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Making the Most Out of Digital Trade in the United Kingdom

Javier López González, Silvia Sorescu, and Chiara Del Giovane

The digital transformation is having a profound impact on the international trade of the United Kingdom (UK). Digital trade exports have grown three times faster than other exports and now represent more than half of total exports, twice the OECD and EU averages. This strong performance is, in part, driven by a favourable domestic regulatory environment and an ambitious digital trade agenda in the United Kingdom's trade and digital economy agreements. Econometric analysis shows that digital trade chapters in trade agreements can double the impact of the agreements, with issues around data protection, consumer protection, source code and cybersecurity potentially delivering the largest gains. To remain at the forefront of digital trade the United Kingdom should continue domestic reforms, including digitisation of trade documents and processes. To ensure that exporters maintain access to other markets, the United Kingdom should continue to engage in discussions on digital trade provisions in trade agreements and support ongoing multilateral and plurilateral discussions, including in the context of the WTO Work Programme on E-commerce and the Agreement on E-commerce.

Key words: E-commerce, Services trade, Trade agreements, Data flows, Digital connectivity

JEL codes C54, F13, F14, F15, F68, O3

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Key messages

- **The United Kingdom has embraced digital trade earlier and faster than most countries.** The United Kingdom's digital trade exports grew at nearly three times the rate of 'other trade' exports. Digital trade now represents more than half of the United Kingdom's exports, twice the OECD and EU averages.
- **The United Kingdom has a strong comparative advantage in digitally deliverable services sectors**, especially financial and professional services. It also has a high digital content of exports in other sectors, including agriculture and mining, textiles, and food.
- **The United Kingdom's domestic regulatory environment is well positioned to enable opportunities for digital trade.** The United Kingdom has one of the lowest Digital Services Trade Restrictiveness Index scores. However, restrictions in export markets for United Kingdom firms are growing, underscoring the need to continue engaging in wider international co-operation efforts.
- **The UK has embraced digital trade provisions in its trade agreements.** By the end of 2023, over 40% of agreements signed by the UK had a digital trade chapter. **These are more ambitious in terms of both the number and the depth of commitments than other OECD and EU countries.**
- **The United Kingdom is also increasingly turning to digital economy agreements.** These provide: i) more numerous and more binding commitments on a range of issues; and ii) commitments to co-operate in 'new digital economy issues' such as AI, digital identities, or law-tech.
- Results from the econometric analysis suggest that:
  - **The importance of digital connectivity for trade is growing.** The impact of digital connectivity on trade costs is three times higher today than it was 20 years ago.
  - **Digital connectivity delivers a double dividend:** A 1% increase in bilateral digital connectivity leads to a 2.1% increase in domestic sales and a 1.6% increase in exports.
  - **Domestic regulatory reform helps exporters.** A 0.1-point reduction in the DSTRI score is associated with an average reduction in export costs of 19.3% across all sectors. Impacts can be as high as 32.1% for digitally deliverable services.
  - **Digital trade chapters in trade agreements can double the impact of trade agreements.** Particularly important are elements of trust (data protection, source code and cybersecurity), provisions on data flows and bans on local storage requirements.
- The growing importance of digitalisation for United Kingdom trade and competitiveness is matched by its ambitious digital trade policy agenda. To remain at the forefront of digital trade the United Kingdom should:
  - **Continue processes of domestic reform**, including through continued efforts to digitalise trade documents and processes, and enhance other digital trade facilitation measures that are particularly beneficial for SMEs.
  - **Continue negotiating deeper and more numerous digital trade chapters in trade agreements and new digital economy agreements**. Specific attention could be on binding commitments in areas such as data protection, cross-border data flows, source code and data localisation, where trade gains are likely to be highest.
  - **Continue supporting ongoing multilateral and plurilateral discussions** to ensure better access to international markets for UK exporters, including in the context of the WTO Work Programme on E-commerce and the Agreement on E-commerce.

1. Trade, digitalisation and the United Kingdom

The digital transformation has had a substantial effect on trade. On the one hand, growing digital connectivity has led to more 'traditional' trade through lower overall trade costs. This means more trade in agricultural and food products, textiles, machinery, manufactures and services. On the other hand, digitalisation has also changed how and what we trade. For goods, platform-enabled trade in small parcels has witnessed an important expansion.1 For services, there has been growing trade in services that were previously considered non-tradeable; new combinations of embedded services in 'smart' products; and trade in new services (including cloud computing, intermediation services and fin-tech).

But while digital transformation makes it cheaper and easier to engage in trade, it also increases the complexity of transactions. For example, the purchase of an e-book rests, not only on market access for the related service, but also on the ability to access devices used to read e-books, e-readers; access to digital networks to order the e-book and the ability to engage in electronic payments and to transfer data across borders. A barrier on one of these linked transactions will affect the need or the ability to undertake the other transactions.

At the same time, digitally enabled trade transactions are expected to meet a range of emerging "trade and …" objectives, including privacy and data protection, consumer protection, cybersecurity, and national security. In this fast-evolving environment, governments are facing new challenges to ensure that the opportunities and benefits from digital trade, for both consumers and for businesses, are realised and shared more inclusively. Understanding the nature of the evolving changes is key to understanding the implications of digital transformation for the United Kingdom's (UK) trade.

1.1. What is digital trade and how has the policy environment been evolving?

Digital trade can be understood as a modern take on the WTO definition of e-commerce: the "production, distribution, marketing, sale or delivery of goods and services by electronic means". However, the term is often used to refer to a combination of issues.

For *measurement purposes*, digital trade is defined as "all trade that is digitally ordered and/or digitally delivered" (OECD, WTO, IMF, 2020[1]), (IMF et al., 2023[2]). It therefore incorporates a subset of trade in goods which have been digitally ordered, often through digital platforms, such as a mobile phone that arrives at your doorstep via a parcel. Digital trade also includes a subset of services trade when these are digitally ordered and/or digitally delivered, such as music-streaming services or e-payments.

In *policy discussions*, the term digital trade is used to refer more broadly to *trade in the digital era*. Beyond digitally ordered and/or delivered goods and services this includes: i) rising trade across all sectors of the economy due to lower trade costs spurred by rising digital connectivity; ii) digitalisation of trade documents and processes, including at the border; and iii) increased flows of data across international borders in support of international trade transactions.

1.1.1. Existing WTO rules remain relevant for digital trade

While it is true that WTO rules were adopted at a time when no one could have anticipated the far-reaching effects of digital technology on trade, the regulatory framework established under the WTO agreements has full bearing on digital trade. The General Agreement on Trade in Services (GATS) establishes important rules that are crucial for digitally ordered and delivered services. Similarly, digitally enabled or ordered trade in goods remains subject to commitments and obligations under the General Agreement on Tariffs and Trade (GATT). Moreover, the Information Technology Agreement (ITA), the Trade Facilitation Agreement (TFA), the Technical Barriers to Trade (TBT) Agreement, the Trade Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), the GATS Annex on Telecommunication and the Annex on Financial Services all continue to matter for digital trade.

[1] See López González and Sorescu (2021[15]).

The question is therefore not whether existing WTO rules apply, but rather *how* they apply and what gaps might exist in the multilateral rulebook. Trade rules are predicated on identifying whether products are goods or services and the borders they cross, but new business models and the global nature of the Internet have blurred these distinctions. Today, firms can flexibly service markets from different locations, and their products bundle goods and services (for example, a smart home speaker connected to a voice-controlled digital personal assistant), making it increasingly difficult to identify the particular trade rules that might apply to a specific transaction.

Moreover, the nature of the measures that affect digital trade is changing. Measures that affect access to and use of digital networks have become more important. Likewise, in the digital era, there are new consequences from some traditional trade issues. For example, growing trade in parcels has given new meaning to trade facilitation and *de minimis* thresholds. There are also new issues that are emerging for trade, as might be the role of data flows, consumer protection, and national security. Many of these issues are now being discussed at the WTO.

1.1.2. WTO discussions on digital trade are progressing

Multilateral discussions on digital trade began in 1998 with the introduction of the Work Programme on E-commerce (WTO, 1998[3]). That same year, WTO Members agreed on a Moratorium on applying customs duties on electronic transmissions, which has been regularly extended (most recently at the 13th Ministerial Conference held in Abu Dhabi in February 2023). However, progress on digital trade related issues has been slow. It was not until January 2019 that a group of WTO Members agreed to "initiate exploratory work together toward future WTO negotiations on trade-related aspects of electronic commerce" (WTO, 2019[4]).

As of June 2024, this Joint Initiative (JI) on e-commerce comprised 91 Members, covering a range of issues, including facilitating electronic transactions through discussions on e-signatures and e-payments, as well as issues such as paperless trading, personal data protection, consumer protection, cybersecurity, and telecommunications. In a statement dated 26 July 2024, the co-chairs of the JI discussions (Australia, Japan, and Singapore) confirmed the achievement of a stabilised text.[2]

However, progress on governance of digital trade-related issues has largely taken place outside WTO discussions in the context of bilateral and regional trade agreements.

1.1.3. Digital trade provisions in trade agreements are growing

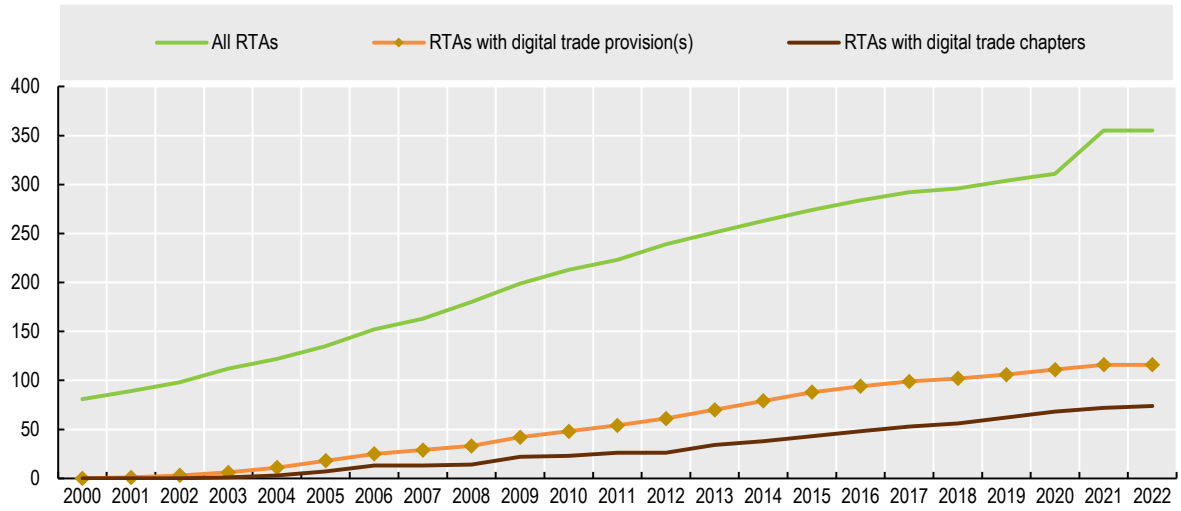
The number of RTAs with digital trade provisions has been growing – Figure 1. According to the TAPED (Trade Agreements Provisions on Electronic-commerce and Data) database (Burri and Polanco, 2020[5]; Burri, Vasquez Callo-Müller and Kugler K., 2022[6]), by June 2022, there were 116 agreements with digital trade, or e-commerce, provisions, representing 33% of all existing agreements. 74 of these agreements had a digital trade, or e-commerce, chapter, representing 21% of all existing agreements. Overall, since 2001, 44% of agreements signed contain a digital trade, or e-commerce, provision of some sort.[3]

Digital trade provisions in trade agreements capture a wide array of issues important for digital trade in goods and services. They can be part of a wider e-commerce (or digital trade) chapter or appear in other chapters (e.g. IP provisions or telecoms or financial services chapters) – see (Burri and Polanco, 2020[5]; Burri, Vasquez Callo-Müller and Kugler K., 2022[6]). They cover a range of cross-cutting issues from digital trade facilitation (electronic authentication frameworks, paperless trading) to privacy and data protection; consumer protection; source code; customs duties on electronic transmissions and cybersecurity (to name but a few). As the recent OECD Digital Trade Inventory shows (Nemoto and López-González, 2021[7]), the rate of uptake of digital trade provisions differs across issues, both for countries taking part in the JI discussions and for those that do not (Figure 2).

[2] The statement and the stabilised text of an Agreement on Electronic Commerce are available at INF/ECOM/87. For an evolution of the discussions under the JI, see 20 January 2023 statement, 28 July 2023 statement, 20 December 2023 statement, and 14 March 2024 statement.

[3] Digital trade provisions refer to the presence of a provision that can be considered as important for digital trade as identified in (Burri and Polanco, 2020[5]). Digital trade chapters refer to there being a separate chapter in the trade agreement.

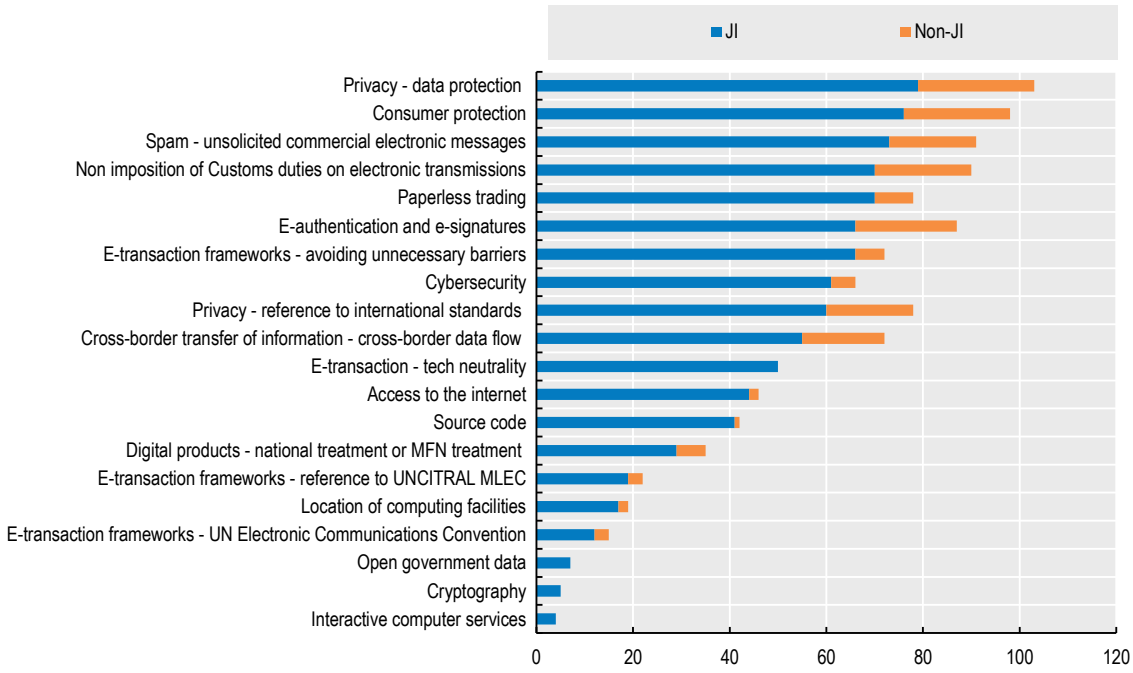
Figure 1. A growing number of RTAs have digital trade provisions



Note: Analysis only considers agreements currently in force. RTA with digital trade provisions refers to there being at least one e-commerce/digital trade provision, whether in a separate chapter or not (e.g. IP provisions which might be important for the digital economy but are not in an individual e-commerce chapter). RTAs are identified from the WTO RTA database. Digital provisions from the TAPED database.
Source: López González, Sorescu and Kaynak (2023[8]).

Figure 2. Coverage of digital trade issues in trade agreements

Number of jurisdictions and coverage of issues in RTAs



Note: Figure identifies number of countries with different digital trade provisions in their RTAs according to whether they are participating in the Joint Initiative (JI) on e-commerce or not.
Source: Nembo and López González (2021[7]).

1.2. How do we measure digital trade?

There is little evidence to suggest that existing trade statistics significantly underestimate the amount of digital trade that is taking place, however digital trade remains largely invisible in trade statistics (see OECD, WTO, IMF (2020[1]) and IMF et al. (2023[2]). That is, a digitally ordered book will be captured in trade statistics under the relevant customs code, but this code will not distinguish whether imported books have been digitally ordered or not. Similarly, in services, measurement of cross-border transactions has always been difficult, however, for digital trade the challenge is compounded by the need to identify those services which are digitally ordered as well as those which are digitally delivered – Box 1 summarises some of the ongoing measurement challenges.

Box 1. Measuring digital trade

For measurement purposes, digital trade is defined in the *Handbook for Measuring Digital Trade* as "all trade that is digitally ordered and/or digitally delivered". The *Handbook* further suggests that existing trade statistics capture most aspects of digital trade although not all.

For instance, given that the value of digitally ordered parcels often falls below *de minimis* thresholds, there is a concern that small parcel trade may not be fully captured in official statistics (although the impact on overall values of trade is likely to be marginal). More significant challenges exist in the area of trade in services (digitally delivered), particularly to households. Data from VAT returns from firms are being used to improve current measurement. These approaches typically lead to upward revisions, but the overall impact remains small, amounting to revisions of less than 0.4% of total imports.

To address these challenges, countries are exploring new data sources, such as credit card information, and developing projects linking business register data with customs data to provide information on the size of imports and exports by e-tailers (classified as NACE 47.91). Government statistical agencies are also exploring the scope for adding new questions to existing surveys.

Other challenges relate to when, how and whose trade flows should be recorded. Digital intermediary platforms, which facilitate transactions for a fee, do so without ever taking ownership of the products involved. The identification of these platforms in business registers, their classification in terms of the actual services they provide, and the treatment of the transactions they facilitate – including which parts should actually be recorded as being cross-border, and with which partner country – can pose significant conceptual and empirical challenges.

