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DIGITAL TRADE AND MARKET OPENNESS

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Executive summary

Digitalisation has significantly reduced the cost of engaging in international trade; facilitated the coordination of global value chains; helped diffuse ideas and technologies; and connected a greater number of businesses and consumers globally. But even though it has never been easier to engage in international trade, the adoption of new business models has given rise to more complex international trade transactions and policy issues.

In this rapidly evolving environment, governments are facing growing regulatory challenges in ensuring that the opportunities and benefits from digital trade can be realised and shared more inclusively. The aim of this paper is to help policy-makers by providing a better understanding of the changes shaping digital trade with a view to informing how these might be reflected in trade policy design.

This paper has three parts. The first discusses what we know about how digitalisation is changing international trade and the rules that govern it. The second part focuses on a more in-depth look at the evidence on trade in the digital era, drawing on available data and the illustrative findings from a tailored business questionnaire. Based on this, the third part provides an initial mapping of the *types* of measures that need to be considered when thinking about market openness and digital trade. The concluding section draws on these three parts to offer a perspective on what market openness means in the digital era.

Digitalisation has increased the scale, scope and speed of trade, posing new challenges for policy-makers. With the emergence of new business models, a better understanding of the 'what' and the 'how' of the measures affecting digital trade is needed.

While existing WTO rules and agreements cover digital trade, regional trade agreements (RTAs) are taking up a range of broader issues and there are questions about how well adapted current frameworks are to the bundling of goods and services that is a feature of trade in the digital age:

- WTO rules on goods and services apply to digital trade:
 - The GATS and its annexes remain of primary importance for enabling services that underpin the digital world (such as telecoms) and digitally enabled services.
 - With regard to digitally enabled trade in goods, the GATT and the Trade Facilitation Agreement provide important measures and the Information Technology Agreement has been key in eliminating tariff barriers for certain ICT products.
- Regulation of digital trade issues is being increasingly addressed in RTAs. These cover broader issues ranging from the prohibition of customs duties on electronic transmissions and non-discriminatory treatment in terms of domestic regulation; electronic authentication; data protection and paperless trade. Nevertheless, there is a wide variance across agreements in terms of depth and breadth of the issues covered, and many provisions continue to be 'best endeavours' and not subject to dispute settlement.

Measuring digital trade is difficult, making it hard to understand the *scale* of the policy challenge ahead. Although efforts are underway, it will be some time before robust measurement is possible. In the interim, available data can shed light on certain aspects of trade in the digital era:

- Digital trade is not just about ICT goods and services; digitalisation is pervasive and involves all sectors of the economy.
- Digitalisation is linked with greater trade openness; selling more products to more markets; and less concentrated export baskets.
- Digital connectivity, as proxied by measures of internet penetration, is:
 - associated with higher bilateral trade, and helps parties to better exploit trade benefits from trade agreements;
 - most important for trade in more complex manufactures and digitally deliverable services;
 - giving rise to new complementarities between goods and services: digital connectivity and ICT goods imports are important for digitally deliverable services exports.
- Responses from a tailored business questionnaire, while suffering from the normal biases and based on a small sample, provide some illustrative insights into aspects of firm engagement in digital trade:
 - Digitalisation is important for firms producing goods and services but the propensity to engage in cross-border digital sales appears to be higher in services.
 - Digitalisation involves all segments of the value creation process, but appears to be most valued by firms at the production and design stages.
 - Firms that sell goods are also concerned by issues traditionally associated with services and firms that sell services are concerned by goods issues.

Based on the analysis, a preliminary mapping of the types of measures that affect digital trade suggests the following important implications:

- Digitalisation presents a number of regulatory challenges for trade rules primarily stemming from the increasingly blurred distinction between goods and services, resulting in what some see as uncertainty as to the applicable trade rules.
- What seem to be simple, cross-border, digitally enabled transactions in goods, services or bundled goods with services are actually underpinned by a range of measures which are horizontal to all transactions. This implies that making the most out of digital trade goes beyond removing measures that affect the final delivery of the digital trade transaction and requires thinking about measures affecting the full value chain, including the enablers of digital trade.
- Engaging in digital trade in goods means paying attention to a broader range of supporting services, such as logistics. Similarly, the ability to engage in trade in services, particularly those digitally delivered, is affected by market access in goods.
- As firms increasingly move towards trading bundled goods and services, in part, as a result of digitalisation, the issues they will face accumulate, meaning that both traders and policy-makers will need to consider a wide range of services and goods simultaneously for the potential benefits of digital trade to be realised.

Overall, this work suggests that market openness should be approached:

- *holistically*. The benefits of digital transformation for trade are contingent on a combination of factors. These cross traditional distinctions between goods and services and involve a range of issues related to digital connectivity.
- *through international cooperation*. Digital infrastructures such as the Internet were born global. They offer new opportunities for scale, but they raise key challenges for domestic and international policy in a world where borders and regulatory differences between countries remain. Making the most out of the digital transformation and mitigating some of the associated risks, including from a patchwork of regulation, requires more international dialogue.

While there are differences of view about where and how such dialogue might take place and who should conduct it, trade agreements, whether multilateral, plurilateral and/or bilateral, can offer useful insights into managing exchange across countries with different standards, reflecting different cultural and political contexts. In trade agreements, and as reflected in the market openness principles, combining the benefits of trade with countries' right to regulate has rested on the following principles: i) that standards be transparent; ii) that they be non-discriminatory; iii) that they be not more trade restrictive than necessary to achieve their objective; iv) that they promote competition; v) and that they be interoperable.

Digital Trade and Market Openness

1. The digital transformation¹ is having a profound impact on international trade. Access to digital technologies has lowered barriers to internationalisation and contributed to growing trade competitiveness. Digitalisation has also changed the scope and speed of the activities undertaken by firms; allowing value to move faster and with greater ease; providing new ecosystems for exchange; and helping firms better connect with each other and with consumers across the globe.²

2. Making the most of this new digital environment involves a combination of factors, some of which are internal to the firm, such as the adoption of technology or the acquisition of new skills, and some of which are external, such as market openness. For instance, investment in information and communication technologies (ICT) to enhance data-driven decision-making is associated with higher productivity, but only for firms that are able to adopt new organisational processes or have access to workers with adequate skills (Brynjolfsson and McElheran, 2016a and 2016b, Brynjolfsson, 2011 and Drederik et al. 2003). But realising the full extent of gains from digitalisation in a global world is also contingent on market openness: new technologies are often made available through international trade, and access to international markets for both inputs and outputs can generate economies of scale and boost competitiveness.

3. This paper has three parts. The first draws on the *vectors of digital transformation* put forward in the OECD's *Going Digital* project to identify the changes that digitalisation is bringing in terms of the scope, scale and speed of trade. It then outlines the current trade rules, both multilateral and in regional trade agreements (RTAs), governing digital trade.

4. Part Two examines what we can learn about the nature of trade in the digital era from available data. It undertakes a range of empirical analyses to shed light on the relationship between digitalisation and openness, and what we can measure about the importance of digitalisation for exports of goods and services. It then draws on responses to a business questionnaire to provide some illustrative examples of how certain companies engage in digital trade, and the issues they face.

5. The final part of the paper focuses on a more in-depth mapping of the *types* of measures that firms face when engaging in digital trade, and suggests a framework that can both be used to analyse current issues and help identify future issues.

6. The concluding section draws on the previous sections to offer some perspectives on market openness in the digital era.

¹ Digital transformation refers to the economic and societal effects of digitisation and digitalisation ([DSTI/CDEP/GD\(2017\)9](#)). Digitisation is the conversion of analogue data and processes into a machine-readable format. Digitalisation is the use of digital technologies and data as well as interconnection that results in new or changes to existing activities.

² See also ongoing work on e-commerce in ([DSTI/CDEP\(2018\)6](#)) and ([DSTI/CDEP/MADE\(2017\)6/REV1](#)), which touches upon certain cross-border elements.

Part I. An overview of trade and digitalisation

7. Digital trade encompasses digitally enabled transactions in goods and services which can be either digitally or physically delivered (see Box 1). It is therefore not just about more, or new, digitally delivered services, it is also about increased traditional or supply-chain trade in goods enabled through growing digital connectivity. As a result of digitalisation, trade in smaller, often lower value physical packages (parcels ordered online) and digitally delivered services (such as internet banking) is growing and new types of bundled goods and services, or services embedded in goods, are emerging (Cadestin and Miroudot, 2017).

8. The multifaceted impact of digitalisation on trade drives many of these changes. Indeed, digitalisation not only affects how products are produced, but also how these are traded and consumed. It also changes how companies interact with customers, with other companies and with governments. In this age of hyperconnectivity, production, design, delivery and consumption are geographically dispersed but inextricably linked through trade and constantly connected through digital networks (see Lopez-Gonzalez and Jouanjean, 2017).

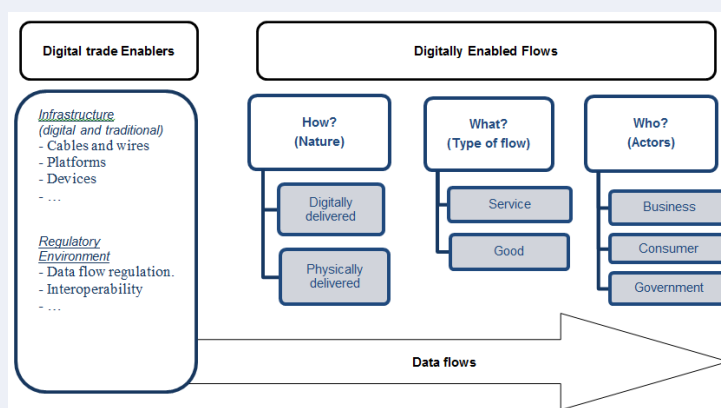
9. This part of the report first identifies how digitalisation has changed the scope, scale and speed of trade and then outlines the current trade rules, both multilateral and in regional trade agreements (RTAs), governing digital trade.

Box 1. What is digital trade?

Digital trade transactions, be they in relation to goods or services, have been part of the landscape for many years and often raise the same, or similar, issues as non-digital transactions. This is because digital trade is not just about digitally delivered services, but also about more traditional – including supply-chain – trade enabled through growing digital connectivity. What is new in digital trade is the scale of transactions and the emergence of new (and disruptive) players transforming production processes and industries, including many that were previously little affected by globalisation.

While there is no single recognised and accepted definition of digital trade, there is a growing consensus that it encompasses digitally enabled transactions in trade in goods and services, whether digitally or physically delivered. This characterisation, drawing on the OECD's (OECD, 2011) and the WTO's (WT/L/274, dated 30 September 1998) definition of an electronic commerce transaction, lends itself to decomposing the digital trading environment into a number of distinct categories of transactions each of which raises different questions for trade and investment policy as well as for measurement.

Whilst all digital trade is enabled digitally, not all digital trade is digitally delivered. Digital trade also involves digitally enabled but physically delivered goods and services (such as a purchase of a good on an on-line marketplace or the booking of a hotel through a matching service).



Source: Lopez-Gonzalez and Jouanjean (2017).

1.1. How is digitalisation changing trade?

10. To illustrate the impact of the changes of digitalisation on trade, it is useful to view digital trade through the lens of the *vectors of digital transformation* (see Annex 1, OECD, 2017c and 2018a).³ These highlight some of the properties of the digital transformation which can, in turn, be related to changes in the trading environment.

³ See [DSTI/CDEP/GD(2017)4/REV1] for a recent draft and introductory text explaining these vectors in greater detail. For the purposes of this paper, only those vectors deemed to be most relevant for digital trade are covered.

1.1.1. Digitalisation is increasing the scale, scope and speed of trade...

Scale

11. Digitalisation allows firms to reach larger numbers of digitally connected customers across the globe and facilitates outsourcing of non-core activities enabling easier scaling of production. For example, digital inputs, such as cloud computing services can help firms access IT services with little upfront investment and scale up (or down) IT functions in response to changes in demand. The flexibility and cost-efficiency linked to using cloud services might be especially important for SMEs seeking to internationalise.⁴

12. Better and faster access to critical knowledge and information can also help smaller firms overcome informational disadvantages, notably with respect to larger firms, and compete on a more even footing. By helping firms better connect, the Internet and data flows allow firms to improve their product offering and customise products to customer needs. Digital technologies also help firms connect with other firms to fulfil contracts and link to global value chains (GVCs).

13. Firms selling digitised services, which tend to have high fixed costs of production but near zero, or marginal, costs of distribution, are able to more easily cater for growing demand, relative to those engaged in traditional trade where physical production and delivery constraints remain. In addition, many services which were provided through local presence (Mode 3) can now, in principle, be provided cross-border (Mode 1), introducing further savings from not having to establish subsidiaries across different countries of operation.

14. But even if technological advances enable reaching scale without mass, for gains to materialise, constraints to the adoption of technology have to be overcome. In parallel, open, transparent and contestable markets are also needed in order to source inputs at competitive prices from global partners and to reach a global customer base, including in the absence of local presence.

Scope

15. Digitalisation is also changing the scope of the activities that firms undertake. Digital retailers, traditionally associated with connecting supply and demand internationally through matching services, are increasingly providing, or facilitating access to, additional complementary warehousing, logistic, e-payment, credit and insurance services. They are in effect creating a new eco-system for trade which is especially useful to SMEs.

16. At the same time, firms are changing the nature and scope of their activities and breaking down traditional sectoral divides in the process. Some ICT hardware firms are moving away from their manufacturing activities and focusing instead on the provision of cross-border network-based services linked to their manufactured products (as is the case of IBM which sold its hardware branch to focus on the provision of services such as Watson). Other companies, traditionally associated with the provision of digital services, are now also specialising in the production of hardware or physical products (such as mobile phones or autonomous vehicles by Google).

⁴ See Gupta et al (2013) and Asante et al. (2016) for a discussion of use of cloud computing by SMEs.

17. The tradability of already established services is also changing and digitalisation is fostering the emergence of new services. These rely on innovative technology to collect, transfer and process data, and are paving the way for new data-driven business models. Cloud computing services, for instance, allow the storage and processing of data remotely, eliminating the need for capital-intensive investments in ICT infrastructure and maintenance. Internet-based payment systems, digital wallets, and new payment solutions foster digitally enabled trade in goods by widening the methods of payments for online purchases, as well as by offering faster and safer transactions.

Speed

18. These changes are taking place at unprecedented speed. With growing interconnectedness and greater demand for just-in-time delivery, trade needs to be faster and more reliable than ever before. For services, this means being able to deliver more rapidly and 'on demand', often 24/7, so that consumers can have instant access to the services they need when they need them (giving firms a greater customer base).

19. For goods trade, digitalisation is helping trade facilitation become more efficient, helping goods move faster across borders, meeting new demands for "just in time" delivery and short-cycle inventory management. Greater information sharing through digital connections is enabling more efficient coordination of activities along global value chains, helping businesses and consumers track packages and facilitating border crossings. Increasingly, firms are directly connected with customs authorities through pre-arrival notices. Electronic payment systems of duties and fees with cargo declarations and/or processing systems are also increasingly integrated and border procedures automated. This is contributing to greater efficiency of customs procedures and processes (see WTO-OECD, 2017).

20. However, while greater speed means that the gains from trade become more apparent more quickly, it also means that structural change will also be more rapid, with important implications for the way countries deal with change (see, for example, discussion on *Making trade work for all* in OECD, 2017).

1.1.2. ... Changing how value is created and traded

21. The movement of data, or information, across borders underpins the digital trade environment. It is at the core of new and rapidly growing service supply models such as cloud computing, the IoT and additive manufacturing. It also underpins trade by enabling the coordination of GVCs and, as discussed above, enabling the implementation of more efficient trade facilitation (Lopez-Gonzalez and Jouanjan, 2017).

22. Data, and its flows, has also contributed to a wider and deeper "servicification" of manufacturing. Producing goods now relies on a greater use of service inputs such as engineering, sales and research undertaken in-house or outsourced, domestically and internationally (Miroudot and Cadestin, 2017). This is often orchestrated, or coordinated, through digital networks. In parallel, services are also increasingly being embedded in goods and new forms of complementarities between goods and services are arising – smart phones are a gateway to the consumption of a wide range of services. This process of "servitisation" helps manufacturers add value and create long-lasting relations with customers (Miroudot and Cadestin, 2017). Data and associated digital technologies are also powering a manufacturing revolution built on digital services known as 'Industrie 4.0'.

23. Managing these new assets – such as the potential value of data – and the changing composition of value – or the growing service content of manufacturing – is a key challenge for policy-makers. Finding ways to achieve public policy objectives such as privacy or security, and ensure cybersecurity, while maintaining the benefits of open data flows and digital trade is challenging. Not all international data flows are trade transactions; many just provide information about markets or help coordinate international production. But restricting an international data flow can have trade implications since it can affect the coordination of internationally dispersed production activities or trade facilitation.

24. At the same time, the growing service content of manufacturing activities, and of goods more generally, enabled by the digital transformation complicates the way trade policy is applied. Services restrictions can affect the delivery of goods – if the sale of e-books is costly this will affect the demand for e-readers. In parallel, if the cost of an e-reader is high, due to, for example, high tariffs, then this is likely to affect the demand for e-books.

1.1.3. ... and giving rise to new ecosystems for trade

25. The digitalisation of trade is also allowing consumers and smaller firms to participate more directly in trade. As sellers, online platforms significantly reduce the costs of selling across borders, so much so that individuals and smaller firms are now more engaged in international transactions. This is also true from the buying perspective. Smaller actors such as SMEs or even individuals, can now source final or intermediate goods globally increasing choice and therefore welfare.

