thanks to the successful acquisition of foreign clients, the greater scale of its operations may allow for productivity gains: this could be achieved through further specialisation of the employees in specific tasks, e.g. by creating separate units dedicated to data analytics and marketing. If these productivity gains enable the company to improve the attractiveness of its asset management services regarding quality and price, this is likely to boost its revenue growth and lead to an increase in the number of staff.

At the level of the city or region, there is a further channel through which exports of a specific services sector can boost employment: The creation of new jobs in tradable activities increases demand for local services and goods (Kemeny and Osman, 2018[3]; Bartik and Sotherland, 2019[4]). Growth in the number of workers in exporting firms supports employment growth in other activities. For instance, new jobs in a city's thriving, export-oriented movie industry could lead to employment growth at local restaurants, grocery shops, gyms, and hairdressers.

Beyond such multiplier effects, growth in exports of a large number of firms can contribute to agglomeration economies at the level of a local economy, i.e. the economies of scale that arise from the spatial concentration of economic activity (Faggio, Silva and Strange, 2017[5]). In regions such as Silicon Valley, USA, or Bangalore, India, the clustering of firms facilitates the matching of workers and employers, the sourcing of specialised inputs, and exchanges of complex knowledge (Lorenzen and Mudambi, 2012[6]).

The existing empirical literature provides support for a positive link between service exports and employment growth at different levels of analysis. Two recent contributions analysing Italian (Bamieh, Bripi and Fiorini, 2021[7]) and British (Lassmann and Spinelli, 2020[8]) firm-level data report a positive effect of services exports on total firm-level employment for the periods 2009-2017 (Italy) and 2004-2017 (United Kingdom). Similarly, growth in services exports is associated with lower job loss risk according to an analysis of labour force survey data covering 31 European countries and the period 2008–2016 (Benz and Johannesson, 2019[9]).

Regarding empirical research adopting a subnational perspective, a recent study drawing on data from the United Kingdom highlights a positive link between employment growth and services exports at the regional level. Computing a regional measure of uncertainty about potential services trade policy changes between January 2015 and December 2019, Javorcik et al. (2020[10]) find that UK regions facing a higher threat of increases in trade barriers concerning professional service exports to the European Union experienced a larger decline in online job adverts after July 2016. In a further contribution focused on the United Kingdom, Gutierrez-Posada et al. (2022[11]) examine multiplier effects of employment growth in asset of tradable

[5] Importantly, this scenario assumes that the company's domestic sales and the labour intensity of production remain unchanged.

creative services between 1998 and 2018. These authors find that each additional job in these activities is associated with the creation of 1.9 new local jobs in other industries.[6]

When considering imports of services, the effect on employment is theoretically ambiguous. Contributions conceptualising the labour market implications of offshoring (Grossman and Rossi-Hansberg, 2008[12]; Wright, 2014[13]) suggest that opposing forces might be at play. On the one hand, the sourcing of services from abroad should exert downward pressure on domestic labour demand: When a firm purchases services from a foreign supplier, it might be replacing inputs that were previously generated using domestic workers – either within the same firm or by the employees of local suppliers.

Yet, in addition to this substitution effect, there is a second channel that may lead to an increase in demand for domestic workers: When a firm sources services from abroad, this can lead to productivity gains, which may allow the firm to expand its output and recruit additional workers. For example, a law firm that outsources parts of the legal research and document review to a specialised foreign provider may thereby generate cost savings that enable it to offer its legal services at a more attractive price. The resulting revenue growth can cause the firm to increase its total number of staff.

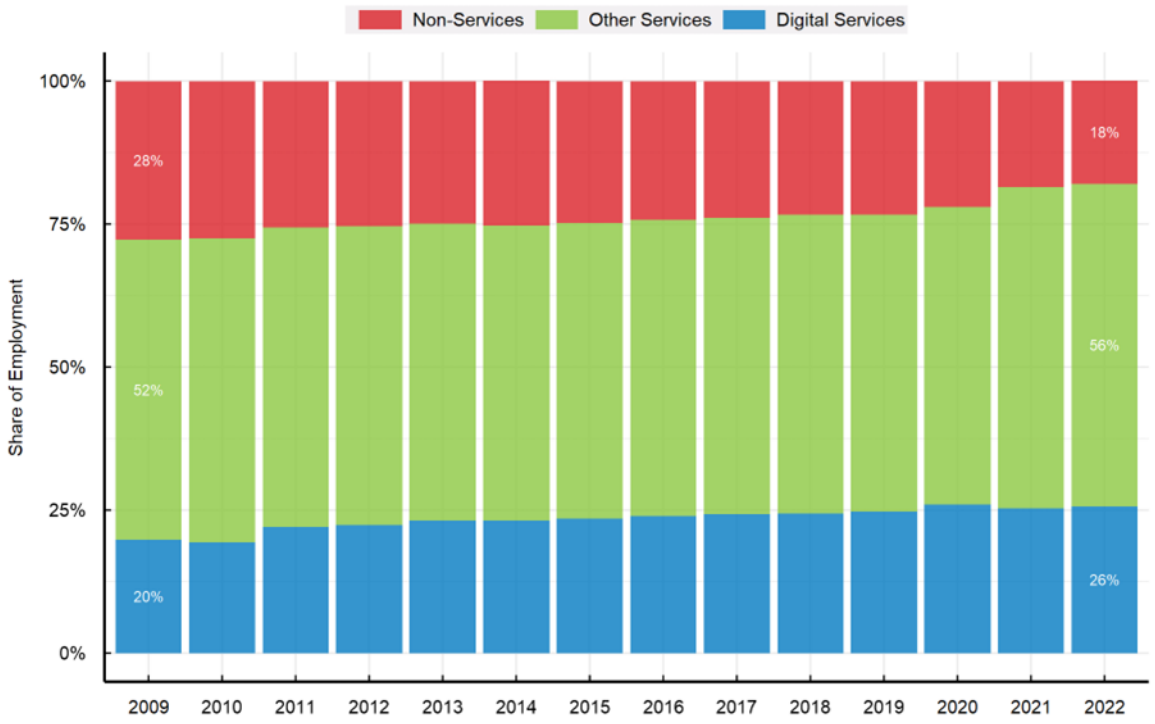
Recent studies analysing British (Hijzen et al., 2011[14]; Lassmann and Spinelli, 2020[8]) and Italian (Bamieh, Bripi and Fiorini, 2021[7]) data provide support for a positive link between firm-level services imports and firm-level total employment. Two further analyses drawing on British micro data find that sourcing of foreign services inputs is positively associated with aggregate employment at the regional level (Magli, 2020[15]; De Lyon, 2021[16]). The results of Magli (2020[15]) suggest that positive spillovers from offshoring firms to local non-offshoring firms explain the positive association between services imports and employment at the level of the local economy. Similarly, De Lyon (2021[16]) finds that the positive effect on local employment is driven by non-importing firms.

The above-mentioned recent empirical findings for the UK resonate with patterns emerging from micro data from the UK Labour Force Survey analysed for this report.[7] Figure 2.1 shows the share of workers in the UK employed in three broad sector groups. Indeed, between 2009 and 2022 employment in digital services sectors expanded significantly, growing from 20% to 26%. In light of the strong increase in digital services imports and exports over this period, this substantial employment growth points to the labour market opportunities created by digital services trade.

[6] These authors subsume the following activities under creative industries: Advertising and marketing; architecture; crafts; design; film, TV, video, radio and photography; information technology (IT), software, and computer services; publishing; museums, galleries, and libraries; music, performing and visual arts.

[7] The UK Labour Force Survey provides data for approximately 60.000-70.000 individuals each year (with lower response rates from 2020 onwards), covering issues such as a worker's sector, occupation, wage, and education. Respondents are randomly sampled to be representative of the UK population.

Figure 2.1. Increasing employment in digital services



Note: Non-services encompass the agriculture, mining, manufacturing, utilities, and construction sectors. Digital services sectors refer to finance, communication, professional and administrative services and other service activities. The remaining group of other services covers wholesale and retail, transport, hospitality, entertainment, real estate, health, education, and public services. The y-axis indicates the share of all employed people who work in a given sector group.
Source: UK Labour Force Survey.

2.2. Digital skills are crucial in enabling workers to participate in digital services trade

Having reviewed the literature on the aggregate employment effects of services trade, we now turn our attention to potential differences across specific categories of workers. Growth in exports can be expected to increase the relative demand for the category of workers that is intensively used in the production of the corresponding service. Especially producer services, such as financial services, are skill-intensive (Delgado and Mills, 2020[17]) and strong export performance is therefore likely to benefit high-skilled workers.

Support for the positive effect of services exports on the demand of high-skilled workers is provided by an analysis of Swedish matched employer-employee data for 2003-2015 (Nordås, Lodefalk and Tang, 2019[18]) as well as a study analysing the consequences of uncertainty about potential new barriers to services exports: Javorcik et al. (2020[10]) find that UK regions that were more exposed to potential barriers to professional services exports to the EU after July 2016 saw a reduction in online job adverts that was particularly pronounced for higher skilled jobs.

Regarding imports of services, concerns about a potential threat to high-skilled jobs featured prominently in the early debate about growth in the international sourcing of services inputs (Brainard and Litan, 2004[19]). Drawing on US occupation-level employment data for the period 1997-2006, Crinò (2010[20]) finds that international sourcing of services inputs increases employment in more skilled occupations relative to less skilled occupations. This resonates with empirical results based on British worker-level data for 1992-2004 (Geishecker and Gorg, 2013[21]) suggesting that services offshoring contributes to a widening of the wage gap between skilled and less skilled workers.