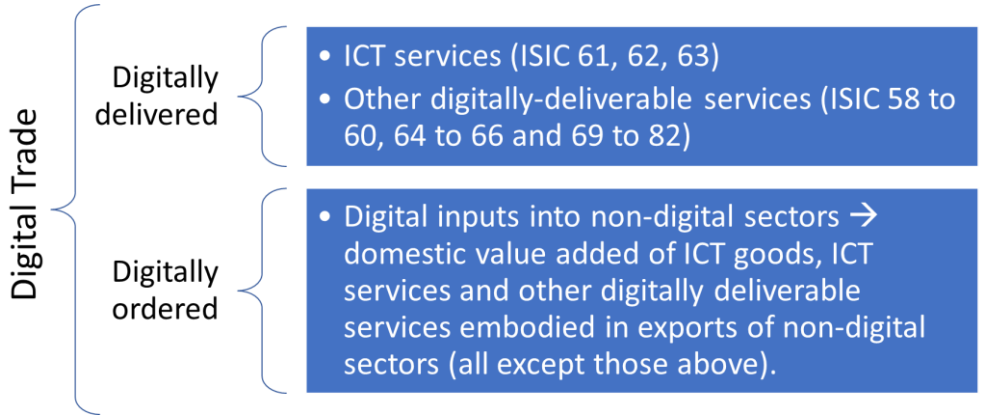
Efforts are underway to better capture digital trade in official trade statistics, including through the 'living' Handbook for Measuring Digital Trade which is at its second edition (July 2023) and is co-ordinated by the OECD and WTO-led inter-agency Task Force on International Trade Statistics (TFITS). This taskforce brings together representatives from international agencies (OECD, UNCTAD, WTO, IMF, EUROSTAT, UN, and the World Bank Group) plus more than 25 countries, including Brazil, The People's Republic of China, India, Indonesia, the Russian Federation, South Africa, and Thailand, in addition to many OECD countries. Nevertheless, it will be some time before robust and internationally comparable measures are identified, reflecting also the broader challenges in measuring digitalisation. Until better measures for digital trade are available, analysis has to proceed carefully, using existing statistics to shed light on particular aspects of trade in the digital era.

Source: OECD, WTO, IMF (2020[1]); IMF et al. (2023[2]).

In the absence of comprehensive and comparable (official) digital trade statistics, proxy measures can be used to get a sense of the nature and evolution of digital trade (Figure 3) – see (Lopez-Gonzalez, Sorescu and Kaynak, 2023[8]). Based on the assumption that all trade that is digitally deliverable is indeed delivered digitally, trade in ICT services (e.g. computer and telecommunications services) and trade in other digitally deliverable services (e.g. financial services, business services) can be used to proxy for *digitally delivered trade*.[4]

Digitally ordered trade, which covers transactions in goods and services, is more challenging to identify. Nevertheless, digital inputs into non-digital sectors can serve as a crude proxy for digitally ordered trade. This captures the value of inputs from ICT goods and services and digitally-deliverable services embodied in the exports of what might be considered non-digital sectors (i.e. all sectors except ICT goods, ICT services and digitally-deliverable services).[5] Here the assumption is that the use of digital inputs, whether ICT goods such as computers, ICT services such as telecommunication services, or digital platforms (classified in the sectors in which these operate – e.g. transport services for rider-sharing applications), is proportionate to the digital ordering process.

Figure 3. Using existing statistics to capture digital trade



Note: Digital trade calculated using Input-Output tables. While digitally delivered trade can be calculated using traditional statistics, digitally ordered trade is instrumented using input output tables and calculating the import content of exports following López González, Sorescu and Kaynak (2023[8]).
Source: Own elaboration based on López González, Sorescu and Kaynak (2023[8]).

One important caveat is that these measures do not, at present, cover trade in Mode 3 services – those supplied via a commercial presence in domestic markets.[6] This is an important shortcoming as much digital trade is likely to operate through commercial presence, including due to regulation requiring domestic domain names or data to be stored in domestic servers.

[4] See OECD, WTO, IMF (2020[1])) and IMF et al (2023[2]). for details about these categorisations across different nomenclatures. Note that, as per this Handbook, only services are digitally deliverable.

[5] This can be calculated using Input-Output tables as the domestic value added of digital inputs (ICT goods, ICT services and digitally-deliverable services) in non-digital exports (all sectors except ICT goods, ICT services and digitally-deliverable services). It is worth noting that this proxy is based on the assumption that the use of digital inputs correlates with digital ordering (an assumption which is hard to test). One advantage of this measure is that it captures digitally deliverable services embodied in goods, or what might be termed digital mode 5 services.

[6] This is something that can be incorporated in the future by linking these measures to the AMNE database (see https://www.oecd.org/sti/ind/analytical-amne-database.htm).

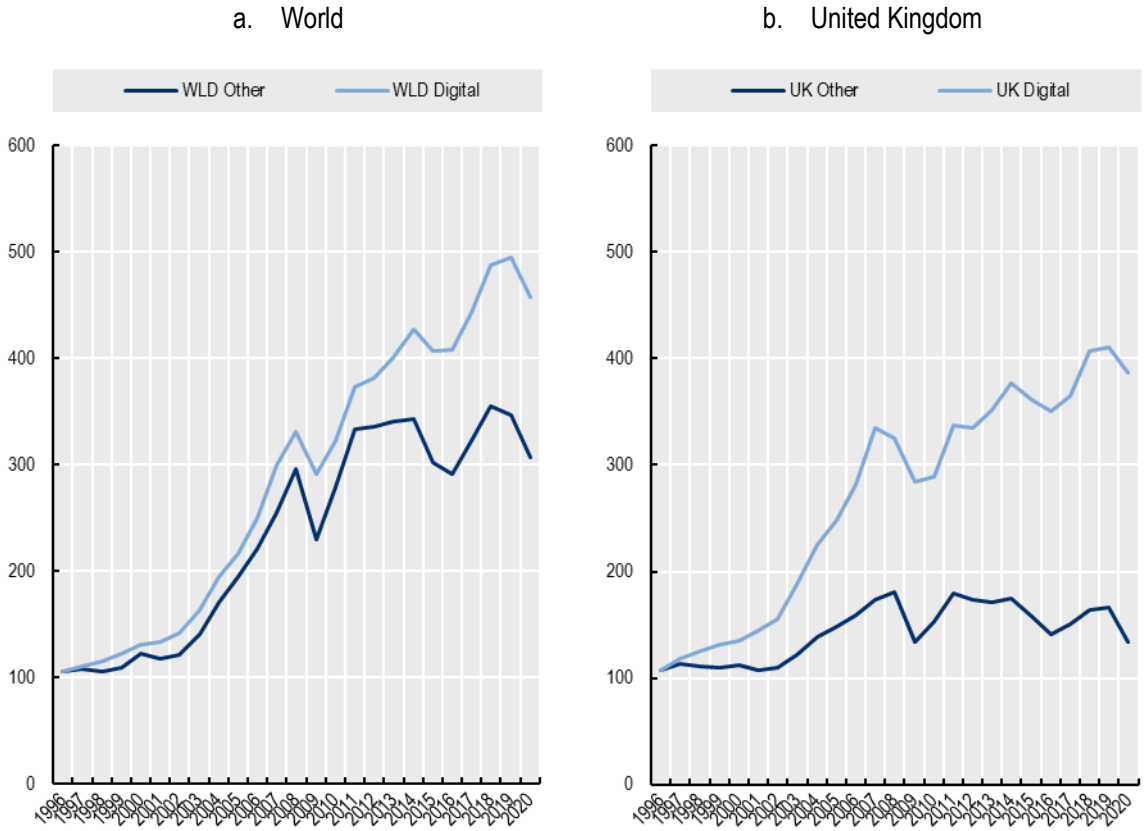
1.3. How is the UK participating in digital trade?

1.3.1. The UK has embraced digital trade earlier and faster than most countries

The digital transformation has been ongoing for several decades, however a more apparent decoupling in the rate of growth of global digital trade relative to 'other trade' is most apparent after 2011 (Figure 4a). By 2020, digital trade represented 25% of global trade. For the UK, the digital transformation not only started earlier, it also proceeded at greater speed. By 2020, digital trade exports in the UK had grown nearly three times faster than 'other trade' to represent more than half of the UK's exports (Figure 4b).

Figure 4. Digital trade is growing faster than non-digital trade, especially in the UK

Growth of trade



Note: Changes in exports relative to 1995 (1995=100).
Source: Own calculations using TiVA database (2023).

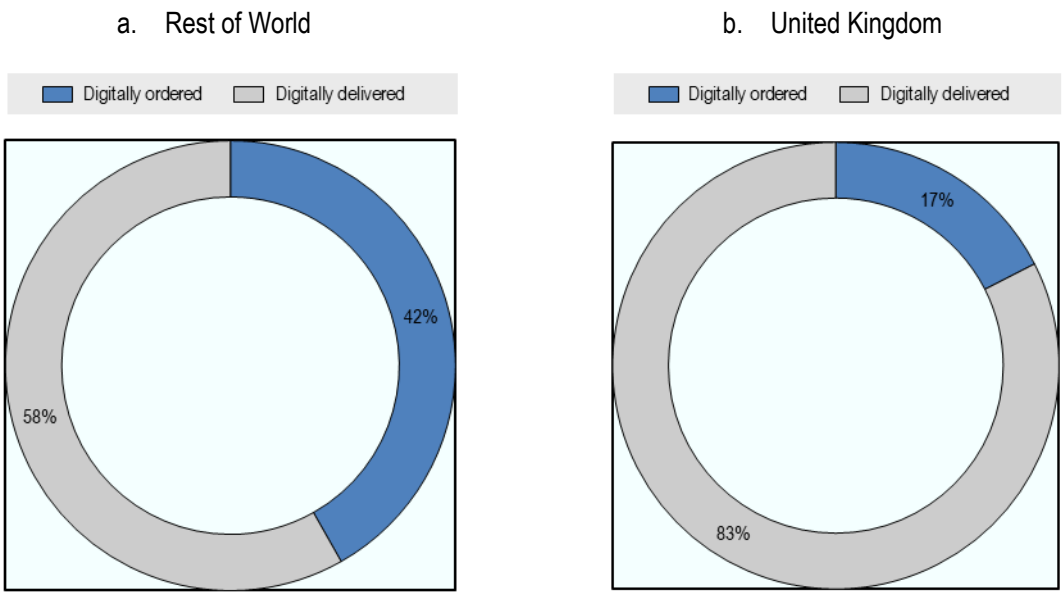
1.3.2. The UK has a comparative advantage in digitally delivered trade

Globally, digitally delivered trade, composed of ICT services and other business services that are predominantly digitally delivered, represented 58% of global digital trade in 2020. In the UK, digitally delivered trade represented 83% of digital trade exports, underscoring the UK's strong comparative advantage in digitally delivered trade (Figure 5).[7]

[7] Comparative advantage is generally calculated as the share of sector k exports in overall exports of country A divided by the share of sector k exports of all countries in global exports. Following this logic, the share of UK digitally delivered exports over the share of world digitally delivered exports can be used a measure of revealed comparative advantage in digitally delivered trade.

Figure 5. The UK has a comparative advantage in digitally delivered trade

Share of digital trade by type in 2020



Note: Digitally delivered trade is identified as ICT services (ISIC 61, 62, 63) and other digitally deliverable services (ISIC 58 to 60, 64 to 66 and 69 to 82). Digitally ordered trade is identified as digital inputs (ICT goods and services and other digitally deliverable services) in non-digital sectors (all those not counted as digital). Trade data in the figure covers exports of the 77 economies and a rest of world group in the 2023 TiVA revision.
Source: Own calculations using TiVA database (2023).

1.3.3. Digital trade represents more than half of the UK's exports, one of the highest shares in the world

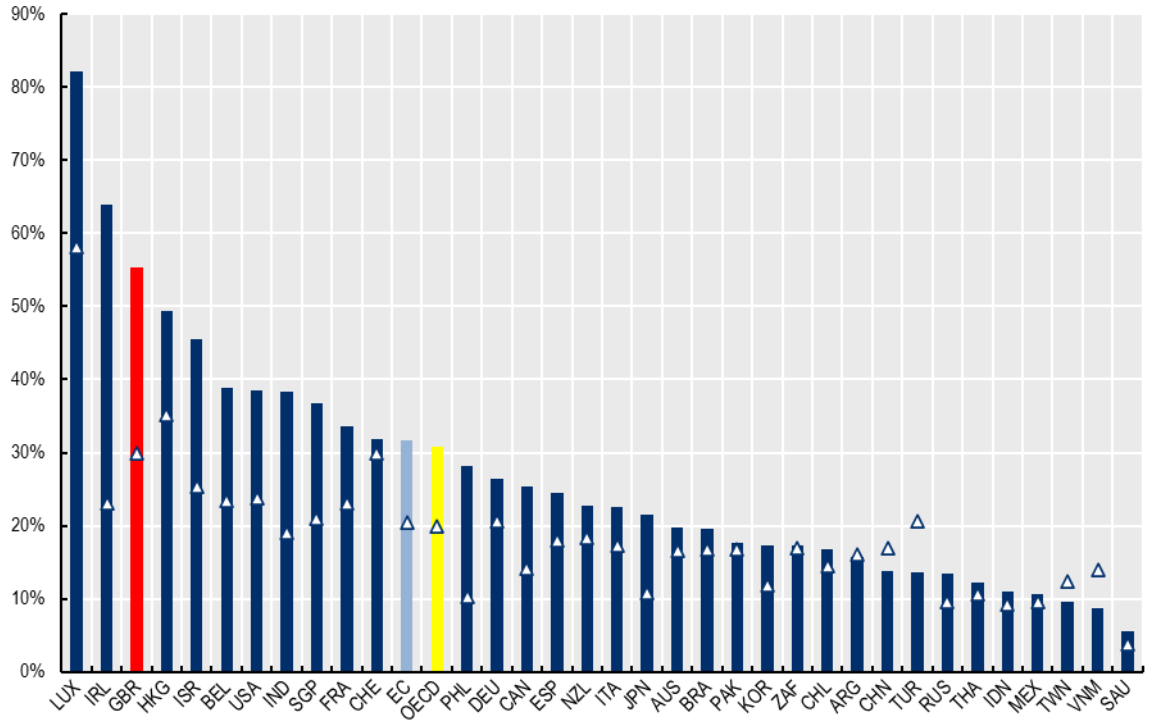
Digital trade represents more than half of UK exports in 2020, one of the highest shares across countries covered and nearly twice the OECD and EU averages (Figure 6). According to the OECD Trade in Value Added database, this would amount to more than USD 350 billion, or, at current exchange rates, just over GBP 280 billion.[8] Moreover, the share of digital trade exports has nearly doubled since 1995 – from 30% of exports to 55% in 2020. Overall, digital trade has become more important as a share of total exports across many countries. This is most evident in Ireland, which tripled the share of its digital trade exports and in India where the share of digital trade exports doubled. By contrast, countries like China or Viet Nam have seen their shares decline.[9]

[8] Rate used GBP 1 = USD1.266 exchange rate on the 20th of January 2024 accessed: https://www.bankofengland.co.uk/boeapps/database/Rates.asp?Travel=NIxIRx&into=GBP.

[9] In China, the declining share is explained by a faster increase in non-digital trade exports, as highlighted in Lopez-Gonzalez, Sorescu and Kaynak (2023[8]), China increased its global share of digital trade fourfold.

Figure 6. The UK has nearly doubled the share of its digital trade exports

Share of digital trade in total exports



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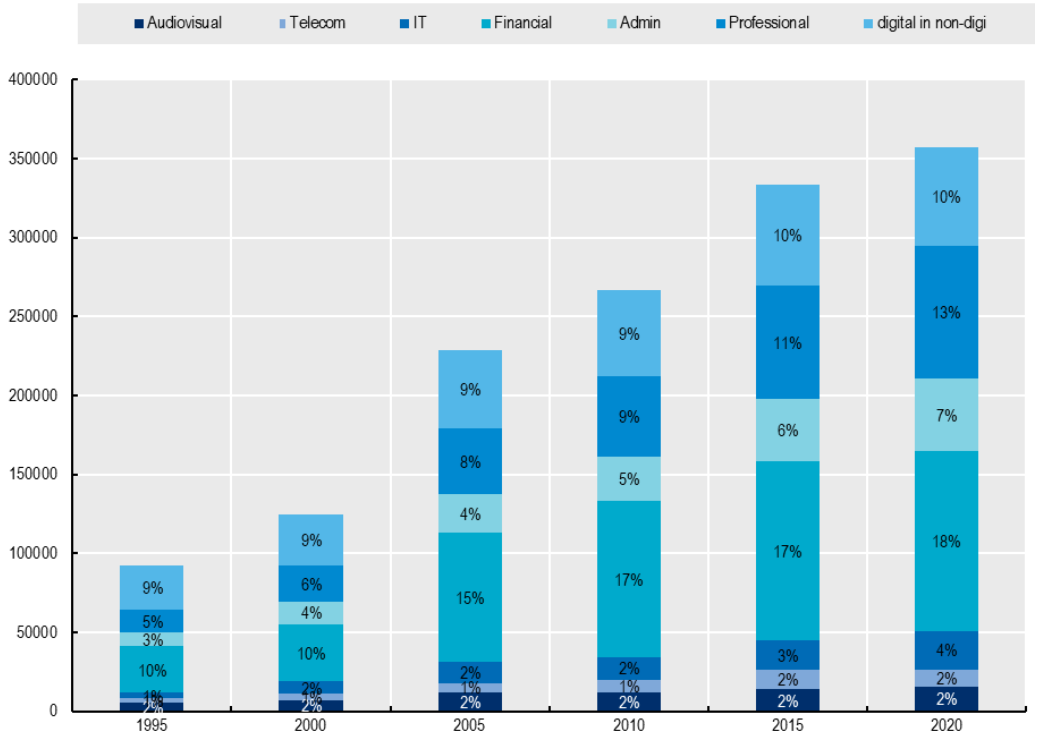
Source: Own calculations using TiVA database (2023).

1.3.4. The UK's digital trade exports are predominantly in services sectors, especially financial and professional services

In 2020, the UK's top digital trade export sector was financial services, occupying 32% of digital trade exports and 18% of total exports. Second to this sector was professional services with a share of 24% of digital trade exports (13% of total exports) – Figure 7. These sectors are also those that have grown most. Importantly, there was little evidence of a decline in digital trade during the early periods of the COVID-19 pandemic, quite the opposite, digital trade exports were robust to the pandemic.

Figure 7. UK digital trade exports by type

USD million, shares in overall exports



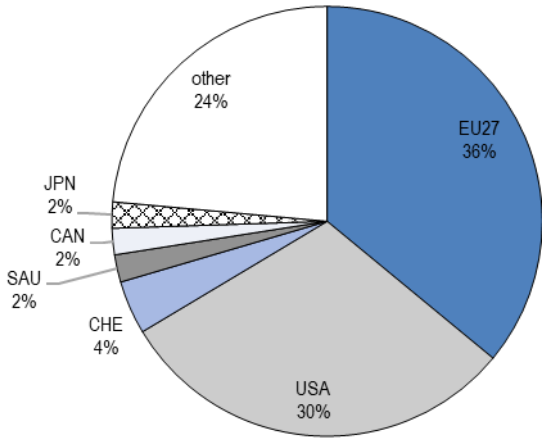
Note: Audio-visual services (ISIC58, 59, 60), Telecommunications (61), IT (62, 63), Financial (64, 65, 66), Admin (77 to 82), Professional Trade (69-75) data in the figure covers exports of the 77 economies and a rest of world group in the 2023 TiVA revision.
Source: Own calculations using TiVA database (2023).

