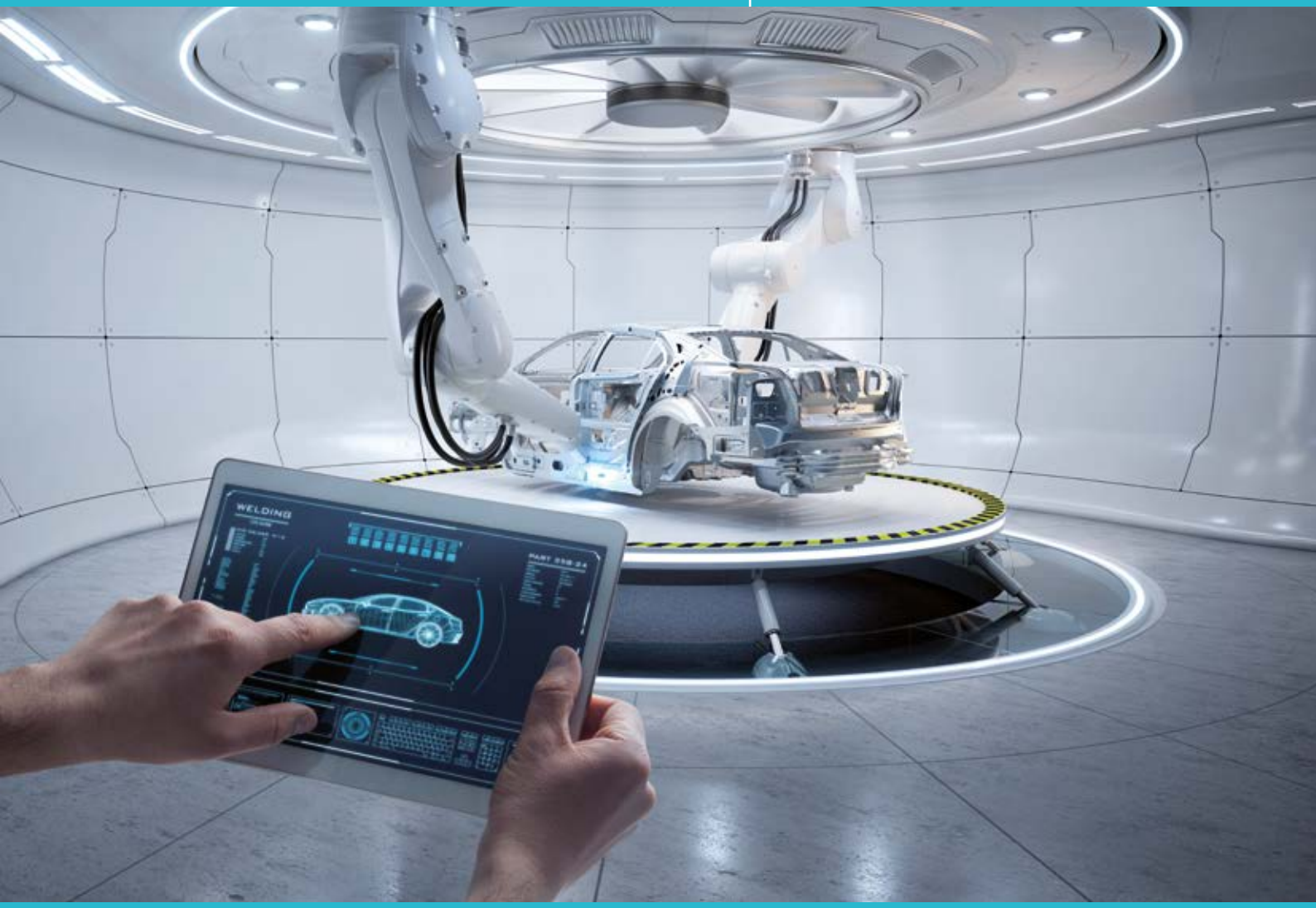
WORLD TRADE ORGANIZATION

WORLD TRADE REPORT 2018

The future of world trade: How digital technologies are transforming global commerce



What is the World Trade Report?

The World Trade Report is an annual publication that aims to deepen understanding about trends in trade, trade policy issues and the multilateral trading system.

What is the 2018 Report about?

The 2018 World Trade Report examines how digital technologies are transforming global commerce. It considers the different ways in which digital technologies affect international trade and the extent of potential forthcoming changes, and discusses the consequences of this transformation for existing and future international trade cooperation.