26. In parallel, new digital technologies such as distributed ledgers, or blockchain, have the potential to create novel ecosystems for trade: helping coordinate value chains by increasing trust and speed of transactions; empowering actors; enabling the verification of the provenance of products; facilitating the transfer of funds and helping better enforce or automate contracts (such as through smart contracts). At the same time, this can enhance trust for consumers, increase the resilience of value chain for private actors, and enable the public sector to better manage risk and costs for customs authorities.

1.2. The rules governing digital trade

27. Against the background of this rapid and far-reaching change, it is often said that the rules that underpin the digital trade environment have struggled to keep pace with changing business models. Indeed, existing multilateral trade rules were negotiated when digital trade was in its infancy, and despite being technologically neutral, questions are arising over whether they adequately address the needs of firms engaged in digital trade.

28. For example, trade rules are traditionally predicated on identifying whether products are goods or services and the borders they cross. But, in the digital era, these distinctions may not always be clear cut. Firms are now increasingly able to flexibly operate from different locations and to bundle goods with services. This makes it difficult to identify the particular trade rules that apply to specific transactions.

29. Moreover, in the fast-moving digital trade environment, goods need to be shipped efficiently across borders, supporting services delivered when and where they are needed and information about production, or the characteristics of products, needs to be accessible across the globe. Barriers affecting one of these flows, whether goods, service or information, can have considerable consequences for digital trade.

30. As global trade is increasingly migrating into the digital realm, understanding the rules that govern market openness for digital trade is an essential step in assessing the environment in which digital trade unfolds and areas where attention may be required. Against this background, this section provides a brief factual overview of the current international regulatory framework affecting digital trade from both the perspective of existing WTO rules and agreements, and developments in regional trade agreements (RTAs).

1.2.1. WTO rules on goods and services apply to digital trade

31. E-commerce was introduced as early as 1998 into the agenda of global trade policy making through the work programme on e-commerce launched by the WTO (WTO, 1998). While progress has been slow, at the 11th Ministerial Conference in Buenos Aires, Members agreed to continue work under the current work programme and "maintain the current practice of not imposing customs duties on electronic transmissions" until the next Ministerial (WTO, 2017a). A group of 71 Members further agreed to "initiate exploratory work together toward future WTO negotiations on trade-related aspects of electronic commerce" (WTO2017b).

32. Although 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 (Wu, 2017).

33. The General Agreement on Trade in Services (GATS) establishes important rules that are crucial for the digital world and in particular for digitally delivered services. General principles on most-favoured-nation and transparency apply across the board, while schedules of commitments govern market access and national treatment irrespective of the technological means through which these are delivered.

34. Commitments made for cross-border supply (Mode 1) are relevant where services are supplied digitally (as affirmed by the WTO panel in the *US-Gambling* case).⁵ Although other modes are also relevant, some degree of uncertainty exists about the extent to which commitments related to consumption abroad (Mode 2) could also be relevant for digital trade, given that consumers may seek services on the Internet from suppliers established in other countries.

35. In addition, specific rules exist within the GATS legal framework for telecommunications services (the Annex on Telecommunications and the Agreement on Basic Telecommunications services) and financial services (the Annex on Financial Services).

36. Other WTO rules are also relevant for digital trade. Digital technologies facilitate trade in goods, including for parcels which are often ordered online. As physical goods need to cross borders to complete commercial transactions, obligations under the General Agreement on Tariffs and Trade (GATT) and related agreements play an important role.

37. In this context, the WTO Trade Facilitation Agreement (TFA), which entered into force in February 2017, is also relevant since it includes requirements for WTO members to implement or maintain measures facilitating import and export processes. On the one hand, simplified and more efficient customs procedures are relevant for traditional trade in

⁵ The WTO Dispute Settlement Panel confirmed that Mode 1 supply covers all means of delivery, including those over the Internet (WTO, 2004).

goods as they ensure faster and cheaper delivery. On the other hand, technological developments for modernizing these processes through increased use of technological means such as electronic pre-arrival processing or the acceptance of electronic documents by the relevant authorities can further facilitate digital trade by making the process more efficient.

38. Additionally, the Agreement on Technical Barriers to Trade (TBT) covers government measures on technical regulations and standards applicable to information and communication technology (ICT) and electronic products (for instance, standards governing telecommunications and broadband networks or regulations on encryption).

39. The Information Technology Agreement (ITA) also plays a role when it comes to trade in ICT products, some of which form part of the infrastructure needed for digital trade, such as computers and telecommunication equipment. The ITA covers MFN commitments to eliminate tariffs on certain ICT products. Product coverage under the Agreement was expanded at the 2015 Nairobi WTO Ministerial Conference to include new products that have emerged due to technological developments (e.g., new generation semi-conductors, GPS navigation equipment, etc.).

40. Moreover, the value of many goods and services is increasingly determined by the intellectual property (IP) embedded in them. As digital trade often implicates intellectual property rights (IPRs), particularly copyright and trademarks, the Agreement on Trade-Related Aspects of Intellectual Property Rights (the TRIPS Agreement) provides important minimum standards for the protection and effective enforcement of these rights. TRIPS specifically covers computer programmes and grants them the same IPR protection as that applying to literary works.

41. Figure 1 below provides an overview of how some of the WTO agreements affect digital trade at three different layers: the network infrastructure layer, the technical layer (codes that operate the network) and the content layer. The figure maps the agreements that are more directly relevant but it is not meant to be exhaustive. For instance, access to the networks that underpin digital trade requires appropriate infrastructure, whether wired or wireless, for which trade rules related to telecommunication services, ICT goods, technical regulations, and standards are applicable. On the technical layer, technical standards across networks can help ensure seamless communication and IPRs are relevant for computer software and domain names. On the content layer, a broader range of rules can be applicable depending on the content traded. For instance, IPR protection and enforcement through TRIPS is relevant for media content offered online, while the TFA is relevant in case of cross-border goods trade enabled by digital networks.

Figure 1. WTO rules and digital trade

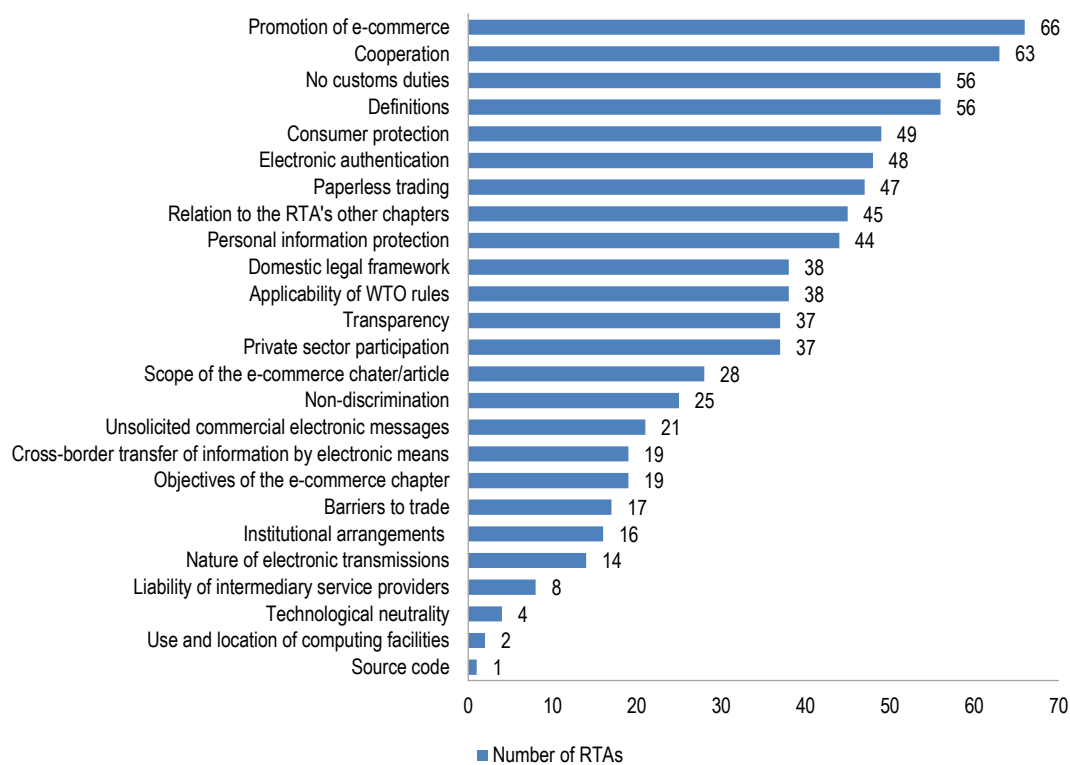
	Layer component	Relevant WTO trade regulation
Content	Goods	GATT, TFA, ITA
	Entertainment Books, films, music, games, television	TRIPS
	Telecommunications Access to networks, email, VoIP, etc.	GATS Annex on Telecommunications and Agreement on Basic Telecommunications
	Retail and supply chain management Online platforms, websites	GATT, TFA
	Financial services Payments and other financial transactions	GATS Annex on Financial Services
	Other Social media, data storage and processing, cloud computing, etc.	TRIPS, GATT, TFA, ITA
Technical	Domain names	TRIPS, TBT
	IP addresses	
	Software	
	Internet Protocols (TCP/IP)	
Infrastructure	Undersea and terrestrial cables	TBT, GATT, ITA, GATS Annex on Telecommunications and Agreement on Basic Telecommunications
	Satellite and wireless networks	
	Internet exchange points	
	Devices (computers, smartphones, etc.)	

Source: Authors' assessment.

1.2.2. But new issues are increasingly addressed in RTAs

42. With slow progress on updating international trade rules in the multilateral trading system, global governance of digital trade has gradually migrated to bilateral and regional trade agreements (RTAs). Currently, 75 RTAs, representing 27% of all RTAs notified to the WTO as of May 2017, include specific provisions on digital trade (Monteiro and Teh, 2017).

43. In recent years, there has been a sharp increase in the number of RTAs including specific provisions on digital trade. Between 2014 and 2016 alone, close to two-thirds of RTAs notified included such provisions. However, the issues covered differ widely: from customs duties on electronic transmissions and non-discriminatory treatment to domestic regulation, electronic authentication, data protection and paperless trade (Figure 2).

Figure 2. Main types of e-commerce provisions in RTAs

Source: Monteiro and Teh (2017) based on the WTO RTA database.

44. A growing number of RTAs now include specific chapters or sections dedicated to 'e-commerce' or 'digital trade'. However, specific provisions of relevance to digital trade can also be found in other parts of RTAs such as annexes, side documents, and joint statements.

45. Most RTAs contain a workable taxonomy and definitions on aspects such as digital products and electronic transmissions. Another common provision in RTAs confirms the applicability of trade rules to e-commerce, particularly with respect to cross-border services, financial services and investment. National treatment and MFN obligations apply also to digital products in most agreements. Many RTAs also apply WTO rules to e-commerce, and thus adopt a customs duties moratorium on electronic transmissions. Furthermore, RTAs pledge not to discriminate on grounds of technology, to minimise regulatory burdens, and align domestic regulations with international model laws on electronic commerce. There is, however, strong variance across issues covered in different agreements and many provisions continue to be 'best endeavours' and/or not subject to dispute settlement.

46. Among more recent RTAs (such as the Japan–Australia Economic Partnership Agreement or the Additional Protocol to the Framework Agreement of the Pacific Alliance, negotiated by Mexico, Chile, Colombia, and Peru), the regulatory approach has been more comprehensive. Building and expanding on the provisions included in earlier agreements, recent RTAs add value by establishing permanent prohibitions on customs duties on electronic transmissions, promoting paperless trade, electronic authentication and

e-signature, promoting the free flow of information across borders, while acknowledging legitimate concerns about privacy and security, prohibiting data localisation requirements, and adopting measures to enhance consumer confidence in the digital environment.

47. Beyond the provisions contained in dedicated chapters on e-commerce, RTAs also address a broad range of other issues relevant for digital trade in the context of other chapters or parts of the agreement. Firstly, market access provisions in an RTA's services schedule will have implications for the extent to which services can be supplied digitally. This is particularly relevant for commitments made under Modes 1 and 2 when services can be supplied digitally as well as under Modes 3 and 4 for supporting services in particular in sectors such as telecommunications, computer or logistics services.

48. Secondly, substantive provisions in other chapters of the agreement are relevant as well. Indeed, recent RTAs generally specify that e-commerce is subject to the provisions of other specific chapters, notably those on trade in services, investment, financial services, and telecommunications (Monteiro and Teh, 2017). In addition, RTAs increasingly include specific provisions in the chapter on intellectual property rights (IPRs) that aim to strengthen the protection and enforcement of IPRs in the digital realm. This can include commitments for the parties to ratify or accede to WIPO treaties of relevance in the digital environment,⁶ ensure effective dispute settlement mechanisms for domain names, and establish enforcement mechanisms against circumventions of technological protection measures and removal of rights management information from copyrighted products. Some more recent RTAs also address the issue of intermediary liability.

49. Lastly, rules on tariffs and trade facilitation are also relevant for platform-based digital trade involving trade in goods.

50. In the absence of further multilateral regulation, the growing proliferation of RTAs further intensifies the "spaghetti bowl" effect of preferential agreements creating greater regulatory complexities. As more RTAs cover digital trade and e-commerce, the question arises whether certain provisions would be sufficiently homogeneous to facilitate their "multilateralisation".

51. Previous studies on RTAs suggest that there could be some prospect for this where RTAs contain similar or converging approaches on certain issues (Herman, 2010). Examples would include, for instance, the adoption of common definitions and agreement on making the moratorium for customs duties permanent. Beyond these, however, the breadth and depth of e-commerce provisions vary significantly which could raise challenges for multilateralisation efforts (Wu, 2017).

⁶ WIPO Copyright Treaty and the WIPO Performances and Phonogram Treaty.

Part II. Evidence on trade in the digital era

52. The changes that digitalisation brings to trade are hard to identify empirically. Efforts to measure digital trade are relatively recent (OECD, 2017a) and there are a number of empirical challenges.⁷ With this in mind, this section uses currently available data to shed light on aspects of *trade in the digital era*. It then draws on responses to a tailored business questionnaire to shed some light on the experiences of firms engaging in digital trade and illustrations of the broad measures they face.

2.1. What does the data tell us about the nature of trade in the digital era?

53. While intuitively it is clear that digitalisation is important for trade, and trade is important for the diffusion of digital technologies, measuring the nature of the links and therefore the scale of the policy challenge at hand is difficult. Even if traditional trade statistics for goods record many digitally-enabled trade transactions, they do not differentiate goods transactions according to whether they have been digitally enabled or not. In services, measurement of cross-border transactions has always been more difficult but for digital trade, the challenge is compounded by the need to identify those services which are *digitally enabled* as well as those which are *digitally delivered*. The rise of 3D printing is set to raise similar challenges in capturing digital delivery for goods.

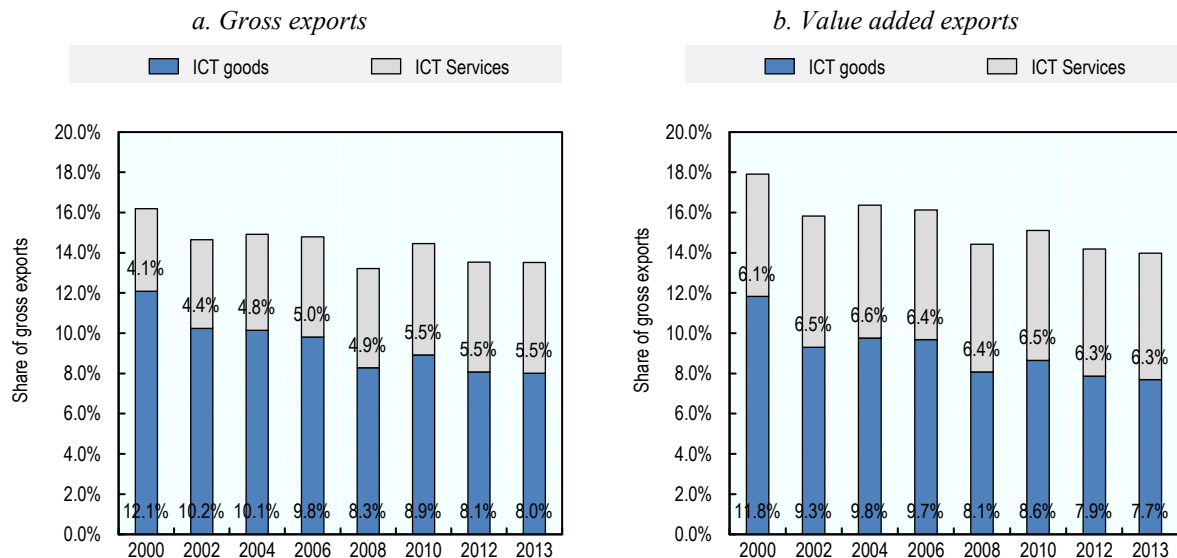
54. Although efforts are underway to better capture digital trade in official trade statistics (OECD, 2017a), it will take some time before robust measures are identified. At the same time, measuring the nature and spread of digitalisation is also difficult. Here too, efforts are underway, as seen from the latest *OECD Science, Technology and Industry Scoreboard 2017*, but there is no single measure that captures all facets of this phenomenon. This implies that, until better measures are available, analysis of digital trade has to proceed with caution and using existing statistics to shed light on particular aspects of trade in the digital era.