1.3.5. The UK's digitally delivered services trade is mainly with the US and the EU

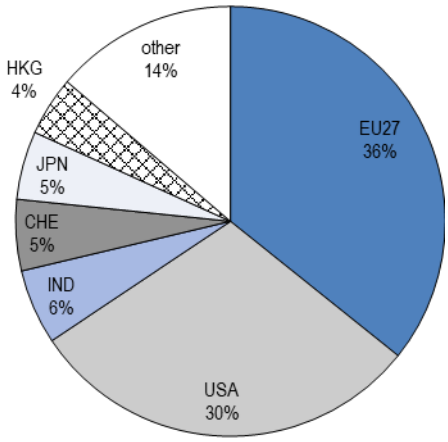
The UKs digitally delivered services trade is concentrated. In 2021, more than one third of UK imports and exports of digitally deliverable services are with the EU, making the region the largest trading partner. The United States follows closely representing 30% of exports and imports. Other partners, including Switzerland and Japan also important but to a much lower degree.

Figure 8. UK imports and exports of digitally deliverable services are concentrated

a. Exports



b. Imports



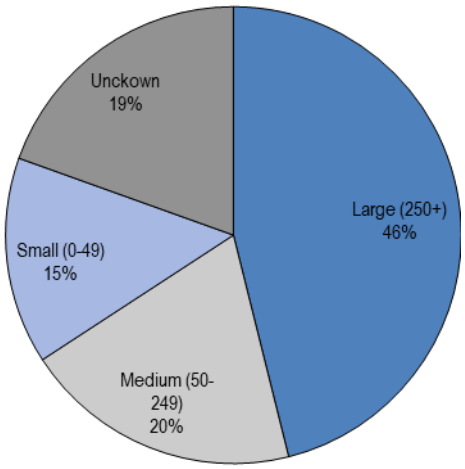
Note: Digitally deliverable services identified using ONS sectoral classification sectors (SDA – business, SF – insurance, SG – financial, SH - charges IP, SI - Telecoms, computer and information, SJ - other business services, SK1 – Audiovisual). Data are for 2021.
Source: Own calculations using ONS - TISP - EBOPS data.

1.3.6. Larger firms dominate digital trade

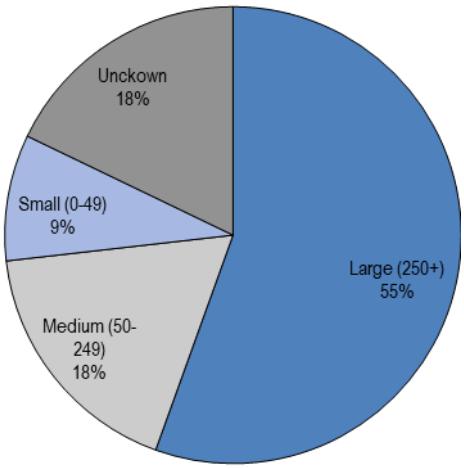
Larger firms represent around half of the UK's exports and imports of digitally deliverable services with smaller firms represent around 10% in 2021. These shares are relatively similar to those seen for all other sectors of the economy.

Figure 9. UK imports and exports of digitally deliverable services are concentrated

c. Exports



d. Imports



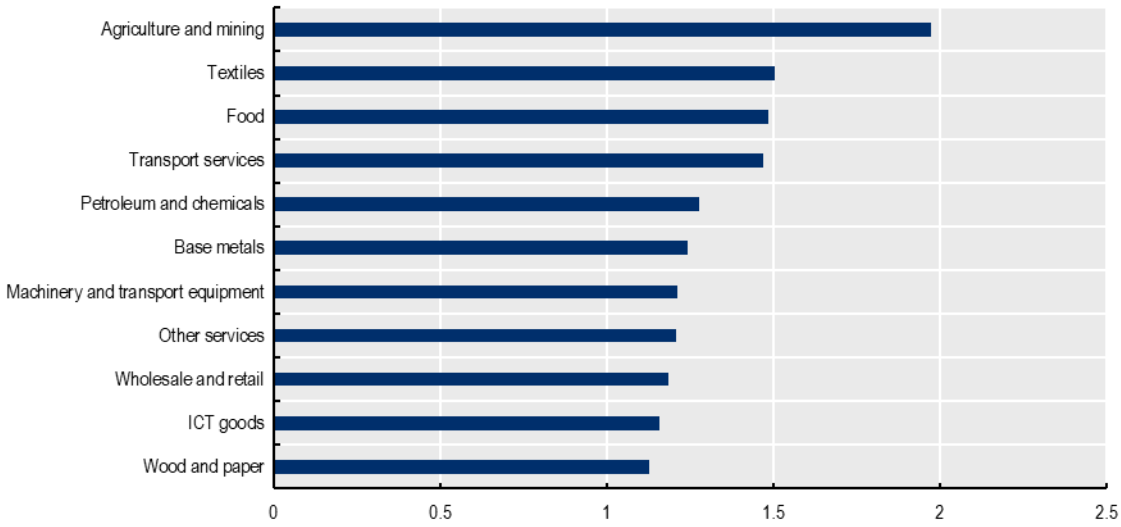
Note: Digitally deliverable services identified using ONS sectoral classification sectors. Data are for 2021.
Source: Own calculations using ONS - TEC data.

1.3.7. The UK's digital input content of exports is higher than average across all sectors

In the absence of detailed statistics on the adoption of digital technologies by sector, Input-Output tables can be used to identify the digital value added embodied in exports. This measures the extent to which sectors are reliant on outsourced digital solutions to produce exports.[10] By dividing the UK's share of digital inputs in exports by the equivalent share in the rest of the world, a measure of the relative intensity of digital inputs in exports across different sectors can be obtained (Figure 8). The results suggest that the UK has a high digital intensity in exports across all sectors of the economy, but especially in agriculture and mining, textiles and food. That is, the UK appears to be leveraging digital inputs to produce exports more than the average across the globe.[11]

Figure 10. The digital intensity of UK exports is higher than the average

Share of digital inputs in exports of the UK divided by the equivalent share for the rest of the world (2020)



Note: A value above one shows that the UK share of digital inputs in exports is higher than the equivalent share in the rest of the world.
Source: Own calculations using TiVA database (2023).

2. Digital trade policies and the UK

Against the backdrop of rapid change, the UK has been actively pursuing digital trade policies, whether through domestic reforms, growing participation in digital trade discussions in trade agreements or via participation in intergovernmental arrangements. Indeed, today, the UK is at the forefront of many discussions on digital trade both in the context of services and goods.

[10] It is worth noting that this is an imperfect measure of the digital intensity of exports. Input-Output tables capture digital inputs, largely when these have been outsourced rather than the extent to which ICT inputs are being used within the industry (the firm or factory). Ideally, the digital intensity of exports should be captured by decomposing the value added of the different sectors into that which is created with digital assets versus that which is not.

[11] It is worth noting that differences in use of ICT can arise for reasons beyond differences in the adoption of outsourced ICT technologies. For instance, they may reflect different export product compositions within broad industrial categories. That is, it might be that some form of agriculture production has the potential to be more ICT intensive than another (aggregation bias). If a country trades a particular product more intensively then this will be reflected in the ICT use shares provided. Nevertheless, within broadly similar aggregates, the analysis can provide useful guidance on comparative performance.

2.1. How has the domestic environment for digital trade evolved in the UK?

2.1.1. The UK's approach to digital trade is ambitious and holistic, resting on 5 pillars

The UK's Digital Trade Strategy focuses on addressing barriers to digital trade across five areas:[12]

- **Open digital markets**. The UK seeks to establish predictable and open regulatory principles with its trading partners, ensuring that British businesses are able to compete fairly with domestic suppliers in overseas markets; and seeking to secure market access for the UK's services. The UK also supports a permanent ban on applying customs duties on electronic transmissions at the WTO and securing further market access for services sectors such as financial, professional business, legal, technology and creative industries.
- **Data flows**. This includes preventing unjustified barriers to cross-border data flows and data localisation (while maintaining the UK's high standards for personal data protection). It also involves ensuring that data flows can drive innovation and improve trade opportunities, including by enabling new ways of trading using new technologies and working with trade partners to publish transparent, anonymised, and open government datasets.
- **Consumer and business safeguards**. The UK aims to advance digital consumer rights, such as seeking access to redress and reducing spam (unsolicited commercial electronic messages) and to ensure effective and balanced intellectual property frameworks. The UK is also committed to net neutrality and open internet access as a means of developing an open, secure, and trustworthy online environment and to avoiding unreasonable or unjustified requests for disclosure of source code as a condition for operating in certain markets.
- **Digital trading systems**. The UK is working to develop 'digital by default' customs and border processes, making trade easier for businesses and to facilitate multilaterally the flows of data necessary to support digitisation of customs and border processes and facilitate easier, cheaper, and more efficient international trade through the use of digital technologies (e.g. paperless trading, electronic contracts, electronic authentication, and electronic trust services); as well as to promote interoperability.
- **International co-operation and global governance**. The UK is also working to support rules governing digital trade that are responsive to digital innovation and emerging technologies through existing dialogues within the WTO such as the Joint Initiative on E-Commerce, its network of free trade agreements, and international co-operation between regulators to develop mutually acceptable standards.

The approach is holistic, touching not only on ensuring lower barriers for its firms, but also on data flows which underpin modern day trade transactions; paperless trading systems; trust; and ensuring active regulatory co-operation. It is both outward and inward looking leading to important domestic and international regulatory changes.

2.1.2. The UK has one of the least trade restrictive domestic environments for digital trade

Over the period 2014-22, the OECD Digital Services Trade Restrictiveness Index (DSTRI) underscores a stable and open regulatory environment for digitally enabled services in the UK. Indeed, the UK is one of the countries with the lowest DSTRI scores, suggesting that the UK is well positioned to enable opportunities for digital trade importers and exporters (Figure 11). The areas where the UK is identified to be (somewhat) more restrictive are in: i) infrastructure and connectivity (cross-border data flows[13]); and ii) electronic transactions (where additional benefits for regulatory predictability could be achieved through

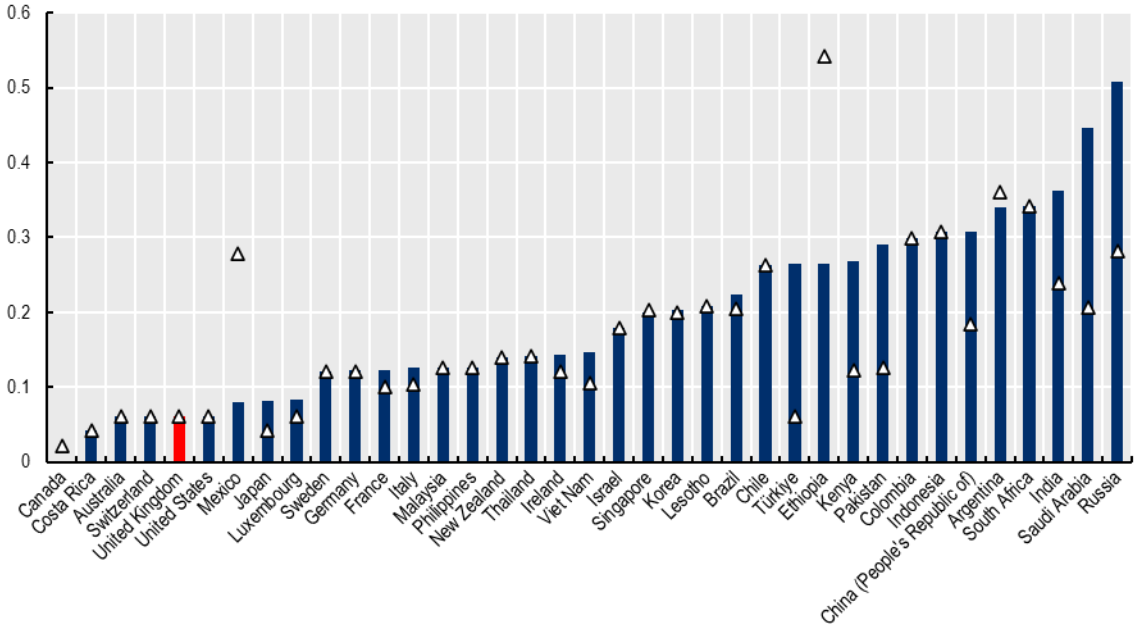
[12] See https://www.gov.uk/government/publications/digital-trade-objectives-and-vision/digital-trade-objectives.

[13] The Digital STRI accounts for the fact that cross-border transfer of personal data is largely possible to countries with substantially similar privacy protection laws.

further harmonisation of national contract rules for cross-border electronic transactions with internationally standardised rules).[14]

Figure 11. The UK has one of the least trade restrictive environments for digital trade

Digital Services Trade Restrictive Index across selected partners (2014 and 2022)



Note: Values closer to one imply higher restrictions. Triangles show values for 2014, bars for 2022.
Source: Own calculations based on the OECD Digital Services Trade Restrictiveness Index 2023.

2.1.3. Domestic regulations in other services sectors supporting digital trade are also less restrictive than OECD averages

Digital transactions are supported by a range of services, such as communication and network services, computer services (e.g. software, applications, and technical assistance), financial, or distribution services (e.g. online wholesale or retail platforms). Digital orders often translate into physical delivery of goods where the quality, timeliness, and cost of transportation and logistics services are key to the competitiveness of firms selling through digital platforms. All these supporting services provide essential inputs facilitating digital trade, lowering costs, and boosting competitiveness (López González and Ferencz, 2018[9]).

Regulations in these services sectors which support digital trade are less restrictive in the UK than in most OECD countries, again highlighting that the UK is well positioned to take advantage of the digital trade environment (Figure 12a). Regulations are tightest in services such as commercial banking, some logistics-related services, as well as broadcasting services. As regards specific policy areas, regulations related to the movement of people, which affect all sectors, can be relatively stringent; there are also some limitations on rights of access to public procurement.

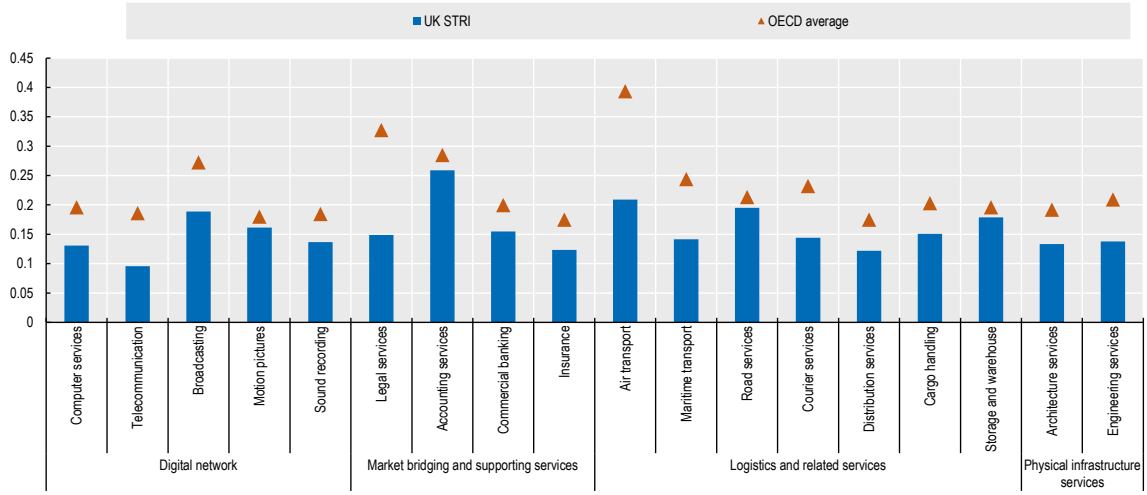
Since 2014, regulations have become more stringent across several sectors, especially distribution, logistics (storage and warehousing), computer, architecture, broadcasting, and commercial banking (Figure 12b). However, in 2020-2021, the STRI values decreased substantially across all sectors particularly due to new regulations introduced following the end of the transition period for the UK's

[14] The DSTRI highlights the UK is not at this stage a party to the UN Convention on the Use of Electronic Communications in International Contracts nor to the Convention on Contracts for the International Sale of Goods.

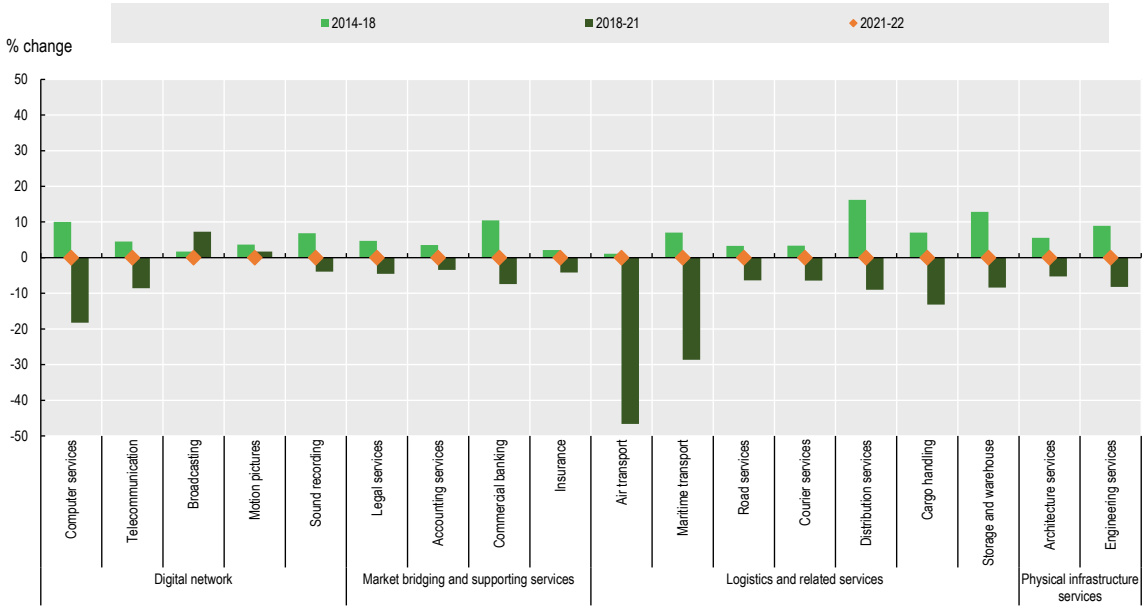
departure from the European Union (31 December 2020). After this period, no significant changes were observed in 2021-2022.

Figure 12. UK domestic regulations in services sectors supporting digital trade are also less restrictive than OECD averages

a. UK STRI and OECD average, selected sectors, 2022



b. Evolution of STRI, selected sectors, 2018-22



Note: A score of 1 is most restrictive.
Source: Own calculations based on the OECD STRI 2023 database.