Find out more

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Contents

Acknowledgements and Disclaimer	**2**
Foreword by the WTO Director-General	**3**
Key facts and findings	**5**
Executive summary	**6**
A. Introduction	**14**
1. Technological innovations have shaped global trade	16
2. A new world in the making	19
3. Structure of the report	20
B. Towards a new digital era	**22**
1. The rise of digital technologies	24
2. How much digitalization?	49
3. Conclusions	59
C. The economics of how digital technologies impact trade	**62**
1. Lower trade costs: opportunities and challenges	64
2. Changes in trade patterns	80
3. Quantitative analysis of the impact of new technologies on trade	110
4. Conclusions	116
D. How do we prepare for the technology-induced reshaping of trade?	**130**
1. Main opportunities and challenges	132
2. How do governments respond?	132
3. Digital trade and international cooperation	148
4. Conclusions	193
E. Conclusions	**202**
Opinion pieces	
Tim Harford, “What else needs to change?”	29
Wim Naudé, “Emerging technologies and the future of African manufacturing”	46
Avi Goldfarb and Dan Trefler, “How artificial intelligence impacts international trade”	140
Robert W. Staiger, “On the implications of digital technologies for the multilateral trading system”	150
Patrik Tingvall and Magnus Rentzhog, “Is the WTO 3D printing-ready?”	158
Anupam Chander, “Enabling and regulating the digital economy”	194
Bibliography	**204**
Technical notes	**218**
Abbreviations and symbols	**223**
List of figures, tables and boxes	**225**
WTO members	**229**
Previous World Trade Reports	**230**

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Disclaimer

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Foreword by the WTO Director-General

Trade and technology are closely interlinked. From the invention of the wheel, to the railways, to the advent of containerization, technology has constantly played a key role in shaping the way we trade – and this phenomenon is accelerating like never before. We are living through an era of unprecedented technological change, and a series of innovations that leverage the internet could have a major impact. For example, the Internet of Things, artificial intelligence, 3D printing and Blockchain have the potential to profoundly transform the way we trade, who trades and what is traded.

These developments could unlock many opportunities for individuals, entrepreneurs and businesses around the world. However, this process is not automatic. Technological advances per se are not a guarantee of greater trade growth and economic integration. History shows that successfully managing the structural changes driven by technology is central to ensuring that everybody can benefit. Therefore, we need to understand how to harness these new technologies. This is key to ensuring that the trading system can promote growth, development and job creation, and helping in the effort to deliver the Sustainable Development Goals.

The *World Trade Report 2018* highlights the interplay between technology and trade. It looks at how digital technologies are transforming global commerce today, and at their implications in the years to come. This report provides a qualitative analysis of the changes that are underway, and attempts to quantify the extent to which global trade may be affected in the next 15 years.

The Report helps to illustrate some of the big changes that are already happening. For example, it shows how digital technologies are reshaping consumer habits. E-commerce is booming thanks to the widespread use of the internet and of internet-enabled devices which provide consumers with direct access to online markets. UNCTAD estimated the total value of global e-commerce transactions, both domestic and cross-border, at US$ 25 trillion in 2015. This represents an increase of around 56 per cent compared to 2013. Firms are also surfing this wave, as digital technologies allow for easier entry into markets and increased product diversity, making it easier for them to produce, promote and distribute their products at a lower cost.

The Report also shows the impact of technological advances in cutting trade costs. Between 1996 and 2014, international trade costs declined by 15 per cent. Technological innovation played an important role here, and it has the potential to do even more. Notwithstanding the current trade tensions, we predict that trade could grow yearly by 1.8 to 2 percentage points more until 2030 as a result of the falling trade costs, amounting to a cumulated growth of 31 to 34 percentage points over 15 years. The Report finds that the decline in trade costs can be especially beneficial for micro, small and medium-sized enterprises, and for firms from developing countries, if appropriate complementary policies are put in place and challenges related to technology diffusion and regulation are addressed. Our estimations foresee that, in such a scenario, developing countries' share in global trade could grow from 46 per cent in 2015 to 57 per cent by 2030.

The advance of digital technologies can also bring about changes in the structure of trade. Beyond easing trade in goods, digital technologies can facilitate services trade and enable new services to emerge. The Report predicts that the share of services trade could grow from 21 per cent to 25 per cent by 2030. Other effects could include, for example, Blockchain helping smaller businesses to start trading by supporting them in building trust with partners around the world. 3D printing may help to democratize manufacturing by lowering the barriers to entry. More generally, these technologies could potentially lead to an expansion in global value chains, further shifting production activities to developing countries. Or we could see the opposite effect if it becomes more efficient to bring production activities back together in "smart" local factories than to offshore them.

Notwithstanding the benefits of digital technologies, they are also giving rise to a number of concerns. This includes market concentration, loss of privacy, security threats, the digital divide, and the question of whether digital technologies have really increased productivity.

These are very important questions, which deserve the attention and action of the international community. We can't simply leave the evolution of our technological future to chance, or trust it to market forces. We all have a duty to make this technological revolution a truly inclusive one.

Domestically, governments may need to look at how to tackle many of these challenges, including in areas such as investment in digital infrastructure and human capital, trade policy measures and regulation. International cooperation can also help governments derive more benefits from digital trade and help drive inclusion. At present, WTO members are trying to get to grips with these issues. The WTO framework, and in particular the GATS, is relevant for digital trade and WTO members have already taken certain steps to promote digital trade within the existing framework. In addition, discussions are ongoing among a large group of members regarding how members may want to respond to continued changes in the economy, and to ensure that everybody can participate and benefit from the digital economy.