2.1.1. Digital trade is not just about ICT goods and services, it involves all sectors of the economy

55. Digital trade is often associated with trade in ICT goods and ICT services, and indeed, this is an important element of the evolving environment. Indeed, ICT goods and services play a key enabling role for digital trade, however data show that the overall share of ICT goods and services in global exports has, in fact, been declining (Figure 3). Although this masks a relative increase in the share of ICT services in gross, and value added, exports, and in part reflects declining prices for ICT goods, growth patterns of ICT goods and services are not aligned with the expectation that digital trade has been growing fast recently.⁸

⁷ For example; identifying exogenous variations in the adoption of general purpose technologies.

⁸ It also shows the relative importance of ICT goods versus ICT services both as final goods and as inputs into production.

Figure 3. Gross and value added exports of ICT goods and services

Note: ICT goods are identified as ISIC rev 3 sectors 30 to 33, ICT services as sector 72 (computer services) and sector 64 (post and telecommunications).

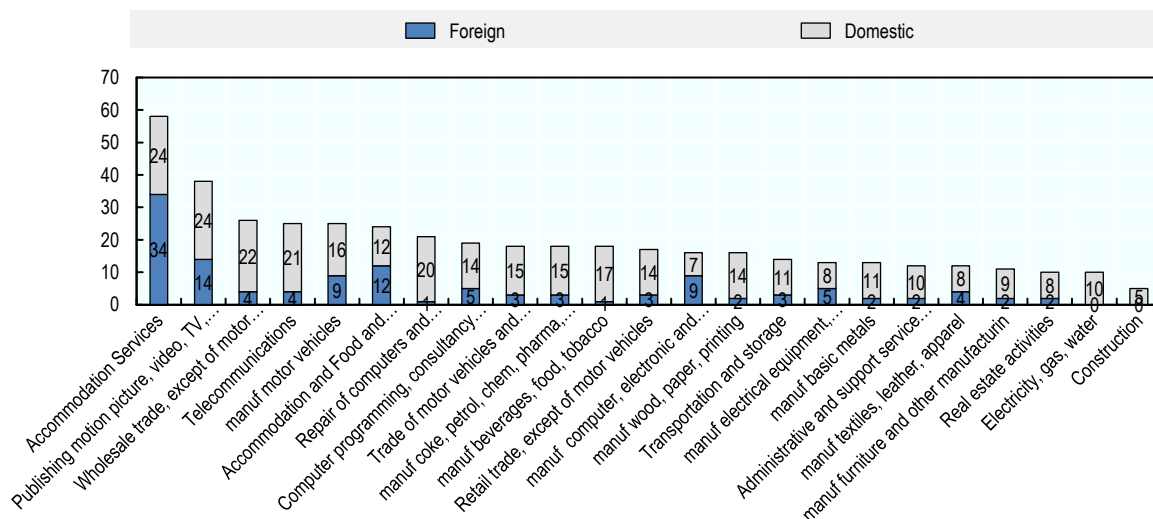
Source: Own calculation using OECD-WTO TiVA 2017 revision

56. This is, in part, because digital trade is about more than trade in ICT goods and services: amongst other things, it is also about digital sales and purchases across a wide range of industries (Figure 4).⁹ That is, a full picture of digital trade only emerges once we take account of the growing role of digitalisation in enabling trade in a range of sectors. In the EU, for example, nearly 60% of enterprises providing accommodation services sell online, and more than half of these sell across borders (in this case defined as selling to other EU countries *and* the rest of the world). In manufacturing sectors, the number of enterprises with online sales tends to be lower (e.g. 25% of enterprises in the motor-vehicle sector sell online), perhaps reflecting the presence of other physical constraints to exporting. On average, about one third to one fifth of the digital sales of manufacturing firms are cross-border (Figure 4a).

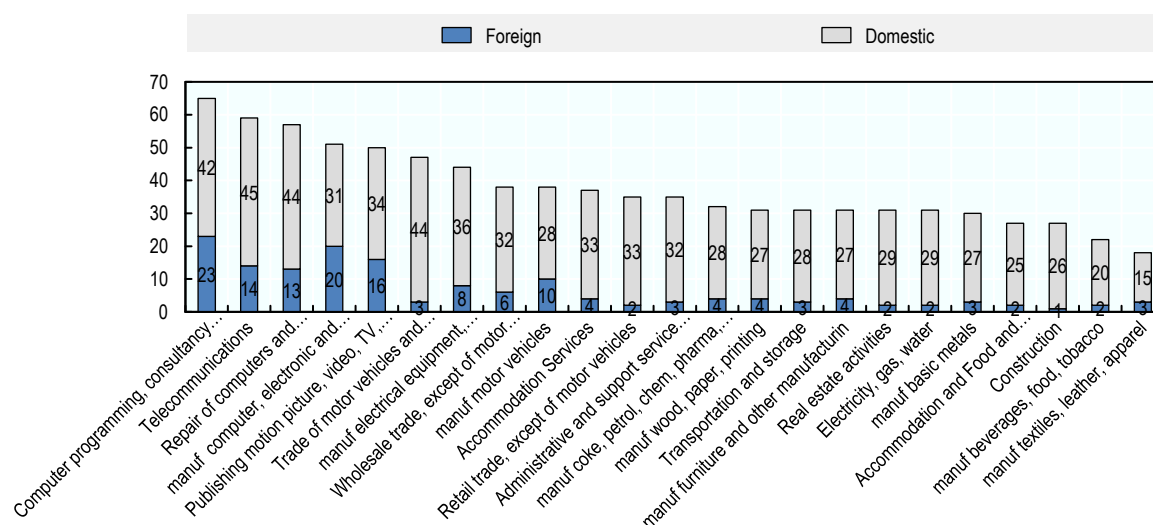
⁹ Beyond the trade in ICT and other sectors presented in this section, investments in ICT are part of the enabling environment.

Figure 4. Enterprises engaged in digital sales and purchases by sector – EU28 average 2011

a. Electronic sales



b. Purchases via computer networks



Note: Purchases variable identifies EU28 average of enterprises having purchased via computer networks. Sales identifies enterprises having undertaken sales via electronic sales. Foreign is herein defined as selling to other EU countries and to the rest of the world.

Source: Own calculations using Eurostat.

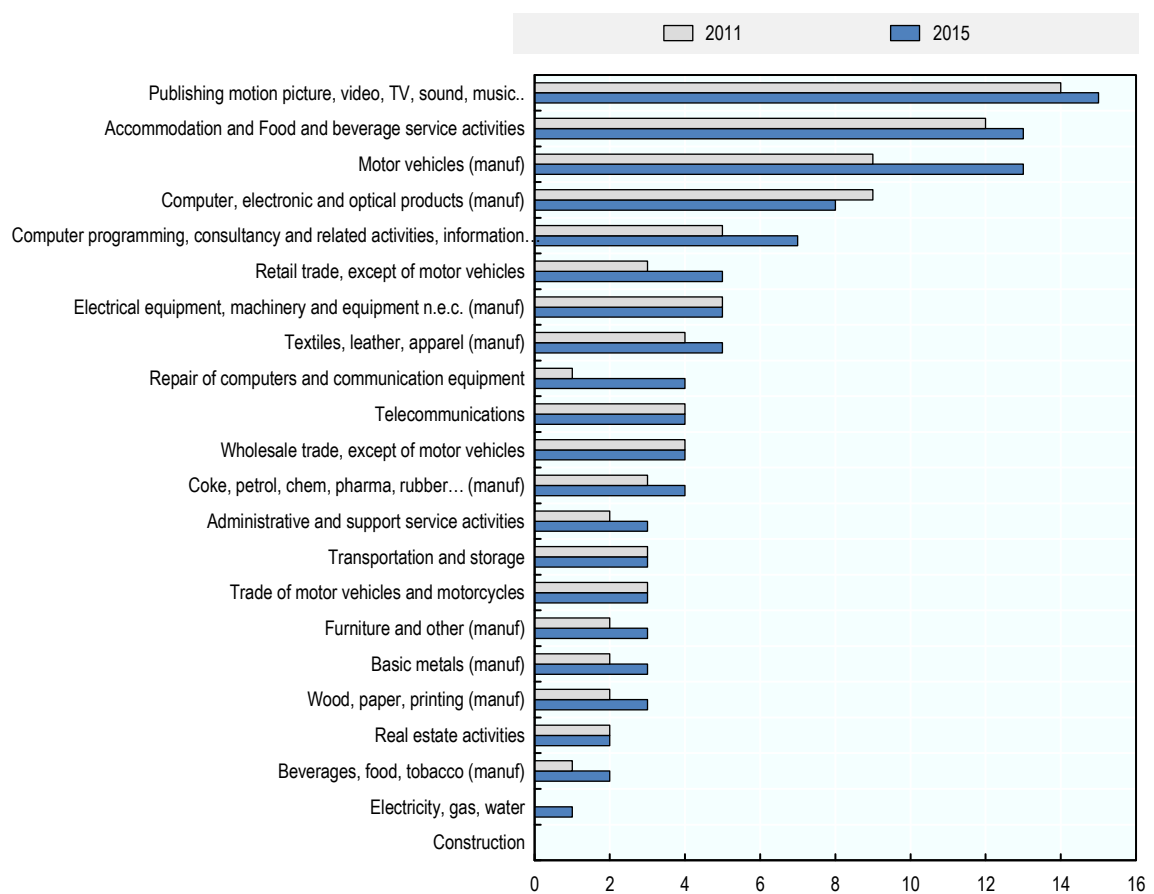
57. Another important feature of digital trade relates to firms purchasing inputs via digital networks (Figure 4b). Indeed, the ability to more easily source inputs, whether digital or not, is likely to be an important contributing factor to upscaling production. Digital inputs, such as cloud computing services can help firms access IT services with little up-front investment and scale up (or down) IT functions in response to changes in demand. Available data show that, on average, and across most sectors, a higher percentage of firms engage in online purchases relative to online sales. Firms in manufacturing sectors tend to engage in purchases through computer networks as often as those in services

sectors. One important aspect of the digital transformation is therefore the ability to source digital inputs from abroad.

58. Evidence also suggests that the number of firms selling across borders using online tools is growing across nearly all sectors (Figure 5). In manufacturing sectors such as 'motor vehicles', the number of firms with cross-border sales in the EU grew from 9% in 2011 to 13% in 2015. The only sector that saw a decline in this period is the manufacture of computer and electronic equipment. Where services sectors are concerned, higher levels, and often growth, is taking place in sectors where digital delivery is possible such as audio-visual content providers or computer programming.

Figure 5. Enterprises engaged in cross-border electronic sales (2011-15)

As a percentage of enterprises in each sector



Note: Values are averages across sectors for EU-28 countries. They show the share of enterprises having done electronic sales to other EU countries and the rest of the world. Cross border sales are herein defined as selling to other EU countries and to the rest of the world

Source: Own calculations using Eurostat.

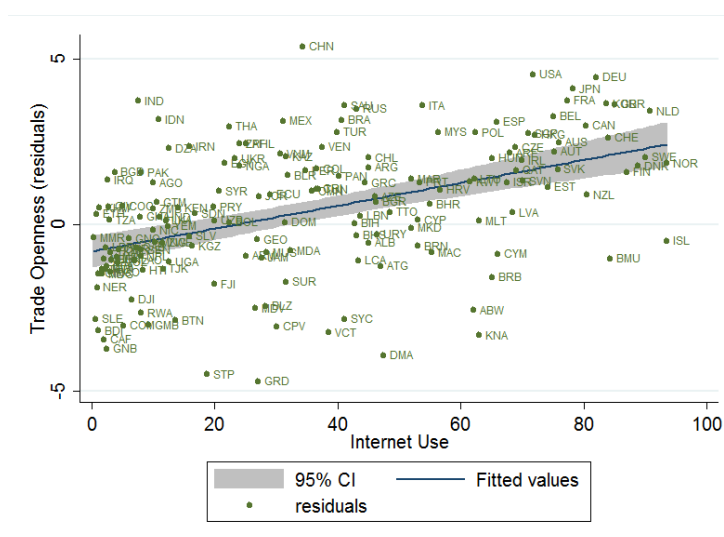
59. Although the figures presented give an indication of the propensity of firms to engage in cross-border online sales, they do not give a sense of the value associated with these sales and are only available for EU countries. This reflects the current state of available data for analysis: incomplete and geographically concentrated. It is therefore difficult to get a sense of the magnitude, or scale, of digital trade or indeed the extent to which countries at different levels of development are engaging in this trade.

2.1.2. Digitalisation is associated with positive outcomes in goods trade

60. Until better data on digital trade become more readily available, identifying the links between trade and digitalisation has to be approached piecemeal, focusing on what can be measured. One useful starting point is to draw correlations between indicators of digital connectivity and trade outcomes.¹⁰ However, it is important to note that correlations do not identify the presence of causation nor the possible direction of causation – whether certain trade outcomes arise as a result of, or a consequence of, digitalisation. They also do not provide information on the channels of transmission. While they will require further analysis when data on digital trade permits, they nevertheless highlight the presence of interesting relationships.

61. Correlating internet use with indicators of goods trade openness, while controlling for levels of development, reveals that internet penetration is associated with more open economies (Figure 6).¹¹ In part, this reflects the positive role of digital connectivity on trade openness, but it also suggests that trade openness may promote and enable the uptake of digital technologies.

Figure 6. Trade openness and Internet use



Note: Figure shows correlation between Internet use per 100 inhabitants and trade openness (imports + exports over GDP). Residual trade openness is obtained by regressing trade openness with respect to per capita GDP and size of markets with country specific fixed effects and time dummies so as to control for correlations between trade openness and internet use arising through per capita income.

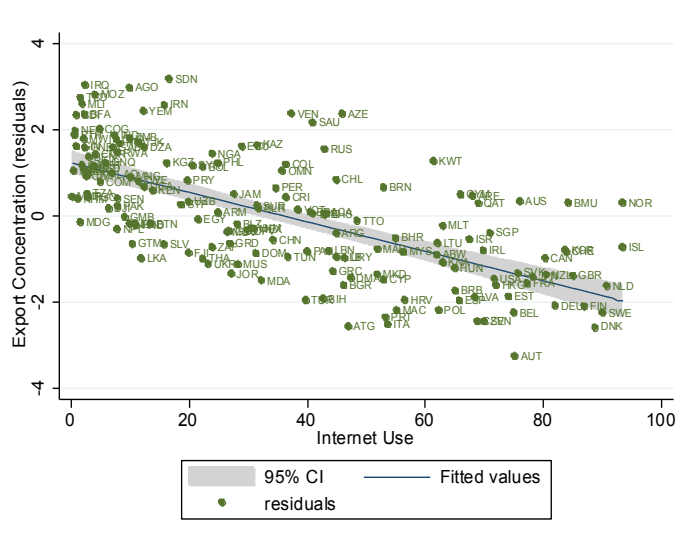
Source: Authors' calculations based on trade data obtained from the CEPII database, GDP and population data from WDI and internet use from ITU.

62. Higher internet use is also associated with exporting more goods into more markets (Figure 7), reflecting the likely importance of digital connectivity for finding customers in

¹⁰ See Annex 2 for a discussion of indicators of digital connectivity.

¹¹ There is a longstanding literature highlighting the links between openness to trade and economic growth. See, amongst many others: Dollar (1992), Edwards (1998), Frankel and Romer (1999), Kneller et. al (2008) and Kim (2011)).

Figure 8. Internet use and export concentration



Note: Figures show correlation between internet use per 100 inhabitants and export concentration measures using a Herfindahl index calculated at 6-digits. To avoid correlations arising through other variables the residuals from a regression of the trade outcomes with respect to per capita GDP and size of markets with country specific fixed effects and time dummies are taken.

Source: Authors' calculations based on trade data obtained from the CEPII database, GDP and population data from WDI and internet use from ITU.

2.1.3. Digital connectivity directly and indirectly benefits goods trade

63. Given the ubiquity of digitalisation, the lack of data on digital trade and the numerous channels through which digitalisation can affect production and trade, conducting empirical analysis on digital trade has been difficult (see Box 2). Nevertheless, empirical analysis can usefully focus on specific aspects at the intersection of digitalisation and trade – such as the trade-enabling role of digitalisation. One approach is to incorporate measures of digital connectivity or internet penetration into a traditional gravity model of trade (see Annex 3 for a short background on the gravity model) building on the work of Freund and Weinhold, 2002 and 2004, Clarke and Wallsten (2006), and more recently Choi, 2010, Riker, 2014 or Benz et al. 2017.¹³ While this will not identify the stock of the volume of trade that is digitally enabled, it will deliver insights into the extent to which *changes in measures of digitalisation are linked with changes in trade.*

¹³ The analysis is predicated on the notion that current trade statistics do not overall significantly under-record digitally enabled trade even if they don't currently identify what part of a delivered trade transaction has been digitally enabled (see OECD, 2017a).

Box 2. Identifying the impact of the digital transformation on trade

An early attempt at identifying the link between digitalisation and trade is provided in two papers by Freund and Weinhold (2002 and 2004). Using the number of registered domain names as an indicator, the first paper looks at the impact of internet penetration on trade in services. The second identifies the impact of internet penetration, using the same proxy, on goods trade. Both find substantial positive effects of around 1 percentage point increases in goods and services exports as a result of growth in internet penetration. This work was updated by Clarke and Wallsten (2006), Vemuri and Siddiqi (2009), Choi (2010), Riker (2014) and Benz et al. (2017) using different indicators for internet penetration, such as internet infrastructure and, increasingly, internet use. All confirm the positive relationship between trade and digitalisation.