In both computer and telecommunications services, which are particularly important supporting sectors for digital trade, some restrictions on foreign entry and movement of people exist. This includes screening without exclusion of economic interests, where according to The National Security and Investment Act 2021 (NSIA), which came into force on 4 January 2022, mandatory notification is required for any "notifiable acquisitions" in 17 sensitive areas of the economy that could harm the UK's national security grounds. Computer services (relevant for advanced robotics, Artificial Intelligence, data infrastructure, computing

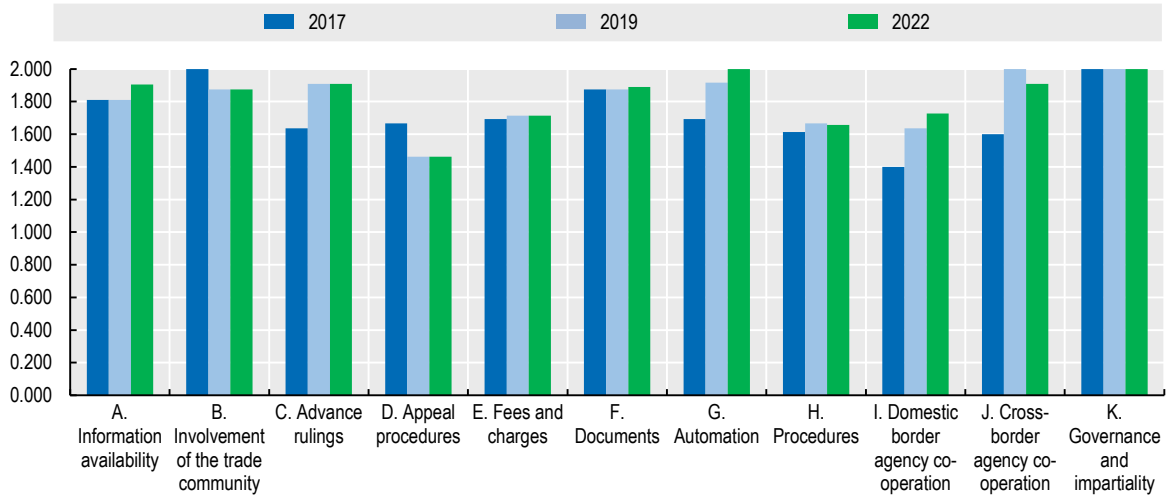
hardware) are one of the covered sectors. This allows the UK government to review and intervene in transactions even after they have been completed.[15] They also include labour market tests or similar economic considerations on intra-corporate transferees[16], contractual services suppliers[17], and independent services suppliers. Laws or regulations establishing a process for recognising qualifications gained abroad also apply to computer services.

In the case of financial services, another key digitally deliverable service, procurement regulation does not explicitly prohibit discrimination of foreign suppliers, while foreign operators – in both fixed and mobile – seeking interconnection do not benefit from regulated termination rates on a non-discriminatory basis.

2.1.4. The UK continues to be a top performer in digital trade facilitation

Following the entry into force of the WTO Trade Facilitation Agreement (TFA) in 2017, the UK continued to improve its overall trade facilitation policy environment. The OECD Trade Facilitation Indicators (TFIs) highlight progress across areas of 'information availability', 'advance rulings', 'automation of border processes', as well as 'border agency co-operation'. Areas where more progress could be made include 'involvement of the trade community', 'appeal procedures', 'simplification of documents', 'streamlining of processes', and 'border agency co-operation' (Figure 13). This also highlights that further efforts to improve automation of border processes need to be complemented by continued efforts to streamline procedures and to increase stakeholder involvement in the regulatory process for trade-related regulations.

Figure 13. Trade facilitation performance in the UK



Note: The TFI ranges between 0 and 2, where 2 is the maximum performance that can be achieved.
Source: OECD TFIs database (2023).

[15] More information is available at : https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1044388/nsi-process-flowchart.pdf. Before the adoption of NSIA 2021, there was no obligation to notify transactions. However, according to the Enterprise Act 2002, the UK government can intervene in an M&A transaction involving a transfer of material influence (above 15% shareholding) on public interest grounds when certain criteria listed in the Enterprise Act are met.

[16] As of 1 December 2020, a new Intra-Company Transfer route has been put in place which updated the previous Tier 2 (Intra-company transfer) for established workers who are being transferred to do a skilled role in the United Kingdom.

[17] The UK makes provision for the admission of contractual service or independent service suppliers only where its commitments under a relevant international agreement such as the GATS are engaged. As of December 2020, there is no longer a requirement for employers to undertake a Resident Labour Market Test. However, UK sponsors need to obtain a sponsorship license and pay the Immigration Skills Charge for the duration of the employment. Applicants must also meet skills and qualification requirements and are subject to minimum salary thresholds.

In recent years, the UK has accelerated work to enhance the use of digital tools and technologies for easing the cost of trade, which can also help address several of the challenges relating to streamlining processes and improving collaboration mechanisms between border agencies. Ongoing efforts are targeting three areas:

- **Digitalisation of trade-related documents**. The *Electronic Trade Documents Act 2023* came into force in September 2023 supporting the use of electronic transferrable records in domestic law. This is paving the way for increased use of electronic documents such as bills of exchange, promissory notes, bills of lading, ship's delivery orders, warehouse receipts, marine insurance policies, and cargo insurance certificates (Box 2 for an example about how this has helped a particular company go paperless). Due to the common use internationally of English law for commercial trade contracts, the Act also provides further opportunities to support the adoption of digital trade documents at a broader, global level.

  The Act states that one of the conditions for a paper document to be issued as an electronic one is that a "reliable system" must be used to ensure its security and use, providing the courts with the role in determining the full application of this new law in case of litigation.[18]

- **Digitalisation for streamlining border processes**. The 2025 *UK Border Strategy*[19] sets out a roadmap for facilitating trade, drawing heavily on the implementation and use of digital technologies. It aims to deliver a *Border Target Operating Model* (BTOM) to extract maximum value from border data to improve the understanding of how goods cross-borders and ensure compliance while facilitating trade.

- **Trade facilitation tools for traders**. This includes an enhanced *Trusted Trader* programme and the UK's *Single Trade Window* (STW), which amongst other features will seek to provide access to APIs to build supply chain data pipelines into government, to enable it to better understand what and how goods are moving across the border.[20] The STW will also enable agencies to enhance the sharing of data across border agencies to assess traders, while using advanced analytics-enabled risk engines to automate decisions and support officials at the border. The Strategy also foresees exploring the deployment of technologies such as geofencing, digital seals and smart contracts when enabling the Trusted Trader programme, through the Ecosystem of Trust Model.[21]

Digital tools for trade facilitation are also increasingly found in the scope of the trade agreements and digital economy agreements signed by the UK. The UK's agreements are some of the most advanced in the inclusion of provisions that focus on promoting electronic transferrable records as well as that support paperless trading, customs procedures automation, or customs data exchange systems (Section 2.3).

[18] In this sense, the Act foresees that a court may take into account certain factors when considering whether an electronic trade document system is reliable. In requiring a system to be reliable, and in setting out various factors that may be taken into account when assessing reliability, the Act does not prescribe or endorse any particular type of technology. It simply provides a non-exhaustive list of factors that a court may take into account when assessing the reliability of a particular electronic trade document system. More details provided at: https://www.gov.uk/government/news/uk-economy-to-receive-1-billion-boost-through-innovative-trade-digitalisation-act; https://kennedyslaw.com/en/thought-leadership/article/2023/the-electronic-trade-documents-act-2023-uk-modernises-the-law-surrounding-electronic-bills-of-lading/.

[19] See https://www.gov.uk/government/publications/2025-uk-border-strategy; https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/945380/2025_UK_Border_Strategy.pdf.

[20] Carriers would also be better integrated with government systems to provide data.

[21] Six pilot projects were carried out between the last quarter of 2022 and the first quarter of 2023 (The Ecosystem of Trust Evaluation Report, August 2023).

Box 2. Case study of company reducing trade-related paperwork due to digitalisation

Fort Vale, a UK-based manufacturer, effectively implemented an e-bill of lading for its shipment of foot valves from Burnley to Singapore. The technology and logistics partners were LogChain, NG Transport, Woodland Group, BT (Rune) and EES Freight Services.

The project led to a 100% removal of logistics paperwork, 85% reduction in adjacent and associated paperwork, 89% reduction in processing time (manpower), eight times reduction in data required and automated intelligence-derived border compliance.

This pilot showed the benefit of alignment with the Digital Economy Agreement signed between the UK and Singapore and the involvement of government agencies in both jurisdictions.

> "*This is the first fully digitalised movement of goods under the UK's new Electronic Trade Documents Act (ETDA), which will transform and simplify the process of exporting from the UK to the world. We are already working to expand this pilot across Southeast Asia and we will work with all partners to realise the benefits of paperless trade, which is great for both business efficiency and the environment." (Martin Kent, His Majesty's Trade Commissioner for Asia Pacific)*
>
> *"Fort Vale are extremely enthusiastic and excited by the prospect of successful digital trade transactions. As an organisation, Fort Vale exports around 90% of its products worldwide. A significant number of our key accounts are based in Singapore and as such, the opportunity to be part of this historic moment was something not to miss. Fort Vale see the benefits of security, efficiency, cost savings and reduced risk of delays as real positives not only for our organisation, but as a contribution to frictionless trade between the UK and Singapore as a whole." (Graham Blanchard, Global Sales & Marketing Director, Fort Vale).*

Source: Submitted by ICC United Kingdom from ICC United Kingdom (2023) *Seizing the moment, unleashing the potential of trade digitalisation*, accessed: ICC United Kingdom | Seizing the moment — Unleashing the potential of trade digitalisation (shopify.com).

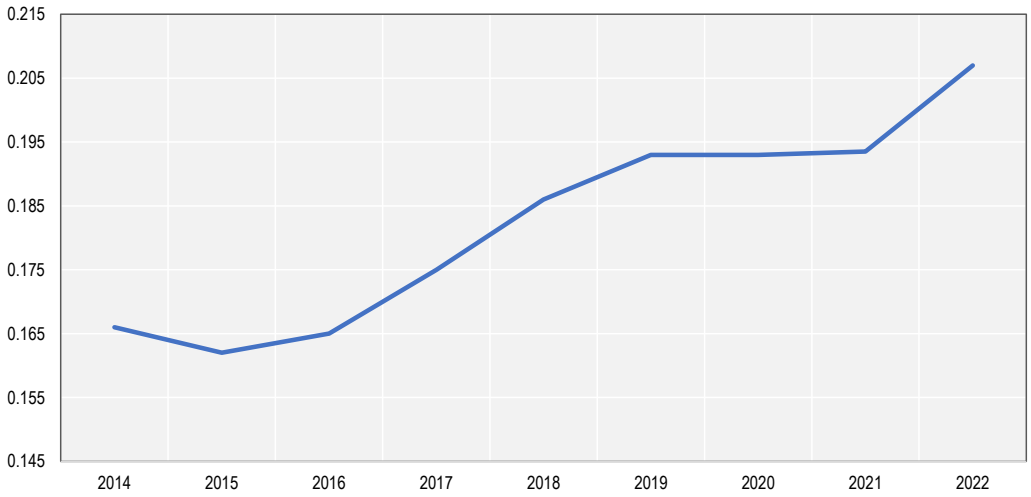
2.2. What is the policy environment that UK digital trade exports are facing?

2.2.1. UK digital trade exporters face an increasingly restrictive environment

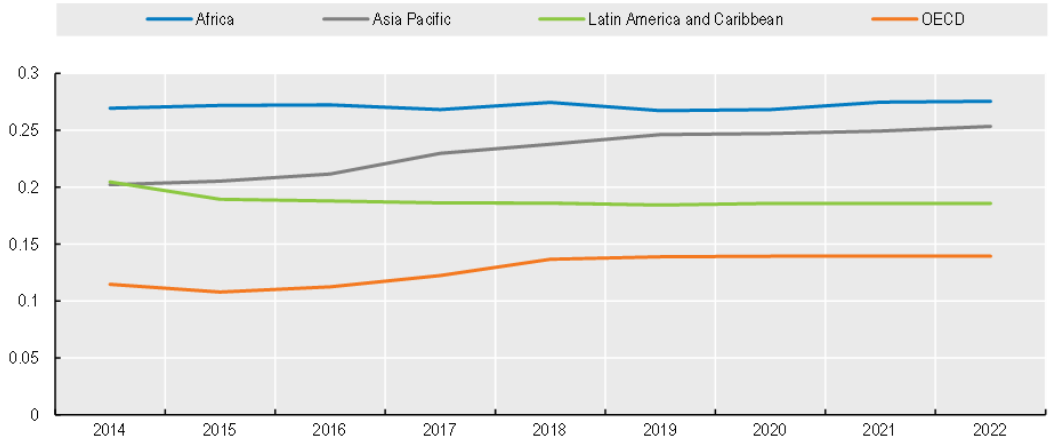
The operating environment for the UK's digital trade exports is increasingly restrictive. The average values of the DSTRI increased by 25% in 2022 compared to 2014 (Figure 14a). There are also wide heterogeneities across regions (Figure 14b). African countries have the highest levels of restrictions but are also the top reformers with many economies having introduced significant liberalisation measures in recent years. In the Asia-Pacific region, barriers are also high on average, and have been increasing in recent years. In OECD countries, barriers are the lowest, but the recent trend has been more tightening. In the Latin America and Caribbean region, the regulatory environment has been relatively stable over time with signs of moderate liberalisation.

Figure 14. The regulatory environment for digital trade is becoming more restrictive

a. Average DSTRI score, 2014-22



b. Average DSTRI score across different regions, 2014-22



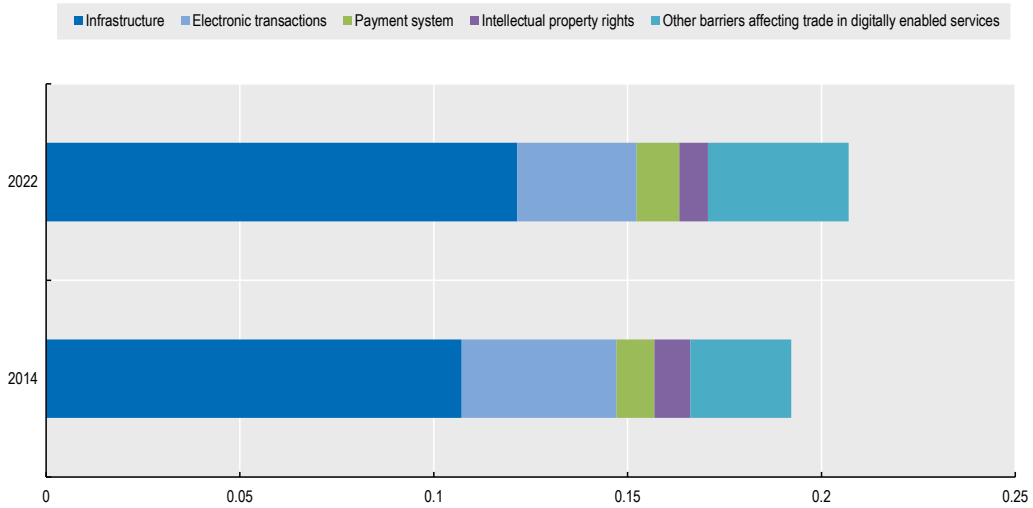
Note: The DSTRI ranges between 0 and 1, where 1 is the highest level of restrictiveness.
Source: OECD DSTRI database (2023).

2.2.2. Barriers are highest in the area of infrastructure and connectivity, including data governance

Globally, barriers faced by UK exporters are greatest in the area of infrastructure and connectivity (Figure 15). These are driven by limitations on cross-border data flows, data localisation requirements, and lack of pro-competitive regulations on interconnections across communications networks.

Figure 15. Increases in DSTRI globally are driven by higher restrictions to infrastructure and connectivity, e-payments and other barriers affecting trade in digitally enabled services

Global average DSTRI averages by key components, 2014 and 2022



Note: The DSTRI ranges between 0 and 1, where 1 is the highest level of restrictiveness. The average includes 100 economies.
Source: OECD DSTRI database (2023).

2.3. How is the UK participating in international discussions on digital trade?

2.3.1. The UK is an active participant in international discussions on digital trade

Beyond domestic regulations, important efforts to find cooperative approaches to foster digital trade are underway across a range of fora. These include UNCITRAL, UN CEFACT, OECD and, in regional fora. Progress in these discussions is captured in the OECD Digital Trade Inventory (DTI) (Box 3) – (Nemoto and López-González, 2021[7]).

Box 3. The Digital Trade Inventory

The OECD Digital Trade Inventory (Nemoto and López-González, 2021[7]) maps the range of international rules, principles and standards relevant for discussions on digital trade. The Digital Trade Inventory maps countries' overall engagement in 35 international instruments introduced in different international fora (listed in Nemoto and López-González (2021[7])), based on the policy framework that underpins the discussions in the JI on e-commerce at the WTO as of December 2022 (Ismail, 2023[10]):

A. Enabling e-commerce: electronic transaction frameworks, electronic authentication and electronic signatures, electronic contracts, electronic invoicing, and paperless trading.

B. Openness and e-commerce: customs duties on electronic transmissions, open government data, access to and use of the internet for electronic commerce/digital trade.

C. Trust and e-commerce: online consumer protection, unsolicited commercial electronic messages, personal information protection/personal data protection, source code, ICT products that use cryptography, and cybersecurity.

D. Cross-cutting issues: cross border transfer of information by electronic means/cross-border data flows, and location of computing facilities.

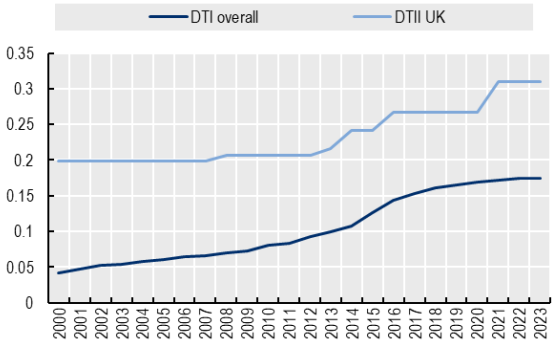
E. Telecommunications: Disciplines related to telecommunication services.

F. Other: Logistics services, use of technology for trade facilitation, domestic regulation, entry of business persons or issues of goods and services market access.