Change is part of life. The question is not whether we like it, but rather how we choose to respond. Are we ready to rise to the challenges and seize the opportunities that this brave new world presents? I believe that this is the defining question facing governments around the world today. I hope this report will inform their response, and help to put inclusivity at the heart of these efforts. While there is no "one-size-fits-all" recipe, I am convinced that international cooperation will remain central to helping governments navigate these changes and to ensuring that digital technologies can help build a more open and inclusive trading system – now and for generations to come.

Roberto Azevêdo
Director-General

Key facts and findings

- Digital technologies such as artificial intelligence, the Internet of Things, additive manufacturing (3D printing) and Blockchain have been made achievable by the exponential rise in computing power, bandwidth and digital information.
- Digital technologies are reshaping consumer habits by shifting purchases online through the widespread use of internet-enabled devices which provide consumers with direct access to online markets.
- It is estimated that, in 2016, the value of e-commerce transactions totalled US$ 27.7 trillion, of which US$ 23.9 trillion was business-to-business e-commerce transactions.
- On the supply side, digital technologies allow for easier entry and increased product diversity, making it easier for firms to produce, promote and distribute their products at a lower cost.
- The benefits of digital technologies notwithstanding, they are also giving rise to a number of concerns, including market concentration, loss of privacy and security threats, the digital divide, and the question of whether digital technologies have really increased productivity.
- International trade costs declined by 15 per cent between 1996 and 2014. New technologies will help to further reduce trade costs. Our projections predict that trade could grow yearly by 1.8 to 2 percentage points more until 2030 as a result of the falling trade costs, amounting to a cumulated growth of 31 to 34 percentage points over 15 years.
- The wide adoption of digital technologies changes the composition of trade in services and goods, and redefines intellectual property rights in trade. Trade in information technology products has tripled in the past two decades, reaching US$ 1.6 trillion in 2016.
- The importance of services in the composition of trade is expected to increase. We predict the share of services trade to grow from 21 per cent to 25 per cent by 2030.
- Digitalization has led to a decline in trade of digitizable goods (e.g. CDs, books and newspapers) from 2.7 per cent of total goods trade in 2000 to 0.8 per cent in 2016. The trend is likely to continue with the advent of 3D printing technology.
- Regulation of intellectual property rights, data flows, and privacy as well as the quality of digital infrastructure are likely to emerge as new sources of comparative advantage.
- The decline in trade costs can be especially beneficial for MSMEs and firms from developing countries, if appropriate complementary policies are put in place, and challenges related to technology diffusion and regulation are addressed. Our estimations foresee that, in such case, developing countries' share in global trade could grow from 46 per cent in 2015 to 57 per cent by 2030.
- Digital technologies give rise to opportunities and challenges that may require the consideration of governments and the international community in areas as diverse as investment in digital infrastructure and human capital, trade policy measures and regulation.
- Provisions referring explicitly to digital technologies have been included in an increasing number of regional trade agreements. The most common provisions refer to e-government, cooperation and the moratorium on customs duties on electronic transmissions.
- While the WTO framework, and in particular the General Agreement on Trade in Services, is relevant for digital trade and WTO members have already taken certain steps to promote digital trade within the existing framework, members will have to consider how they want to respond to continued changes in the economy and the way we do business.

Executive summary

A. Introduction

Technological innovations have shaped global commerce.

From the invention of steamships, railways and the telegraph which fuelled the first industrial revolution in the early 1800s, to the advent of containerization in the 1950s and, more recently, the rise of the internet, technological innovations have significantly reduced trade costs and transformed the way we communicate, consume, produce and trade. However, technological advances are not a guarantee of greater or of stable trade growth or economic integration. In fact, over the past two centuries, it has been the ability to manage technology-driven structural changes that has largely determined whether global trade integration has progressed or regressed.

The rise of digital technologies promises to further transform international trade.

We are entering a new era, in which a series of innovations that leverage the internet could have a major impact on trade costs and international trade. The Internet of Things (IoT), artificial intelligence (AI), 3D printing and Blockchain have the potential to profoundly transform the way we trade, who trades and what is traded.

Understanding how these technologies may impact world trade is essential to help maximize the gains.

While technological advances are an essential enabler of international trade expansion, the capacity to manage the changes at play is equally important. Appreciating the depth and breadth of these changes is critical to help governments reap the benefits that these technologies create and address the challenges that may arise.

B. Towards a new digital era

The digital revolution has been enabled by technological changes in computing, communications and information processing.

The past half-century has seen a massive increase in processing and computing power, an equally enormous decline in its cost, and widespread adoption of personal computers. This has been accompanied by an equally rapid increase in bandwidth – the carrying capacity of a communication system – which has proved to be an important catalyst for the swift growth of the internet and mobile networks. Finally, the ability to turn many forms of information that once existed solely in analogue form into digital information and to collect, store and analyse it has expanded enormously.