More recently, empirical work has turned to data from platforms such as eBay to capture how determinants of goods trade via digital platforms might differ from those of goods trade via more traditional means (online versus offline trade). Using a gravity model for online and offline trade, Lendle et al. (2016) find that distance plays a reduced role on trade conducted over the eBay platform relative to offline trade. They posit that reductions in search costs have a trade cost reducing effect on such trade. Kim et al., (2017) also rely on private company data, providing further evidence on the diminishing role of distance, and hence trade costs, on online trade.

As more data becomes available, researchers are aiming to decode the determinants and characteristics of digital trade between countries. While approaches using private company data have the advantage of getting closer to specific elements of the digital trade environment, reduced sample size and possible selection effects make generalised conclusions difficult. By contrast, work relying on official trade statistics, while allowing for more generalised conclusions, does not lend itself to identifying the different channels of transmission, and can only provide insights in relation to what is currently being measured: goods trade or cross-border supply of services (mode 1). Ultimately, once official statistics are better able to capture digitally enabled transactions, comparisons with non-digitally enabled transactions will pave the way for new insights into the importance of digitalisation and the channels of influence. For the time being, analysis is restricted to what can be measured, more specifically the enabling role that digital technologies might play, whether through demand or supply.

64. Digital connectivity between two countries, or the potential thereof, can be proxied using a range of measures (see Annex 2 for a discussion of different measures). One which is readily available, and has good country and time coverage, is based on the share of the population using the internet.¹⁴ The potential for digital connectivity between two countries can be proxied by the minimum of the share of the population that is using the Internet. This would reflect that, for digitally enabled trade to flourish, both supplying and demanding countries require good connectivity.¹⁵ Intuitively, the measure acts as a mass parameter of potential digital connections, akin to what Freund and Weinhold (2002) refer to as the 'cybermass'.

¹⁴ Country coverage is especially important as other measures of digitalisation tend to only be available for developed countries.

¹⁵ At the extreme, if country A has 90% of its population using the internet but country B has 0%, it is not by increasing the number of internet users in country A that there will be more digitally enabled trade, the binding condition must be determined by the minimum potential for internet connectivity between the two countries.

65. This measure can then be plugged into a gravity model (see Annex 3) to identify how 'digital connectivity' might affect traditional trade in goods, thereby isolating some of the enabling channels of influence.¹⁶ Controlling for individual country-sector-year supply and demand conditions (using fixed effects), the results identify a positive correlation between digitalisation, or the potential thereof, and goods exports (see Annex Table A.1).¹⁷ Overall, and on average, a 10% increase in bilateral digital connectivity raises goods trade by nearly 2%.¹⁸

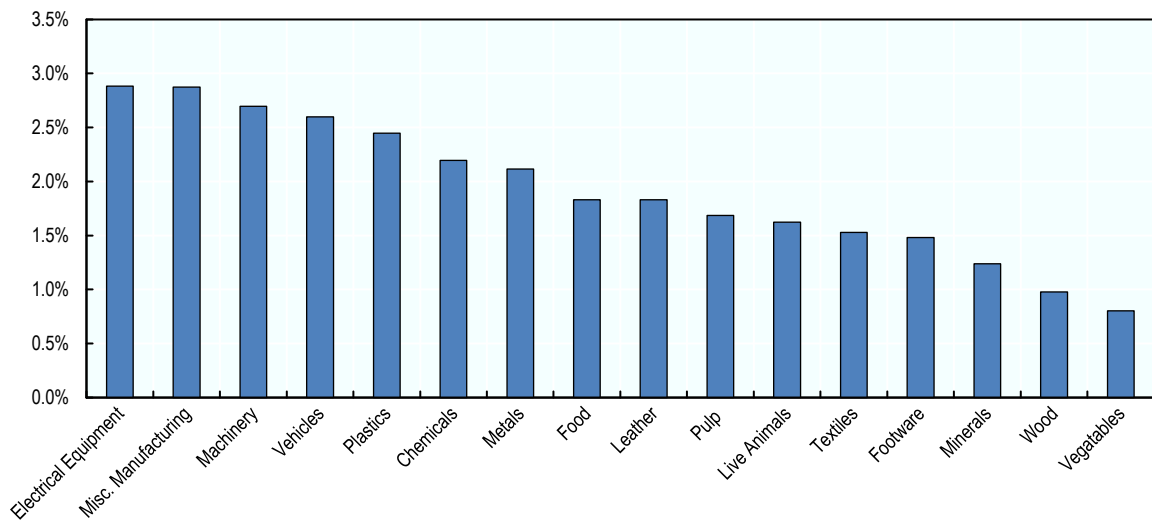
66. However, the effect is not homogeneous across income groups. In developed countries, a 10% increase in bilateral digital connectivity is associated with a 5% increase in bilateral exports; whereas, for developing countries, the increase in exports from an equivalent increase in digital connectivity is 0.12%. These differences should not be interpreted as indicating that developing countries have less to gain from digitalisation. Rather, they reflect that, although internet use, or digital connectivity, is an important condition for digitally enabled trade, there are other factors at play. Skills, or firm adoption of new digital technologies, are important factors for firms seeking to profit from trade through digitalisation (as suggested by the firm level evidence in Brynjolfsson and McElheran, 2016a and 2016b). In this respect, more work is needed to empirically assess how internet use and adoption of digital technologies interact to drive trade in developing countries.

67. The measure of bilateral digital connectivity is also associated with growing exports across all sectors although with variations across product categories. Increases in bilateral digital connectivity have larger effects on more complex manufactures, such as machinery, electrical equipment and vehicles than they do for primary goods (Figure 9), a factor which may also influence the differing outcomes across income groups.

¹⁶ A temporal lag of one year is taken in order to reduce the incidence of reverse causation.

¹⁷ The results account for zero trade flows using PPML techniques. See Annex 3.

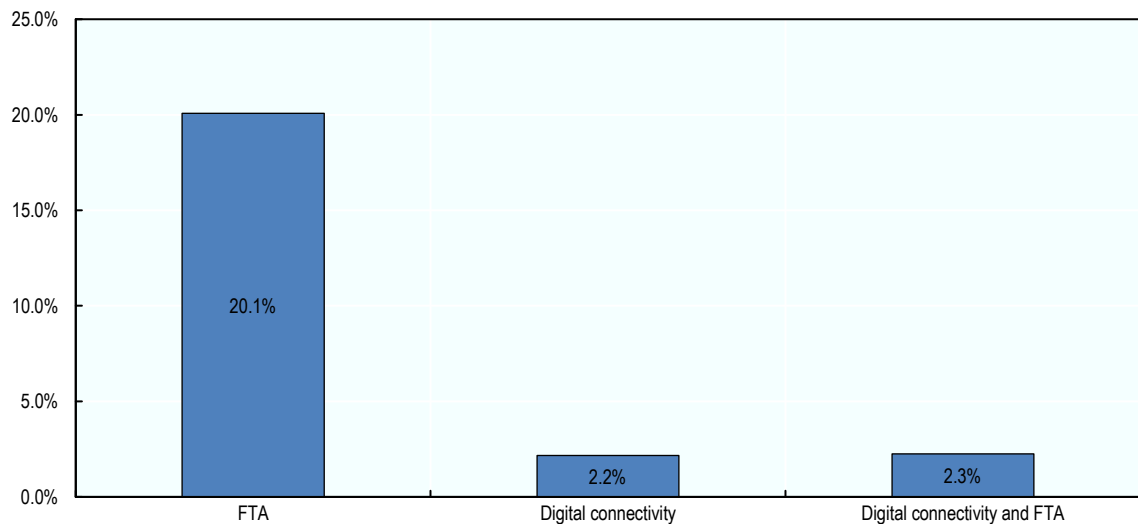
¹⁸ To put this result into context, Freund and Weinhold (2004) found that a 10% increase in internet penetration in the late 90's increased goods trade by around 0.2% suggesting that the effect of internet penetration on trade might be growing.

Figure 9. Digital connectivity and goods exports by sector

Note: Figure shows percentage increase in exports as a result of a 10% increase in bilateral digital connectivity derived from a gravity model. See Annex Table A.2 for regression results.

Source: Own calculations.

68. The modelling exercise also suggests that digital connectivity may also affect trade in goods more indirectly, allowing countries to better exploit regional trade agreements (Figure 10). Indeed when the proxy measure of bilateral digital connectivity is interacted with a dummy variable identifying the presence of a trade agreement between two country-pairs, a positive and statistically significant effect emerges. When combined with an RTA, a 10% increase in digital connectivity increases exports by an additional 2.3% – the combination of digitalisation and an RTA therefore delivers additional gains to trade.

Figure 10. Digitalisation, RTAs and goods trade

Note: Figure shows the coefficients from a gravity model which incorporates internet use, RTAs and an interaction term between these showing individual effects as well as combined effects (i.e. the impact of internet use conditional on sharing an RTA). See Annex Table A.3 for further details.

Source: Own calculations.

69. While the transmission mechanisms that underpin these correlations are hard to pin down and further work in this area is required, the findings provide a glimpse of some emerging relationships between trade in goods and digitalisation: showing how digital connectivity may act as an enabler for goods trade.¹⁹

2.1.4. Digital connectivity is also important for trade in digitally deliverable services

70. The potential trade-enabling role of digitalisation on services can also be analysed using similar methods (Figure 11).²⁰ Applying the same gravity approach, but using data on services exports from the TiVA database, mainly covering developed and emerging economies, highlights that bilateral digital connectivity is important for services exports. But there are also differences across sectors.²¹ For example, a 10% increase in the minimum internet use between countries leads to a 3.2% increase in exports of the post and telecommunications sector. However, in sectors such as construction or wholesale and retail trade, the impact is found to be negative. For construction this may reflect the fact that long-term construction projects are recorded by convention as Mode 3 (and so not as cross-border trade in services). For retail and wholesale trade, this likely reflects the role of platform-enabled trade in reducing demand for the kinds of intermediary, merchanting services captured in wholesale service statistics.

71. Overall, the results suggest that digital connectivity is most trade-enhancing for the exports of those sectors that can be considered "digitally deliverable" (USITC, 2014).²² Indeed, the impact of increasing digital connectivity is found to be highest for the telecoms, computer and other business sectors.

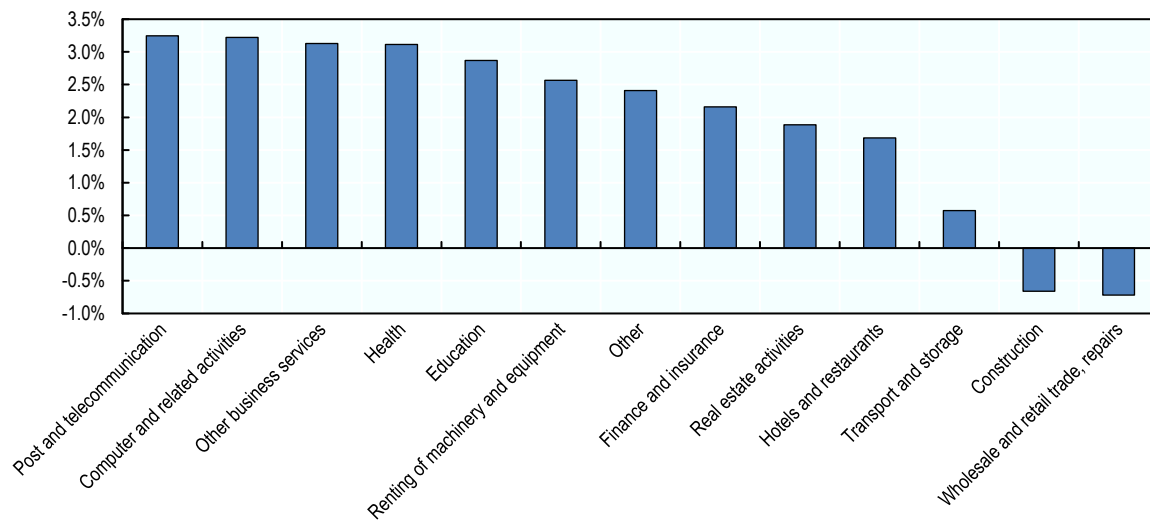
72. One important caveat of the analysis is that bilateral trade in services will be affected by differences in the regulatory approaches of countries which are not currently captured in this analysis (see Nordas, 2016). Another important caveat is that bilateral services trade data, derived from national accounts, does not identify what is or what is not effectively digitally delivered. In addition, the bilateral component of trade in services is also subject to estimation.

¹⁹ Ideally, instead of total trade, digitally enabled trade in goods would be used as a dependent variable, giving a more precise correlation between digitalisation and trade, and as data on digital trade becomes available, these correlations will need to be updated.

²⁰ Albeit for a reduced sample of countries only since bilateral data on services is harder to come by, especially for developing countries.

²¹ These figures are in line with more recent findings where Choi (2010) suggests that a doubling of internet use leads to a 2-4% increase in services trade.

²² Digitally deliverable services are those "that may be, but are not necessarily, delivered digitally" (USITC, 2014). In TiVA this broadly relates to: telecommunications (64); finance and insurance (65 to 67) computer and related activities (72); Other business services (73 to 74).

Figure 11. Digital connectivity and services exports by sector

Note: Figure shows percentage increase in exports as a result of a 10% increase in bilateral digital connectivity derived from a gravity model. See Annex Table A.4 for regression results.

Source: Own calculations.

2.1.5. And it gives rise to new complementarities between goods and services

73. While the role of services in enhancing trade in goods has been well documented (Miroudot and Cadestin, 2017; OECD, 2017b), less attention has been placed on how goods trade can help service delivery. Indeed, with devices increasingly being used to consume services, as is the case of applications through mobile phones, or e-books through e-readers, new complementarities between goods, services and data flows are arising.

74. To explore these new interactions, a proxy variable for the combined importance of digital connectivity and connected devices is introduced to the gravity model (Table 1). The variable is calculated as the product of total imports of ICT goods and the lagged measure of digital connectivity. The results show a statistically significant relationship between this measure and services exports, suggesting that digitalisation is also indirectly linked to services through goods. It is, however, found to be especially important for 'digitally deliverable' services. This suggests the presence of complementarities between connected ICT goods and digitally deliverable services.

Table 1. ICT goods imports, digital connectivity and services exports

	All services	Digitally deliverable services
Log of combined GDP	+	+
Log of distance	-	-
Contiguity	+	+
Former colony	+	+
Common language	+	+
Free trade agreement	+	-
Minimum internet use	+	+
Minimum internet use * ICT good imports	+	+
Fixed effects: reporter-product-year	YES	YES
Fixed effects: partner-product-year	YES	YES
N	327 306	88 419
Adj R-sq	0.789	0.739

Note: See Annex Table A.5, sign identifies statistically significant effect and direction of the effect, where there are no entries, the variables were not found to be statistically significantly different from zero.

Source: Own calculations.

2.2. Insights from the business questionnaire

75. Information about how firms engage in digital trade and the nature of the measures they face is not readily available. But understanding the perspective of business on the measures that condition their participation is important in helping alert policy-makers to the implications of different regulatory approaches and the areas where action may be needed to promote digital trade.

76. To this end, a tailored questionnaire was developed and distributed to the business community through an online link in December 2017 and again in January 2018.²³ This section discusses the findings from the responses received.

77. The usual caveats to such exercises apply. Online questionnaires suffer from selection biases related to the means of distribution and/or firms self-selecting whether to respond. The analysis in this section is therefore not intended to provide a complete, or representative, portrait of the forms of engagement of all firms in digital trade; neither is it intended that the responses to the questionnaire identify the overall importance of different measures. Rather, the information can be seen as illustrating certain characteristics that might be important for firms engaged in digital trade.

2.2.1. Characteristics of responding firms

78. Responses were received from 77 firms operating in 18 countries. Of these 43 (55%) were micro-enterprises with less than 10 employees (14 of which as single traders), 18 (24%) were small or medium sized enterprises (between 10 and 250 employees) and the remaining 16 (21%) were large companies (above 250 employees). In this respect, the firm size distribution is relatively well aligned with averages across countries.

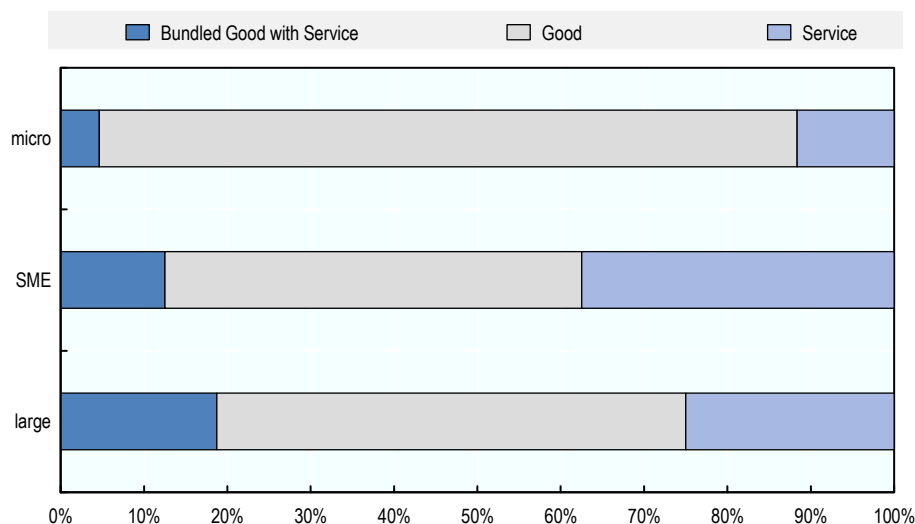
²³ Through personal contacts as well as through BIAC's business association membership.