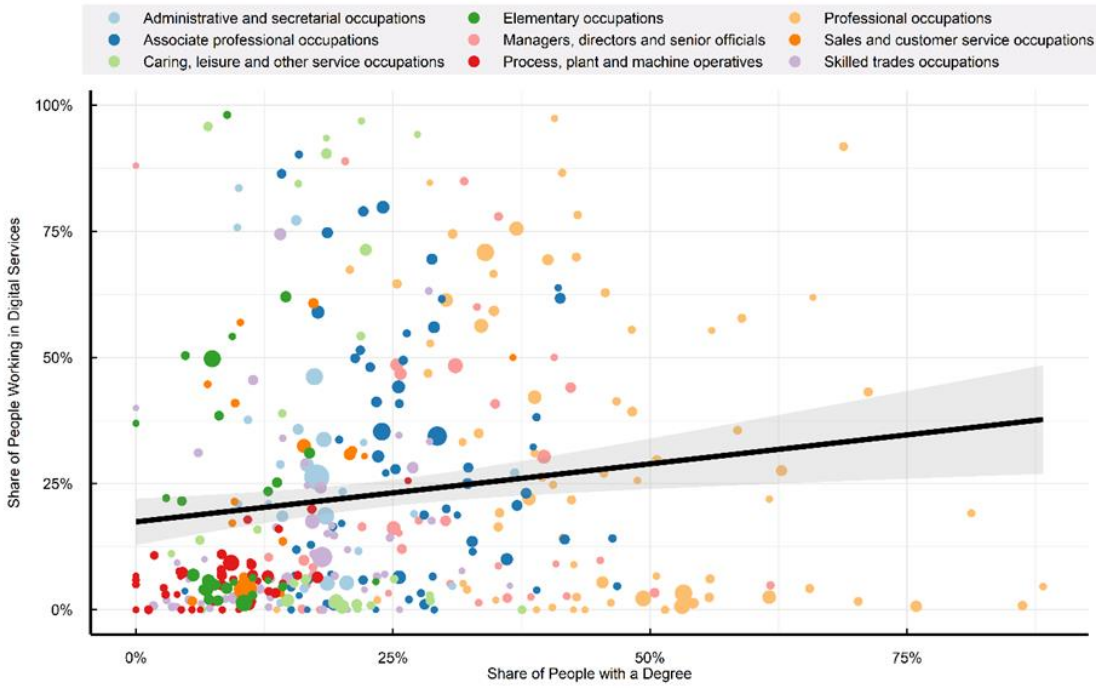
While the above-mentioned studies suggest offshoring reduces relative demand for low-skilled workers, several recent contributions do not find support for such an effect. Combining firm-level and individual-level data for the United Kingdom (2004-2017), Lassmann and Spinelli (2020[8]) report that services imports

have the same positive overall effect on wages of high-skilled compared to low-skilled workers. By contrast, De Lyon (2021[16]) draws on British micro data on firms and workers for 2003- 2016 and finds that regional-level exposure to imports of services has a negative effect on average wages in high skill occupations and on wages in the top half of the earnings distribution.[8]

The existing results regarding the effect of services imports on higher skilled versus less skilled workers seem inconclusive, but it is important to take into account a further dimension: At a given level of skills, the characteristics of a worker's specific tasks shape her exposure to competition from workers in other countries. Jobs that are more intensive in face-to-face interactions, less suitable for digital communication and less routinisable are generally considered as less directly exposed to services offshoring (Blinder, 2006[22]). Several studies show that occupations defined as more tradable based on such criteria are more likely to experience employment reductions due to services imports (Crinò, 2010[20]; Liu and Trefler, 2019[23]; Frenkel and Ngo, 2023[24]).

Returning to patterns emerging from UK Labour Force Survey data analysed for this report, one way to explore whether the expansion of digital services has a differential impact depending on workers' skill level is to compare employment in these sectors and levels of education. Figure 2.2 shows, for very detailed four-digit occupation categories, the share of workers in that occupation who have a degree beyond secondary education (corresponding to UK qualification levels 4-8) and the share who work in digital services sectors.

Figure 2.2. Education weakly correlated with employment in digital services sectors



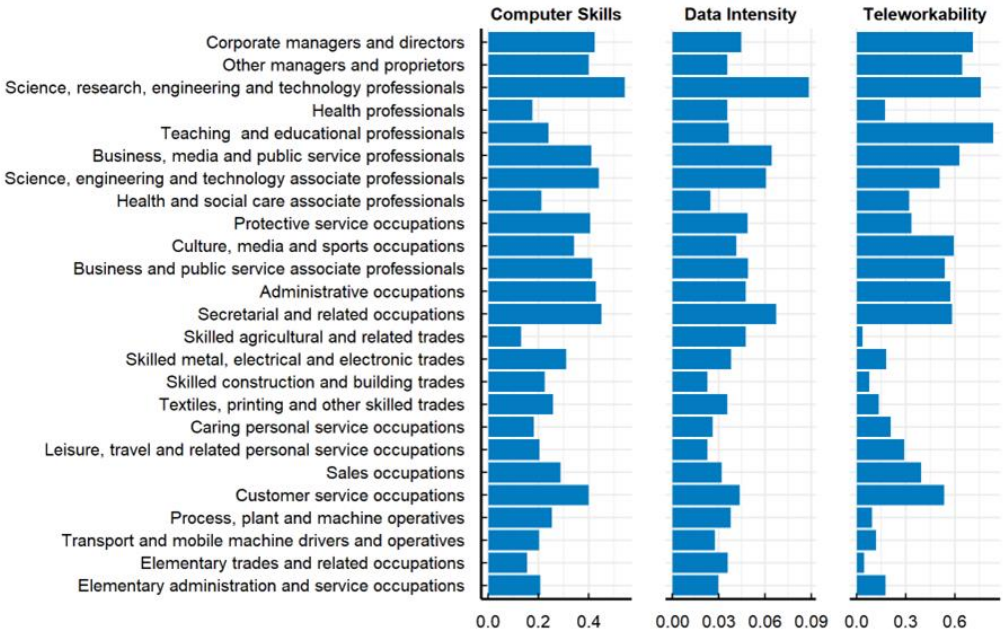
Note: Each dot represents a four-digit occupation category within the UK SOC classification system. The colours represent the nine major groups into which occupations are organised in this system. The size of each dot is proportionate to the number of people employed in that occupation. The x-axis captures the share of people in an occupation with a degree beyond secondary education, corresponding to UK qualification levels 4-8. The y-axis measures share of people who work in a digital services sector, which are finance, communication, professional and administrative services, and other service activities. Data for 2019.
Source: UK Labour Force Survey.

[8] Similarly, results of a study using detailed Belgian firm-level data for 1996–2005 indicate that services offshoring has a negative impact on employment growth among high-educated workers (Ornaghi, Van Beveren and Vanormelingen, 2021[52]).

On the one hand, a positive correlation can be seen between education levels and the share of digital services employment. It is on average the case that occupations which are more often filled by those with more education are somewhat more likely to be employed within a digital services firm. But on the other hand, the relationship is not very pronounced. Many occupations see a high share of digital services but only a small share of degree holders, and a modest number also display the inverse combination. Thus, it is by no means a simple story of digital services only providing employment for those with high levels of education.

The potential skill bias of digital services trade may not be captured simply by broad measures such as education level. Instead, highly specific technical skills may be required to fulfil occupations in digital services and particularly in the trading of those activities. Figure 2.3 shows three different measures of digital skills relevant in twenty-five broad occupation groups: intensity in computer skills[9], data intensity,[10] and feasibility of working at home.[11]

Figure 2.3. Variation in three occupation features relevant for digital trade



Note: Computer skills measures the share of online job advertisements for a given occupation that mention a set of relevant keywords related to computer activities. Data intensity is also constructed based on job ads, capturing the frequency of words related to data entry, management, and analytics. Teleworkability refers to the ease of doing a job remotely, measured on the basis of survey answers regarding common activities in an occupation. The occupation categories shown are the 25 sub-major groups of the UK SOC classification system.
Source: Braxton and Taska (2023[25]) for computer skills; Schmidt et al. (2023[26]) for data intensity; Dingel and Neiman (2020[27]) for teleworkability.

[9] The measure for computer skills was created by Braxton and Taska (2023[25]). They leverage information of online job advertisements, with the data shown here using ads placed in the United States in 2017. The aim is to capture what skills are asked for when hiring in a given role. Specifically, the variable indicates the proportion of job openings within an occupation group that contains a specific set of keywords, such as "computer" and software names, reflecting the prevalence of computer-related skill requirements.

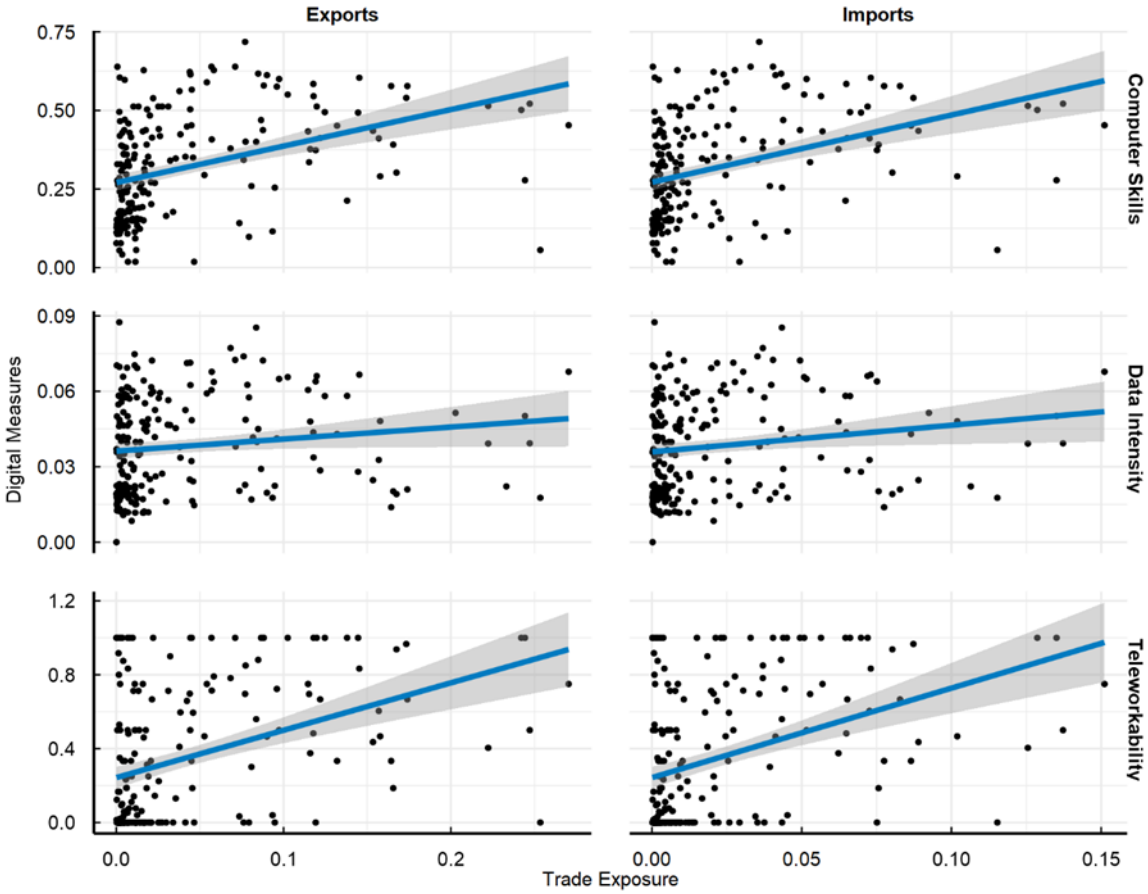
[10] Schmidt et al. (2023[26]) developed a measure of data intensity at the occupation level. They use data from online job advertisements, in this case between 2012 and 2022 in the UK, the US, and Canada. Extracting keywords related to data entry, database management, and data analytics, they classify occupations in their use of each of these activities. Combining the three dimensions results in an overall measure of data intensity of the occupation.