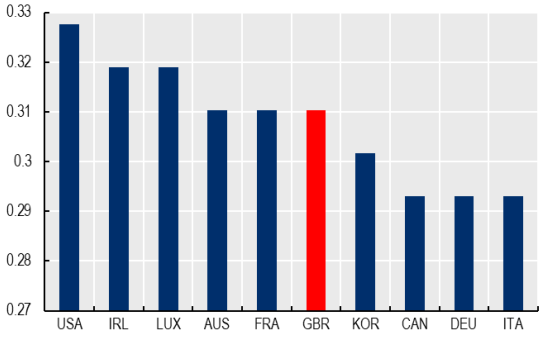
A summary measure of the Digital Trade Inventory shows that the UK has increased its adherence to international and regional instruments related to digital trade since the early 2000s (Figure 16a). Indeed, the UK is now a top 10 performer in the adoption of international instruments, on par with other OECD economies such as Australia and France but behind the United States, Ireland, and Luxembourg (Figure 16b).

Figure 16. UK's adherence to international and regional instruments related to digital trade has been growing over time

a. Evolution compared to the average, 2020-23



b. Top-10 performers in 2023



Note: The DTI includes information for 193 economies.
Source: Authors' calculations based on the OECD Digital Trade Inventory, 2023.

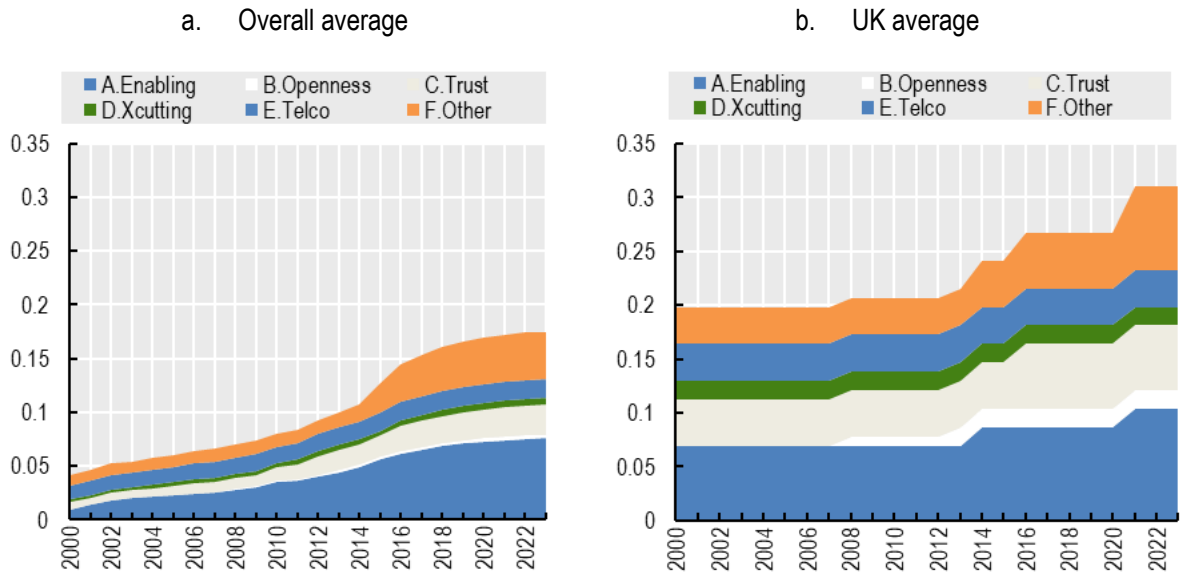
The adherence to international and regional instruments relating to digital trade has also been more comprehensive and faster than world averages (Figure 17a). Most progress has been achieved in the areas of **telecommunications, enabling e-commerce, trust, and other** (Figure 17b)**.** Progress includes:

- **Telecommunications**: The UK adopted the WTO Reference Paper on Telecommunications in 2000, a binding and international instrument.
- **Enabling e-commerce**: The UK has adopted a range of international instruments, such as: the UNCITRAL Model Law on E-commerce (in 2000); the UNCITRAL model law on e-signatures (2006); and the OECD Recommendation of the Council on Electronic Authentication (2007). In paperless trading, one of the key dimensions to enabling e-commerce, progress has been supported through the implementation of the WTO Trade Facilitation Agreement as well as through the implementation of regulatory frameworks for e-authentication and e-signatures systems[22].
- **Trust and e-commerce:** The UK adopted since early 2000s instruments related to the protection of personal data (Convention 108 and the OECD Privacy Guidelines in 2000), cybersecurity (the OECD Recommendations in relation to Guidelines for Cybersecurity, the Wassenaar Arrangement, and the Convention on Cybercrime of the Council of Europe - Budapest Convention in 2001) and to cryptography (the OECD Guidelines on Cryptography Policies in 2000). As regards consumer protection and spam, the UK has adopted the OECD Recommendations on Consumer Protection in e-commerce in 2016.
- **Openness and e-commerce:** In 2008, the UK adopted the OECD Recommendations on public sector information. In 2013, the UK adopted the G8 Open Data Charter.
- **Other:** With respect to goods market access, the UK ratified the WTO International Technology Agreement (ITA) in 1996 and the updated ITA in 2015. Other relevant areas concern competition in online platforms where the UK adopted in 2014 the OECD Recommendation concerning

[22] The "Electronic Communication Act" was in force between 2000-13, when it was replaced by the 2013 EU Regulation on e-identification and trust services for e-transactions in the internal market.

International Co-operation on Competition Investigations and Proceedings, and electronic payments where the UK adopted in 2016 the OECD Recommendation of the Council on Consumer protection in e-commerce.

Figure 17. Evolution of international instruments covered across policy areas, 2020-23



Note: The DTI includes information for 193 economies.
Source: Authors' calculations based on the OECD Digital Trade Inventory, 2023.

2.4. How has the UK's participation in digital trade provisions in RTAs and digital partnership agreements evolved?

2.4.1. The UK has some of the most comprehensive and deep digital trade provisions in trade agreements

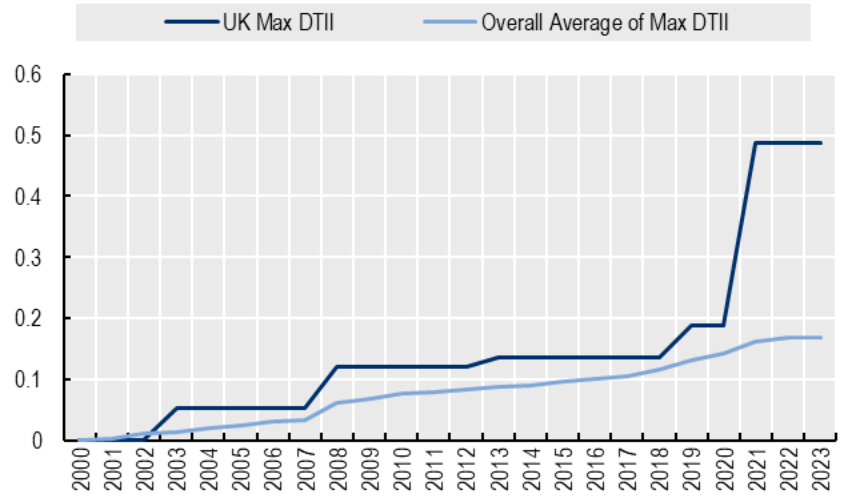
Since leaving the European Union, the UK has signed 39 regional trade agreements (RTAs), covering 73 trading partners.[23] Twenty of these, more than half of all agreements, have digital trade provisions, while 16 agreements have a digital trade chapter.[24] When compared to the average, digital trade provisions in RTAs signed by the UK since 2021 are significantly more ambitious in terms of both the number and depth of commitments (Figure 18). Overall, the UK and Singapore are the top performers in terms of coverage and depth of digital trade provisions in trade agreements. The UK is, together with Singapore, Australia, Chile, and New Zealand, among the economies with the most comprehensive agreements in terms of the coverage and depth of digital trade-related provisions (Figure 19). Other economies such as Japan, Peru, Malaysia, and Canada have a similar number of trade agreements signed but these are less deep in their coverage.

[23] As of November 2023. EU counted as one. 31 of these are continuity (rollover) agreements.

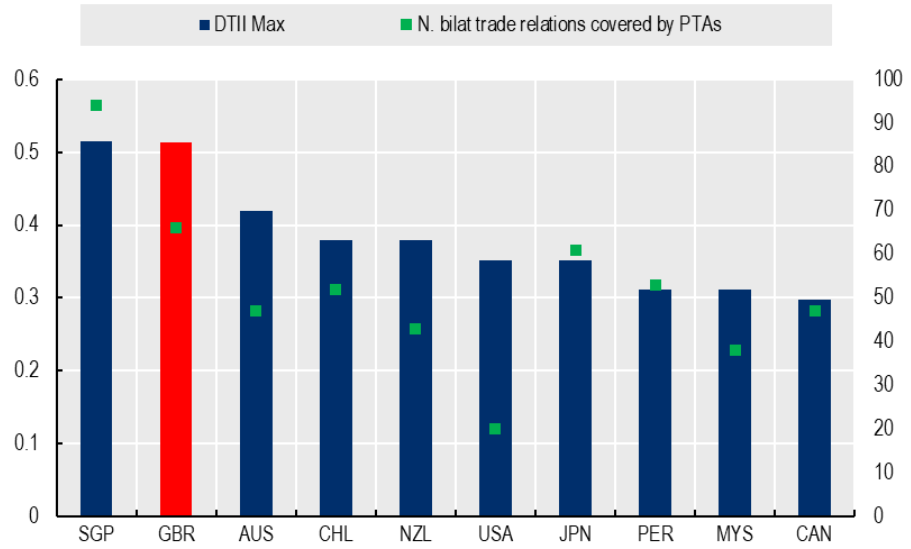
[24] Annex Table A A.2 provides the list of agreements signed by the UK and covered by the analysis.

Figure 18. The UK's digital trade provisions are increasingly deep and comprehensive

a. Depth of provisions in RTAs



b. Depth and number of digital trade provisions in RTAs in 2023



Note: Panel a: The chart reflects until 2020 the agreements signed by the European Union. The Digital Trade Inventory summary measure or RTAs ranges from 0 to 1 (maximum that can be achieved). Panel b: EU members partner countries are counted individually as partners.
Source: Authors' calculations based on the OECD Digital Trade Inventory, 2023 drawing on the TAPED database (November 2022 version).

2.4.2. The UK's digital trade provisions in regional trade agreements are deep

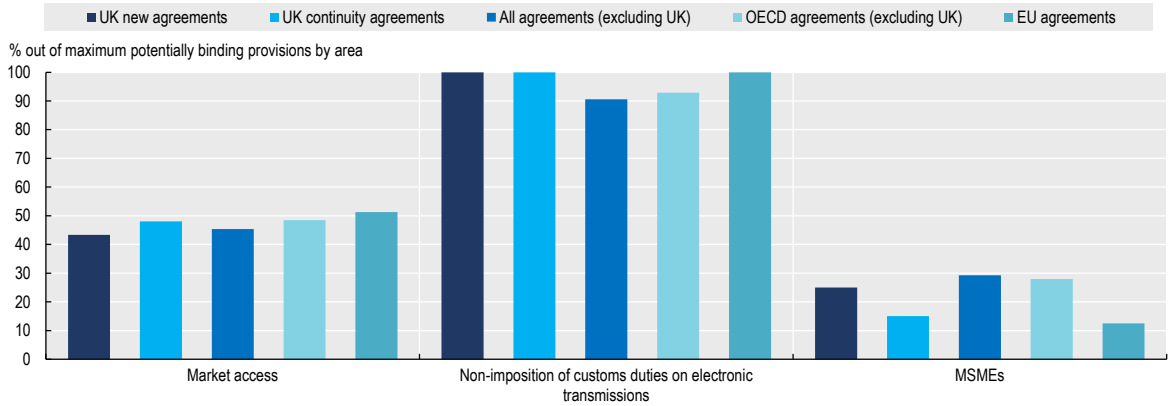
The UK's digital trade provisions in RTAs, according to the areas covered by its Digital Trade Strategy, are often deeper, on average, than agreements to which other OECD or EU economies are parties (Figure 19).[25] This is most notable in areas relating to market access, customs duties on electronic transmissions, data flows or data transmission in services chapters / sections, data and electronic government, and co-operation on ICT aspects.

[25] Open digital markets, data flows, consumer and business safeguards, digital trading systems, and international co-operation and global governance.

- **Open digital markets**: In the area of market access, the agreements to which UK is a party include binding commitments for services (and investment) market access and national treatment for sectors needed for e-commerce/digital trade (namely, computer and related services, telecommunications, and financial services). All UK agreements include a provision on the non-imposition of custom duties on electronic transmissions (NICDET). Fewer UK agreements include commitments on MSMEs, although this is on par with the average across other agreements with digital trade chapters covering this area.
- **Data flows**: All UK agreements include provisions on data protection with around half, mostly since leaving the EU, including binding provisions on the free movement of data (e.g. Australia-UK FTA, EU-UK TCA, New Zealand-UK FTA).[26]. UK's recently signed agreements also include non-binding commitments on open government data.
- **Consumer and business safeguards**: Consumer protection is included in all UK agreements. This concerns provisions for the protection of consumers using e-commerce, or consumer confidence in e-commerce, prevention of deceptive and fraudulent practices, and co-operation activities, as well as provisions on unsolicited commercial electronic messages. About one-third of the UK agreements include binding commitments on source code, algorithms, and encryption. These include prohibitions to require the transfer of, or access to, source code of software owned by a person, as a condition for the import, distribution, sale, or use of such software. The UK's trade agreements have been including binding commitments on cryptography since 2021. Only around one-third of the UK agreements include non-binding commitments on cybersecurity.
- **Digital trading systems**: In the area of electronic transaction frameworks, all UK agreements include provisions on authentication, electronic signatures, or digital certificates (albeit not always binding), but much fewer refer to the consistency of the domestic legal framework with various UNCITRAL instruments. In digital trade facilitation, all UK agreements include provisions on customs procedures automation or customs data exchange systems.
- **International co-operation, global governance, and other issues:** All UK agreements include commitments regarding co-operation on ICT, including many binding provisions. 'New data issues' – such as competition policy related to the digital economy, digital identity, fintech or Artificial Intelligence – remain more ambitious at this stage than on average for other agreements with digital provisions, including those to which OECD members or EU are parties.

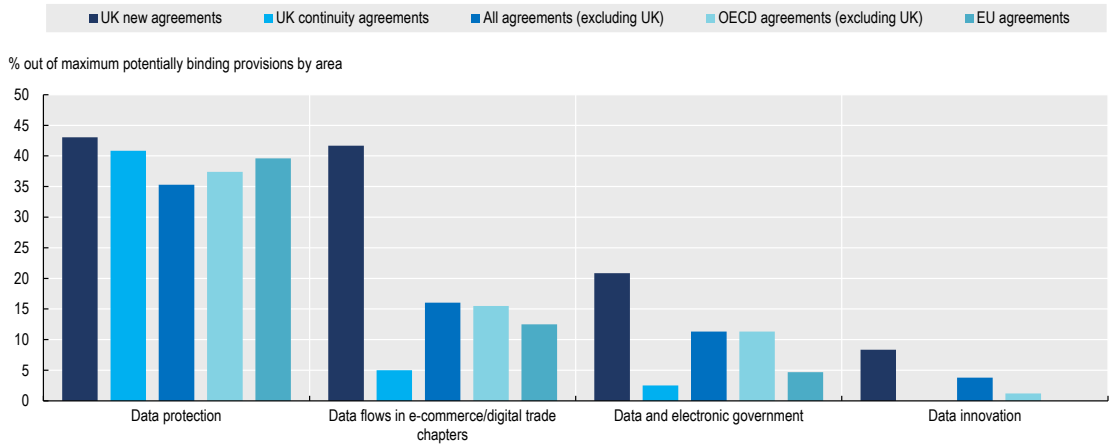
Figure 19. Digital trade provisions in the agreements with digital trade chapters signed by the UK

a. Provisions relating to open digital markets

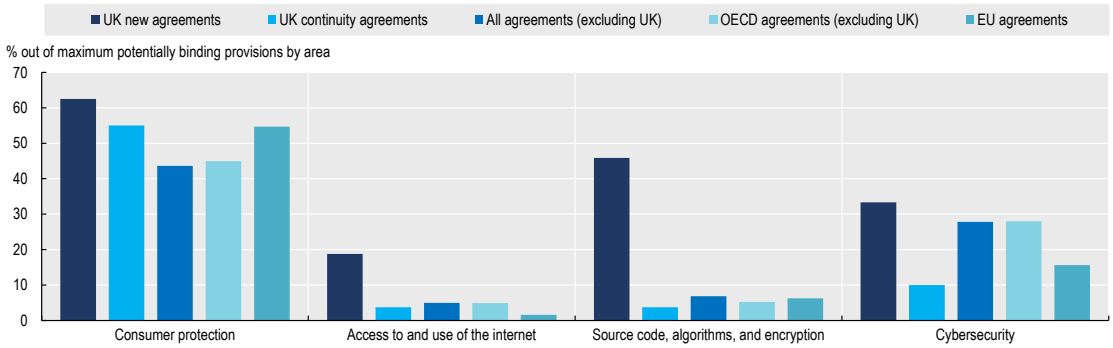


[26] Prior to 2021, agreements to which the UK was also party tended to incorporate best endeavour commitments on cross-border data flows, largely following the EU approach in this area.