79. The majority of respondents (43) were headquartered in the US, six firms in the EU, six in Russia and the rest in different countries such as Thailand, Turkey, Jordan, Singapore or Saudi Arabia. The responses are therefore heavily biased towards developed countries, especially the US.

80. Most respondents, 53 firms, reported their best-selling product to be a good, 15 firms reported to sell a service and seven sold bundled goods. Within firm size categories there are examples of firms selling each of these product categories, which is useful for drawing comparisons (Figure 12).

81. The sectors covered are, however, biased towards services. 34 firms, most of which were micro-enterprises, operated in the retail sector. Another 31 firms operated in other services, within which the 'Information and communication' sector was best represented (eight firms). Only 12 respondents, or 15% of the sample, claimed to operate in manufacturing sectors. None reported operating in agriculture.

Figure 12. Products sold by firm size



Note: Share over category of firm. The sample consists of 16 SMEs, 16 large firms and 43 micro-enterprises.
Source: OECD business Questionnaire.

82. Overall, although there are many biases in the data, such as geography or sector of activity, there is also sufficient variance across categories of companies (large, small and micro), or in terms of the type of product sold (goods, services and bundled goods), to provide some useful initial illustrative insights for policymakers. One interesting aspect of the responses received is that they include many micro-enterprises, which are notoriously hard to survey.

83. In terms of ICT costs, sales and digital intensity of production processes, the Business Questionnaire suggests that the propensity to engage in cross-border digital sales is higher in the service sector than it is in manufacturing. Moreover, in manufacturing, larger firms appear to engage most in digital trade, in turn suggesting that physical constraints and trade costs continue to matter (see Annex 4).

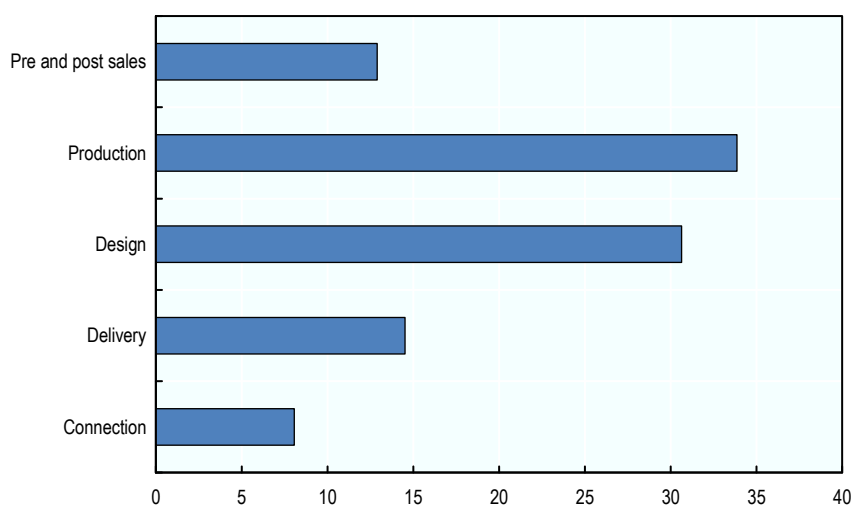
84. The questionnaire also asked firms to identify the digital intensity of different processes. Overall, production was reported to be most digitally intensive with design

following closely, delivery and pre-and-post-sales were third and fourth and connection last (Figure 13).²⁴ This most likely reflects the areas where firms value digitalisation most.

85. But there were differences in terms of products sold and sector of operation. For goods, design and production were most digitally intensive, with delivery and connection least important. For services, delivery was nearly as important as design and production. Also, as expected, for retail, no firm reported delivery to be the most digitally intensive process but in services this was reported to be as digitally intensive as production.

86. There are two takeaway lessons from these illustrative results. The first is that digitalisation, although important for all segments of the value creation process, is mostly valued in the production and design segments. The second is that the type of product traded determines how important each segment is in terms of its digital intensity. For goods, it is mainly production and design, for services, delivery is as important.

Figure 13. Digital intensity of different processes



Note: Based on responses from 62 firms (33 micro, 14 large and 15 SME).

Source: OECD Business Questionnaire.

2.2.2. Firm perceptions on the measures that affect participation

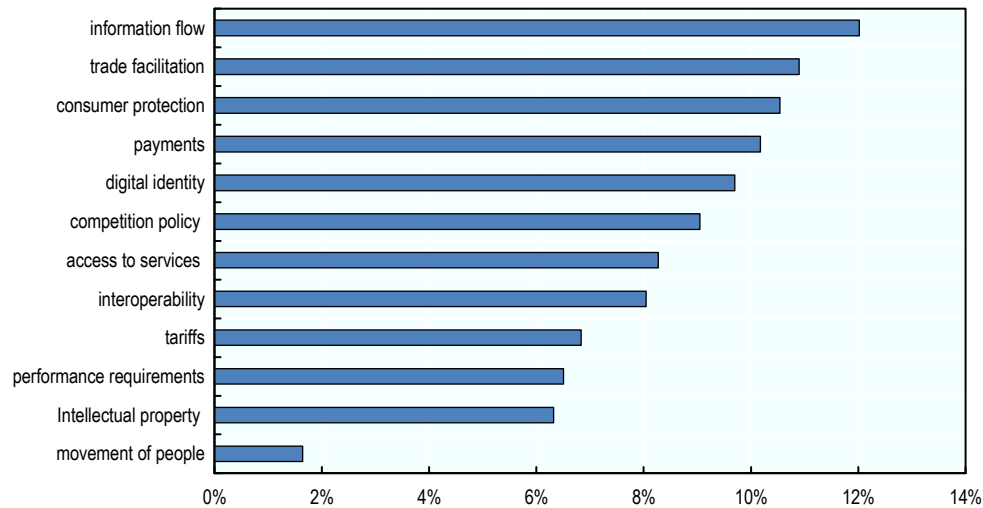
87. The challenges faced when engaging in trade, as perceived by responding firms, are diverse (Figure 14 and Annex Table 6).²⁵ On aggregate, information flows is one of the

²⁴ Categories were defined as follows in the questionnaire: i) design: whether R&D, market re-search or pre-production; ii) Production: whether in a factory or office, i.e. getting products to market and relating to the main activity of the firm; iii) Delivery: getting the products you produce to consumers; iv) Pre and post-sales: connecting with consumers or user-base, advertising, post sales services; v) Connection: connecting the different processes together, design to users, to production or traceability.

²⁵ Firms were asked to rank different issues that affected participation in trade; to generate a common ranking, weights were used. The most important issue raised was given 50% of the weight, the second choice 25% and so forth. When these are shown as a share of top issues in Annex Table 6, repeated most were 'digital identity', 'consumer protection', 'competition policy' and 'trade facilitation', with 'information flows' and 'access to services' also reported as important.

top issues, a close second is trade facilitation, with consumer protection, payments and digital identity following closely behind.

Figure 14. Issues affecting overall operations (weighted by rank)



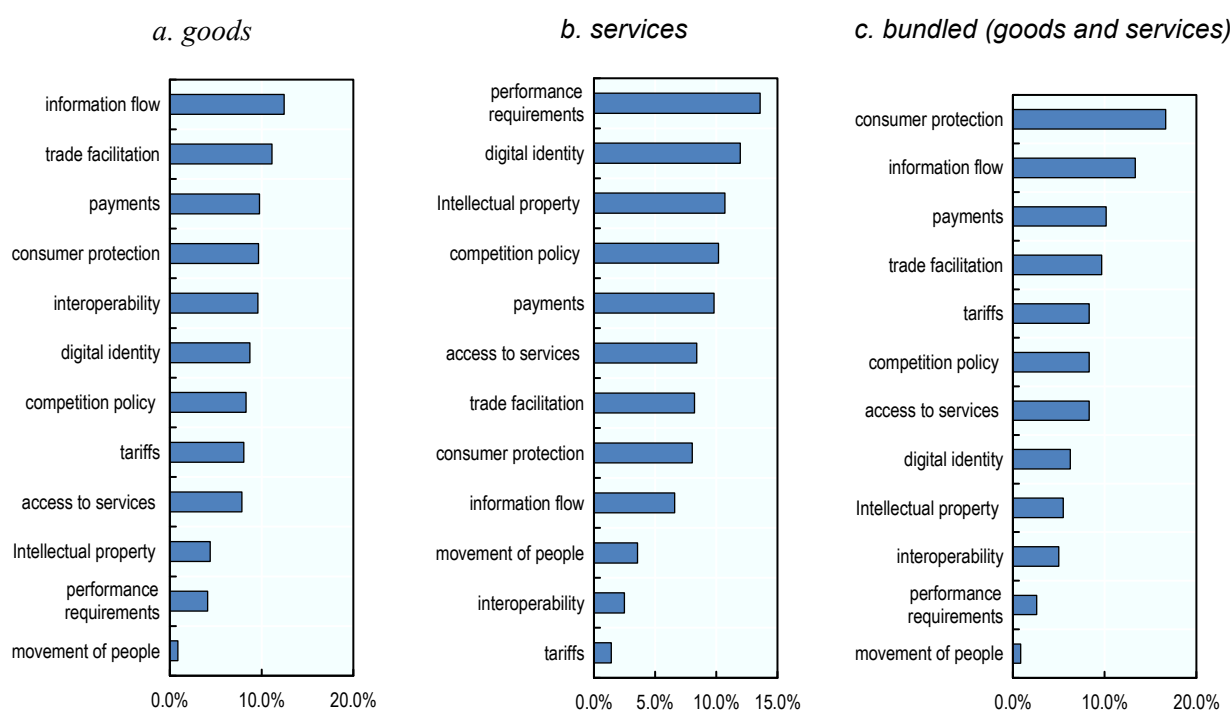
Note: Based on responses from 62 firms (33 micro, 14 large and 15 SME). The bars show the number of times that each of the issues is mentioned by firms over all other issues with a 0.5 weight attributed if the issue is the most important, 0.3 weight if it is second most important, 0.125 if third most important, 0.05 if fourth most important and 0.025 if fifth most important. The bars add up to 100%. See Annex Table A.6. for the ranking of issues.

Source: OECD Business Questionnaire.

88. Firms which sell goods are not only concerned about traditional 'goods issues' such as tariffs or trade facilitation, they also appear to be concerned about measures such as information flows and payments. Those selling services are mainly concerned about competition and payments issues, but they are also concerned about 'goods issues' such as trade facilitation. Finally, those which sell bundled goods are concerned with a range of measures spanning both goods and services as well as information flows (Figure 15).

89. Although the small sample makes it hard to derive concrete observations on the rankings, the results nevertheless highlight the range of issues that are of concern to firms engaged in digital trade. The fact that these range across all elements, from goods to services to digital connectivity, provides support to the notion that new approaches to market openness need to look at these elements more jointly.

Figure 15. Challenges by product category



Note: Based on responses from 62 firms (33 micro, 14 large and 15 SME). The bars show the number of times that each of the issues is mentioned by firms over all other issues with a 0.5 weight attributed if the issue is the most important, 0.25 weight if it is second most important, 0.125 if third most important, 0.05 if fourth most important and 0.025 if fifth most important.

Source: OECD Business Questionnaire.

2.2.3. Summary of the findings from business engagement

90. Although the findings from the business questionnaire are based on a small sample of self-selecting firms they provide important illustrative insights into how firms engage in digital trade:

- Responding firms seem to be able to engage in digital trade with relatively minor upfront ICT costs.
- The propensity to engage in cross-border digital sales is higher in services (with few differences across firms of different sizes). In manufacturing, larger firms appear to engage more, suggesting that physical constraints, or scale, continue to matter.
- Digitalisation is important for all segments of the value creation process, but it is most valued by responding firms at the production and design stages.
- Responding firms face a range of measures when engaging in trade in the digital era. Although it is hard to tell which matter most, it is clear that firms that sell goods are also concerned with services issues and firms that sell services are concerned by goods issues.

91. While responses the survey were limited, a number of useful engagements with the business community have shed light and provided interesting examples of the issues faced

by companies (Box 3). These are clearly illustrative, rather than representative; given the problems of ascertaining what would be a representative sample in the global digital age (a million companies worldwide?), these examples can nonetheless be informative for policy-makers, including as the basis of a discussion with the domestic private sector about potential issues and problems faced.

Box 3. Insights from engagement with business community

One especially interesting example of a modern firm selling a bundled product is Ledger. It provides physical USB wallets for cryptocurrencies such as bitcoin (the wallet isolates cryptographic secrets from computers and smartphones which might be more easily hackable). Beyond finding talent, Ledger claim that some of their key concerns relate to developing products to international standards and shipping to clients all over the world – an example of a cutting edge firm which is concerned with traditional trade issues. Similarly, one of the leading internet retail firms was most concerned not by domestic regulatory reach but by tariffs applied on specific hardware for servers.

Another example of interactions between digital connectivity, goods and services is the case of Cheerz. It is a photo printing site and app that offers users the possibility of creating personalised photo-albums, prints, calendars, magnets and other such products. Much of its business comes from its mobile application and therefore it requires that its user-base have access to mobile devices and digital services. Moreover, to deliver their products, the business model relies on logistical services and at-the-border issues (when delivery is cross-border) – an example of the range of issues that concern modern firms.

But beyond what firms produce, dialogue with business highlights the prominent role that digital services play in underpinning operations, especially for start-ups and small enterprises. For example, in France, Qonto provides online banking services to micro and small enterprises. It helps these firms navigate domestic banking procedures, and, as a result of its bi-lingual (English and French) offering, it has attracted many foreign start-ups struggling with differing administrative and accounting requirements and language. At the same time, software such as Talentsoft, a cloud-based human resource software, aims to help firms manage talent. Other companies provide the critical digital service infrastructure which support the operations of modern firms: Dropbox for file-sharing, Skype for communication, Paypal for payments and so forth.

Engagement with firms, notably SMEs and start-ups, highlights the importance they attribute to access to such digital services. These are the backbone to their activities: allowing them to focus on their comparative advantage rather than having to dedicate time dealing with administrative burdens and helping them scale up or down depending on the business needs.

Part III. Thinking through measures affecting digital trade

92. Market openness (see Box 4) refers to the “ability of foreign suppliers to compete in national markets without encountering discriminatory, excessively burdensome or restrictive conditions” (OECD, 2010). It is about creating a business friendly environment which is conducive to firms reaping the benefits of trade and which contributes to economic growth (Romalis, 2007). At the same time, market openness is also a critical framework condition to enable the digital transformation to flourish (OECD, 2018b)

93. However, with the adoption of new business models spurred by the digital transformation, the way firms engage in trade is changing, raising both new regulatory and trade policy challenges for governments and new issues for firms. Indeed, digitalisation may be altering the terms of competition; blurring the boundaries of markets; and changing how regulations affect trade.

94. This part of the report delves deeper into the types of measures that affect digital trade in an effort to provide a better understanding of market openness in the digital era. It first provides an overview of some of the regulatory challenges facing governments in digital trade. It then draws on the empirical analysis and the responses to the business questionnaire to suggest a framework for thinking through what market openness means in the digital era and how it should be approached going forward. The paper concludes with some suggestions on how traditional market openness principles apply in the digital era.

Box 4. What is market openness

Market openness is characterised by a regulatory environment where foreign suppliers of goods and services have the ability to “compete in a national market without encountering discriminatory, excessively burdensome or restrictive conditions” (OECD, 2010). This entails not just the elimination of barriers to trade and investment but also the adoption of appropriate international approaches to trade-policy making.

The OECD developed six market openness principles to help policy-makers create a business environment that is friendly towards trade, investment, competition and innovation:

Transparency reduces uncertainty and promotes compliance. Transparency in the process allows stakeholders to comment on relevant regulations before implementation, improving both enforceability and the quality of legislation.

Non-discrimination entails effective equality between 'like' goods and services, no matter where they originate from, promoting competition and innovation.

Avoidance of trade-restrictive effects that go beyond what is necessary to ensure the achievement of the desired regulatory objective.

Harmonisation of international measures avoids regulatory fragmentation.

Mutual recognition of the equivalence of other countries' regulatory measures and conformity assessments helps minimise impediments from diverging national standards.

Competition encouraging effective competition among suppliers in a market.

These principles can help in better understanding what measures might be relevant for openness in digital trade, and how these measures could lead to more favourable regulatory environments for digital trade.

Source: OECD (2010), OECD (2005), OECD (1997).

3.1. Regulatory and policy challenges

95. Digitalisation, while presenting a large number of new opportunities, also gives rise to a number of regulatory challenges for governments wishing to ensure that the opportunities and benefits from digital trade can be realised and shared inclusively. This section outlines some of the key trade-related regulatory challenges that digitalisation raises for policy makers.

96. Regulatory challenges arise due to the blurring distinction between goods and services in digital trade, and the ensuing uncertainty as to the applicable trade rules. For instance, it is increasingly difficult to separate services and goods with the rise of the “Internet of Things” and the greater bundling of goods and services. At the same time, goods are being substituted by services -- for instance, printed books and DVDs are being replaced by e-books and movie downloading or streaming services -- further shifting the regulatory boundaries between what is treated as goods and services. As the GATT and GATS provide different rules and commitments for goods and services, the choice makes a difference. This matters as changes and uncertainties could result in regulatory fragmentation or create the risk of moving towards more restrictive regulation.