The shift from mechanical and analogue electronic technology to digital technologies, the rapid adoption of the latter, particularly in the information and communication sectors, and the sweeping economic and even social changes that have accompanied this shift, have all laid the foundations for the digital revolution.

The technologies that are of particular interest in this report – IoT, AI, 3D printing and Blockchain – have been made possible by these same forces.

The IoT equips everyday objects with identifying, sensing, networking and processing capabilities that allow them to communicate with one another and with other devices via the internet to achieve particular objectives. The IoT can improve consumers' quality of life, for example by helping to track physical fitness and health or to better manage household tasks and supplies through smart appliances, such as connected refrigerators. For businesses, the IoT can help to improve operational efficiency through better preventive maintenance of machinery and products, and can also provide opportunities to sell new digital products and services. Nevertheless, wider adoption of the technology faces some stiff challenges. The deployment of connected devices, many of which were designed without much thought for security, can contain dangerous vulnerabilities. Connecting large numbers of new devices to the internet can create serious bottlenecks in telecommunication systems. Finally, as so many companies are competing to develop new connected devices, compatibility issues are likely to arise in the future.

Artificial intelligence (AI) is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with humans, such as the ability to reason, discover meaning, generalize or learn from past experience. Much AI today is "narrow" or "weak" AI, in that it is designed to perform relatively limited tasks (e.g. facial recognition or playing chess). However, the long-term goal of many AI researchers is to create "general" or "strong" AI which would outperform humans at nearly every cognitive task. AI can be used to increase efficiency in the production of goods and services and to aid innovation by generating new ideas. While AI has reached a lot of important milestones, numerous

technical challenges still lie ahead of it, including certain cognitive tasks that people often undertake without thinking, such as perceiving and navigating their physical environment. Forthcoming research on AI is likely to focus on making AI systems more robust and maximizing their societal benefits while mitigating adverse effects, which could include increased inequality and unemployment.

3D printing is the process of making a three-dimensional solid object of virtually any shape from a digital model. In time, it could lead to a shift towards more digital and localized supply chains and lower energy use, resource demands and related CO_2 emissions over the product life cycle. However, full realization of the potential of 3D printing depends on overcoming a number of obstacles. The necessary material technology is still nascent and building complex objects is slow. There are also regulatory issues that need to be addressed before 3D printing can be widely adopted in the consumer market. Finally, although declining in recent years, the cost of printers, materials and scans is still relatively high, especially for deployment in micro, small and medium-sized enterprises (MSMEs).

A blockchain is a decentralized, distributed digital record of transactions (ledger) that is secured using various cryptographic techniques. Information, once added to a blockchain, is time-stamped and cannot be easily modified, making it easy to track attempted changes, and transactions are recorded, shared and verified on a peer-to-peer basis by anyone with the appropriate permissions. Blockchain is only one type of distributed ledger technology. However, the term "blockchain" is now commonly used to refer more generally to distributed ledger technology and to the phenomenon surrounding it. Although Blockchain technology presents interesting features in terms of security, immutability, transparency, traceability and automation, its wide-scale deployment currently hinges on various challenges. Scalability remains limited, existing blockchain networks and platforms do not "talk" to one another, and there are a number of unresolved legal issues, ranging from the legal status of blockchain transactions to the question of liability.

With digitalization, economic activity around the world has been subject to tremendous changes.

New business models have emerged, with digital technologies as their main underpinnings; digital platforms are becoming the new marketplace amidst the rapid expansion in internet access over the last decade. Ever-increasing online visibility, through interactive websites, apps and social media, has become embedded in marketing strategies, allowing businesses to interact with customers and thereby boost online sales. Companies also rely increasingly on artificial intelligence (AI) and big data to analyse consumers' online shopping experiences in order to profile preferences and adapt products accordingly.

In this regard, a large array of products and services, including travel booking, telehealth and e-learning are delivered remotely through information and communication technology (ICT) networks. Digital technologies such as 3D printing are making it feasible to supply customized goods and services to consumers who show a preference for personalized products.

The benefits of digital technologies notwithstanding, they are also giving rise to a number of concerns and questions, including about market concentration, loss of privacy, productivity and the digital divide.

There are commercial and social benefits to the collection and analysis of personal data. But there are also growing concerns that companies are not taking data privacy seriously enough. Partly as a result of this, a number of governments are enacting legislation to better clarify what information about individuals companies can collect and retain and what they can do with this data.

The nature of competition in digital markets is materially different from competition in traditional markets as it tends to be based on innovation rather than on pricing. To this extent, anti-competitive effects that arise may be transient. However, significant welfare losses may arise from these anti-competitive effects before one platform or entrenched business model is replaced by another.