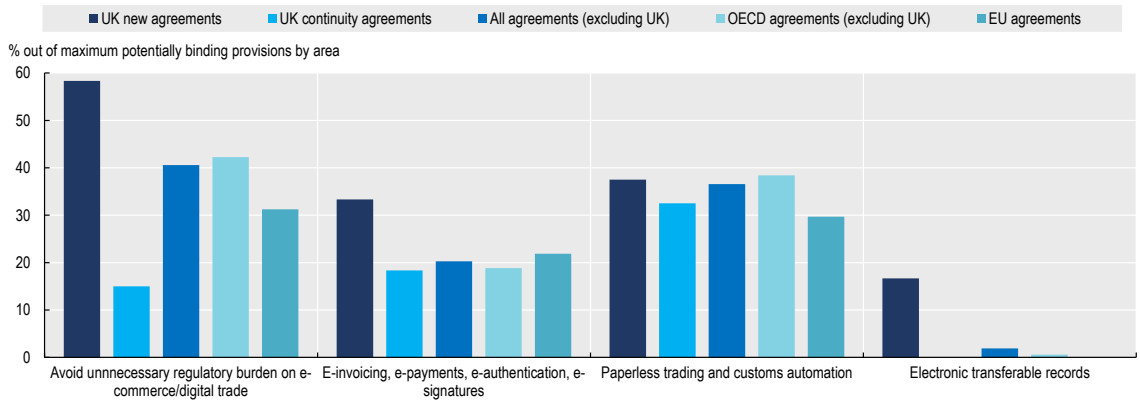
b. Provisions relating to data flows



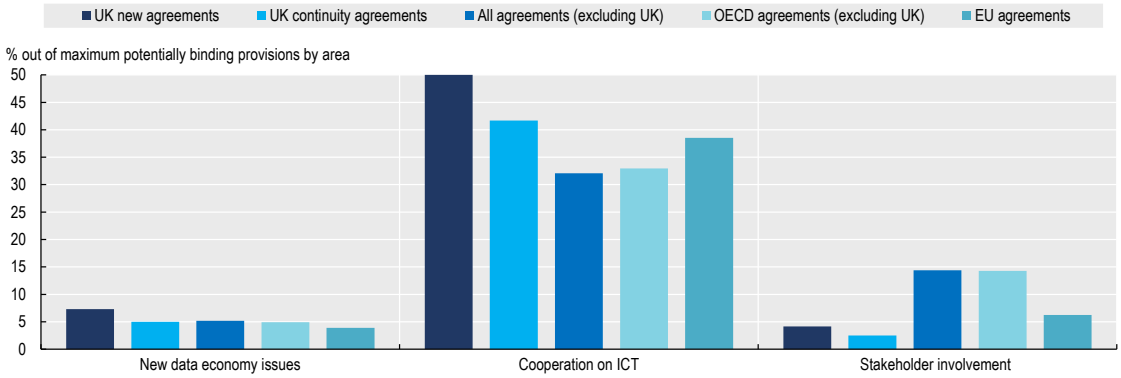
c. Provisions relating to consumer and business safeguards



d. Provisions relating to digital trading systems



e. Provisions relating to international co-operation, global governance, and other issues



Note: The set of measures covered by area is provided in Annex A. The bars represent the percentage of 'soft' and 'hard' commitments covered out of the maximum number of potentially binding commitments within each area ('hard' commitments are those enforceable by the agreement parties). The DEAs/DTAs averages include the digital trade agreements signed by the UK. 'Agreements with OECD parties' include at least one party which is an OECD member.
Source: Authors' calculations based on the TAPED database (November 2023 update), https://www.unilu.ch/en/faculties/faculty-of-law/professorships/burri-mira/research/taped/.

2.4.3. The UK's participation in digital economy agreements

In parallel to the inclusion of digital trade provision or chapters in RTAs, countries have also increasingly started negotiating broader digital economy or trade agreements. Since 2020, 9 digital economy agreements and digital trade agreements have been signed, all of which are underpinned by an existing RTA (e.g. all existing DEPA members are also party to the Comprehensive and Progressive Agreement for Transpacific Partnership (CPTPP)). This is partly why these digital economy agreements incorporate many of the issues discussed in the RTAs, but they also extend discussions across a number of areas including co-operation on artificial intelligence, digital identity, open government data, etc. (Lopez-Gonzalez, Sorescu and Kaynak, 2023[8]).

For instance, both DEPA and Australia-Singapore DEA cover issues related to Artificial Intelligence (AI) or SMEs, which are not often included in digital trade chapters in RTAs. However, these tend to be best endeavour clauses seeking to promote shared values and continued dialogue and co-operation.[27] The agreements are often characterised as 'living agreements': "designed to deepen mutual understanding of the digital economy and to be responsive to emerging technologies, business models and regulatory challenges" (Honey, 2021[11]). In a world where rapid technological change is having a profound impact on our economies and societies, flexible and more coordinated approaches to the governance of the digital economy can have an important role to play in shaping digital trade (Lopez-Gonzalez, Sorescu and Kaynak, 2023[8]). As such, interest in these agreements is rising. In addition to recent DEAs, China (November 2021), Canada (May 2022) and Costa Rica (2023) submitted a formal request to launch negotiations for their accession to the DEPA[28].

In the case of the UK, the Digital Economy Agreement with Singapore entered into force in 2023 and an agreement was reached for a Digital Trade Agreement with Ukraine in November 2022. Through its engagement in DEAs/DTAs, the UK has been including (i) more and binding commitments particularly in areas concerning data flows, consumer and business safeguards, and digital trading systems; and (ii) commitments to co-operate in 'new digital economy issues' such as AI, digital identities, or lawtech

[27] For example, the AI chapter of the DEPA stipulates that: "Parties shall endeavour to promote the adoption of ethical and governance frameworks that support the trusted, safe and responsible use of AI technologies [..] In adopting AI Governance Frameworks, the Parties shall endeavour to take into consideration internationally recognised principles or guidelines, including explainability, transparency, fairness and human-centred values."

[28] On 18 August 2022, the DEPA Parties established a Working Group for China to begin DEPA accession negotiations. A similar group was also established on 24 August 2022 for Canada and on 6 October 2023 for Costa Rica.

(Figure 20). Compared to other DEAs and DTAs signed,[29] agreements such as the UK – Singapore DEA are also more ambitious in terms of the number and enforceability of measures in areas concerning data innovation; consumer protection; source code; digital trading systems; and new data economy issues.

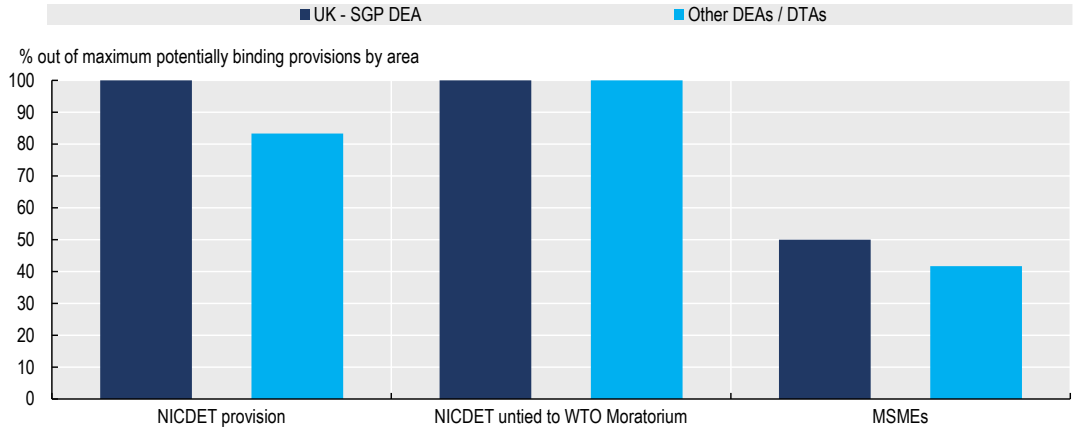
- **Open digital markets**: Both the UK-Singapore DEA and UK-Ukraine DTA include an obligation not to impose customs duties on electronic transmissions. Both agreements also cover co-operation to tackle barriers to the participation of small and medium sized enterprises (SMEs) in the digital economy, joint working groups to shape standards relevant to the digital economy, and co-operation on competition policy for digital markets.
- **Data flows**: Both digital economy/trade agreements contain provisions preventing from adopting or maintaining measures that prohibit or restrict the cross-border flow of data – including financial services data – except if the measure aims to achieve a legitimate public policy objective and does not constitute arbitrary and unjustified discrimination, a disguised restriction on trade, nor imposes restrictions greater than what is required to achieve that policy objective; commitments on personal data protection; as well as a set of obligations on open government information.[30] The UK-Singapore DEA includes a provision on data innovation, encouraging for data to be shared and reused.
- **Consumer and business safeguards:** Both digital economy/trade agreements include obligations to protect the rights of consumers online, including laws and regulations that ban misleading, deceptive, fraudulent, and unfair commercial practices which may harm consumers; obligations on preventing unsolicited commercial electronic messages; articles on business safeguards: a) guarding against the forced transfer of, or access to, source code of software, while retaining the access necessary in the event of an investigation, inspection, examination, enforcement action, or judicial proceedings; and b) prohibiting the forced transfer of or access to, except under limited circumstances, proprietary information related to cryptography, such as cryptographical algorithms, by state authorities as a condition for entering a Party's market. The agreements also include commitments to collaborate on cybersecurity.
- **Digital trading systems**: Both digital economy/trade agreements include provisions ensuring the legal effect, validity or enforceability of electronic contracts, except under specific circumstances. The UK-Singapore DEA includes requirements to maintain frameworks for electronic transactions consistent with international guidelines (the UNCITRAL Model Law on Electronic Transferable Records). The agreements include provisions on digitalising trade administration documents, as well as promoting interoperability; commitments on doing business electronically through electronic authentication and electronic signatures, along with commitments on mutual recognition; and provisions supporting the implementation of interoperable cross-border electronic invoicing systems. Through the DEA, UK and Singapore will also share best practices and information on logistics, including as regards trade in parcels.
- **International co-operation, global governance, and other issues:** Both agreements include commitments to co-operate on emerging technologies, such as AI, through sharing best practices on laws, regulations, policies, enforcement and compliance, and promoting collaboration on research and development and opportunities for investment. The agreements also include commitments to pursuing the development of frameworks and standards to promote compatibility and interoperability between respective digital identity regimes. The UK-Singapore DEA includes provisions to co-operate on lawtech.

[29] In addition to the agreements to which the UK is party to, the TAPED database includes the following DEAs/DTAs: ASEAN Agreement on Electronic Commerce; Agreement between the US and Japan Concerning Digital Trade; Australia - Singapore Digital Economy Agreement; Digital Economy Partnership Agreement ("DEPA") between Singapore, Chile and New Zealand; Mercosur Agreement on Electronic Commerce; Digital Partnership Agreement between Korea and Singapore. The database does not include at this stage other types of initiatives such as Digital Trade Principles (e.g. EU – Japan Digital Trade Principles, EU – Singapore Digital Trade Principles), which also focus on areas enabling digital trade.

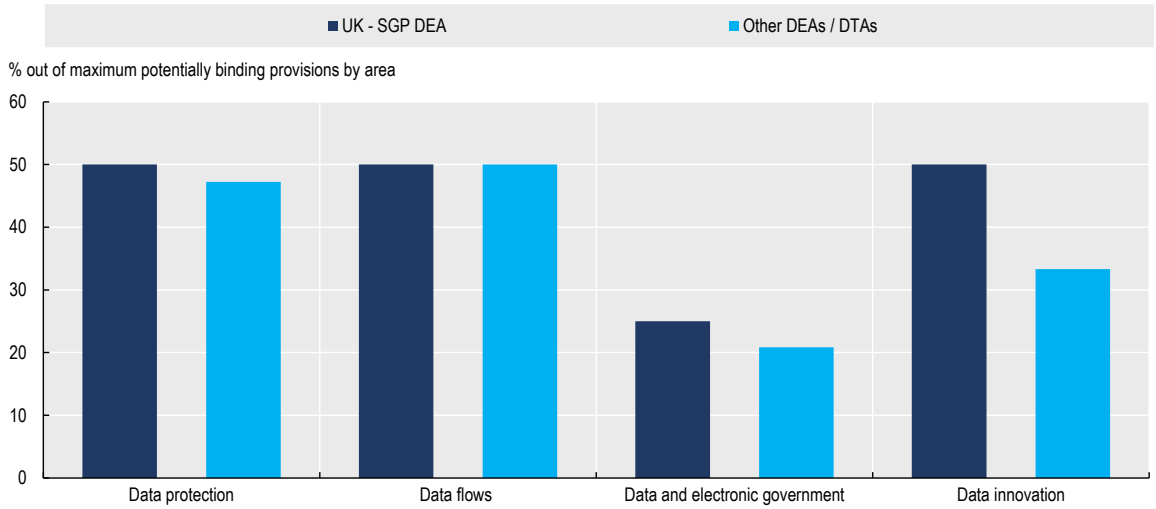
[30] The obligations made in the DEA and DTA do not alter or undermine the UK's domestic legislation on personal data protection. Onward transfers to third parties are still governed by the UK's Data Protection Act 2018.

Figure 20. Digital trade provisions in UK's digital economy agreement compared to other digital economy/trade agreements

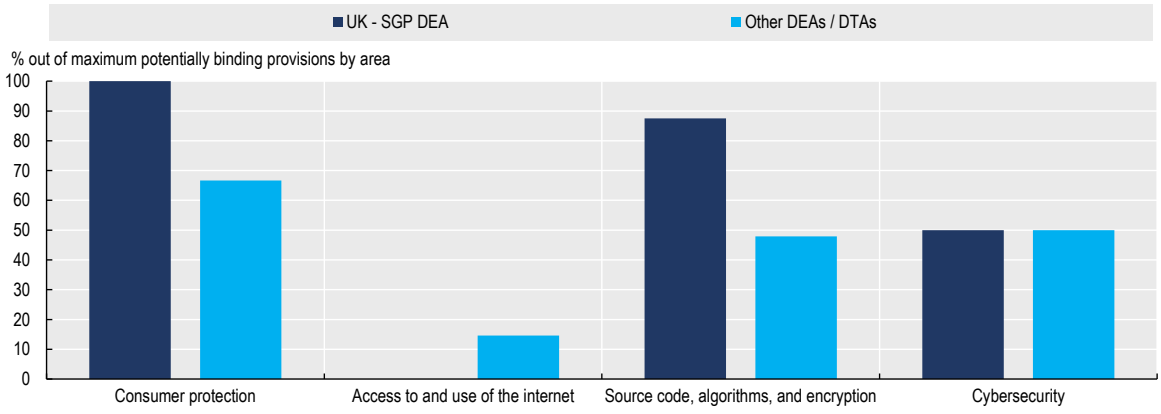
a. Provision relating to open digital markets



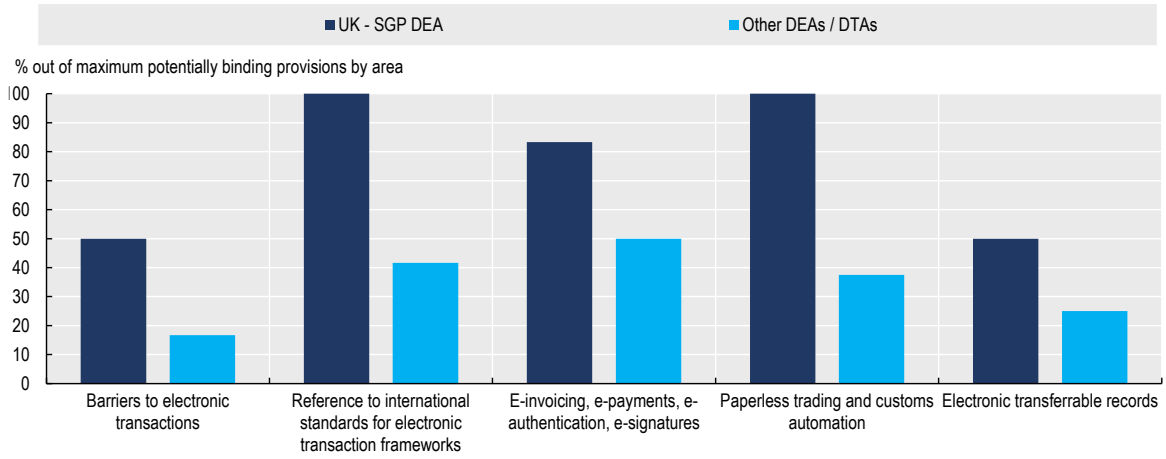
b. Provisions relating to data flows



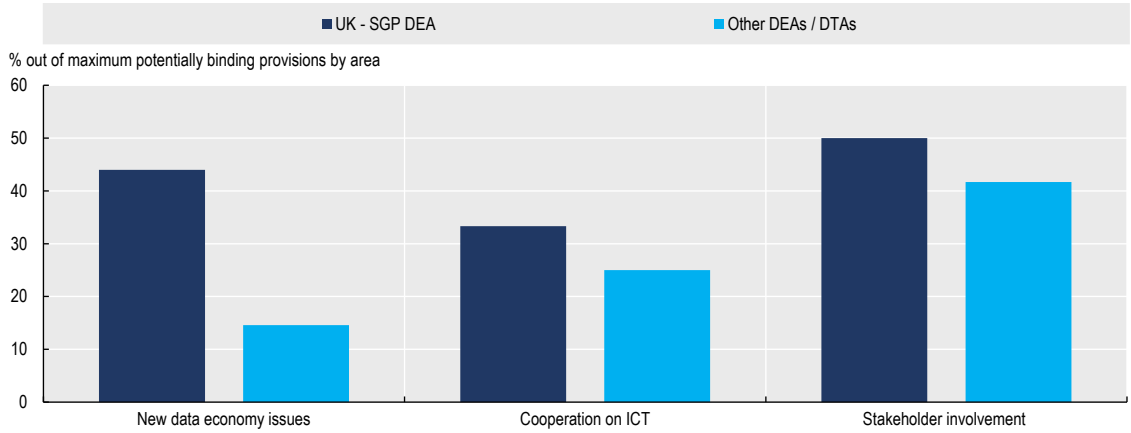
c. Provisions relating to consumer and business safeguards



d. Provisions relating to digital trading systems



e. Provisions relating to international co-operation, global governance, and other issues



Note: The set of measures covered by area is provided in Annex A. The charts do not include areas of market openness, which are less relevant for DEAs/DTAs. The latest update of the TAPED database does not include the UK-Ukraine DTA, thus the charts include only the UK-Singapore DEA. The bars represent the percentage of 'soft' and 'hard' commitments covered out of the maximum number of potentially binding commitments within each area ('hard' commitments are those enforceable by the agreement parties). The DEAs/DTAs averages include the digital trade agreements signed by the UK. 'Agreements with OECD parties' include at least one party which is an OECD member.
Source: Authors' calculations based on the TAPED database (November 2023 update), https://www.unilu.ch/en/faculties/faculty-of-law/professorships/burri-mira/research/taped/.

3. Identifying benefits of digital connectivity and digital trade provisions in trade agreements

The impact of digital connectivity and digital trade policies on trade is multifaceted. Digital connectivity and digital trade policies have a direct impact on the ability to order and to deliver trade digitally. But they will also affect trade through trade cost reductions, even when transactions are not digitally ordered or delivered. To capture this multifaceted impact, this section focuses on the broader question of the impact of digital connectivity and digital trade policies on trade and, in particular, on the role of digital trade provisions in trade agreements.[31]

[31] Different product-based categorisations including agriculture, manufacturing, ICT goods, ICT services, digitally-deliverable services and other services, are also used to identifying whether these impacts differ across different broad sectors.

3.1. The impact of digital connectivity on trade flows

3.1.1. Digital connectivity is increasingly important for trade

To date, analysis of the impacts of digitalisation on trade has mainly explored the trade-enabling role of digital connectivity. This empirical literature has largely used proxy measures for digital connectivity in a gravity model setting (Box 4). Freund and Weinhold (2004[12]) estimated that a 10 percentage points increase in the growth of web hosts in a country could lead to a 0.2 percentage point increase in export growth. Similarly, Lin (2015[13]) showed that a 10% increase in the number of Internet users raised international trade by 0.2%-0.4%. Choi (2010[14]) focused on the effect of Internet use on services trade, highlighting that a doubling of Internet usage in a country increased trade in services between 2% and 4%.