97. In addition, the classification of services in the digital economy is crucial since it provides the basis on which countries make legally binding trade commitments. Challenges arise from the uncertainty as to how certain new services should be classified. For instance,

there are different views as to where services such as search engines, cloud computing, Internet platform services, mobile applications, and online games fit in the WTO Services Sectoral Classification List used in the GATS (WTO, 1991). This list follows the UN Provisional Central Product Classification (CPC), and although the CPC has been revised subsequently, the GATS commitments have remained anchored to the old classification scheme.

98. Moreover, classification boundaries are also increasingly fading both within sectors (e.g., between basic and value-added telecommunications services²⁶) as well as across sectors (e.g., telecommunications services increasingly bundled with audio-visual and ICT services as television, streaming and voice calls made available on the Internet through different platforms) (WTO, 2009). This could give rise to uncertainties relating to which trade commitments are applicable for digital transactions.

99. Similar issues are also arising in the case of goods. Reports from business suggest that uncertainty on the part of customs authorities about how to treat new "smart" products is leading a rise in discretionary decisions which can reduce predictability and transparency, and result in the goods being classified under a heading that attracts a higher tariff.

100. The inherently international nature of the Internet and digital networks also means that local regulatory measures can have global effects. Regulatory challenges may result from the heterogeneity among countries' rules and regulations governing particular aspects of digital trade. Indeed, although the Internet opens up the possibility to reach new markets globally, firms are still required to comply with the laws of countries to which they export or where their customers are based. Legal uncertainties and added compliance costs related to differing regulatory regimes may lower incentives to enter new markets, particularly for small businesses that do not have sufficient resources to offset the higher costs.

101. Furthermore, as information and data increasingly become the raw material of the digital economy, a balanced regulatory approach to cross-border data flows is warranted in view of ensuring that the benefits from digital trade can be reaped while, at the same time, ensuring that legitimate public policy objectives can be met. Fragmented approaches to these issues may impose costs on firms operating across multiple jurisdictions.

102. Another challenge relates to the protection and enforcement of intellectual property rights, particularly to strike the right balance that allows right holders to effectively enforce their rights against illegal copying and downloading while not creating costly burdens for intermediaries and not imposing unnecessary obstacles to creativity and innovation for users.

103. Digital trade is also subject to rules governing, and closely entwined with, traditional trade in goods and services and therefore existing regulatory barriers could indirectly affect digital trade. In case of services, for instance, market access commitments will largely define the extent to which services can be supplied, including when these are delivered digitally. Nonetheless, some services, even if supplied digitally, might need to be supported in person. For instance, computer software can easily be transferred digitally but technicians may still need to travel to clients to set the system up and provide training to local staff. Similarly, some professional services, such as legal or accounting services, can partially be supplied through online platforms, especially if they relate to simpler tasks (e.g., preparation of legal documents, legal advice etc.). However, more complex

²⁶ For instance, communications services are bundled with online data processing and email services.

professional services, particularly in business-to-business transactions, require personal interaction with clients, either through travelling or establishing a commercial presence in the host country. In the case of goods, traditional barriers, such as tariffs on specialised server equipment, may affect the ability of firms seeking to meet requirements for local data storage.

3.2. Thinking through the range of measures affecting digital trade

104. The measures that affect how modern firms engage in digital trade are varied. This is because the completion of what might be referred to as a single digital trade transaction, for instance, the cross-border purchase of an e-book from a digital marketplace platform, rests on a series of factors which support or enable the transaction.

105. The types of measures that underpin this simple transaction, once fully traced, involve a wide range of issues covering both goods and services. For example, the ability to order the e-book from an online retailer will initially depend on access to digital networks. The quality and costs of access is conditioned by the available physical infrastructure, the regulations that govern its use and the cost of an internet connection - in turn, affected by the degree of competition in the telecommunications services market. The ability to pay for the e-book will depend on the presence of interoperable e-payment methods, and the cost of the e-book on the degree of openness in related retail services. Moreover, the overall demand for the e-book will invariably depend on the cost of the e-reader which, in turn, will be conditioned by issues related to goods such as tariffs, trade facilitation or other technical regulations.

106. This example helps illustrate some of the building blocks that matter for digital trade. It also highlights the complexity of the issues that underpin even a relatively simple digital trade transaction. Against this background, this section aims to provide a preliminary framework for thinking about the different types of measures that affect digital trade with a view to laying the foundations for deepening the analysis of specific measures in future "deep-dives" undertaken as part of forthcoming work.

107. The measures that can affect digital trade can be articulated under a common framework, broken down by layer. The framework provided below attempts to identify elements underpinning digital trade transactions (Figure 17). It is intentionally broad and similar to the framework for WTO provisions (Figure 1) that apply to digital trade.

108. At the core of any and all digital trade transactions, whether involving goods, services or bundled goods with services, lies the **'infrastructure and connectivity'** layer, composed of the physical infrastructure and the regulations that underpin digital networks (see, OECD, 2016 for a discussion of some of the regulations underpinning broadband policy in Latin America). Most of the issues in this layer concern domestic policy, but there are also important trade considerations, such as access to inputs for the physical infrastructure, or the tariffs imposed on these, or more complex issues such as technical interoperability, net neutrality or data flows, here related to the logistics of the packets of data being sent.

109. The cost of access to digital infrastructure will be determined, in part, by the degree of competition in the telecommunications market. In this respect, restrictions affecting telecom services can be a trade-related horizontal measure affecting the ability of firms to engage in digital trade.

110. The '**enabling and supporting services**' layer is also transversal and has different components. An important one relates to measures that affect access to key enabling services such as computer services. Effective competition among the providers of soft digital infrastructure that are important for building a digital presence (from cloud computing to processing power), will keep ICT costs competitive.

111. Support services, such as retail or financial services also play a key role. Retail provisions will affect the extent to which digital retailers are able to function in particular markets, or have access to selling on particular digital platforms, and financial provisions related to, for example, interoperability of e-payment systems will affect how firms and consumers buy and sell products digitally. Again, effective competition measures and well-functioning dispute settlement mechanisms will further support and enable digital trade.

112. Another key element of this enabling environment relates to provisions that affect the flow of data across border. As firms migrate files and communication to the digital realm, the movement of data across borders becomes a key ingredient of modern day business. Measures that affect the free-flow of data, although often related to issues such as privacy or digital security, can impact the coordination of GVCs change the way businesses operate and affect the services they can offer. The extent to which these enabling and supporting services affect digital trade remains an empirical issue which could be explored in future work.

113. The '**support services and goods**' layer identifies the set of supporting services specific to the type of products traded. When trading goods or bundled products, support services related to the efficiency of logistics and distribution systems will affect the costs of goods ordered digitally. When trading bundled products or services, access to ICT goods will matter for the consumption of digitally deliverable services such as online streaming, or indeed construction services as might be the case of sending digital design files to computers in other countries. The implications of the measures under this category could also be further investigated in forthcoming work.

114. Finally, the last layer, '**specific provisions**' relates to the most visible measures which *directly* impact the goods and services being traded. For goods, this means tariffs, non-tariff measures such as technical requirements or issues related to getting goods through borders, such as trade facilitation, or pre-arrival notices. For services, this means regulatory measures that affect the delivery of services such as market access, national treatment or domestic regulations. Many of these issues could be picked up in the context of future work.

115. Three important implications are raised by this analysis:

- The first is that **what seem to be simple cross-border digitally enabled transactions in goods, services or bundled goods, are actually underpinned by a range of complex measures which are horizontal to all transactions.** This implies that making the most out of digital trade goes well beyond dealing with measures that affect the final delivery of the digital trade transaction.
- The second is that this analysis again underscores that **engaging in digital trade in goods means facing services issues** such as logistics services. In turn, engaging in trade in services, particularly those that are digitally delivered, **will also depend on issues related to market access in goods.**

- The third is that, as firms increasingly move towards trading bundled goods, they will increasingly need to consider issues related to goods and services, adding to the number of issues to consider significantly.

Figure 16. Building blocks of digital trade

	Goods	Bundled products	Services
Specific provisions	NTMs		
	Tariffs		
	Trade facilitation – de minimis, customs handling, pre-arrival notices...		
		Market Access	
		National Treatment	
		Domestic regulation	
Support services and goods	Support services for goods – logistics, transport, courier		
		Supporting goods for services – Computers, smart phones, tablets	
Enabling and supporting services	Support services – retail or financial services (e-payments)		
	Enabling Services – Computer services		
	Business environment – Competition policy, regulations on establishment, local content requirements, dispute settlement, IPR		
	Transparency		
Infrastructure and connectivity	Telecommunications services		
	Technical – measures that affect use of infrastructure – flows of data, technical interoperability, domain names, net neutrality, Internet protocols, e-contract and e-signature provisions		
	Infrastructure – measures affecting the use and access to equipment (cables and wires, wireless networks)		

Source: Own elaboration.

116. As foreshadowed, the purpose of this exercise is to identify the broad types of measures that countries will need to consider when thinking about digital trade. It is hoped that this mapping exercise helps i) inform about new issues that need to be considered; ii) identify how these relate to each other; and iii) provide a backdrop for future analysis. In particular, the framework presented herein will be useful to identify specific future "deep dives" on particular issues. At the same time, it will provide an overarching framework, or chapeau, through which to assess the relative importance of different types of issues affecting digital trade. For example, a future deep-dive on data flows will identify the nature of different regulatory approaches across countries but contextualise this as a horizontal element of a grander digital environment detailed in the framework.

Conclusion: So, what does market openness mean in the digital era?

117. Although it has never been easier to engage in trade, the adoption of new business models and the growing bundling of goods and services have given rise to more complex international trade transactions and policy issues. As a result, ensuring market openness has become more important and complex.

118. Indeed, matching services, logistical support and secure payment systems are providing solutions that enable firms, notably SMEs, to sell their products online and across borders at a fraction of the cost. Firms can also now draw on data from users to better respond to consumer preferences, better target services and connect and customise production processes globally. But the growing reliance on digital services and new digital technologies at all stages of production, design and delivery also means that the number of cross-border interactions has grown. As a result, a single final transaction between a firm and a consumer now relies on a range of supporting or enabling cross-border transactions which are themselves subject to different trade policy issues (as illustrated in Figure 17).

119. These changes underscore the importance of market openness for making the most out of digital trade. At the same time, the greater bundling of goods and services enabled by digital transformation, also challenge traditional market openness distinctions between goods and services. Not only do these now have to be considered jointly, but a greater focus on openness to information transfers and digital connectivity is also needed.

120. As a result, market openness in the 21st century should be approached *more holistically*. For example, Internet access may be a necessary but it is not a sufficient condition for digitally enabled trade in goods to flourish. If logistics services in the receiving (or delivering) country are costly due to service trade restrictions increasing prices, or if goods are held up at the border by cumbersome procedures, then the benefits of digital transformation may not materialise. Platform-enabled trade transactions might be curtailed or might not take place at all.

121. In this interconnected world, the benefits of digital transformation for trade are contingent on a combination of factors. Within the firm, investment in information and communication technologies (ICT) such as big data is associated with higher productivity, but only for firms that adopt new organisational processes or have access to workers with adequate skills. Reaping these benefits also requires market openness. New technologies are often made available through international trade, and access to international markets for both inputs and outputs is necessary for scaling production and increasing competitiveness. Indeed, successful 'born global' firms combine both adoption of new technologies and access to global markets.

122. At the same time, market openness in the 21st century also needs to be approached *more jointly*. Many digital infrastructures such as the Internet were born global. They offer new opportunities for scale, particularly for SMEs and businesses in developing economies, but they raise key challenges for domestic and international policy in a world where borders and regulatory differences between countries remain.

123. In this context, trade agreements, whether multilateral, plurilateral and/or bilateral, offer useful insights into the process of managing exchange across countries with different standards, reflecting different cultural and political contexts. In trade agreements, and as

reflected in the market openness principles (Box 3), combining the benefits of trade with countries' right to regulate has rested on principles that:

- i. Standards and processes are *transparent*;
- ii. these are applied to everyone in the same way (i.e. *non-discriminatory*); and
- iii. in achieving their legitimate public policy objectives, countries do not use measures that restrict trade more than is necessary to achieve the objective (i.e. *least trade restrictive*).²⁷

124. Reaping the benefits of digital trade will increasingly also require international dialogue on approaches that ensure the *interoperability* of differing regulatory regimes and technologies. While it is premature to define what this type of dialogue might look like, and indeed, in which fora this is to be carried out, it must include developed and developing countries and be multi stakeholder, involving, for example, the business community, the Internet technical community, trade unions, and civil society in the policy-making process.

²⁷ Market openness hinges also on effective *competition policies* that ensure fair terms for all players on the market. This entails having access to effective redress mechanisms in case of anti-competitive behaviour as well as competition authorities' ability to tackle emerging competition issues taking place in the digital realm.

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Annexes

Annex 1: Vectors of digital transformation

The vectors for Digital Transformation are summarised in OECD 2017c and 2018a. Below an excerpt from these texts explaining what these are:

In order to better understand the transformative effects that the use of digital technologies and data can have across the economy and society, the OECD has identified seven "vectors of digital transformation" (vectors) that identify key properties of digital transformation. These vectors provide one lens of analysis to ensure that existing or new policies are well-suited to a digital economy and society. Rather than being structurally discrete, the vectors are intertwined and can have differential and reinforcing effects across policy domains.

- *Scale without mass.* The low marginal cost of many digital products allows firms to scale quickly and globally with less investment in tangible assets and human resources.
- *Panoramic scope.* Data flows and software-enabled processes support the digitisation of activities, lowering barriers to gaining scope through the combination, processing, and integration of digital resources within and across different products and at global level.
- *Speed:* Temporal and intertemporal dynamics. The use of digital technologies accelerates processes and interactions, which can generate opportunities but may also fit poorly with time frames of public administrations, institutional processes, and behaviours.
- *Intangible capital and new forms of value creation.* Increasing investment in intangible assets (e.g. data and software) enables new forms of value creation, such as coupling capital goods with digital services, e.g. tractors, houses, or cars, and monetising services via online platforms.
- *Transformation of space.* Digital production, consumption and trade imply movement of intangible digital value across the global Internet, which can undermine constraints of location and distance as well as the sovereignty of borders and jurisdictions.
- *Empowerment at the edges.* The Internet's architecture and digital technologies empower intelligence at the edge of networks, broadening markets and communities and increasingly moving previously centralised responsibility, e.g. privacy and security, to decentralised users. Platforms and ecosystems. Digital intermediation, for example in e-commerce, social networks, content distribution, or search and storage, leads often to the centralisation of flows, access to and control of data, which in turn can become a strategic asset and competitive advantage.

Annex 2: Indicators of digital connectivity

Measuring the nature and spread of digitalisation is difficult. As foreshadowed in this paper, the digital transformation is a multifaceted concept involving elements of both access and use of digital technologies. As a result, many different indicators are being used to assess the spread and evolution digitalisation.

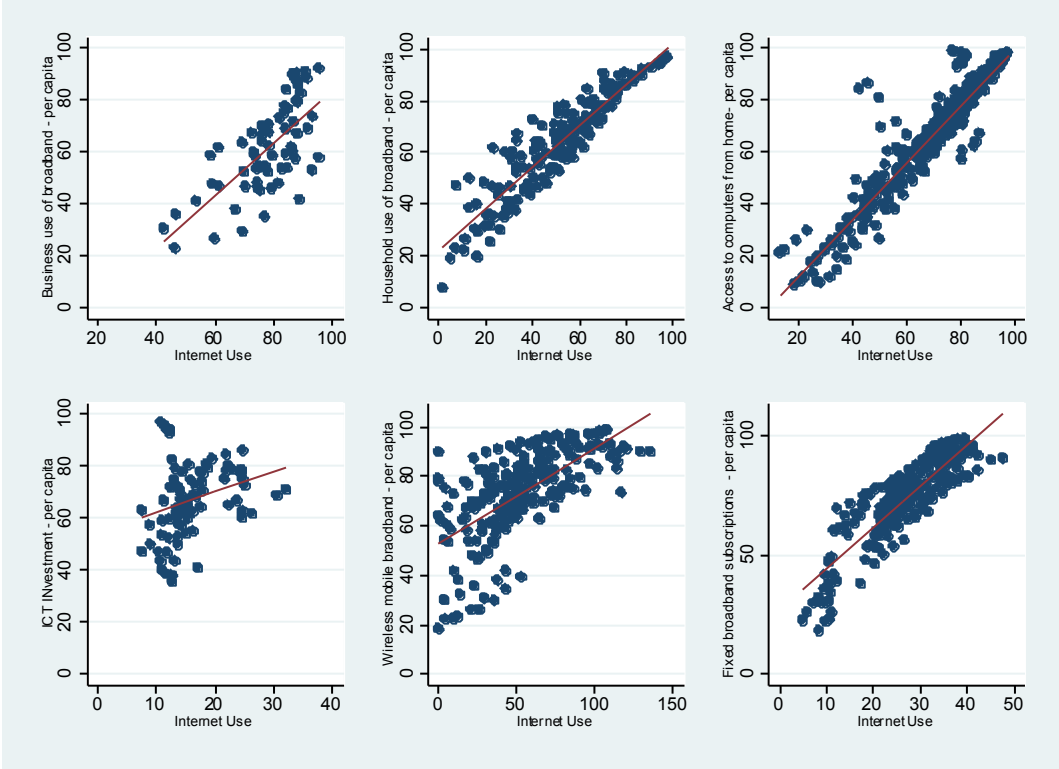
In the latest *OECD Science, Technology and Industry Scoreboard 2017* a comprehensive set of indicators are identified, these include, amongst others, measures of mobile broadband penetration; age of first internet access; or share of the population using the internet.