Questions have been raised about how much the adoption of digital technologies has raised economic productivity. Measures of productivity in the United States, for instance, suggest a significant slowdown since 2005. Several explanations have been given to explain this discrepancy, including the mismeasurement of inputs and outputs, and delays in the time needed for technological change to work itself throughout the whole economy.

The digital divide is one of the major challenges facing the digital economy. The digital divide between developed and developing countries remains wide in terms of access to broadband services and e-commerce platforms, quality of infrastructure and legal framework. Similar divides exist within countries, for example, internet penetration rates are higher for men than for women, small firms lag behind large firms

in their readiness to engage in the digital economy, and the impact of digitalization varies significantly across skill categories, increasing demand for high-skill workers which are complementary to that digitalization, while decreasing demand for less skilled workers when the latter are easily replaced by labour-saving technologies and automation.

Digital intensity differs across sectors and firms.

Sectors differ significantly in their dependence on digital technologies. On average, services firms are more intensive users of digital technology than manufacturing firms, while high-tech firms are more intensive users of industrial robots than services or low-tech firms.

Even in the most advanced economies, constant innovation and changing business models inevitably result in gaps in data collection.

Efforts to collect data on digital trade remain in their infancy, particularly in developing economies and least-developed countries (LDCs), where smaller transaction volumes and lower levels of ICT penetration call into question the value of dedicating limited resources to developing the relevant statistics. Despite these challenges, it is possible to illustrate the current state of the digital economy using available statistical and anecdotal evidence and to make inferences about its likely future direction.

Official data on e-commerce transactions is sparse and not comparable across economies, but it does offer some useful information.

In their latest Information Economy Report, the United Nations Conference on Trade and Development (UNCTAD) estimates that the total value of global e-commerce transactions, both domestic and cross-border, was US$ 25 trillion in 2015, up 56 per cent from US$ 16 trillion in 2013 (UNCTAD 2017a). The US International Trade Commission (USITC) offers a similar estimate of US$ 27.7 trillion for global e-commerce in 2016, up 44 per cent from 2012. USITC estimates the magnitude of business-to-business (B2B) transactions at US$ 23.9 trillion in 2016, six times larger than business-to-consumer (B2C) transactions (US$ 3.8 trillion). Current statistics do not break down e-commerce transactions by origin. As a result, domestic and cross-border transactions are not separately identifiable.

The statistical community has developed a "work in progress" conceptual measurement framework, taking into account the nature of the transactions ("how"); the product ("what"); and the actors involved ("who"). Under this framework, "digitally-enabled" transactions are split into "digitally-ordered" and "platform-enabled". E-commerce transactions are understood to be digitally-ordered but may be delivered either digitally or physically.

Firm-level financial data provide indications of where the market is going.

A series of financial reports from leading publicly traded digital economy firms (e.g. Alibaba, Alphabet, Amazon, Facebook, Microsoft, Netflix, Spotify, etc.), taken together, demonstrate not only the global reach of these firms but also the fact that they continue to have vast opportunities to grow their international operations. For example, nearly one-third (32 per cent) of Amazon's net sales are international. The international streaming revenue of Netflix rose from US$ 4 million in 2010 to more than US$ 5 billion in 2017. Although Alibaba's commerce revenue is mostly domestic (92 per cent in 2016-17), it is notable for being a large e-commerce firm based in a developing economy with considerable scope to grow its cross-border activities.

C. The economics of how digital technologies impact trade

New technologies may help reduce trade costs.

New technologies may decrease the relevance of distance, whether geographical, linguistic or regulatory. They also facilitate searches for products, help verifying quality and reputation, and help to match consumer preferences to products.

Certain AI applications can benefit trade in goods, for example by optimizing route planning and enabling autonomous driving, reducing logistics costs through cargo and shipment tracking, using smart robots to optimize storage and inventory, and integrating 3D printing in order to reduce the need for transport and logistics services. New technologies can thereby reduce trade costs by reducing transportation and storage costs, but also by reducing time to transport, as well as the uncertainty of delivery times due to better logistics. These costs represent a major share of overall trade costs and therefore their reduction can have a large potential impact on trade flows.

Trade costs related to customs procedures still hamper trade, especially in manufacturing products. Basic electronic systems reduce the time spent on customs compliance while Blockchain and AI promise further reductions. Their highest potential lies in time-sensitive goods flows such as global value chain (GVC)-related trade or perishable products.

Information and transaction costs are especially important in manufacturing, where they account for around 7 per cent of total trade costs. Online platforms help to overcome obstacles such as a lack of information and of trust in cross-border transactions. In addition, the IoT and Blockchain may simplify verification and certification procedures, and real-time translation and online platforms facilitate communication in different languages.

Innovations in cross-border payments and financial services further facilitate trade – for example, e-commerce platforms that circumvent traditional payment systems through blockchain technologies may help to bring down the transaction costs of cross-border trade.

The potential decline in trade costs can disproportionately benefit MSMEs and firms from developing countries...