[11] Occupations also differ in the ease with which they can be performed remotely, a feature that has been termed "teleworkability". Dingel and Neiman (2020[27]) measure the feasibility of remote work based on the O*Net database by the US Department of Labor. Using survey answers to questions such as "do you use email less than once per month", with a specific value associated to each question, an overall index ranging from 0 to 1 is constructed, with higher scores indicating greater ease of working remotely.

Figure 2.3 shows how different occupation groups score on each of these dimensions of digital skill. Some occupations, such as science and business-related activities, score relatively high across the board. Others, for example health and personal care jobs, see lower values on all three measures. Yet notably, the three dimensions are not always highly correlated and it is not uncommon for occupations to score high on one but low on another. This suggests that the returns to and relevance of particular skills may differ further, depending for example on the particular service or the mode by which it is traded.

Figure 2.4 looks more closely at this relationship between digital skills and trade in digital services. The vertical axis captures the three measures described above, for each of the highly detailed occupation categories represented by each dot. The horizontal axis measures exposure to digital services trade. This is calculated as imports or exports in the digital-intensive sectors normalised by output in each sector, weighted by the share of people working in that occupation who are employed in each of those sectors.

Figure 2.4. Occupation digital measures associated with increased trade in digital services sectors



Note: Each dot represents a four-digit level occupation category in the UK SOC classification system. Computer skills measures the share of online job advertisements for a given occupation that mention a set of relevant keywords related to computer activities. Data intensity is also constructed based on job ads, capturing the frequency of words related to data entry, management, and analytics. Teleworkability refers to the ease of doing a job remotely, measured on the basis of survey answers regarding common activities in an occupation. Trade exposure at the sector level is measured as trade flows normalised by output in 2019. Occupation-level exposure is a weighted average of the five digital services sectors (finance, communication, professional and administrative services, and other service activities) based on the share of people employed in each occupation who are active in these sectors.
Source: Braxton and Taska (2023[25]) for computer skills; Schmidt et al. (2023[26]) for data intensity; Dingel and Neiman (2020[27]) for teleworkability; and OECD TiVA data for trade exposure.

For each of the three digital skill measures, a clear positive correlation can be seen with higher levels of trade exposure. Higher levels of computer skills, data intensity, and teleworkability are all associated with higher levels of exports and imports of digital services in the sectors where people in those occupations work. This suggests that the presence and development of these skills has played an important role in the expansion of digital services trade.

Digital technologies act as a powerful driver of increases in services tradability. Analysing patterns of cross-border services trade between 47 economies over a 20-year period, Benz et al. (2022[28]) find that trade costs for financial services, communication services and business services fell by between 30% and 60% between 2000 and 2019. Their study highlights the central role played by information and communication technology (ICT) in reducing the costs of exporting to remote destinations. Drawing on detailed British firm-level data, Kneller and Timmis (2016[29]) similarly find that broadband adoption increased firms' probability of exporting business services.

By lowering the costs of trading services across borders and distance, ICT adoption has acted as a powerful motor for the expansion of international services trade in recent years (WTO, 2019[30]). For workers, the impressive dynamism of digitally deliverable services has led to an increase in exposure to services trade both in terms of the absolute volume of exports and imports as well as with respect to set of activities that are traded.

Digital-intensive services require specific skills: Drawing on survey data regarding skills and labour market participation covering 31 countries, Grundke et al. (2018[31]) find that digital-intensive industries especially reward workers having relatively higher levels of self-organisation and advanced numeracy skills. Export growth in digital-intensive services may therefore disproportionately benefit workers possessing such skills. Similarly, imports of digital-intensive services may display complementarities with specific digital skills that could also contribute to a wage premium for specific skills, e.g. regarding managerial or analytical tasks (Crinò, 2011[32]). Recent empirical research based on US data suggests that digital skills also shape adjustment processes of displaced workers, with workers lacking such skills seeing substantially larger income reductions after having lost their job (Braxton and Taska, 2023[25]).

2.3. By lowering services trade costs, digital technologies enable more firms to export

While individual-level skills are of pivotal importance to workers' labour market prospects, the relevance of the employer's characteristics is also well-established in the literature. A wage premium is often observed for employees of larger firms and exporting firms (Baumgarten, 2013[33]; Bamieh, Bripi and Fiorini, 2021[7]). By reducing the cost of trading services, digital technologies enable more firms to start trading. For example, digital technologies have been shown to reduce trade costs associated with language barriers (Brynjolfsson, Hui and Liu, 2019[34]). This suggests the dynamism of digital services trade may help to ensure more workers reap the benefits of trade.

Yet, several related streams of literature point to a more complex picture. Key features of the technologies and business models underpinning the growth of digital services trade may contribute to a widening gap between the wages paid by leading firms at the technology frontier and technologically lagging firms. While the COVID-19 pandemic has boosted ICT adoption, not all firms are equally capable of making use of these technologies. Data from several countries show SMEs generally lag behind regarding the adoption of digital technologies and are less likely than larger firms to use remote working (OECD, 2021[35]; Crescenzi, Giua and Rigo, 2022[36]; OTS, 2022[37]). Given that teleworking relies on technological and managerial capabilities that are highly relevant to cross-border services trade (Baldwin and Dingel, 2022[38]; Sytsma, 2022[39]), this casts doubt on expectations that growth in digital services trade will reduce firm-size wage gaps.

Moreover, recent empirical research focused on productivity dispersion among firms finds that laggard firms catch up to the productivity frontier at a relatively lower speed in more digital intensive industries (Berlingieri et al., 2020[40]). According to results obtained by Corrado et al. (2021[41]), this pattern may reflect lagging firms' insufficient capacity to invest in intangible assets that display complementarities with digital

technologies.[12] A key characteristic of intangible capital is its scalability and successful digital business models frequently assume a rapid scaling up at low marginal cost (Haskel and Westlake, 2018[42]; Cadestin et al., 2021[43]). For example, once an anti-virus software has been successfully developed and tested in one major market, its rollout to more countries may require relatively limited additional investment.[13] Several contributions link signs of a growing productivity gap between the most productive firms and laggards to a disproportionate accumulation of intangible assets in a relatively small number of leading companies often described as "superstar firms" (Autor et al., 2017[44]; Tambe et al., 2020[45]).

The contrast between lagging firms struggling to capitalize on new technologies and leading companies reaping returns on investments in scalable intangible assets suggests the digital transformation and growing digital trade may not necessarily benefit all firms and workers equally (Tambe et al., 2020[45]). The scalability of intangible capital and complementarities between intangible assets seem to favour larger firms. Yet, a recent analysis comparing patterns across manufacturing and services finds signs that in skill-intensive services the capacity to achieve productivity gains from investments in intangible assets is less shaped by firm size than in manufacturing (Corrado, Hulten and Sichel, 2005[46]).

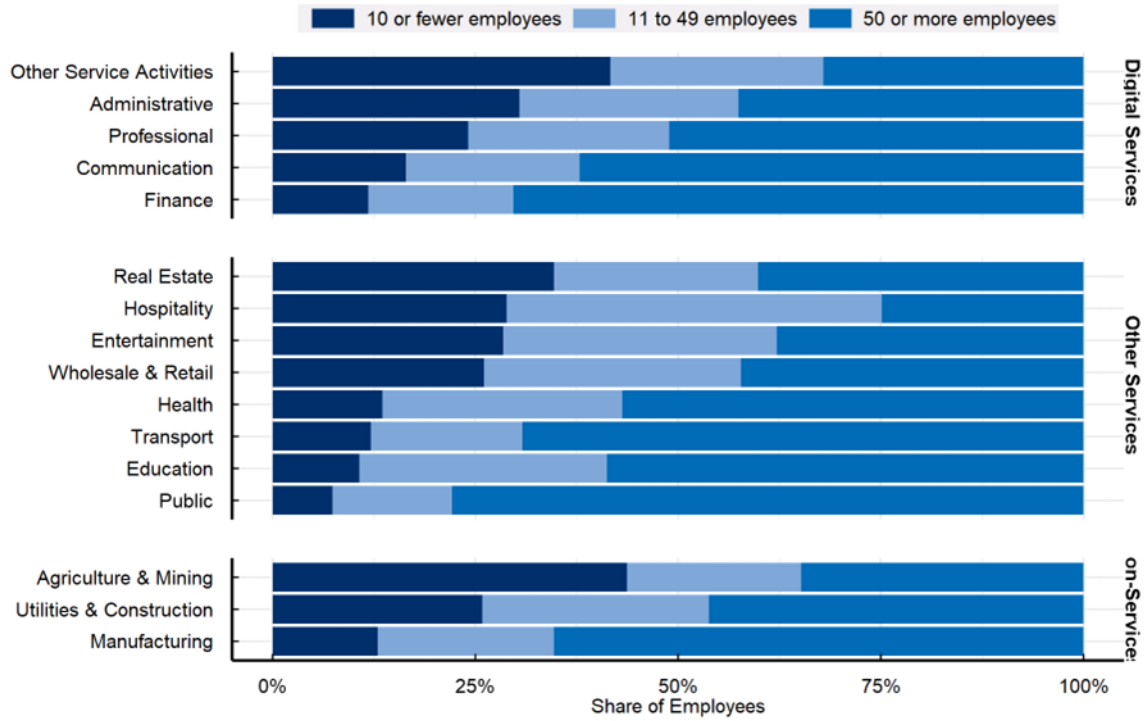
Against the backdrop of concerns about the growing market power of leading firms exploiting the scalability of intangible assets (Durand and Milberg, 2019[47]; IMF, 2019[48]), Jaax and Miroudot (2021[49]) stress the importance of combining openness to trade and investment with a strong capacity to monitor market concentration trends. The different elements of the trade–investment–intellectual property nexus need to be carefully balanced to create a comprehensive regulatory framework that combines the advantages of international connectivity with strong incentives to innovate and simultaneously prevents leading firms from stymying competition.

The UK labour force survey data prepared for the present report enable us to shed some descriptive light on the link between digital services trade and SMEs. A first step is to establish the firm size distribution differs across sectors. Figure 2.5 shows, for 2019, the share of employed people working in firms with fewer than ten employees, between 11 and 49 employees, or more than 50 employees. Considerable variation exists between sectors, ranging from only 7% of people working in public services to 44% of those in agriculture and mining working in micro-enterprises. Digital services do not differ structurally from other sectors, with a similar range and distribution of firm sizes.

[12] Intangible capital encompasses a wide range of knowledge-based assets that lack a physical embodiment. Intangibles are frequently grouped into three categories (Corrado, Hulten and Sichel, 2005[46]): computerised information (such as datasets on consumer preferences), innovative property (e.g. a new financial product), and economic competencies (e.g. a strategy to improve information sharing between a multinational enterprise's subsidiaries and the headquarters).

[13] Regarding workers, this scalability might in some cases limit the effect of export growth on labour demand. Yet, this aspect remains underexplored in the empirical literature.