In a similar vein, López-González and Ferencz (2018[9]) showed that a 10% increase in 'bilateral digital connectivity' raised goods trade by nearly 2% and services trade by about 3%.[32] López-González and Sorescu (2021[15]) found that the impact of digitalisation on parcels trade was nearly twice that of total goods trade, showing that a 10% increase in bilateral digital connectivity raised trade in parcels by around 4%. More recent work by (Herman and Oliver, 2022[16]) finds that a one standard deviation increase in 'joint internet connectivity' can increase trade by over 38%.[33] Benz, Jaax and Yotov (2022[17]) also highlight the importance of digitalisation for growing services tradability in the past two decades.[34]

Two messages emerge from this literature, the first is that growing digital connectivity is associated with growing trade. The second, that the impact of digital connectivity on trade seems to be growing. This is confirmed by econometric evidence which shows that the impact of digital connectivity on trade costs is three times higher today than it was in 1995 (Figure 21).

The trade-cost reducing impact of digital connectivity translates into a quantitatively significant trade flow increasing effect.[35] A double dividend from growing digital connectivity emerges. On average, a 1% increase in domestic digital connectivity is associated with a 2.1% increase in domestic trade and a 1.5% increase in international trade (Figure 22).[36]

[32] Bilateral digital connectivity is defined as the minimum of the shares of the population with access to the internet across two countries.

[33] Joint internet connectivity is defined as the product between two countries of the shares of individuals connected to the internet.

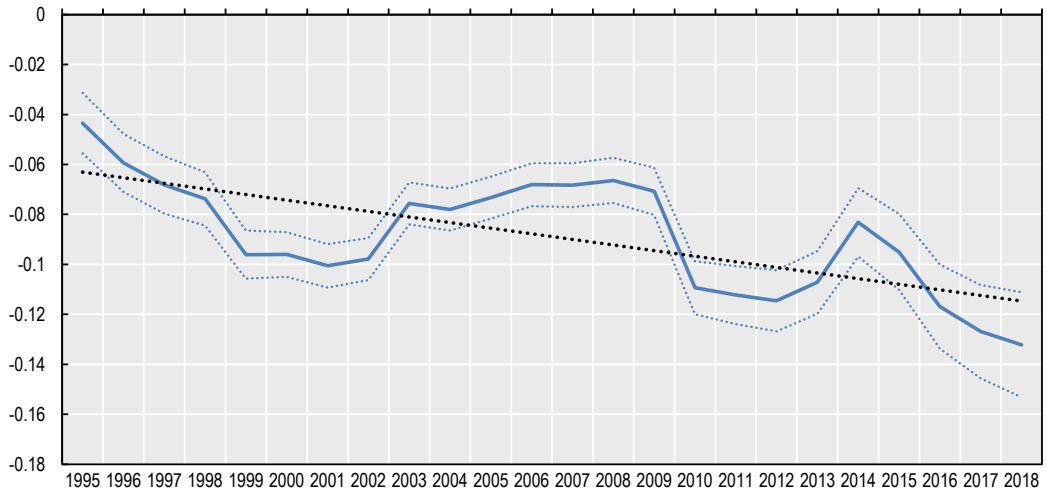
[34] Using data on eBay transactions and a gravity model for online and offline trade, (Lendle et al., 2016[33]) found that distance plays a reduced role on trade conducted over the platform relative to offline trade. The authors suggest that reductions in search costs have a trade cost reducing effect on such trade. (Kim, Dekker and Heij, 2017[35]) also rely on private company data, providing further evidence of the diminishing role of distance, and hence trade costs, on online trade. Indeed, growing evidence supports the idea that there is a diminishing impact of distance on international trade (Kim, Dekker and Heij, 2017[35]), including for services trade (Benz, Jaax and Yotov, 2022[17]).

[35] See Annex B for details on the gravity trade estimations.

[36] This double dividend also appears in the work of Herman and Oliver (2022[16]) although they find that international trade increases by more than domestic trade.

Figure 21. The impact of digital connectivity on trade costs is three times higher in 2018 than in 1995

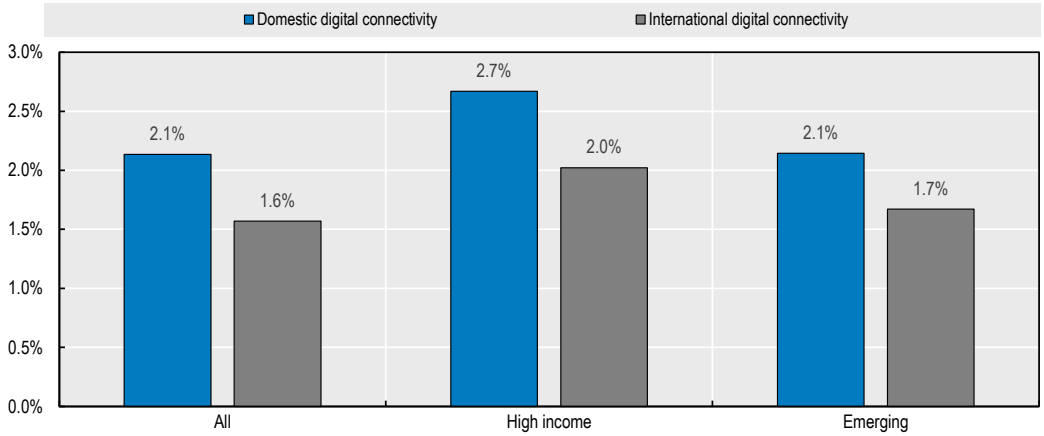
Impact of digital connectivity on international trade costs by year, 1995-2018



Note: The graph plots the impact of increasing minimum digital connectivity on international trade costs using a structural gravity model. Blue dotted lines show the 95% confidence intervals.
Source: (Lopez-Gonzalez, Sorescu and Kaynak, 2023[8]).

Figure 22. The double dividend of digital connectivity

Impact of a 1% improvement in bilateral digital connectivity on domestic and international trade



Note: Results from a gravity model for the period 1995-2018 using PPML and reporter-sector-year and partner sector-year fixed effects. See Annex Table A E.4. for regression results.
Source: Own calculations using TiVA 2021 database.

Available estimates for digital connectivity in the UK highlight that, in 2023, 7% of households did not have internet access. While this is down from around 11% in 2020 and 24% in 2011, the prevalence of digital exclusion can vary depending on age and socio-economic status.[37] Even in areas where there is good digital infrastructure available, a digital divide may still exist for individuals who are not able to use or access digital services or due to the quality or affordability of the services.

Box 4. Using the structural gravity model for trade analysis

The gravity model has become the workhorse for international trade analysis. Since its first use in (Tinbergen, 1962[18]), the gravity model has received numerous theoretical underpinnings, most notably by (Anderson, 1979[19]), (Eaton and Kortum, 2002[20]), (Anderson and Van Wincoop, 2003[21]) and (Arkolakis, Costinot and Rodriguez-Clare, 2012[22]) (see also (Head and Mayer, 2014[23]), (Yotov et al., 2016[24]), (Yotov, 2022[25]) for a summary of the literature). These theoretically derived underpinnings are collectively referred to as the *structural gravity model*.

At its most basic, the gravity model stipulates that trade between two countries is proportionate to their economic mass, measured as their share in world GDP, and a set of trade costs, some of which are bilateral, such as distance, or specific trade policies others multilateral, such as how remote you are from others (multilateral resistance).[1]

A number of important lessons have emerged from the empirical application of structural gravity models. The early literature, motivated by theoretical underpinnings, underscored the importance of exporter-year and importer-year fixed effects to control for multilateral resistances (Anderson and Van Wincoop, 2003[21]), and where possible country-pair fixed effects (to control for time invariant and unobservable trade costs between country pairs). Later, emphasis was placed on the use of Poisson Pseudo-Maximum-Likelihood (PPML) estimators to account for heteroscedasticity[2] and zero trade flows (Santos Silva and Tenreyro, 2006[26]).

More recently, focus has shifted towards the use of theory-consistent 'domestic trade flows' in the estimation process (see Yotov et al. (2016[24])).[3] This enables the identification of a 'border effect' capturing the extent to which countries trade more domestically than they do internationally. An important advantage of using domestic trade flows is that, by interacting explanatory variables with a border dummy, it enables the identification of impacts that might otherwise be collinear with the use of certain fixed effects. For example, it enables the analysis of the impact of country-specific policies that do not vary across trade partners as might be WTO membership but also unilateral domestic regulations.

1. Multilateral trade resistance refers to the barriers to trade that each country faces with all its trading partners.
2. If the error terms in the usual log linear specification of the gravity equation are heteroscedastic, this violates the assumption that they are statistically independent of the regressors (i.e., dependent variables used) and suggests that the estimation method leads to inconsistent estimates of the elasticities of interest.
3. Domestic trade flows are important for a number of reasons (see (Borchert et al., 2022[27]), (Yotov, 2021[28]), (Yotov, 2022[25])). They provide solutions to the "missing globalisation puzzle", which refers to the surprising finding that the volume of trade has become increasingly sensitive to distance ((Disdier and Head, 2008[29])). They also enable estimating the importance of international trade relative to domestic trade.

[37] For instance, 18% of lower-income households and 18% of people aged over 65 years state do not have Internet access. There is currently no cross-government strategy specifically on tackling digital exclusion. The most recent digital inclusion strategy was published in 2014 (House of Commons Library, Access to broadband services, September 2023: https://researchbriefings.files.parliament.uk/documents/CDP-2023-0176/CDP-2023-0176.pdf).

3.2. The impact of digital trade policies on trade flows

3.2.1. Digital trade policies have the potential of having important effects on trade

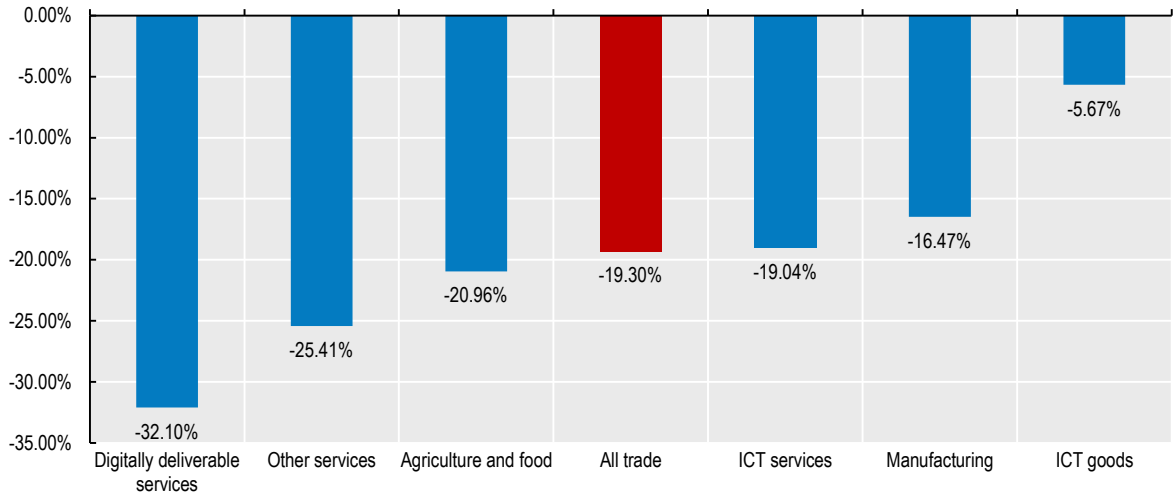
The impact of digital trade policies on trade has received less attention in the empirical literature, largely due to a lack of quantitative evidence on the measures capturing the digital trade policy landscape. Two types of digital trade policies are of interest. The first are domestic measures affecting digital trade, as might be captured by indicators such as the DSTRI. These include domestic approaches to data flows, or the existence of different measures affecting e-payments. The second are digital trade provisions in trade agreements, as described in the previous section.

Domestic regulatory reforms increase export competitiveness

Domestic regulatory reform can enhance export competitiveness (Figure 22). A 0.1-point reduction in the domestic DSTRI score, which captures an important domestic regulatory reform, is associated with a decrease in export costs of 19.3%.[38] The effect is highest for digitally-deliverable services (-32.1%) and 'other services' exports (-25.4%). Importantly, the case for reform is not limited to services. An equivalent reduction in the domestic DSTRI score is associated with a 21% decrease in export costs in agriculture and food sectors and a 16.5% decrease in export costs in manufacturing sectors.[39] Although these impacts are sizeable, it is important to note that the UK already has a very low DSTRI, giving less room for wider reform.

Figure 23. Domestic reforms can have important effects on exports

Ad valorem equivalent of reducing the DSTRI by 0.1 points



Note: The figure shows by how much export costs decrease as a result of a 0.1-point decrease in the Digital STRI. *Ad valorem* equivalent can be calculated following Benz and Jaax (2020[30]) as exp(-(-0.1*DSTRI coefficient)/(elasticity-1))-1. Using the DSTRI coefficients from Lopez-Gonzalez, Sorescu and Kaynak (2023[8]) and the elasticities from Egger et al. (2021[31]).
Source: Adapted from (Lopez-Gonzalez, Sorescu and Kaynak, 2023[8]).

[38] A 0.1-point change in the DSTRI can entail an important regulatory reform. For comparison, a 0.04-point decrease captures a move from a more to a less restrictive approach to data transfers.

[39] The magnitudes are comparable to Benz and Jaax (2020[30]) who obtained trade costs reductions from reducing regulatory barriers in services (measured as a 0.1-point reduction in the STRI) up to 109% for financial services.

Digital trade chapters can lead to sizeable impacts on trade

While there is a robust body of empirical evidence on the impact of trade agreements on trade using the structural gravity model, this has not been readily applied to the context of e-commerce provisions in RTAs.[40]

The impact of digital trade chapters in RTAs on trade is found to be positive. Signing an RTA is found to increase trade by 24%, however, if this RTA has a digital trade provision, and controlling for other provisions in that RTA, the digital trade chapter more than doubles the impact to 56%.[41]

Table 1. Impact of digitalisation and e-commerce chapters in RTAs on trade

	All	High-income	Emerging
Log of minimum bilateral digital connectivity	0.136***	0.136***	0.138***
	(5.88)	(5.97)	(6.05)
EU	0.402***	0.405***	0.512***
	(24.92)	(25.17)	(13.47)
RTA	0.217***	-0.0286	-0.0396
	(7.76)	(-0.59)	(-0.83)
RTA with an e-commerce provision		0.405***	0.446***
		(5.53)	(6.19)
Depth of RTA			-0.123***
			(-3.18)
Constant	13.44***	13.47***	13.46***
	(145.52)	(149.84)	(149.68)
N	853822	853822	853822
Reporter-time FE	YES	YES	YES
Partner-time FE	YES	YES	YES
Reporter-partner FE	YES	YES	YES

Note: Results from a gravity model for the period 1995-2019 using PPML.
Source: Own calculations.

When looking at impacts of specific provisions (Table 2), the results suggest that 'Trust', which includes issues around data protection, consumer protection, source code and cybersecurity can deliver most gains from trade agreements. This is followed by issues related to cross-cutting measures which largely comprises data flow provisions and bans on local storage requirements.[42]

[40] Three challenges arise when trying to estimate the impact of digital trade provisions in trade agreements.

Disentangling the impact of the digital trade chapter from confounding factors. Unobserved heterogeneity, arising from omitted variable bias and/or selection bias, implies that RTAs dummy's, if not appropriately specified, may capture that countries that already trade with each other a lot tend to be prone to singing trade agreements among each other. The use of reporter-year, partner-year and bilateral fixed effects helps attenuate this effect.

Isolating the impact of having an e-commerce chapter. The issue is that countries that sign digital trade chapters in their trade agreements are also likely to have other chapters such as services or investment chapters. The challenge is to control for this using variable that capture the overall depth of the agreement.

Identifying the impact of specific digital trade provisions in digital trade chapters. The issue being that different parts of the digital trade chapter are likely to be more or less impactful. Identifying which is most important can be difficult.

[41] The impact of the RTA is calculated as: RTA=(exp(rta)-1)*100. These impacts are in line with (Herman and Oliver, 2022[16]).

[42] The different areas covered in RTAs are:

Table 2. Impacts of specific provisions

	Overall	Enable	Open	Trust	Cross-cutting	Other
Coefficient	0.446	0.398	0.400	0.543	0.453	0.428
Impact	56%	49%	49%	72%	57%	53%
N	853 822	853 822	853 822	853 822	853 822	853 822

Note: Results from a gravity model for the period 1995-2019 using PPML and reporter-partner, reporter-sector-year and partner-sector-year fixed effects. USITC ITPD-E trade data.
Source: Own calculations.

4. Conclusions and policy recommendations

The UK has embraced digital trade earlier and faster than most countries. Digital trade exports grew at nearly 3 times the rate of 'other trade' exports and now represent more than half of UK's exports, twice the OECD and EU averages. Digital trade has become a key element of UK competitiveness. The UK has a strong comparative advantage in digitally deliverable services sectors, especially financial and professional services. At the same time, it also has a high digital content of exports in other sectors, including agriculture, food, mining, and textiles.

The UK's domestic regulatory environment is well positioned to enable opportunities for digital trade. Indeed, the UK has one of the lowest OECD DSTRI scores. However, restrictions in export markets for UK firms are growing, underscoring the need to engage in wider international co-operation. This matters as the econometric analysis shows that 0.1-point reduction in the domestic DSTRI score, which captures an important domestic regulatory reform, is associated with a decrease in export costs of 19.3%. The effect is highest for digitally-deliverable services (-32.1%), but is also significant for agriculture and manufacturing sectors.

The UK can also continue to reap the benefits from further efforts in improving digital connectivity and reducing Internet access gaps between socio-economic groups or regions.

The UK should fully implement the strategies it has initiated in the areas of digitalising trade-related documents in the business-to-business trading process, as well as in digital trade facilitation tools used for business-to-government trade administration and border processes such as the Single Trade Window.

The UK has embraced digital trade provisions in its trade agreements. By the end of 2023, over one-third of the agreements signed by the UK had a digital trade chapter. These are more ambitious, in terms of number and depth of commitments, than other OECD and EU countries. Through its engagement in digital economy or trade agreements, the UK has also been including (i) more and binding commitments particularly in areas concerning data flows, consumer and business safeguards, and digital trading systems; and (ii) commitments to co-operate in 'new digital economy issues' such as AI, digital identities, or law-tech.

These efforts are important in light of the econometric analysis showing that RTAs with digital trade chapters have the potential of doubling the effect of trade agreements, in particular those that include provisions targeting trust (e.g. data protection, source code) and data flows or bans on data localisation.