Many trade costs such as logistics and transaction costs or cumbersome customs procedures weigh more heavily on MSMEs and are much higher in developing countries. Innovations in cross-border payment systems have had their largest impact in developing countries and for MSMEs. Hence, the potential of new technologies to facilitate trade for MSMEs and developing countries disproportionately can be large.

...but there are also challenges related to complementary policies, technology diffusion and regulation.

While new technologies and big data offer many opportunities for firms to organize their production and reach consumers more efficiently, there are also challenges.

If digital technologies are to realize their promises, ICT services are paramount. Machines need to be able to "speak" to each other regardless of the technology used and of whether the IoT, 3D printing or blockchain technologies are involved, and ITC services can enable this.

Much progress has been made on digital connectivity in terms of mobile/cellular, fixed broadband and internet penetration. Nevertheless, such progress has not been uniform across and within countries, nor between urban and rural populations.

Finally, while preliminary findings on new technologies such as 3D printing or Blockchain are promising, more work is needed in order to explore their potential fully. In addition, a number of technical and regulatory challenges still have to be overcome, including warranty and liability issues, lack of interoperability of various platforms, and the legal status of smart contracts.

New technologies can also significantly affect what we trade, who trades what and how we trade. The wide adoption of digital technologies is changing the composition of trade in different categories of services and goods, and is redefining intellectual property rights in trade.

Services sectors are at the centre of the recent technological revolution, as technological advances have enabled a growing array of services to be purchased online and supplied digitally across borders. Beyond facilitating trade in traditional services, digital technologies are enabling new services to replace trade in goods, ensuring the continued importance of services in the composition of trade. For example, new developments in the field of remote controlled robotics (such as telesurgery) have opened new ways to trade services and could trigger extensive changes in international trade.

With the increasing adoption of digital technologies, trade in information technology products has seen a steady increase in the past decades. A further reduction in trade costs enabled by digital technologies could give rise to increased trade in certain goods, most notably time-sensitive, certification-intensive and contract-intensive goods. Technologies have also enabled mass customization, creating virtually infinite varieties to meet individual consumer needs. On the other hand, digitalization has led to a decline in the trade of certain digitizable goods – such as CDs and newspapers. Trade in certain other consumer goods may be affected by the development of the "sharing economy" business model.

The evolution of digital technologies has radically transformed the linkages between intellectual property and international trade, as the increased availability of digital technologies has significantly lowered the costs to create, copy and distribute creative works on a global scale. Alongside the burgeoning trade in intellectual property licences, trade in the ownership of intellectual property rights is growing in diversity. The rise of the internet as a distribution channel is changing the ways in which creative works are made accessible and revenues generated and shared.

New technologies are likely to change established trade patterns as the importance of traditional sources of comparative advantage changes and new sources emerge.

Digital economies are likely to reinforce the importance of skills and capital endowment, as they are capital-intensive and skill-intensive. AI, 3D printing and advanced robotics could reduce the role of labour as source of comparative advantage.

In contrast, physical infrastructure, border processes and geographical factors might become less relevant, which would benefit remote or landlocked economies, as well as economies with less developed physical infrastructures and customs procedures.

Energy infrastructure is an important factor in defining comparative advantage in digital-intensive sectors, because the servers that support digital technologies depend on storage devices, power supplies, and cooling systems that consume vast amounts of energies.

Another factor that could become more important for trade patterns in the digital age is market size. Digital technologies benefit from access to large amounts of information, which may be advantageous to large developing economies.

With regard to institutions, the digitalization of trade may magnify their importance for comparative advantage, given that data privacy and intellectual property rights regulation rely on credible enforcement, although new technologies may also reduce the role of institutions for comparative advantage.

In addition to these traditional sources of comparative advantage, new sources will arise for trade in digital-intensive products. The regulation of intellectual property rights, data flows, and privacy are likely to be of particular importance, as well as the quality of digital infrastructure, since reliable and fast network access is becoming a necessity for conducting business.

The advance of digital technologies brings about opportunities and challenges for developing and developed countries alike.

For instance, as digitalization increases the complexity of tasks performed by workers, developed economies may strengthen their comparative advantage in skill-intensive sectors, although as new technologies diminish the importance of physical infrastructure, developing economies may also gain comparative advantages in the sectors most affected by the shift from physical to digitalized trade.

Digital technologies may affect the international fragmentation of production. However, the overall impact on GVC trade is hard to predict.

Digital technologies could lead to more GVC trade in the future for two reasons: first, because GVC trade is particularly hampered by communication, transportation, logistics, matching and verification costs, all of which digital technologies have the potential to reduce; and second, because digital technologies increase the quality and availability of services that act as enablers of value chains or that are used as inputs to the production of goods.

On the other hand, smart automation and 3D printing may encourage reshoring, i.e. the relocation of production or other business functions from countries with low labour costs back to countries with larger and richer markets – although, to date, there is little empirical evidence to link the adoption of digital technologies by firms with their reshoring decisions.

The pace and extent of the adoption of 3D printing might significantly affect GVC trade in the future.