Figure 2.5. Distribution of employment by firm size similar for digital services and other sectors

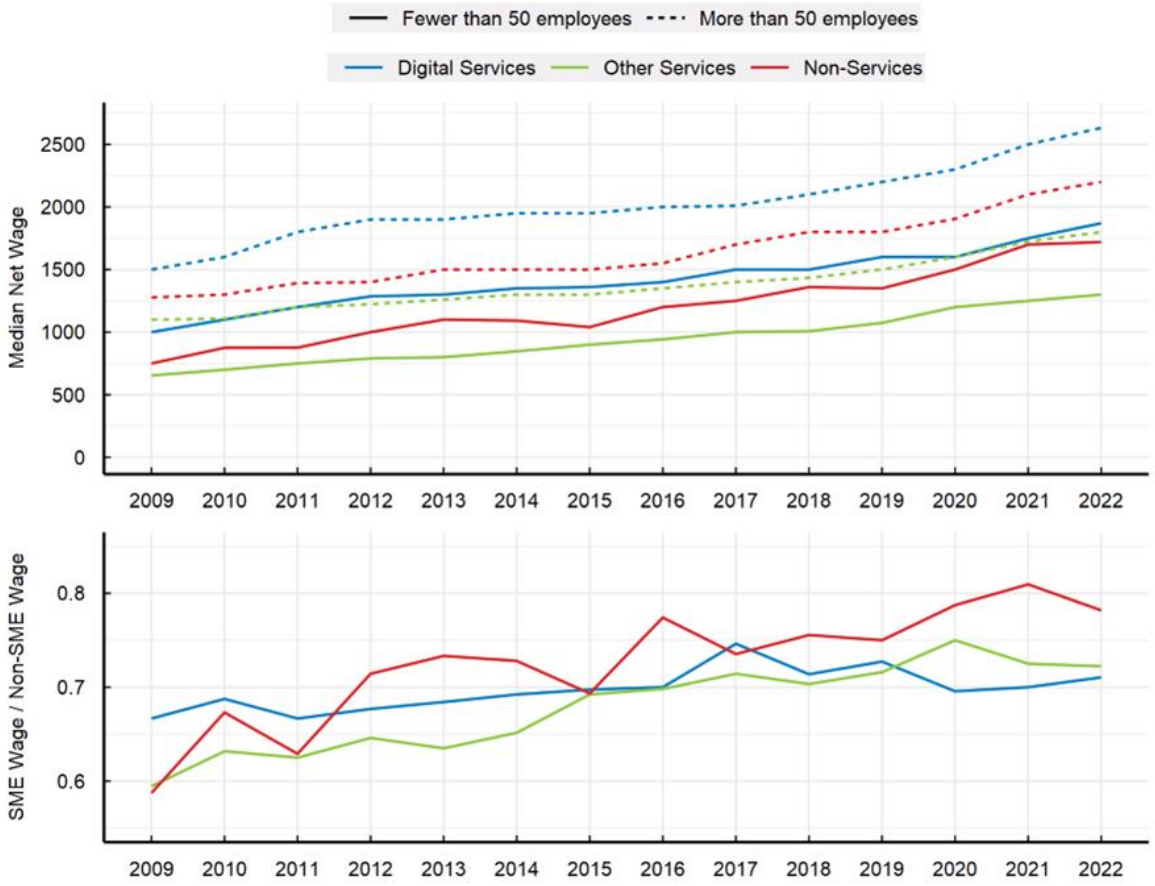


Note: The x-axis represents the share of people working in a given sector who indicate that the firm in which they are employed is in each of these three size categories in 2019.
Source: UK Labour Force Survey.

Turning to the question of whether being employed in larger firms leads to considerably higher remuneration for workers, Figure 2.6 shows two trends in wages over time. The top panel shows the median take-home income for employees in the three sector groups, split by those working in firms of more or fewer than 50 people. Across the board, digital services see considerably higher wages than other sectors, showing the potential benefits of an expansion of digital services employment. In each sector group, employees of larger firms receive substantially more income than those working in SMEs.

In absolute terms, the gap between small- and large-firm wages is biggest in the digital services, but this is a result of the higher overall levels of income in these sectors. To examine these patterns from another angle, the bottom panel of Figure 2.6 shows the ratio between the median wage for people in firms under 50 employees and the median wage of those working in firms over 50 people. Over time this ratio has been fairly, with signs of a slow movement closer to 1 for all sectors, meaning the relative difference between small and large firms is shrinking. The three sector groups see very similar values on this measure, meaning digital services do not see a greater level of distinction between small and large firms than other sectors, although to some extent the reduction of the gap has been less rapid in digital services. Based on these data and these firm-size categories, there are no signs that digital services trade may have led to a widening of the firm size wage gap.

Figure 2.6. Relative wages by firm size category similar across sector groups



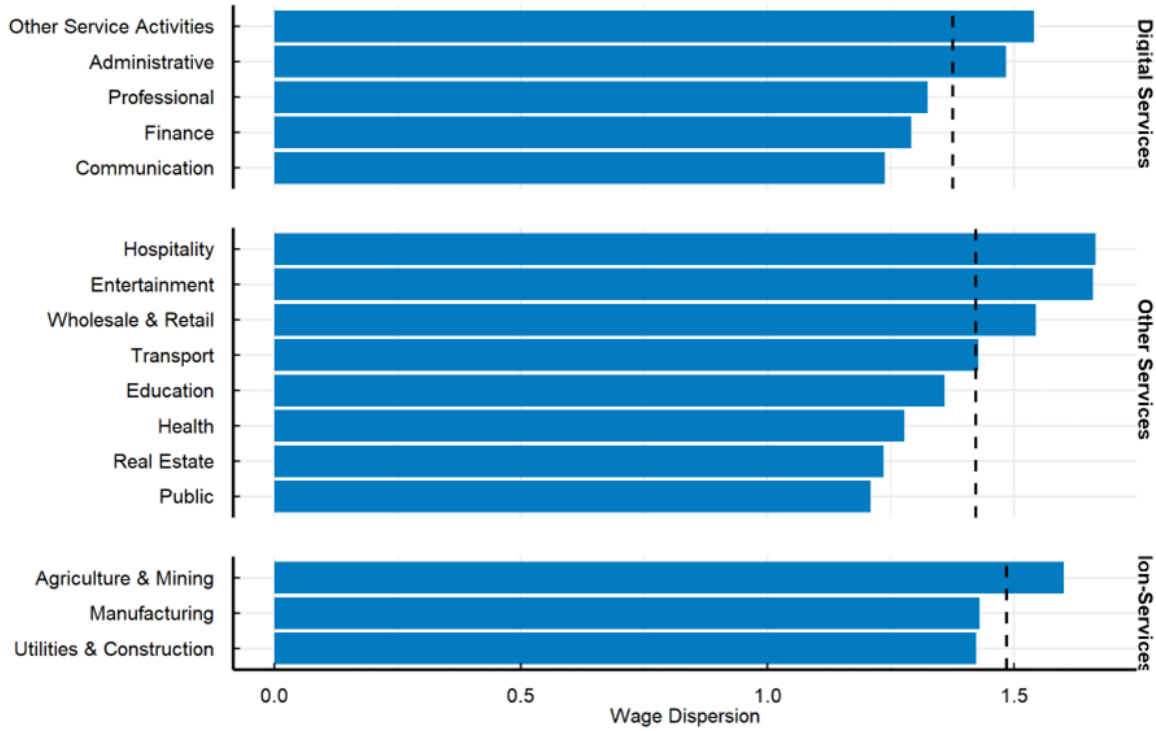
Note: Non-services encompasses the agriculture, mining, manufacturing, utilities, and construction sectors. Digital services sectors refers to finance, communication, professional and administrative services and other service activities. The remaining group of other services covers wholesale and retail, transport, hospitality, entertainment, real estate, health, education, and public services. On the top graph, the y-axis measures the median take-home income for employees in each sector and size group. Regarding the top panel, solid lines refer to larger firms (more than 50 employees) and dashed lines refer to smaller firms (fewer than 50 employees). The bottom panel shows on its y-axis the ratio of median wages in the smaller firm category (fewer than 50 employees) relative to the median wage in the larger category (more than 50 employees).
Source: UK Labour Force Survey.

Inequality in income can also be a concern within sectors and firms rather than across them, for example due to differences in compensation due to occupation or personal characteristics. One proxy for the extent of income inequality is wage dispersion, measured as the ratio between the 90th percentile and the 10th percentile of the log of income within a given group (Berlingieri, Blanchenay and Criscuolo, 2017[50]). A high score on this measure means that those closer to the top of the income distribution earn significantly more than people nearer the bottom, while a value closer to 1 indicates a greater level of equality.

In Figure 2.7, the wage dispersion for each sector in the UK in 2019 is shown. Values range from 1.2 for public services to 1.7 for hospitality. While variation exists within sector groupings, on average the digital services sector displays the lowest level of wage dispersion at 1.38. While the existing empirical literature remains inconclusive regarding the impact of services trade on wage disparities within firms and industries (Crinò, 2010[51]; Ornaghi, Van Beveren and Vanormelingen, 2021[52]), the picture emerging from Figure 2.7

only shows relatively high wage dispersion (compared to the average across all sectors) for other business services and administrative services.[14]

Figure 2.7. Wage dispersion is lower in digital services sectors



Note: Wage dispersion is calculated as the ratio between the 90th percentile and the 10th percentile of log net income, calculated within each sector and drawing on data referring to 2019. The dashed lines indicate the average value across the sectors of each of the sector groups.
Source: UK Labour Force Survey.

2.4. Some regions may benefit more than others from increased digital services trade

In addition to these mechanisms for effects on wage gaps between workers with different skills and workers in different types of firms, the growth of digital services trade may also impact disparities in the wages of workers across different regions within a country. Although the adoption of digital technologies has been shown to reduce the impact of geographical distance on cross-border services trade (Benz, Jaax and Yotov, 2022[28]), skill-intensive and digital-intensive services display a high level of spatial clustering within countries (Leamer and Storper, 2001[53]; Adler and Florida, 2021[54]; Atkin, Chen and Popov, 2022[55]). Clearly, the benefits of face-to-face communication as an efficient means of establishing trust and exchanging tacit knowledge remain highly relevant (Storper and Venables, 2004[56]). Rather than fully substituting face-to-face communication, modern communications technologies may constitute a complement that could even increase the economic benefits of urban density (Büchel and Ehrlich, 2020[57]; Tranos and Ioannides, 2021[58]).