Overall, the evidence presented in this report suggests that the UK is one of the top digital trade performers, whether with respect to participation or to domestic and international regulations. The UK is encouraged

Enabling e-commerce: electronic transaction frameworks, electronic authentication and electronic signatures, electronic contracts, electronic invoicing, and paperless trading.

Openness and e-commerce: customs duties on electronic transmissions, open government data, access to and use of the internet for electronic commerce/digital trade.

Trust and e-commerce: online consumer protection, unsolicited commercial electronic messages, personal information protection/personal data protection, source code, ICT products that use cryptography, and cybersecurity.

Cross-cutting issues: provisions on the movement of data and provisions banning local storage requirements.

to continue its ambitious digital trade policy agenda, continuing the process of domestic reform, engaging in wider and comprehensive digital trade chapters in trade agreements and undertaking further digital economy agreements. The UK also needs to continue playing a strong role in supporting ongoing plurilateral discussion to ensure better access to international markets for its exporters.

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Annex A. The United Kingdom's trade agreements with digital trade provisions

Table A A.1. Digital trade areas included in agreements and related provisions

Selected areas based on the TAPED Database mapped to the UK's Digital Trade Strategy Pillars

UK Digital Trade Strategy Pillar	Mapping to areas covered by TAPED	Provision selected based on TAPED
A. Open digital trade markets	Market access	Does the agreement provide for national treatment (NT) in e-commerce/digital trade?
		Does the agreement provide for most-favoured-nation (MFN) treatment in ecommerce/digital trade?
		Are there services (and investment) market access (MA) and NT commitments for the sectors needed for e-commerce/digital trade? (computer and related services, telecommunications and financial services)
	Customs duties	Does the provision prohibiting the imposition of customs duties on electronic transmissions clarify that the 'content' of electronic transmissions is covered?
	MSMEs	Does the agreement include provisions for the facilitation of ecommerce/digital trade by small and medium-sized enterprises (SMEs) or micro, small and medium-sized enterprises (MSMEs)?
B. Data flows	Data protection	Does the agreement include provisions on data protection?
		Does the agreement include provisions on data protection with no qualifications?
		Does the agreement include provisions on data protection according to domestic law?
		Does the agreement include provisions on data protection recognising certain key principles?
		Does the agreement include provisions on data protection recognising certain international standards?
		Does the agreement include provisions on data protection as a least restrictive measure?
	Data flows in e-commerce/digital trade chapters	Does the e-commerce/digital trade chapter include a provision on the free movement of data? Is the provision on the free movement of data subject to exceptions?
		Does the e-commerce/digital trade chapter contain a mechanism to address barriers to data flows?
		Does the e-commerce/digital trade chapter contain a provision banning or limiting data localisation requirements?
		Does the agreement contain a provision on a future discussion/provisions or agreement on the free flow of data?
		Does the agreement contain a provision on a future discussion/provisions or agreement on the free flow of data outside the dedicated ecommerce/digital trade chapter?
	Data and electronic government	Does the agreement include provisions on e-government?
		Does the agreement include a provision on open government data or open data?
	Data innovation	Does the agreement contain a provision referring to data innovation, allowing data to be shared and reused?
C. Consumer and business safeguards	Consumer protection	Does the agreement include provisions on consumer protection?
		Does the agreement include provisions on Unsolicited Commercial Electronic Messages?
	Access to and use of the internet	Does the agreement include Principles on Access to and Use of the Internet for e-commerce/digital trade?
		Does the agreement include provisions on net neutrality?

UK Digital Trade Strategy Pillar	Mapping to areas covered by TAPED	Provision selected based on TAPED
		Does the agreement include provisions on Internet Interconnection Charge Sharing?
		Does the agreement include a provision on interactive computer services?
	Source code, algorithms, and encryption	Does the agreement include prohibitions to require the transfer of, or access to, source code of software owned by a person, as a condition for the import, distribution, sale or use of such software?
		Does the provision on source code make a separate reference to requiring the transfer of, or access to, an algorithm as a condition for the import, distribution, sale or use of the artificial intelligence enabled product/ service?
		Does the agreement include provisions on cryptography?
		Does the agreement contain a provision on access to encrypted and/or unencrypted communications?
	Cybersecurity	Does the agreement include provisions on cybersecurity?
D. Digital trading systems	Avoiding unnecessary regulatory burden on e-commerce/digital trade	Does the agreement include a provision on electronic transactions framework? (i.e. avoid any unnecessary regulatory burden on e-commerce/digital trade, or that e-commerce/ digital trade must not be more restricted than other trade)
	E-invoicing, e-payments, e-authentication, e-signatures	Does the agreement contain provisions on e-invoicing?
		Does the agreement contain provisions on the facilitation of e-payments?
		Does the agreement include provisions on electronic authentication, electronic signatures or digital certificates?
	Paperless trading and customs automation	Does the agreement include a provision on paperless trading?
		Does the agreement contain a provision on electronic transferable records?
		Does the agreement contain a provision on customs procedures automatisation or custom data exchange systems?
	Electronic transferrable records	Does the agreement contain a provision on electronic transferable records?
E. International co-operation, global governance, and other issues	New data economy issues	Does the agreement contain a provision on competition policy related to the digital economy?
		Does the agreement contain a provision on digital identities?
		Does the agreement contain a provision on digital inclusion?
		Does the agreement contain a provision on Financial Technology (Fintech) co-operation?
		Does the agreement contain a provision on Artificial Intelligence (AI)?
		Does the agreement include an understanding or provisions allowing government procurement including by use of electronic means?
		Does the agreement include an understanding or specific provisions on standardisation, interoperability, or mutual recognition regarding digital means?
		Does the agreement contain a provision on Legal Technology (Lawtech) co-operation?
	Cooperation on ICT	Does the agreement include an understanding on provisions about co-operation on ICT, e-commerce/digital trade?
		Does the agreement include provisions on the participation of the Parties in international fora to promote e-commerce/digital trade?
		Does the agreement consider specific institutional arrangements for e-commerce/digital trade, e.g. working group, committees, etc.?
	Stakeholder involvement	Does the agreement include a provision ensuring that measures regulating e-commerce/digital trade support industry-led development? Or the input of the industry as stakeholders? Or encourages business exchanges and cooperative activities?
		Does the agreement include a provision on facilitation of input by other interested persons in the development of e-commerce/digital trade?

Source: Authors' compilation based on TAPED database (November 2023 version).

Table A A.2. Trade agreements and digital economy agreements signed by the UK

Agreement	Partner economies	Continuity agreement	Year of entry into force	Digital provision	Digital trade chapter	DEA
UK - EU	EU-27		2021		x	
UK - Albania	Albania	x	2021			
UK - Australia	Australia		2023		x	
UK - Cameroon	Cameroon	x	2021	x		
UK - Canada	Canada	x (under renegotiation)	2021		x	
UK - CARIFORUM	Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Dominican Republic, Grenada, Guyana, Jamaica, St. Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago	x	2021		x	
UK – Central America	Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama	x	2021		x	
UK - Chile	Chile	x	2021			
UK – Andean countries	Colombia, Ecuador, Peru	x	2021			
UK – Côte d'Ivoire	Côte d'Ivoire	x	2021	x		
CPTPP	Australia, Brunei Darussalam, Canada, Chile, Japan, Malaysia, Mexico, Peru, New Zealand, Singapore, Viet Nam		- (signed 2023)		x	
UK – Eastern and Southern Africa States	Mauritius, Seychelles, Zimbabwe	x	2021			
UK - Egypt	Egypt	x	2021			
UK – Faeroe Islands	Faeroe Islands		2021			
UK - Georgia	Georgia	x	2021		x	
UK - Ghana	Ghana	x	2021			
UK – Iceland, Liechtenstein, Norway	Iceland, Liechtenstein, Norway	x	2021		x	
UK - Israel	Israel	x (under renegotiation)	2021			
UK – Japan	Japan		2021		x	
UK - Jordan	Jordan	x	2021			
UK - Kenya	Kenya	x	2021	x		
UK - Korea	Korea	x (under renegotiation)	2021		x	
UK - Kosovo	Kosovo	x	2021			
UK – Lebanon	Lebanon	x	2021			
UK – Mexico	Mexico	x (under renegotiation)	2021		x	
UK – Moldova	Moldova	x	2021		x	
UK - Morocco	Morocco	x	2021			
UK – New Zealand	New Zealand		2023		x	

Agreement	Partner economies	Continuity agreement	Year of entry into force	Digital provision	Digital trade chapter	DEA
UK – North Macedonia	North Macedonia	x	2021			
UK – Pacific States	Fiji, Papua New Guinea, Samoa, Solomon Islands	x	2021			
UK – Palestinian Authority	Palestinian Authority		2021			
UK – SACU and Mozambique	Botswana, Eswatini, Lesotho, Mozambique, Namibia, South Africa	x	2021	x		
UK – Serbia	Serbia	x	2021			
UK - Singapore	Singapore	x	2021		x	
UK - Singapore	Singapore		2023			x
UK – Switzerland	Switzerland	x	2021			
UK - Tunisia	Tunisia	x	2021			
UK - Türkiye	Türkiye	x	2021			
UK - Ukraine	Ukraine		2021		x	
UK – Ukraine	Ukraine		- (signed 2023)			x
UK – Viet Nam	Viet Nam	x	2021		x	

Source: Authors' compilation based on the WTO RTA database, 2023; TAPED, 2023.

Annex B. Gravity model to assess the impact of trade agreements with e-commerce/digital trade provisions

The gravity model of trade expresses trade flows as a function of the (economic) size of the trading countries and trade costs. A generic sector-specific structural gravity equation can be expressed as:

$$\left(X_{ij}\right)^k = \frac{Y_i^k E_j^k}{Y^k}\left(\frac{T_{ij}^k}{\Pi_i^k P_j^k}\right)^{-\theta^k} \quad (1)$$

where trade flows from country *i* to country *j* in sector *k*, X_{ij}^k, are a function of the supply of sector *k*-goods from country *i*, Y_i^k, and expenditure for sector *k*-goods in country *j*, E_j^k. $T_{ij}^k > 1$ are trade costs when sector *k*-goods are shipped from exporter-country *i* to importer-country *j*. q^k is the sector-specific trade elasticity, and $\Pi_i^k$and P_j^k are the price indices representing outward and inward multilateral resistance terms, respectively. The size term is captured by $\frac{Y_i^k E_j^k}{Y^k}$ and shows the hypothetical level of frictionless trade between two countries, which is proportional to their overall share of global economic activity. The trade cost term, $\frac{T_{ij}^k}{\Pi_i^k P_j^k}$, is a scaling factor that takes into account trade frictions.

While economic size can be readily observed using available statistics, trade costs are more difficult to capture and include a range of geographical and policy elements. There have been a number of attempts at estimating these trade costs. In this paper, trade is assumed to be a function of the observable trade-cost measures and total trade costs, where all exporter-sector-time (ikt) and importer-sector-time characteristics (jkt) are sub-summed in ikt (A_{it}^k) and jkt (B_{jt}^k) terms respectively. Hence, a generic gravity model can be formalised as follows:

$$X_{ijt}^k = A_{it}^k B_{jt}^k T_{ijt}^k \quad (2)$$

where X_{ijt}^k is the exports of country i to country j at time t in sector k, and A_{it}^k and B_{jt}^k are exporter-sector-time and importer-sector-time fixed effects, respectively, which capture country-specific effects, and the term T_{ijt}^k 43 (which corresponds to term $\left(\frac{T_{ij}^k}{\Pi_i^k P_j^k}\right)^{-q_k}$) in the above gravity equation captures pair-sector-time components which can be attributed to bilateral trade frictions between exporting country i and importing country j in sector k at time t.

Trade flows specifications

Using this modelling framework, the analysis also looks at the impact of the above determinants on trade flows. This involves estimating trade flows in the following structural gravity model framework, where X_{ijt}^k are the exports from country i to country j in sector k (including both cross-border trade and domestic trade flows):

$$X_{ijt}^k = \exp\left(lndist_{ij} + border_{ij} + minlndigi_{ijt} + DSTRI_{it} + RTA_{ijt} + RTA\_ecomm\_chapter_{ijt} + contig_{ij} + comlang_{ij} + colony_{ij} + \eta_{it}^k + \mu_{jt}^k\right) * \varepsilon_{ijt}^k \quad (3)$$

Trade flows specifications are ran using PPML with high dimensional fixed effects. PPML (Poisson Pseudo Maximum Likelihood) allows to account for hetereoscedasticity and for zero trade flows. Robustness checks also include country-pair fixed effects.

[43] The residual term is attributed to t_{ijt}^k.

Assessing the impact of RTAs with e-commerce chapters

The impact of RTAs with an e-commerce chapter on trade flows is assessed using the following specification:

$$X_{ijt}^{k} = \exp\left(minlndigi_{ijt} + EU_{ijt} + RTA\_no\_ecomm\_chapter_{ijt} + RTA\_ecomm\_chapter_{ijt} + RTA\_depth_{ijt} + \eta_{it}^{k} + \mu_{jt}^{k} + \nu_{ij}\right) * \varepsilon_{ijt}^{k} \quad (4)$$

The specifications include exporter-sector-year and importer-sector-year fixed effects (η_{it}^{k} and μ_{jt}^{k}) as well as exporter-importer fixed effects (ν_{ij}) to account from unobserved heterogeneity in the selection of RTA partners.

EU_{ijt} is a dummy variable that controls for whether the exporter *i* and importer *j* are both European Union members in year *t*.

To control for the fact that RTAs including e-commerce chapters could potentially be more likely to be 'deep' agreements (i.e., those agreements which are more extensive in the number of policy areas they cover beyond e-commerce), and that the coefficient of $RTA\_ecomm\_chapter_{ijt}$ does not over-estimate the trade impact of such a chapter, the specification controls for the depth of an RTA by including the variable RTA_depth_{ijt}. This represents the depth of an RTA between countries *i* and *j* in year *t* and can take values from 0 (no trade agreement in force) to 52 (where all possible broad policy areas are included in the trade agreement). Information on the depth of RTAs is obtained from the World Bank Deep Integration Dataset (Mattoo, Rocha and Ruta, 2020[32]). One problem with this measure is that agreements are the sum of their provisions and so including depth can capture the significance of the RTA and E-commerce variables. A dummy where RTA depth was above average was also used delivering similar results. More analysis is needed to better disentangle the impact of e-commerce chapters on trade.

Trade flows specifications are ran using PPML with high dimensional fixed effects. PPML (Poisson Pseudo Maximum Likelihood) allows to account for hetereoscedasticity and for zero trade flows.

Data sources

USITC ITPD-E database

The United States International Trade Commission (USITC) International Trade and Production Database for Estimation (ITPD-E). The ITPD-E contains data on international and domestic trade for 243 jurisdictions, 170 sectors, and 17 years (Borchert et al., 2022[27]).

This allows to cover in the analysis here 29 low-income economies, 50 lower-middle income economies, 53 upper-middle income economies, and 66 high-income economies (Table A B.1). The sectors available in ITPD-E are matched to 33 sectors in 2-digit ISIC Rev. 4 level classification (Table A B.2).

Table A B.1. Economy coverage with the ITPD-E database

Economy groupings by income

Income group	ISO3 country code
Low-income economies	AFG; BDI; BFA; CAF; COD; ERI; ETH; GIN; GMB; GNB; HTI; LBR; MDG; MLI; MOZ; MWI; NER; PRK; RWA; SDN; SLE; SOM; SSD; SYR; TCD; TGO; TJK; UGA; YEM
Lower middle-income economies	AGO; BEN; BGD; BOL; BTN; CIV; CMR; COG; COM; CPV; DJI; DZA; EGY; FSM; GHA; HND; IND; KEN; KGZ; KHM; KIR; LAO; LKA; LSO; MAR; MDA; MMR; MNG; MRT; NGA; NIC; NPL; PAK; PHL; PNG; PSE, SEN; SLB; SLV; STP; SWZ; TLS; TUN; TZA; UKR; UZB; VNM; VUT; ZMB; ZWE
Upper middle-income economies	ALB; ARG; ARM; AZE; BGR; BIH; BLR; BLZ; BRA; BWA; CHN; COL; CRI; CUB; DMA; DOM; ECU; FJI; GAB; GEO; GNQ; GRD; GTM; GUY; IDN; IRN; IRQ; JAM; JOR; KAZ; LBN; LBY; LCA; MDV; MEX; MHL; MKD; MNE; MYS; NAM; PER; PRY; RUS; SRB; SUR; THA; TKM; TON; TUR; TUV; VCT; VEN; WSM; ZAF
High-income economies	ABW; AND; ARE; ATG; AUS; AUT; BEL; BHR; BHS; BMU; BRB; BRN; CAN; CHE; CHL; CUW; CYM; CYP[1]; CZE; DEU; DNK; ESP; EST; FIN; FRA; GBR; GRC; GRL; HKG; HRV; HUN; IRL; ISL; ISR[2]; ITA; JPN; KNA; KOR; KWT; LIE; LTU; LUX; LVA; MLT; MUS; NLD; NOR; NZL; OMN; PAN; PLW; POL; PRI; PRT; QAT; ROU; SAU; SGP; SMR; SVK; SVN; SWE; SYC; TTO; TWN; URY; USA

Note:
1. Note by the Republic of Türkiye: The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Türkiye recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Türkiye shall preserve its position concerning the "Cyprus issue".
Note by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Türkiye. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.
2. The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.
Source: Based on the World Bank country classification by income and USITC ITPD-E.

Table A B.2. Sector coverage with the ITPD-E database

ISIC sector code	ISIC sector name
D01T02	Agriculture, hunting and forestry
D03	Fishing and aquaculture
D05T09	Mining and quarrying, energy production products Mining and quarrying, non-energy production products Mining support service activities
D10T12	Food products, beverages and tobacco
D13T15	Textiles, wearing apparel, leather and related products
D16	Wood and products of wood and cork
D17T18	Paper products and printing
D19	Coke and refined petroleum products
D20	Chemical and chemical products
D21	Pharmaceuticals
D22	Rubber and plastics products
D23	Other non-metallic mineral products
D24	Basic metals
D25	Fabricated metal products
D26	Computer, electronic and optical products
D27	Electrical equipment
D28	Machinery and equipment n.e.c.
D29	Motor vehicles, trailers, and semi-trailers
D30	Other transport equipment
D31T33	Manufacturing nec; repair and installation of machinery and equipment
D41T43	Construction
D45T47	Wholesale and retail trade; repair of motor vehicles
D49D52	Land transport Water transport Warehousing and support activities for trans.
D58T60	Publishing and broadcasting
D61TD63	Telecommunications, computer, and information services
D64T66	Financial and insurance activities
D77TD82	Administrative and support services
D84	Public administration and defense
D85	Education
D86T88	Human health and social work
D94T96	Activities of households

Note: Sectors in USITC ITPD-E are matched to ISIC Rev.4.
Source: USITC ITPD-E.