3D printing is currently used mostly for upstream GVC activities, such as prototyping, complementing traditional "subtractive" production processes. In the longer run, however, 3D printing may to some extent substitute for traditional manufacturing methods, reducing the need for outsourced production and assembly, the number of production steps, and the need for inventory, warehousing, distribution, retail centres and packaging.

Value chains in a world of pervasive 3D printing may not only become shorter – with the emergence of production centres near every large customer base or near centres of innovation – but they might also look very different, being mostly based on the cross-border exchange of data, in the form of designs, blueprints and software, rather than on the cross-border exchange of material goods and services.

A quantitative projection on changes in the size and patterns of international trade by 2030 shows that digital technologies are likely to boost trade, especially in services and for developing countries.

In order to get a sense of the potential quantitative impacts of the changes that digital technologies will bring, this report uses a computable general equilibrium model to examine the impact of three trends: the reallocation of tasks between labour and capital related to robotization and digitalization, the servicification of the production process, and the fall in trade costs.

These simulations show that future technological changes are expected to increase trade growth, especially trade in services. Global trade is projected

to grow by around 2 percentage points more than in the baseline scenario as a result of these trends, and the share of the services trade is projected to grow from to 21 per cent to 25 per cent. Developing countries are likely to gain an increasing share of global trade, but the quantitative effects will depend on their ability to catch up on the adoption of digital technologies. If this catching up occurs, developing and least-developed economies' share in global trade is predicted to grow to 57 per cent by 2030, from 46 per cent in 2015, whereas if catching up does not occur, this share is predicted to rise only to 51 per cent. The organization of global production is projected to change through a rising share of imported intermediate services in manufacturing.

D. How do we prepare for the technology-induced reshaping of trade?

Digital technologies not only create new markets, new forms of trade and new products, but they also lower trade costs and change trade patterns. These changes offer new opportunities and trade gains, and governments may have a role to play in ensuring that firms can seize these opportunities.

First, governments may need to support or accompany private efforts to develop and facilitate access to affordable digital infrastructure and digital infrastructure services. They may also need to take measures to allow digital technologies to lower trade costs, for instance by enabling faster and more reliable management of data across borders or by facilitating trade operations and customs cooperation. At the same time, however, the reduction of trade costs may lower the prices of imported products relative to those of domestic products, possibly generating protectionist pressures from domestic producers subject to import competition.

Second, digital technologies may reshuffle comparative advantages, for instance by making it possible for firms in remote areas to sell digital products around the whole world or by making it profitable for firms in high-income countries to reshore certain activities. This raises questions as to how governments, in particular those of smaller and poorer countries, can seize new trading opportunities. An important dimension of this issue is the digital divide between richer and poorer countries.

Finally, governments will need to address concerns relating to consumer protection, cybersecurity, data privacy and competition that arise with digital trade in a way that is not more trade-distorting than necessary to achieve these important public policy objectives.

Governments respond to the opportunities and challenges raised by digital trade both unilaterally and in cooperation with other governments. Unilateral responses involve investment in digital infrastructure and human capital, trade policy measures and/or changes in domestic regulation. In most areas, international cooperation is helping governments derive more benefits from digital trade, and there may be scope for more beneficial international cooperation than is already in place.

In order to realize the potential benefits of digital trade fully, an increasing number of governments have adopted digital development strategies, which encompass cross-cutting policy measures aimed at improving infrastructure, establishing an adequate regulatory framework, reducing the cost of doing business and facilitating relevant skills development. Both goods and services trade policies can play an important role in promoting the digital economy.

Despite the evidence of the benefits of open and non-discriminatory policies and the adverse effects of restrictive policies and regulation, however, trade measures are still imposed by some governments to protect local businesses, including digital platforms, from foreign competition, restricting the access and operation of foreign services suppliers.

Governments are also developing and implementing new rules and regulations in the pursuit of public policy objectives such as data privacy, cybersecurity, or consumer protection. Some use competition policy to level the trading field for firms and to address the effects of "winner takes all" dynamics. Differences across domestic regulatory regimes may pose a challenge for their interoperability across countries. There may also be a risk of a regulatory race to the bottom, for example with regard to privacy protection regulations, or of the use of regulation as disguised protectionism.

Governments may choose to prioritize differently among these policy measures, depending on their level of development and the extent of digitalization, with developing countries typically focusing on facilitating connectivity and the adoption of digital technologies, while developed countries pay relatively greater attention to regulatory issues related to competition, data flows and consumer protection. However, skills development and the promotion of MSMEs' involvement in digital trade seem to be common concerns for developing and developed economies.

While the WTO framework, and in particular the General Agreement on Trade in Services (GATS), is relevant for digital trade and WTO members have taken certain steps to promote digital trade within the existing framework, there is debate as to whether and how more could be done to support inclusive digital trade.