Similarly, the general literature on agglomeration economies (Faggio, Silva and Strange, 2017[5]) and considerations related to the scalability of intangible assets (Eckert, Ganapati and Walsh, 2022[59]) suggest that large cities constitute a particularly productivity-enhancing environment for the development and application of digital technologies. For workers, this points to a widening of gaps in wages between major agglomerations and peripheral locations – including for workers at a given level of skills. Regarding the

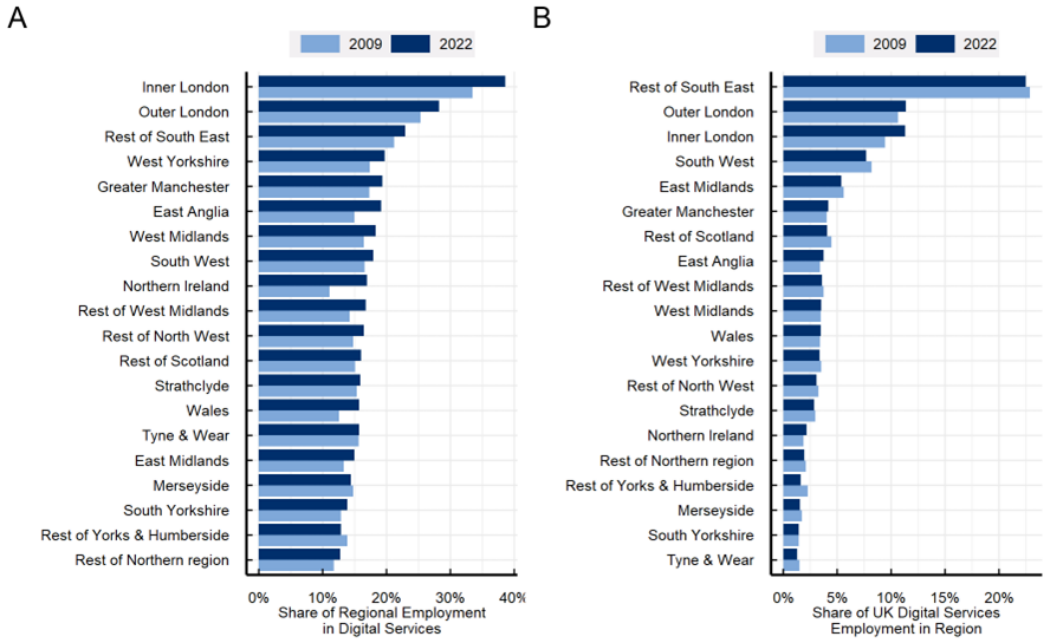
[14] Yet, this explorative discussion of descriptive patterns from the UK Labour Force Survey does not allow for an in-depth assessment of the link between digital trade and wage disparities. For example, matched employer-employee data would provide a promising basis for a more comprehensive examination of this question.

United States, Eckert (2019[60]) shows that increases in the tradability of services explain a large part of the unequal growth of the skill premium across commuting zones between 1980 and 2010.

Figure 2.8 shows the distribution of digital services employment across the UK in two ways. Panel A on the left shows, for each region, what share of overall employment falls within the digital-intensive services sectors. In 2022 these shares ranged from 13% to 39%, with most regions displaying values around 15-20%. The highest shares of digital employment are found in and around London while the lower values are seen in the north of England. Almost all regions saw an expansion in digital services employment since 2009, with particularly notable increases in Wales, East Anglia, and Northern Ireland.

Panel B on the right of the figure shows the share of each region in overall national employment in digital services. Around 45% of digital services employment is located in London and the South East, reflecting the higher shares of digital services within those regions seen in Panel A. Some regions have seen an increase in their share of the UK total while others experienced a decrease, revealing a mixed picture in terms of changes in concentration of digital services over time.

Figure 2.8. Concentration of digital services employment in regions of the United Kingdom



Note: Panel A on the left shows, for each region, the share of people working in that region who are employed in one of the digital services sectors (finance, communication, professional and administrative services and other service activities). Panel B shows, for the total employment in these sectors across the UK, what share is located within each region.
Source: UK Labour Force Survey.

3. Importance of digital trade and services trade for employment and income

The United Kingdom has strong trading relationships with its partners and is robustly integrated in global value chains (GVCs). While this has raised welfare and living standards in the country, it also means that local employment interacts with international influences, such as global changes in demand or supply for specific goods or services. However, traditional trade statistics do not reveal the full nature of these global interdependencies. Trade statistics in value added terms, such as the OECD Trade in Value Added (TiVA) database can provide a more adequate representation of the global interactions of production, trade and consumption.

The OECD Trade in employment (TiM) database complements the TiVA indicators, providing insights into the impact of GVCs on labour market outcomes. The indicators are derived by combining OECD Inter-Country Input-Output (ICIO) tables with appropriate employment by industry statistics (Horvát, Webb and Yamano, 2020[61]).

3.1. UK employment depends strongly on exports of digital-intensive services

A recent extension of the OECD Trade in Employment (TiM) database includes additional sector-disaggregation for the United Kingdom, as well as Germany, France, and Italy. The sector breakdown is extended to 75 sectors. In particular, the database reports a more detailed breakdown in several services sectors, including financial services and business services Table 1.1 reports the sectors of the OECD TiM database that are considered to be digital-intensive services sectors (Calvino et al., 2018[1]).[15]

The analysis shows that in 2019 the jobs of around 3.2 million domestic workers in digital services sectors are embodied in UK exports. For the remainder of this report, we refer to this as “digital exported employment”. The vast majority of these workers, around 2.2 million, are employed in the exporting industry. In other words, these jobs depend directly on cross-border exports of digital-intensive services. Slightly less than one million is employed in other, upstream, sectors.

This number includes employment in digital-intensive services that are used as intermediate inputs for the exports of manufactured good. Consequently, the high number of direct domestic employment embodied in gross exports also shows the high importance of cross-border services exports in the United Kingdom relative to services embodied in manufacturing exports.

Most UK digital exported employment is in ISIC rev. 4 sectors 80-82 with a total of around 800,000 (Figure 3.1). These sectors cover security and investigation activities; services to buildings and landscape activities; as well as office administrative, office support and other business support activities. Importantly, office support and other business support activities include the activities of call centres under class 8220, which is a very labour-intensive activity. This activity alone might be responsible for much of the total digital exported employment in ISIC rev. 4 sectors 80-82.[16]

These sectors rely primarily on employment in the same sector for their exports. They do not contribute much to indirect exports of employment in other upstream sectors. Potential explanations could be a generally low importance of intermediate inputs in these sectors or a relatively higher importance of intermediate inputs that require more capital and less labour for their production.

Legal and accounting services, as well as activities of head offices and management consultancy activities are the second most important area of digital exported employment in the United Kingdom. More than 600 000 jobs are embodied in UK exports of these sectors. The majority of these jobs are in the same sectors, not in other upstream sectors.

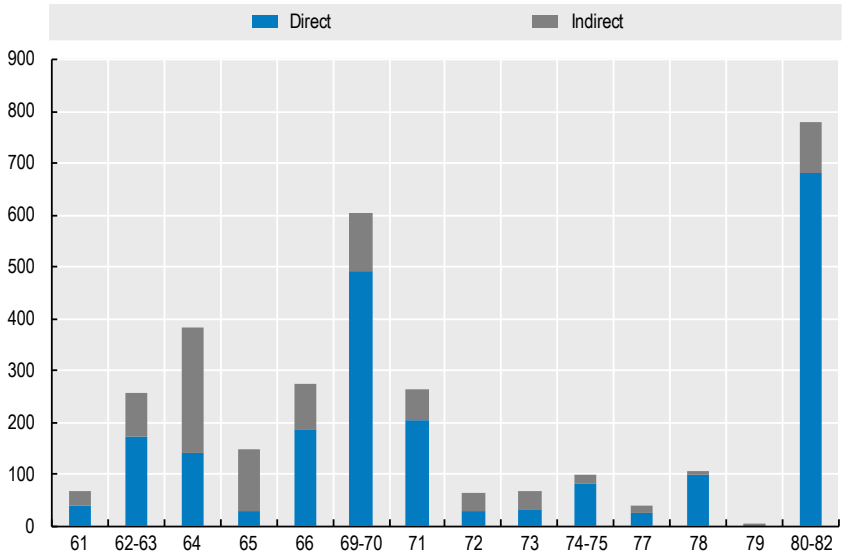
[15] The classification of digital-intensive sectors using the aggregation of Calvino et al. (2018[1]) is reported in the Annex.

[16] A more detailed analysis is not possible due to the lack of adequate data employment embodied in exports on the 4-digit ISIC rev. 4 level.

By contrast, financial services (ISIC rev. 4: 64) is the sector with the highest number of upstream employment that is embodied in the cross-border exports of this sector. This result could be due to the fact that financial services are relatively capital-intensive. Financial services employment is typically in relatively high-skill occupations. At the same time, financial services could rely on a large contribution of intermediate inputs from more labour-intensive sectors.

The relative contribution of upstream employment for exports is even higher in the insurance sector (ISIC rev. 4: 65). Around 80% of the employment embodied in exports of this sector is in other upstream sectors.

Figure 3.1. UK employment embodied in digital-intensive services exports, 2019



Note: Number of employment in thousands by exporting industry (ISIC4, see Table 1.1). Direct domestic employment embodied in gross exports refers to employment in the exporting industry; Indirect domestic employment embodied in gross exports refers to employment in other, upstream, domestic industries.
Source: OECD Trade in Employment (TiM) database.

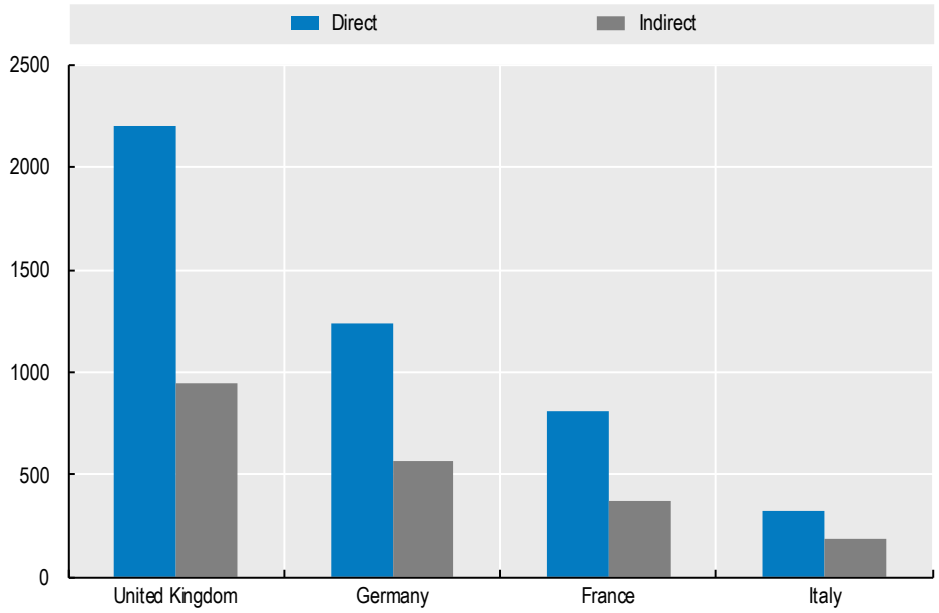
3.2. The United Kingdom is ahead of its peers in terms of employment for digital services exports

A comparison across countries five major OECD members shows that the number of jobs embodied in digital services exports is highest in the United Kingdom, where the jobs of 3.2 million workers are embodied in digital services exports. In comparison, the comparable figure is only 1.8 million in Germany, 0.8 million in France and 0.5 million in Italy. This comparison shows the extremely high importance of digital services exports for the UK labour market (Figure 3.2)

The lead of the United Kingdom is particularly striking in light of the much larger labour markets in some of the other countries. This implies that not only the number of jobs embodied in digital services exports is higher in the United Kingdom compared to the other countries, but also the share of jobs embodied in digital services exports, relative to the total number of employment in each economy.