Drawing on this work, the empirical analysis presented herein uses internet use as a percentage of the population. This choice is largely practical; measures of internet use are available for a large sample of developed and developing countries and these have a good time coverage. However, the choice can be criticised on grounds that it only captures a particular aspect of digitalisation: use by the population.

Indeed, the digital transformation is about much more than people using the internet: it is also about firms being connected; about adopting new, and digitally related, technologies and about changing modes of delivery for trade. However, in terms of undertaking econometric analysis, and especially when using the measure as a proxy of potential digital connectivity, the high correlation of this variable with other measures of digital connectivity makes it appropriate useful tool for analysis.

Internet use correlates very strongly with business and household use of broadband; access to computers; wireless broadband and fixed broadband subscriptions (Figure A.1.). This suggests that this single measure, which is available for more countries and more time periods than others can provide useful variance as a proxy of different aspects of digital connectivity.

Figure A.1. Correlation between indicator of internet use and other indicators of digital connectivity



Source: OECD Telecommunications and Internet Statistics.

Annex 3: Empirical analysis: Gravity models and supporting tables

The gravity model is the workhorse for the analysis of trade and related policies. It posits that trade between two countries is a function of economic mass and relative distances. Since its first use in Timbergen (1962), the gravity model has received numerous theoretical underpinnings, most notably by Anderson (1979) and Anderson and Van Wincoop (2003). These, and subsequent theoretical underpinnings using different models of international trade, are summarised in Head and Mayer (2014).

Exports from country i to country j , X_{ij} , are a function of country i 's output (Y_i) and country j 's expenditure (E_j) over the share of global output (Y) and a set of trade-related costs (Anderson and Van Wincoop, 2003):

$$X_{ij} = \frac{Y_i E_j}{Y} \left(\frac{t_{ij}}{\Pi_i P_j} \right)^{(1-\sigma)}$$

The first term of the equation, $\left(\frac{Y_i E_j}{Y}\right)$, identifies trade in a frictionless world. Prices are the same regardless of where products are produced and therefore countries consume goods in proportion to their global output. The second term, $\left(\frac{t_{ij}}{\Pi_i P_j}\right)^{(1-\sigma)}$, identifies trade-related costs which drive a wedge between domestic and foreign prices. The term t_{ij} captures bilateral trade costs while Π_i and P_j capture inward and outward multilateral resistance.

The natural logarithms of the above equation gives us the standard log-linear gravity model:

$$\ln X_{ij} = \alpha_0 + \beta_1 \ln Y_i + \beta_2 \ln E_j + \beta_3 \ln t_{ij} + \beta_4 \ln \Pi_i + \beta_5 \ln P_j + \varepsilon_{ij}$$

Mass variables tend to be captured using GDP while trade costs t_{ij} are traditionally captured using bilateral distance, contiguity, common language and measures such as tariffs or the presence of FTAs. The multilateral resistance terms are not directly observable but can be controlled for using fixed effects (see Head and Mayer, 2014).

The gravity model estimated in this paper uses this standard formulation but introduces a lag of the minimum internet use between two partners as part of the trade costs. The rationale is that, for there to be good digital connectivity between two countries, both are required to have access to digital networks. A lag of this variable is taken to reduce the incidence of reverse causation. Reporter-product-year (γ_{ikt}) and partner-product-year (ρ_{jkt}) fixed effects are used to control for multilateral resistance. The estimated model takes the following form:

$$\begin{aligned} \ln X_{ijkt} = & \alpha_0 + \beta_1 \ln GDP_{ijt} + \beta_2 \ln Dist_{ijt} + \beta_3 Contig_{ijt} + \beta_4 Col_{ijt} + \beta_5 comlang_{ijt} \\ & + \beta_6 RTA_{ijt} + \beta_7 minintuse_{ijt-1} + \gamma_{ikt} + \rho_{jkt} + \varepsilon_{ijkt} \end{aligned}$$

The model is estimated for goods trade (using data from the BACI database) and for services trade (using data from the TiVA database).

Table A.1. Enabling role of digitalisation on goods trade

	(1)	(2)	(3)	(4)
	All	Developed	Emerging	Developing
Log of combined GDP	1.105*** (6141.93)	1.182*** (4041.17)	0.735*** (3006.07)	0.499*** (2719.43)
Log of distance	-0.633*** (-1498.90)	-0.928*** (-1173.74)	-0.556*** (-751.64)	-0.373*** (-638.06)
Contiguity	1.222*** (576.31)	1.706*** (369.68)	1.647*** (420.02)	0.889*** (359.38)
Colony	0.720*** (235.75)	0.872*** (198.92)	-0.0530*** (-5.99)	1.060*** (231.22)
Common language	0.257*** (308.97)	0.304*** (180.78)	0.430*** (260.56)	0.146*** (149.36)
Free trade agreement	0.464*** (538.4)	0.530*** (314.28)	0.568*** (322.83)	0.372*** (348.16)
Minimum internet use	0.192*** (1458.8)	0.509*** (1702.61)	0.144*** (537.78)	0.0124*** (73.74)
constant	-0.000375 (-0.08)	-0.000491 (-0.06)	-0.00155 (-0.19)	-0.000399 (-0.06)
rep-prod-year FE	YES	YES	YES	YES
par-prod-year FE	YES	YES	YES	YES
N	31,358,496	10,321,344	8,554,464	12,482,688
Adj R-sq	0.618	0.698	0.597	0.476
t statistics in parentheses, * p<.1, ** p<.05, *** p<.01				

Note: Sample includes 160 countries.

Source: Own calculations using CEPII-BACI data and ITU data on internet use.

Table A.2. Digitalisation and trade in goods sectors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Live Animals	Vegetabl es	Food	Minerals	Chemicals	Plastics	Leather	Wood	Pulp	Textiles	Footwear	Metals	Machinery	Vehicles	Electrical Equipment	Misc. Manufacturin g
Log of combined GDP	1.081***	1.115***	1.197***	1.010***	1.151***	1.403***	1.100***	0.704***	1.108***	1.049***	0.876***	1.091***	1.426***	1.095***	1.158***	1.339***
Log of distance	-1244.73 -0.577*** (-327.97)	-1506.17 -0.506*** (-373.45)	-1589.51 -0.742*** (-504.70)	-833.54 -0.880*** (-276.17)	-2125.6 -0.725*** (-558.61)	-1100.71 -1.043*** (-310.93)	-936.49 -0.443*** (-217.69)	-1011.53 -0.430*** (-223.66)	-1095.3 -0.779*** (-322.09)	-2278.6 -0.597*** (-579.66)	-1212.3 -0.398*** (-260.08)	-2075.32 -0.616*** (-497.34)	-1258.52 -1.162*** (-333.61)	-1245.87 -0.597*** (-268.38)	-1367.57 -0.473*** (-229.98)	-1243.35 -0.763*** (-335.70)
Contiguity	1.551*** -176.1	1.525*** -224.33	1.455*** -197.5	2.001*** -125.37	1.349*** -207.33	1.304*** -77.57	1.022*** -99.96	0.985*** -101.77	1.233*** -101.59	1.007*** -194.67	0.897*** -116.56	1.132*** -181.85	1.114*** -63.74	1.172*** -104.84	0.661*** -63.94	1.020*** -89.48
Colony	0.667*** -52.58	0.881*** -89.99	1.197*** -112.68	0.664*** -28.87	0.560*** -59.72	0.850*** -35.09	0.282*** -19.13	0.415*** -29.73	0.745*** -42.54	0.568*** -76.19	0.531*** -47.94	0.563*** -62.77	1.320*** -52.43	0.932*** -57.76	0.755*** -50.66	0.893*** -54.3
Common language	0.216*** -62.52	0.199*** -74.76	0.356*** -123.05	0.178*** -28.43	0.334*** -130.82	0.465*** -70.56	0.137*** -34.12	0.163*** -42.9	0.438*** -91.9	0.177*** -87.18	0.150*** -49.65	0.220*** -90.05	0.703*** -102.5	0.205*** -46.82	0.217*** -53.58	0.380*** -85.02
Free trade agreement	0.486*** -135.71	0.446*** -161.31	0.547*** -182.64	0.503*** -77.55	0.536*** -202.37	0.650*** -95.17	0.351*** -84.5	0.260*** -66	0.502*** -101.8	0.482*** -229.36	0.291*** -93.07	0.430*** -169.86	0.610*** -85.81	0.437*** -96	0.334*** -79.4	0.536*** -115.68
Minimum internet use	0.169*** -309.03	0.0837*** -199.1	0.190*** -416.47	0.129*** -130.8	0.228*** -561.5	0.254*** -243.43	0.190*** -291.83	0.102*** -170.12	0.175*** -233.84	0.159*** -491.12	0.154*** -319.55	0.220*** -564.06	0.279*** -259.74	0.269*** -384.5	0.298*** -458.34	0.297*** -410.77
rep-prod-year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
par-prod-year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	1,959,906	2,939,85	2,939,85	979,953	3,593,161	653,302	979,953	979,953	979,953	4,573,114	1,959,906	3,593,161	653,302	1,306,604	979,953	979,953
Adj R-sq	0.521	0.516	0.564	0.508	0.634	0.725	0.546	0.591	0.634	0.598	0.587	0.616	0.793	0.623	0.713	0.692

t statistics in parentheses, * p<.1, ** p<.05, *** p<.01

Source: Own calculations using CEPII-BACI data and ITU data on internet use.

Table A.3. Digitalisation, trade in goods and FTAs

	(1)
	All
Log of combined GDP	0.978*** (141.12)
Log of distance	-0.621*** (-1230.44)
Contiguity	1.238*** (568.16)
Colony	0.807*** (237.64)
Common language	0.294*** (303.35)
Free trade agreement	0.183*** (167.96)
Minimum internet use	0.225*** (469.91)
FTA*Minimum internet use	0.234*** (636.58)
rep-prod-year FE	YES
par-prod-year FE	YES
N	31,358,496
Adj R-sq	0.6224
t statistics in parentheses, * p<.1, ** p<.05, *** p<.01	

Note: Sample includes 160 countries.

Source: Own calculations using CEPII-BACI data and ITU data on internet use.

Table A.4. Digitalisation and trade in services sectors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	Electricity and water supply	Construction	Wholesale and retail trade, repairs	Hotels and restaurants	Transport and storage	Post and telecommunication	Finance and insurance	Real estate activities	Renting of machinery and equipment	Computer and related activities	Other business services	Public admin and defence	Education	Health	Other
Log of combined GDP	0.906***	1.164***	0.898***	1.409***	0.920***	1.170***	1.221***	1.137***	1.152***	1.410***	1.553***	0.908***	1.107***	1.328***	1.057***
	-145.97	-183.22	-345.29	-262.46	-273.19	-189.44	-203.33	-205.56	-180.25	-201.57	-260.06	-161.89	-182.41	-187.88	-231.27
Log of distance	-1.371***	-1.050***	-1.063***	-1.169***	-1.247***	-1.139***	-0.866***	-0.932***	-0.942***	-1.183***	-1.129***	-0.963***	-0.935***	-0.922***	-1.038***
	(-93.69)	(-89.77)	(-141.21)	(-112.63)	(-127.32)	(-98.69)	(-69.96)	(-91.18)	(-74.97)	(-87.90)	(-94.29)	(-79.44)	(-82.80)	(-85.53)	(-100.89)
Contiguity	0.576***	0.687***	0.417***	0.886***	0.570***	1.048***	0.544***	0.877***	0.871***	0.737***	0.488***	0.569***	0.597***	0.727***	0.817***
	-13.02	-16.43	-13.92	-22.94	-14.62	-25.72	-12.59	-24.03	-20.47	-15.91	-10.9	-15.57	-17.22	-21.68	-21.22
Colony	0.838***	0.556***	0.658***	0.980***	0.856***	0.902***	0.909***	0.532***	0.644***	0.754***	1.296***	0.708***	0.614***	0.638***	0.857***
	-10.99	-8.11	-14.2	-15.47	-14.02	-13.38	-13.45	-9.13	-9.58	-10.2	-18.15	-8.71	-11.1	-11.73	-13.96
Common language	0.252***	0.372***	0.404***	0.291***	0.434***	0.251***	0.561***	0.297***	0.202***	0.470***	0.199***	0.354***	0.218***	0.157***	0.226***
	-6.88	-11.67	-20.37	-10.79	-16.49	-8.49	-18.23	-11.63	-6.75	-14.51	-6.44	-11.16	-8	-6.21	-8.47
Free trade agreement	-0.229***	-0.0401*	0.186***	0.109***	0.104***	-0.025	-0.145***	0.0572***	-0.0603**	-0.000725	0.0717***	-0.109***	0.104***	-0.00348	0.0147
	(-8.06)	(-1.74)	-12.67	-5.4	-5.44	(-1.12)	(-6.12)	-2.9	(-2.51)	(-0.03)	-3.06	(-4.66)	-4.75	(-0.17)	-0.72
Minimum internet use	0.409***	-	-	0.175***	0.0598***	0.335***	0.224***	0.196***	0.266***	0.323***	0.322***	0.467***	0.297***	0.332***	0.250***
	-41.53	(-8.77)	(-16.51)	-28.34	-10.68	-48.85	-29.56	-32.04	-32.07	-36.58	-42.47	-51.78	-41.1	-47.03	-40.24
rep-prod-year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
par-prod-year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	13,819	23,147	36,354	29,449	35,312	25,411	22,905	25,857	21,672	20,319	26,821	10,931	16,396	17,327	28,206
Adj R-sq	0.74	0.674	0.865	0.753	0.793	0.672	0.733	0.684	0.66	0.735	0.772	0.792	0.738	0.717	0.724
t statistics in parentheses, * p<.1, ** p<.05, *** p<.01															

Source: Own calculations using CEPII-BACI data and ITU data on internet use.

Table A.5. ICT goods imports, digital connectivity and services exports

	(1)	(2)
	All services	Digitally deliverable services
Log of combined GDP	1.243*** (833.69)	1.401*** (406.92)
Log of distance	-1.066*** (-382.89)	-1.071*** (-181.88)
Contiguity	0.696*** (70.36)	0.715*** (34.05)
Colony	0.782*** (48.65)	0.960*** (28.53)
Common language	0.319*** (45)	0.364*** (24.61)
Free trade agreement	0.0191*** (3.51)	-0.0230** (-2.00)
Minimum internet use	0.173*** (38.18)	0.222*** (22.6)
Minimum internet use * ICT good imports	0.00136 (2.79)	0.00954*** (9.11)
rep-prod-year FRE	YES	YES
par-prod-year FE	YES	YES
N	353,926	95,456
Adj R-sq	0.788	0.739

t statistics in parentheses, * p<.1, ** p<.05, *** p<.01

Source: Own calculations using CEPII-BACI data and ITU data on internet use.

Annex 4: Business questionnaire and supporting tables

CHARACTERISTICS OF YOUR COMPANY

1. What is the main sector your business operates in?

Respondents select (from a drop-down box) a sector description, based on ISIC rev 4 2 digit codes

1.a. Detailed sector of activity

Respondents select (from a drop-down box) a more detailed sector (at the 4 digit) based on their response to question 1.

2. Company location (of responding firm)

Respondents select (from a drop-down box) the country where the company is located.

3. Does your company belong to another company or enterprise group?

Respondents select from the:

- No
- Yes, we belong to a group as a subsidiary/affiliate
- Yes, we control a group

3.a. Please indicate where the group's headquarters are located?

This question is only asked if the previous question responded "Yes" to being part of a group.

Respondents select (from a drop-down box) the nationality of the group's head company.

3.b. In how many different countries other than the one you are operating from do you have a commercial presence (whether a subsidiary or branch)?

This question is only asked if the previous question responded "Yes" to being part of a group, or controlling a group.

Respondents select from:

- 0
- 1
- 2 to 5
- 6 to 15
- 16 to 49
- 50 to 99
- More than 100

4. How old is your company?

- Less than 1 year
- 1-5 years
- 6-15 years
- 16-25 years
- More than 26 years

5. Number of employees

- Just me
- 1 - 9
- 10 - 49
- 50 - 99
- 100 - 249
- 250 - 499
- Greater than 500

6. Turnover (in million USD)

- less than 0.1
- 0.1 - 0.5
- 0.6-1
- 1.1- 10
- 10. 1 – 50
- 50.1 -200
- >200

7. What is the approximate share of ICT in your firm's total costs?

(ICT is herein defined as the costs of physical infrastructure (computers, storage centres); the workers engaged in their maintenance; and other data management activities (databases, purchases of market research data, etc.))