As demonstrated by the discussions that have taken place since 1998 in the context of the WTO Work Programme on Electronic Commerce, existing WTO rules apply to e-commerce even when there is no specific reference to e-commerce or online trade. WTO rules on trade in goods, services and intellectual property rights do not contain language excluding their application to trade conducted through electronic means and have proved to be sufficiently flexible to accommodate "new" products, services and technologies.

WTO members have taken certain steps to promote digital trade within the existing framework, including a commitment to maintain the current practice of not imposing customs duties on electronic transmissions until 2019, reducing tariffs on the ICT products of members that are party to the WTO Information Technology Agreement, and including provisions related to digital technologies in the WTO Trade Facilitation Agreement, which entered into force in 2017. At a different level, the Aid for Trade initiative is part of a multilateral effort to bridge the digital divide.

More recently, a group of WTO members initiated exploratory work towards future WTO negotiations on trade-related aspects of e-commerce.

Several international and regional organizations cover specific policy areas related to digital trade. The nature and scope of discussion and commitments, including the participation of the private sector, differs across these organizations.

Digital technologies are not a new issue for the international community. Given the cross-cutting nature of digital technologies, international and regional organizations often address specific policy issues, such as skills development, ICT infrastructure, regulatory framework, competition, intellectual property, the participation of MSMEs, sustainable development and data collection. Some of these organizations have discussed and negotiated specific principles and best practices, and some have also developed capacity-building programmes.

Several international organizations serve as a forum for discussing and negotiating treaties, addressing specific aspects of digital trade, such as the World Customs Organization for customs procedures, the United Nations Commission on International Trade Law for domestic regulatory frameworks, and the World Intellectual Property Organization for intellectual property rights protection.

Most of the other activities undertaken by international and regional organizations take the form of infrastructure investment and capacity-building initiatives to help governments, in particular in developing countries, maximize the benefits of digital technologies and trade. These technical assistance programmes can take different forms, including joint initiatives between international organizations. Some of these initiatives also rely on collaborative public and private partnerships.

Over the last 25 years, provisions mentioning explicitly digital technologies have been incorporated into an increasing number of regional trade agreements (RTAs). These provisions, found in multiple chapters of the RTAs, remain particularly heterogeneous.

Reflecting the cross-cutting nature of digital technologies, provisions related to digital technologies can be found in multiple chapters of RTAs, and not only in the chapter on e-commerce. These provisions cover a broad range of issues, including trade rules and market access commitments, telecommunications and the digital regulatory framework, intellectual property protection, management of e-government (i.e. the use of ICT to deliver services in the public administration), including paperless trading, as well as cooperation and technical assistance on science and technology, ICT and e-commerce.

Although certain provisions related to digital technology replicate or clarify a number of existing provisions and/or commitments established under the WTO, other provisions expand commitments or specify new ones. These provisions often complement other relevant provisions found in RTAs, even though they do not make explicit reference to digital technologies.

Most provisions related to digital technologies do not follow a specific, unique template, even in agreements negotiated by the same country. As a result, provisions related to digital technology remain particularly heterogeneous in terms of structure, language and scope.

Although the importance and scope of provisions related to digital technologies have increased in recent years, the most detailed and

comprehensive provisions are often found in a limited number of mostly recent RTAs.

The most common types of provisions related to digital technologies found in RTAs refer to e-government management, as well as cooperation on e-commerce issues and the moratorium on customs duties on electronic transmissions. An increasing number of RTAs also cover the general domestic legal framework of e-commerce and more specific issues, such as electronic authentication, consumer protection and intellectual property. Other issues addressed in a limited number of relatively more recent RTAs include the cross-border electronic transfer of information, data localization and cybersecurity.

Overall, only a limited number of RTAs include provisions addressing most of the issues related to digital technologies identified in this report. The approach to address some of these issues also differs across some agreements, probably reflecting different political sensitivities. Given the dynamic nature of RTAs and the current trends, provisions related to digital technologies are likely to keep evolving with new and more comprehensive types of provisions.

Recent academic and research literature offers a range of views on steps to be taken within the trading system to promote the expansion of digital trade.

Several studies argue that conventional barriers to trade are a significant obstacle to the expansion of digital trade. Some studies emphasize the importance of clarifying and expanding the scope of WTO members' commitments on market access and national treatment under the GATS, without necessarily requiring the creation of a new stand-alone body of rules, as was done for the Information Technology Agreement (ITA).

In addition, an emerging literature also proposes developing new WTO disciplines or enhancing existing ones in light of what has been achieved in some recent RTAs, for example with regard to the cross-border transfer of information, data localization requirements, e-signatures and e-authentication, protecting the personal information of e-commerce users, or protecting online consumers.

Overall, the expansion of digital trade holds the potential to generate considerable benefits, in particular if it takes place under conditions that adequately address important public policy challenges. Issues concerning inclusiveness, privacy protection and cybersecurity are likely to figure prominently in debates on the future governance of digital trade. International cooperation has an important role to play in helping governments to ensure that digital trade continues to be an engine of inclusive economic development.