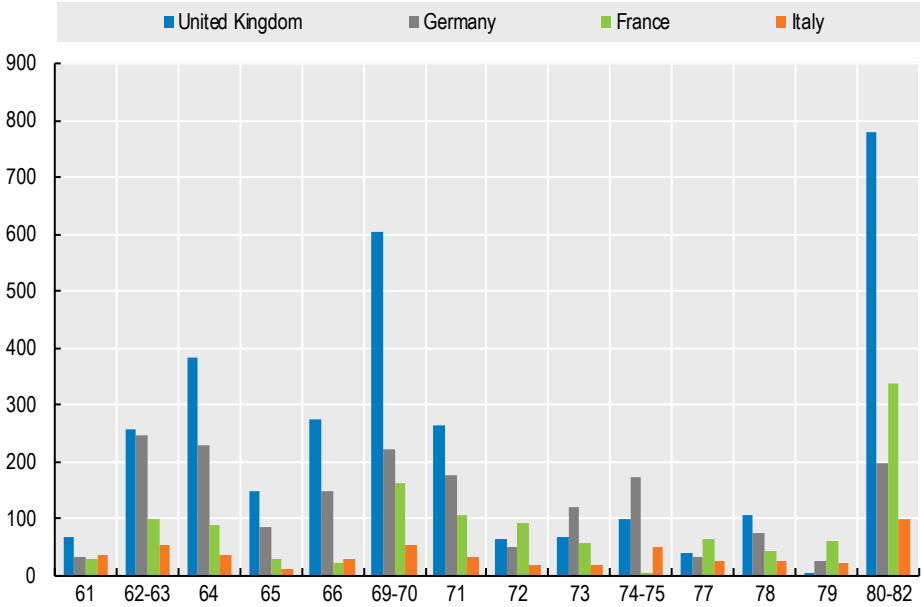
A comparison of individual sectors shows that the strong position of the United Kingdom with respect to digital services exports comes primarily from ISIC rev. 4 sectors 80-82, which include activities of call centres, as discussed above. The other four countries rely on these exports to a much smaller extent for their domestic employment. Other striking differences include the high importance of auxiliary activities to financial service and insurance activities (ISIC rev. 4: 66). In the United Kingdom, exports in this sector account for much larger employment numbers than in the other four countries (Figure 3.3)

Figure 3.2. Benchmarking employment embodied in digital-intensive services exports, 2019



Note: Number of employment in thousands. Direct domestic employment embodied in gross exports refers to employment in the exporting industry; Indirect domestic employment embodied in gross exports refers to employment in other, upstream, domestic industries.
Source: OECD Trade in Employment (TiM) database.

Figure 3.3. Cross-country comparison by sector, 2019

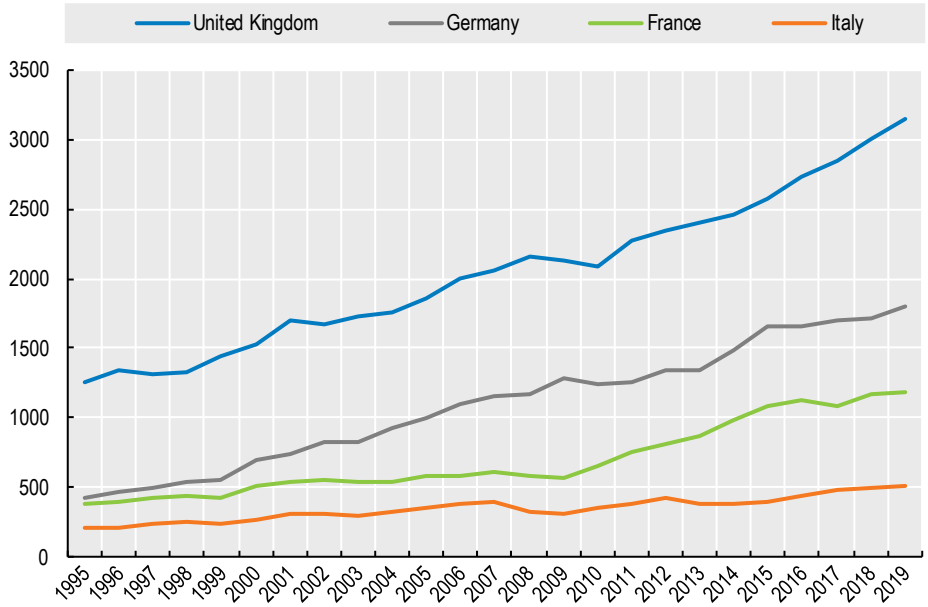


Note: Number of employment in thousands. Direct domestic employment embodied in gross exports refers to employment in the exporting industry (ISIC 4, see Table 1.1); Indirect domestic employment embodied in gross exports refers to employment in other, upstream, domestic industries.
Source: OECD Trade in Employment (TiM) database.

In Germany, ISIC rev. 4 sectors 74-75 are of particular importance. German employment embodied in exports of this sector is very high compared to the other countries. These sectors include other professional, scientific and technical activities (such as design and photography), as well as veterinary activities. In France and Italy, there is a relatively high importance of travel agency, tour operator, reservation service and related activities (ISIC rev. 4: 79)

Employment embodied in digital services exports has expanded strongly since 1995. In the United Kingdom, the number has grown by around 150%, from 1.3 million jobs in 1995 to around 3.2 million in 2019. The other four countries have experienced relatively similar growth rates. Germany experienced the strongest increase of employment embodied in digital services exports, from only 420,000 in 1995 to 1.8 million in 2019, which amounts to a compound growth rate of more than 300%.

Figure 3.4. Employment embodied in digital-intensive services exports over time



Note: Number of employment in thousands. Direct domestic employment embodied in gross exports refers to employment in the exporting industry; Indirect domestic employment embodied in gross exports refers to employment in other, upstream, domestic industries.
Source: OECD Trade in Employment (TiM) database.

This section has shown the high importance of digital services exports for employment in the United Kingdom. More than other OECD countries, the United Kingdom depends on access to foreign markets and export opportunities in digital services for their domestic employment. In this context, the United Kingdom is in a strong position to benefit from further integration of digital services markets. On the other hand, it also stands to lose from potential barriers that could be implemented in the future, e.g. related to the moratorium on customs duties for electronic transmissions.

4. Local multipliers of employment in digital sectors

This section relies on employment data from the ONS Business Register and Employment Survey (BRES). The section shows that employment growth in digital services sectors is associated with additional growth of employment in non-tradable sectors in the same local labour market. The Business Register and Employment Survey (BRES) publishes employee and employment estimates at detailed geographical and industrial levels and is regarded as the official source of employee and employment estimates by detailed geography and industry (ONS, 2022).

This survey reports a detailed breakdown of employment numbers by 4-digit industry and local units. The local unit that forms the basis for this analysis is the travel-to-work area (TTWA). TTWAs are a geography created to approximate labour market areas. In other words, they are derived to reflect self-contained areas in which most people both live and work (ONS, 2016). The dataset includes data for 218 TTWAs. The dataset used for the analysis in this section covers the years from 2015 to 2021.

4.1. Digital services employment is on the rise

In 2021, average employment across all TTWAs was around 140,000. However, local employment is also characterised by a large dispersion. Employment levels were below 10 000 in 22 TTWAs, around 10% of all local labour markets. In some of these there are only 3 000 workers. Most local labour markets in the United Kingdom have a workforce between 10 000 and 100 000 workers.

On the other side of the spectrum, total employment in London stands at more than 5 million, making it clearly the largest TTWA in the United Kingdom. More than 500,000 workers are employed in five additional TTWAs, while 74 local labour markets have employment levels between 100,000 and 500,000 workers (Figure 4.1).

The existence of few large local labour markets implies that average employment per TTWA is larger than employment in the average TTWA. In this context, the average TTWA is the one in the middle of the size distribution, with half of all local labour markets being larger and the other half smaller than the local labour market in this TTWA. The size of the average TTWA corresponds to the median of the size distribution, corresponding to employment of around 65 000 in 2021.

Due to the classification of local employment on the 4-digit level it is possible to use a more granular classification of digital services employment than in the previous section. This section relies on a list of services that is classified as potentially ICT-enabled (UNCTAD, 2015). A table with the ISIC rev.4 4-digit classes categorized as ICT-enabled services according to this classification is included in the annex.

A descriptive analysis of potentially ICT-enabled services employment shows a slight increase in the total share of digital services employment (Figure 4.2). The percentage of employment in ICT-enabled services sectors has grown from 26% in 2015 to 27.2% in 2022. Despite of the increase over this seven-year period, there have been some ups and downs over the years.

Most visible is a dip in the share of digital services employment in 2018, which might have been caused by a restructuring in the operations of multinational enterprises in the anticipation of regulatory changes in the context of the withdrawal of the UK from the EU. Digital services sectors with the most significant employment loss between 2017 and 2018 are “activities of temporary employment agency activities” (-85 515), “activities of head offices” (-34 405), “other business support service activities n.e.c.” (-27 635), “other monetary intermediation” (-14 180), and “computer consultancy activities” (-11 120).