Respondents select from the following:

- Less than 1%
- 1% to 5%
- 6% to 10%
- 11% to 30%
- 31% to 50%
- 51% to 76%
- 76% to 100

8. What is the approximate share of data management costs in ICT costs?

(data management activities refer to activities such as databases, purchases of market research data, and big data analytics)

- Less than 1%
- 1% to 5%
- 6% to 10%
- 11% to 20%
- 21% to 30%
- 31% to 40%
- 41% to 50%
- 51% to 75%
- 75% to 100

9. How important do you consider data management, processing, or analysis to your core business functions?

Respondents select from:

- Very important (core business function)
- Important
- Somewhat important
- Not important
- Not related to business function

10. Where is your data stored?

Respondents are asked to select the three most commonly used practices (but can select more or less as applicable):

- Internally (own servers located in the same country of operation)
- Internally (own servers located in other countries)
- Externally (outsourced to a non-cloud based company located in the same country of operation)
- Externally (outsourced to a non-cloud based company located abroad)
- Externally (cloud-based services with conditions established on the location where the data should be stored)
- Externally (cloud-based services without any conditions on the location where the data should be stored)
- Externally (lease of servers without other services attached to them)
- Do not know

NATURE AND EXTENT OF ENGAGEMENT IN DIGITAL TRADE**11.a. What are the characteristics of your best-selling product and/or service?**

- A Good,
- a Service
- a Bundled Good with Service (e.g., an eReader with a content subscription) [Respondents select one of the three]

11.b. What is the main customer segment your best-selling product and/or service targets?

- Individual consumers (households)
- Business
- Government

11.c. Does your service require a physical device for consumption (e.g. a smartphone, e-reader, tablet..)?

Only if respondents reply "Service" in 11. a.

- Yes
- No

11.d. Can your service be delivered online?

Only if respondents reply "Service" in 11. a.

- Yes
- No

12. What proportion of your company's annual sales of goods and services are digitally ordered?

(digitally ordered refers to the orders placed via the Internet, private networks (EDI), websites or digital platforms)

- less than 1%
- 1-10%
- 11-25%
- 26-50%
- 51-75%
- 76-100%

13. What proportion of your digitally ordered sales are from outside the country where the company is headquartered (Foreign Sales)?

- None
- less than 1%
- 1-10%
- 11-25%
- 26-50%
- 51-75%
- 76-100%

14.a. Please rank the top 3 channels through which these orders are made?

- Own website
- Private Network (electronic data interchange)
- Third party website (platform owned by another company)
- Mobile platforms
- Other

14.b. Please Specify if you use other channels to receive orders than the ones listed above (OPTIONAL)

This is an open-ended and optional question for respondents to provide comments.

15. In how many countries do you have clients/customers which you serve without having a local presence there?

- Zero (sales only to the domestic market)
- 1
- 2-10
- 11-25
- 26-50
- 51-100
- 101<

16. Do you rely on digitally acquired inputs? If so, please describe the most relevant ones and how these are used. (OPTIONAL)

This is an open-ended and optional question for respondents to provide comments.

MEASURES AFFECTING DIGITAL TRADE

This section collects information about the range of measures that affect your ability to engage in digital trade. Since different challenges occur at different stages of the production process, five key stages are distinguished: design, production, delivery, use and connections.

17. Please rank the following processes by order of digital intensity

(digital intensity refers to the extent to which the process is reliant of digital technologies)

- Design (whether R&D, market re-search or pre-production)
- Production (whether in a factory or office, i.e. getting products to market and relating to the main activity of the firm)
- Delivery (getting the products you produce to consumers, whether to-the border, at the border or behind the border)
- Pre and post-sales (connecting with consumers or user-base, advertising, post sales services)
- Connection (connecting the different processes together, design to users, to production or traceability)

18. Please rank the following top 5 issues according to how important these are for your overall operations

- Information flow and interoperability
- IPR
- Access to services
- Tariffs
- Trade facilitation
- Competition
- Payments
- Digital identity
- Consumer protection
- Performance requirements (e.g., local content, technology transfer requirements, etc.).
- Movement of people

19.a. On a scale from 1 (negative) to 5 (positive) with 3 being neutral, please rate how your company's cross-border digital transactions are affected by the following issues. In the last column, please select the process for which these issues are the most important:

For example, if measures that affect the transfer of data abroad are likely to have a positive impact on your economic activity respondents would tick the box 5. In drop-down option please choose the process where the identified issue is important. If an issue is not relevant please select option 3 (neutral).

Category	Name	1	2	3	4	5	Stage
Information flow and interoperability	Measures that affect the transfer of data abroad						
	Measures that impose that data be stored locally						
	Interoperability between systems (technical interoperability)						
	Interoperability between standards						
IPR	Intellectual property right protection and enforcement						
	Intermediary liability						
Access to services	Access to telecommunications and other ICT services at competitive prices						
	Access to supporting services (e.g., transport and logistics, financial) at competitive prices						
Tariffs	Tariffs at home						
	Tariffs abroad						
Trade facilitation	Customs procedures						
	Digital single windows						
	De minimis Thresholds						
Competition	Effectiveness and clarity of competition rules						
Payments	Use of e-payment methods						
Digital identity	Use of e-signatures and e-contracts						
Other	Non-discriminatory conditions for registration of domain names						
	Consumer protection						
	Discriminatory taxation and subsidies						
	Performance requirements (e.g., local content, technology transfer requirements, etc.).						
	Cybersecurity						
	Movement of people						
	Other (please specify):						

19.b. If possible, please provide examples of situations where the above measures affected your firm's digital activities:

This is an open-ended and optional question for respondents to provide comments.

20.a. Do you use digital platforms to engage in cross-border trade?

- Yes
- No

21.a. For what purposes do you use digital platforms when engaging in cross-border trade?

(Respondents rank top 4)

- Providing information on products, opening hours, contact information etc.
- E-purchases (e.g., for inputs into production)
- E-sales
- E-delivery
- Advertising
- Communication with customers
- Enterprise resource planning (software)
- Cloud computing
- Supply chain management
- Digital financing
- E-payments
- Other

21.b. Do you use digital platforms for purposes other than those listed above? (OPTIONAL)

This is an open-ended and optional question for respondents to provide comments.

22.a. Please rank the top 3 areas where you encounter the most challenges when using digital platforms (please refer to the platform that you most use)

(Click and drag 5 options from left to right. Rank the area where you encounter most challenges first)

- Data portability (i.e., the ability to transfer or copy data seamlessly between different platforms).
- Sending goods ordered on platforms
- Receiving payments
- Return policies
- Consumer rights
- Privacy and data security
- Lack of effective choice between platforms
- Other, please specify:

22.b. What other challenges do you encounter when using digital platforms? (OPTIONAL)

This is an open-ended and optional question for respondents to provide comments.

23. What are some of the main benefits for your firm in obtaining access to digital platforms? (OPTIONAL)

This is an open-ended and optional question for respondents to provide comments.

THE BENEFITS AND FUTURE CHALLENGES OF DIGITALISATION (OPTIONAL)

24. What are the benefits of digitalisation to your business? How does digital technology enable your business?

This is an open-ended and optional question for respondents to provide comments.

25. What are the main challenges that you expect digitalisation will bring for your business in the next five years?

This is an open-ended and optional question for respondents to provide comments.

26. What role can trade agreements play in improving conditions for digital trade? What measures contained in trade agreements do you consider to be particularly important for digital trade? Are there any other issues that could be usefully addressed in trade agreements to enhance the global governance for the digital economy?

This is an open-ended and optional question for respondents to provide comments.

27. From the perspective of your business, what are the key components necessary to increase consumers' trust in digital activities?

This is an open-ended and optional question for respondents to provide comments.

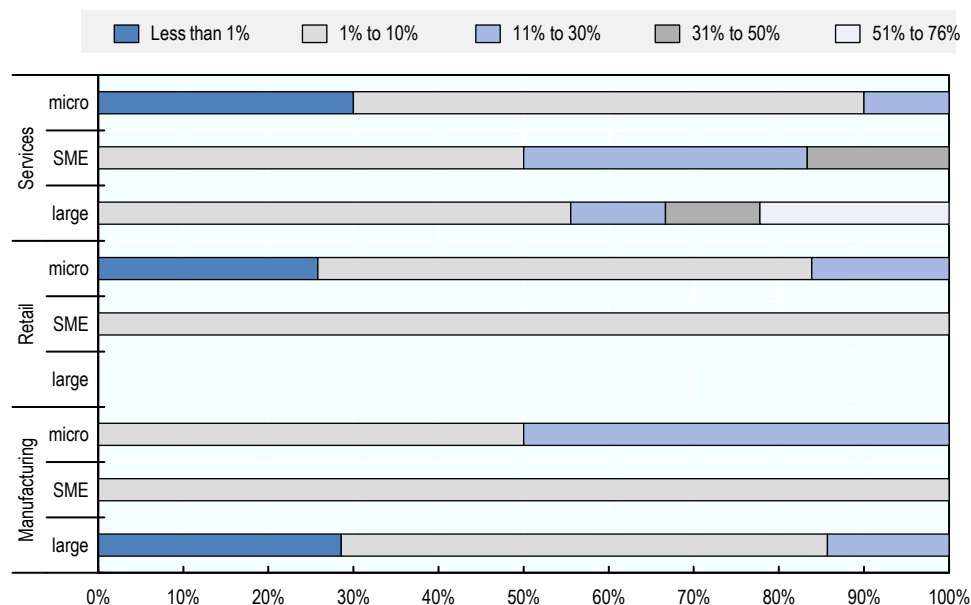
Contact details - voluntary

Respondents can provide contact details for the OECD to follow up, or keep the business informed about the progress of the project.

ICT costs, sales and digital intensity of processes

ICT cost structures vary considerably across firm size and sector of operation (Figure 15).²⁸ Responding firms reported higher ICT costs as a proportion of total costs in the services sectors, and, on average, larger firms tended to have higher ICT costs relative to smaller firms. In both retail and other services, around 90% of respondents claimed to have ICT costs below 10% of total costs.

Figure A.1. ICT costs are highest for larger firms and in the services sectors

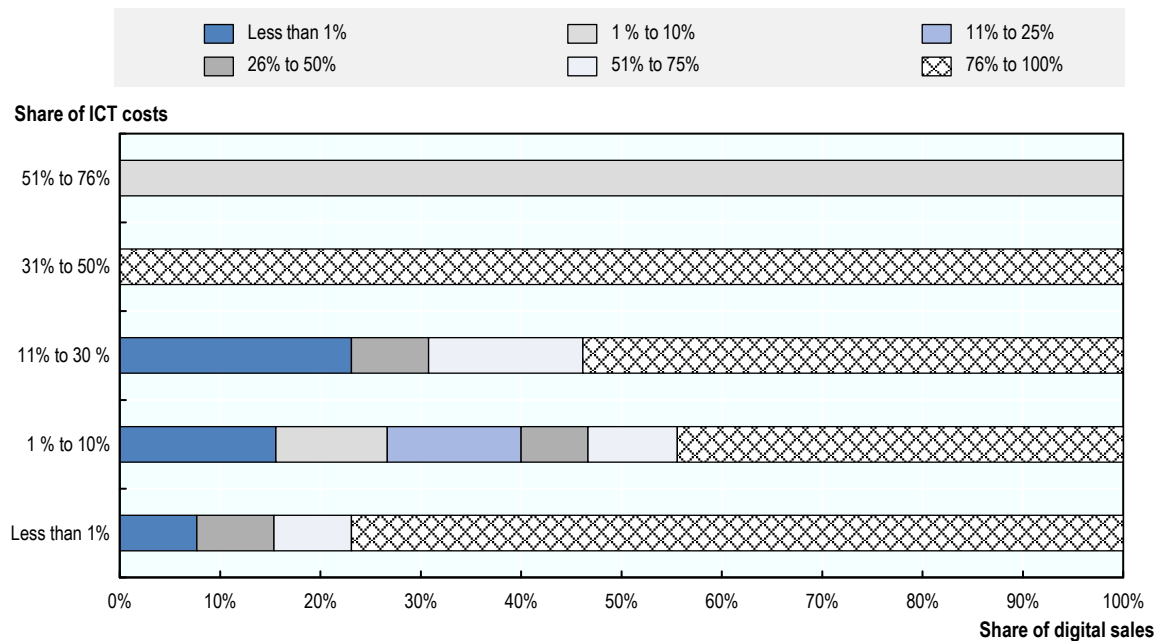


Note: The graph shows the distribution of reported share of ICT costs over total costs. The sample is composed of 12 firms in the manufacturing sector, 3 of which are SMEs, 7 large and 2 micro. In the retail sector there are 34 firms, 31 of which are micro enterprises. In the services sector 12 are SMEs, 9 large and 10 micro.

Source: OECD Business Questionnaire.

The firms reporting the highest ICT costs are not always those that report selling the most digitally (Figure 16). Out of all responding firms, 46% claimed that the share of their ICT cost over total costs was below 10%, but more than half of the sales of these firms were digitally ordered. Most firms in this category were micro-enterprises. This provides some preliminary evidence to the notion that firms, especially smaller ones, might be able to engage in digital sales with little upfront ICT costs.

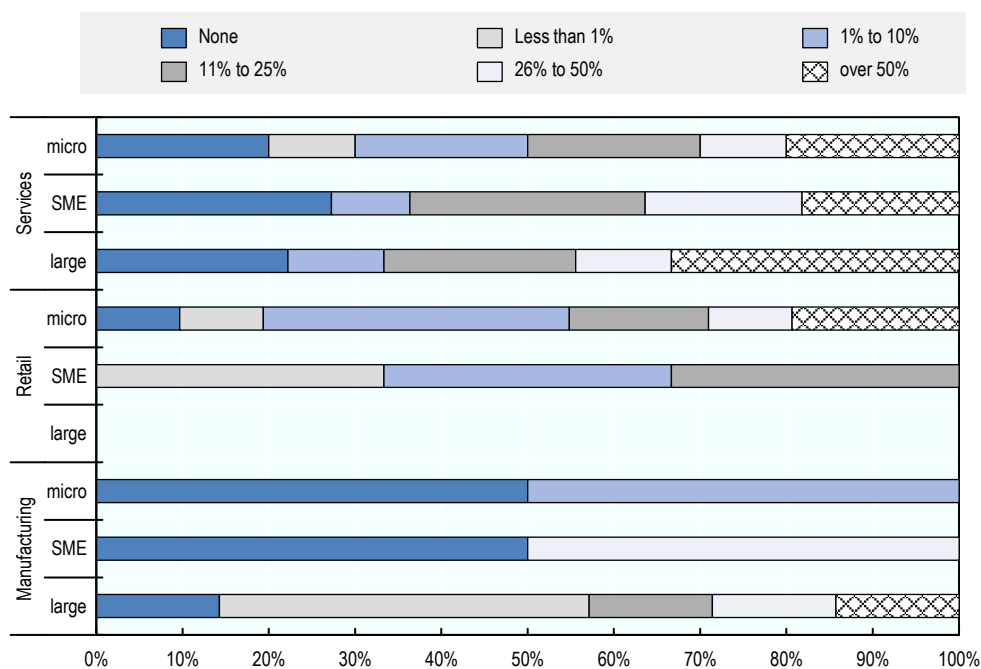
²⁸ ICT costs were defined in the questionnaire as "the costs of physical infrastructure (computers, storage centres); the workers engaged in their maintenance; and other data management activities (databases, purchases of market research data, etc.)".

Figure A.2. Share of ICT costs in total costs against digital sales

Note: The graph shows the distribution of reported share of ICT costs over total costs against the share that companies claimed to sell digitally (76 firms).

Source: OECD Business Questionnaire.

Where electronic sales abroad are concerned, the data show that services, and in particular retail, sectors are most engaged (confirming some of the findings from Figure 2). Within these sectors differences in the degree of engagement by firm size are, however, small – micro, small and large firms have comparable levels of cross-border sales. However, in manufacturing, cross-border sales are generally lower than in services and there are differences across firms of different sizes – larger firms export more through digital networks than smaller firms (Figure 17). This might reflect that larger firms are better able to face the costs associated with the physical constraints of sending digitally ordered goods across borders. This suggests, in turn, that traditional physical constraints continue to matter for firms engaged in digitally enabled trade in goods.

Figure A.3. Digitally ordered sales from abroad are highest in the retail and services sectors.

Note: The graph shows the distribution of digitally ordered sales across firm size and sector. The sample is composed of 12 firms in the manufacturing sector, 3 of which are SMEs, 7 large and 2 micro. In the retail sector there are 34 firms, 31 of which are micro enterprises. In the services sector 12 are SMEs, 9 large and 10 micro.
Source: OECD Business Questionnaire.

Table A.6. Issues affecting overall operations (share)

	Top Issue	2 nd Issue	3 rd Issue	4 th issue	5 th issue
Intellectual property	6.5%	8.1%	0.0%	7.9%	11.1%
access to services	9.7%	4.8%	7.9%	14.3%	11.1%
competition policy	11.3%	6.5%	7.9%	7.9%	3.2%
consumer protection	11.3%	11.3%	9.5%	4.8%	3.2%
digital identity	11.3%	9.7%	6.3%	6.3%	1.6%
information flow	9.7%	16.1%	11.1%	4.8%	28.6%
interoperability	8.1%	9.7%	4.8%	9.5%	1.6%
movement of people	0.0%	3.2%	4.8%	1.6%	0.0%
payments	8.1%	6.5%	22.2%	19.0%	19.0%
performance requirements	4.8%	8.1%	9.5%	6.3%	6.3%
tariffs	8.1%	4.8%	6.3%	9.5%	3.2%
trade facilitation	11.3%	11.3%	9.5%	7.9%	11.1%

Note: Respondents were asked to rank the top 5 issues affecting their overall operations.

Source: OECD Business Questionnaire.