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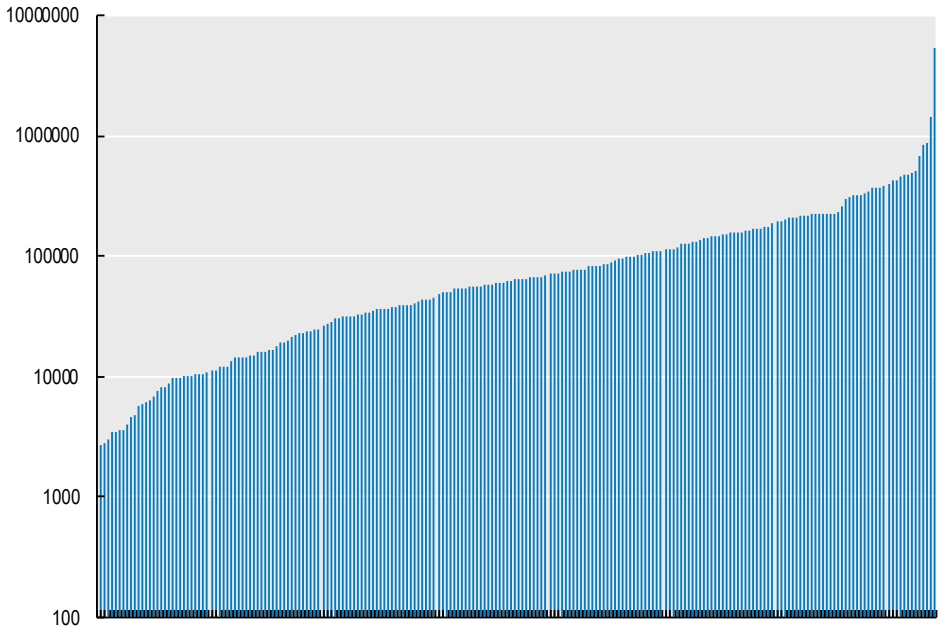
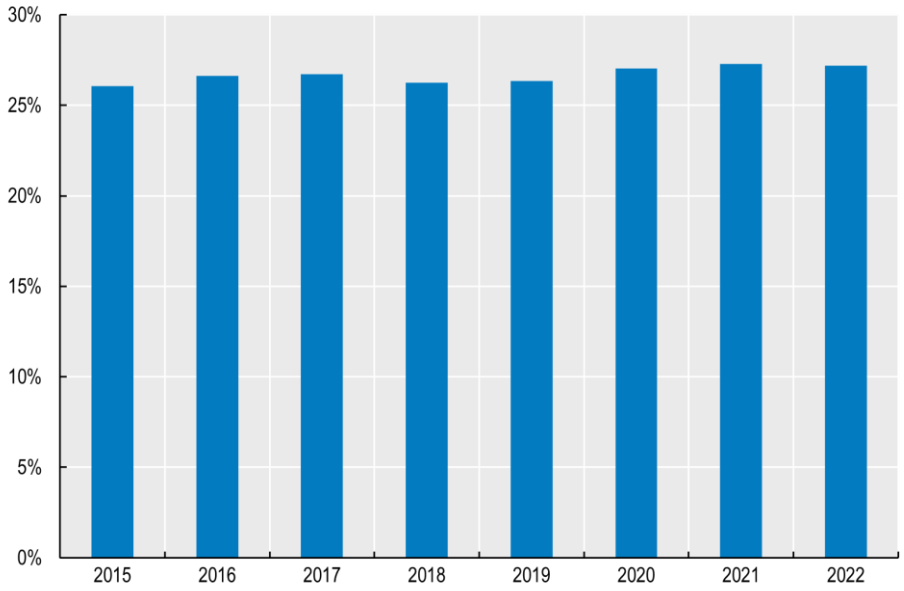
Figure 4.1. Distribution of employment across travel-to-work-areas, 2021



Note: This graph is based on a logarithmic scale. Whereas the lowest value corresponds to a total employment of 2 650 (Campbeltown), the highest value corresponds to a total employment of 5,318,730 (London).
Source: Authors' calculation using ONS Business Register and Employment Survey.

Figure 4.2. Digital services employment increased across the United Kingdom



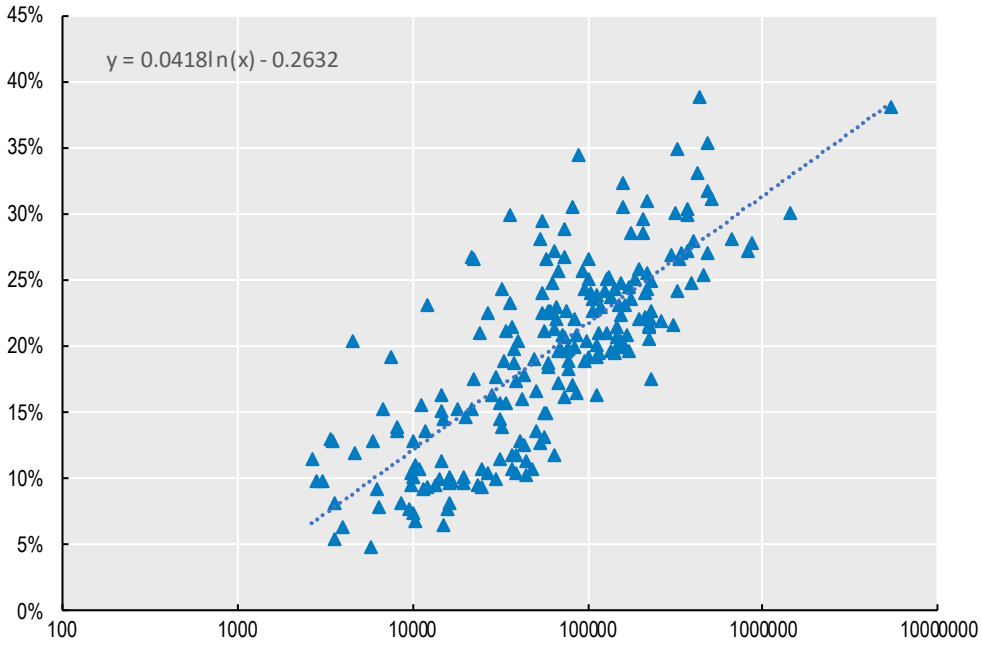
Note: This graph shows the evolution of employment in ICT-enabled services as a percentage of total UK employment.
Source: Authors' calculation using ONS Business Register and Employment Survey.

4.2. Rising concentration of digital services employment in large local labour markets

A comparison of different local labour markets shows that the importance of ICT-enabled services grows with the size of a local labour market (Figure 4.3). The figure shows total employment in a TTWA on a log scale on the horizontal axis and the share of digital services employment in total employment on the vertical axis. Almost 40% of the workforce are employed in ICT-enabled services in some local labour markets. In many others, ICT-enabled services only account for less than 10% of all jobs.

There is a very clear positive correlation between total employment in a local labour market and the share of ICT-enabled services jobs. The trendline has a reasonably good fit and only few TTWAs are relatively removed from the trend. The logarithmic relationship indicated by the trendline suggests that doubling the size of a local labour market is associated with an increase in the share of digital services employment by around 3 percentage points.[17]

Figure 4.3. Digital services are more prevalent in larger local labour markets



Note: This graph displays the relationship between employment in ICT-enabled services as a percentage of total employment (vertical axis) and total employment in a given TTWA (horizontal axis).
Source: Authors' calculation using ONS Business Register and Employment Survey.

This result also implies that digital services employment seems to be relatively concentrated in the largest labour markets. Large agglomerations do not only have higher employment numbers but also higher shares of digital services employment within the total workforce. In fact, while around 37% of total employment is in the ten largest TTWAs in the United Kingdom, the contribution of the ten largest TTWAs to total employment in digital services is around 45%.

Digital employment is concentrated in the largest local labour markets and this concentration has intensified over the last six years. The percentage point increase in the share of digital services employment has been highest for the largest quartile of TTWAs, based on their employment levels in 2015. Initially, these TTWAs had an average employment level of slightly less than 400 000, of which roughly a quarter was in digital services sectors. Until 2021, the share of digital services employment had increased by a full percentage point to 26.5%. TTWAs in the second and third quartile (with an intermediate size) are also characterised by an increase in the share of digital services jobs. However, the gain was somewhat smaller, with only 0.6 and 0.6 percentage points, respectively. By contrast, the smallest TTWAs across the

[17] The slope of the trendline is 0.0418*ln(x). Since ln(2) = 0.6931, it follows that that ln(2) * 0.0418 = 0.0290.

United Kingdom with an average employment of only 11 000 saw their share of digital services employment drop by 0.6 percentage points.

Due to an overall increase in employment, even the smallest TTWAs managed to obtain a net increase in the number of digital services jobs. However, the gain is limited to only 175 jobs, on average three jobs in each local labour market. At the same time, the largest TTWAs created almost 700 000 digital services jobs between 2015 and 2021.

Table 4.1. Increasing concentration of digital employment

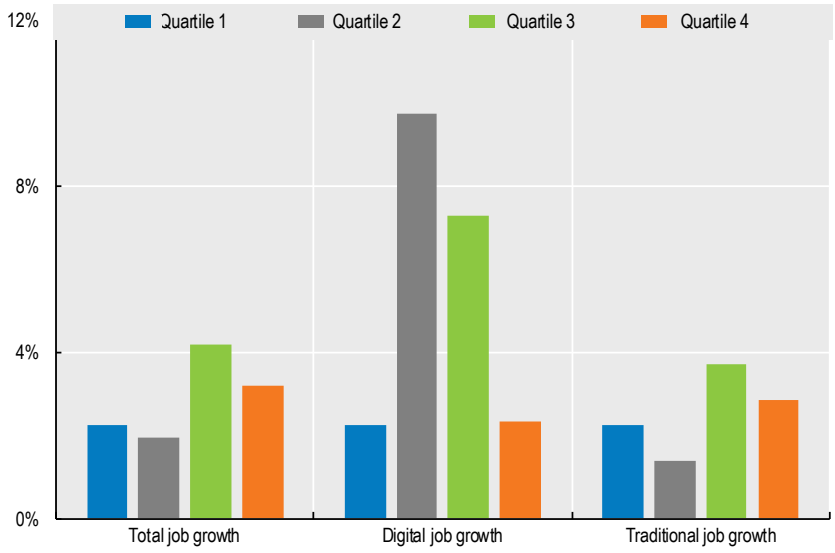
Size quartile 2015	Average employment 2015	Digital share 2015	Digital share 2021	Difference digital share	Digital employment growth
1	11 388	12.3%	11.7%	-0.6 pp.	175
2	42 183	17.2%	18.0%	0.7 pp.	27770
3	95 785	21.3%	21.9%	0.6 pp.	72965
4	392 562	25.5%	26.5%	1.0 pp.	682460

Source: Authors' calculation using ONS Business Register and Employment Survey.

The share of digital services employment is not only related to the total employment in a local labour market, but also to the growth in employment levels. This question is studied by dividing the sample of TTWAs into four groups, depending on their share of digital services employment in 2015. TTWAs in the first quartile had the lowest share of digital services employment in that year, compared to the other TTWAs. By contrast, the fourth quartile is comprised of TTWAs with the highest share of digital employment in 2015.

Job growth between 2015 and 2021 was slightly higher for the TTWAs in quartiles 3 and 4, compared to the rest (Figure 4.4). These are the TTWAs with an importance of digital services employment that was above the median in 2015. Interestingly, however, this difference is at least partly explained by stronger job growth for traditional jobs, i.e. jobs not categorised as digital services employment. Looking at the growth in the number of digital jobs, it seems that the TTWAs with an intermediate share of prior digital employment managed to obtain larger growth rates than the rest.

Figure 4.4. Job growth depends on initial share of digital employment, 2015-2021



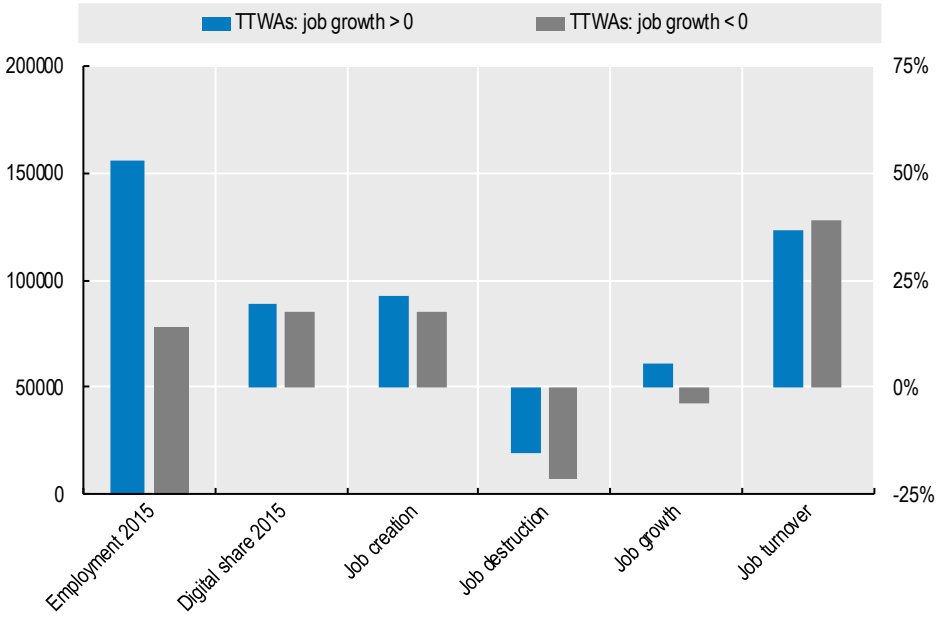
Note: Referring to TTWAs, this graph displays compound job growth between 2015 and 2021 for quartiles of the share of digital employment in 2015.
Source: Authors' calculation using ONS Business Register and Employment Survey.

Not only the share of digital employment but also initial employment levels are an important determinant of job growth between 2015 and 2021. TTWAs with positive employment growth over those years are on average around twice as large as those TTWAs characterised by a decline in the number of local employment (Figure 4.5°). Local labour markets with positive net growth between 2015 and 2021 had an initial employment level of more than 150 000 in 2015. By contrast, initial employment in TTWAs with a negative net growth was only around 80 000.

TTWAs in these two groups also differ according to the initial share of digital employment. Around 20% of all employment was in digital services in local labour markets with positive job growth between 2015 and 2021. By contrast, in local labour markets with negative job growth only around 18% of employment was in digital services. Interestingly, the difference in digital employment across the two groups is smaller than expected from the positive relationship between size and digital employment reported in Figure 4.3.

Irrespective of the net job growth, all TTWAs are characterised by a relatively high job turnover across sector, measured as sum of sector-level job creation in sectors in growing sector plus sector-level job destruction in shrinking sectors. Compound job turnover over the six years between 2015 and 2021 is slightly below 40%.

Figure 4.5. Initially larger TTWAs have added further jobs since 2015



Note: Employment 2015 displayed on left axis; other data displayed on right axis. Job growth is the net effect of job creation and job destruction. Job turnover is the sum job creation and job destruction. All changes are compound rates from 2015 to 2021.
Source: Authors' calculation using ONS Business Register and Employment Survey.

4.3. Digital services jobs have positive spillovers to employment in the non-tradable sector

The expansion of digital employment shown in Figure 4.2 is at least partly related to the parallel expansion of digital services exports. The analysis in this section has shown that job creation in digital services has been relatively concentrated in the largest local labour markets of the United Kingdom. However, the high geographic concentration of employment growth does not necessarily imply that the gains from the expansion of digital services exports are equally concentrated.

Each newly created job in a specific region increases the demand for local goods and services. This can incentivize businesses to create other jobs locally.[18] These employment effects can be quantified through the estimation of local multipliers. These relate the trade increase in a specific part of the economy to a parallel increase in other sectors (Moretti, 2010[62]).

The estimation of local multipliers is based on the following estimation equation:

$$\Delta N_{ct}^{NT} = \alpha + \beta \Delta N_{ct}^{D} + \gamma d_t + \varepsilon_{ct}$$

In this equation, ΔN_{ct}^{D} is the log change of employment in digital services at time *t* in the local labour market *c*. ΔN_{ct}^{NT} is the log change of employment in the non-tradable sector, which is defined as all economic activities outside of digital services, manufacturing, agriculture, mining and public administration & defence. Employment changes are calculated over two-period covering the years 2015-2017, 2017-2019 and 2019-2021. A second specification uses only data from the first two periods, excluding the time of the COVID-19 pandemic, which was characterised by strong labour market adjustments and government interventions, including the Coronavirus Job Retention Scheme (CJRS) and the Self-Employment Income Support Scheme (SEISS), posing significant challenges to labour market statistics during the time of the pandemic. Standard errors are clustered on the TTWA-level.

A main challenge to the robustness of this specification is potential endogeneity of employment changes in digital services. The challenge is addressed through an instrumental variable (IV) strategy that is based on a shift-share instrument. The instrument relies on weighted nationwide employment changes in 75 narrowly defined activities within the digital services sectors. Weights reflect employment shares at the beginning of the period (2015) in each local labour market. Formally, the instrument is calculated as $\sum_j \omega_{jc} \Delta N_{jt}^{D}$, with ω_{jc} as the share of jobs represented by digital services sector *j* in 2015 and ΔN_{jt}^{D} as the nationwide employment changes in digital services sector *j*.

Table 4.2. Regression results for local multipliers

	OLS		IV	
	2015-2021	2015-2019	2015-2021	2015-2019
Log difference digital services	-0.025*	-0.042**	0.081	0.120*
	(0.015)	(0.018)	(0.052)	(0.065)
Period 1	0.010**	-0.024***	0.010**	-0.036***
	(0.004)	(0.005)	(0.004)	(0.007)
Period 2	0.035***	-	0.042***	-
	(0.005)		(0.006)	
Constant	-0.008***	0.026***	-0.012***	0.031***
	(0.003)	(0.003)	(0.003)	(0.004)
Observations	654	436	654	436

Note: Standard errors clustered by TTWA in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations.

Results of the naïve OLS specification suggest a negative correlation between employment changes in digital services and employment changes in the non-tradable sector. Depending on the time horizon, a 10% increase in digital services employment is associated with a decrease of employment in the non-tradable sector by between 0.25% and 0.4%. This result, however, might be biased downwards by the existence of a causal relationship in the opposite direction. Imagine a situation where a negative employment shock in the non-tradable sector leads to a temporary increase in unemployment. Relatively flexible and low-skilled labour-intensive digital services activities, such as call centres, could use this

[18] The positive partial effect on local employment might be partly counterbalanced through general equilibrium effects, e.g. an increase in the local wage level.

opportunity to establish in the same local labour market, exploiting the relatively higher availability of workers in an era of relatively tight labour markets in the United Kingdom.

As explained above, the IV specification addresses these concerns through the creation of an exogenous instrument for the exposure of local labour markets to digital services employment changes. The instrument is exogeneous because it is based on local employment shares that predate the period of observation, as well as national changes in digital services employment.

Results from the IV analysis support the notion of a positive spillover between digital services employment and employment in non-tradable sectors. The coefficient of interest is positive but statistically insignificant in the specification covering the entire period 2015-2021. However, these results might be subject to substantial variation in local employment levels during the COVID-19 pandemic that is unrelated to the structural relationship between digital services employment and employment in other sectors.

Excluding the two years of the COVID-19 pandemic, yields a positive and statistically significant coefficient. The elasticity suggests that a 10% increase in digital services employment leads to a growth of employment in the non-tradable sector by around 1.2%. Employment shares in 2015 can be used to convert this elasticity to absolute effects. In 2015, employment in the non-tradable sector was around 2.4 times larger than employment in digital services. These numbers imply that each additional digital services job creates around 0.3 jobs in the non-tradable sector.[19]

5. Conclusion and policy recommendations

Drawing on a combination of several data sources, this report casts a spotlight on the pivotal importance of digital trade to the UK labour market. More than in most other OECD countries, employment in the United Kingdom depends on access to foreign markets and export opportunities in digital services. In 2019 more than 3 million British workers' jobs were supported by exports of digital services.

In this context, the United Kingdom is in a strong position to benefit from further integration of digital services markets. On the other hand, it also stands to lose from potential barriers that could be implemented in the future, e.g. related to the moratorium on customs duties for electronic transmissions.

The United Kingdom's continued support for plurilateral and multilateral initiatives to dismantle barriers to services trade, e.g. via the WTO joint initiative on services domestic regulation, can help to enable more firms to exploit the potential for further growth in digital services trade. Similarly, continued efforts to enhance digital trade facilitation and ambitious digital trade chapters in trade agreements will help to ensure that UK firms benefit from the dynamism of digital trade.

While the existing literature remains inconclusive regarding the effects of digital trade on wage gaps between workers at different skill levels, there is strong evidence that firms exporting digital services require a specific set of skills. Improving the availability of training programmes and aligning curricula with the rapidly evolving needs of exporters of digital services is crucial for workers' ability to switch into sectors with growing exports and labour demand and with respect to greater participation of SMEs in digital trade. Moreover, further efforts to facilitate the joint consideration of existing datasets across different policy areas can contribute to a more comprehensive picture of the UK's participation in digital trade.

It is also important to take into account that the labour market effects of the strong growth of digital services trade have a spatial dimension: Employment growth in digital services creates additional jobs in other activities in the local economy. These multiplier effects benefit the local economy, with the results presented in this report suggesting a 10% increase in digital services employment leads to a growth of local employment in the non-tradable sector by around 1.2%. Yet, employment in digital services is also concentrated in larger urban agglomerations.

[19] Based on the elasticity of the preferred specification in column (4) and employment shares in 2015, this number is calculated as 0.120 * 2.4.

This provides a rationale for greater efforts to identify and overcome the bottlenecks hampering less densely populated areas from achieving greater employment growth in digital services. Against the backdrop of recent progress in the adoption of technologies allowing for tasks within firms to be conducted remotely, a further fine-slicing of services tasks may offer opportunities for second- and third-tier cities to specialise in specific functions linked to services trade.

In light of the debate about the scalability of intangible assets and digital business models, the United Kingdom should also continue to monitor concentration patterns in digital services. As intangible assets allow for the rapid scale-up of firms in digital-intensive sectors, there is a need to combine a clear emphasis on the removal of barriers to digital services trade with a continuous assessment of competition-related implications of digital technologies.

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Annex A.

Table A A.1. Classification of digital-intensive sectors

Sector denomination	ISIC rev.4	Quartile of digital intensity: 2013-15
Transport equipment	29-30	High
Telecommunications	61	High
IT and other information services	62-63	High
Finance and insurance	64-66	High
Legal and accounting activities, etc.	69-71	High
Scientific research and development	72	High
Advertising and market research; other business services	73-75	High
Administrative and support service activities	77-82	High
Other service activities	94-96	High

Source: Calvina et al. (2018[1]).