Unpacking E-commerce

BUSINESS MODELS, TRENDS AND POLICIES

OECD

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Please cite this publication as:
OECD (2019), *Unpacking E-Commerce: Business Models, Trends and Policies*, OECD Publishing, Paris, *https://doi.org/10.1787/23561431-en*.

ISBN 978-92-64-91297-7 (print)
ISBN 978-92-64-78418-5 (pdf)
ISBN 978-92-64-68962-6 (HTML)
ISBN 978-92-64-96339-9 (epub)

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Foreword

E-commerce has been high on the agenda of policy makers since the mid-1990s. In 1998, the OECD and the Government of Canada jointly organised a Ministerial Conference on Electronic Commerce in Ottawa, calling together leaders from national governments, heads of major international organisations, industry leaders, and representatives of consumer, labour and social interest groups, to discuss the development of global e-commerce. Participants unanimously recognised that e-commerce offered a radically new way of conducting commercial transactions and could become a global driver of growth and economic development. They also recognised that business would have to play a key role in developing and implementing solutions essential for the development of e-commerce.

More recently, at the 2016 OECD Digital Economy Policy Ministerial in Cancún, Ministers declared they would "stimulate and help reduce impediments to e-commerce within and across borders for the benefits of consumers and business". This declaration is in part a reflection that almost 20 years after the Ottawa Ministerial, e-commerce has spread across the globe, altering the ways in which economic actors engage with one another. As predicted, firms continue to invent new business models that dramatically change the e-commerce landscape, resulting in new market players and ways of doing business. It is critical to understand these new developments in order to consider whether the current policy settings are well suited to e-commerce today.

Several international e-commerce initiatives have emerged. In December 2017, the World Trade Organization, the World Economic Forum and the Electronic World Trade Platform jointly launched the Enabling E-commerce Initiative to initiate a global discussion on how small and medium-sized enterprises (SMEs) can better leverage e-commerce. In July 2016, the United Nations Conference on Trade and Development officially launched the e-Trade for All initiative, bringing together key public and private stakeholders to consider how e-commerce can support developing countries to implement the Agenda 2030 on Sustainable Development.

This report recognises these and other related initiatives, and builds on previous and ongoing work from the OECD and other institutions. It analyses how e-commerce has evolved across a range of dimensions and examines new and emerging business models, including how emerging technologies are driving changes across the e-commerce landscape. It also identifies how policies may need to be adapted to remain fit for purpose in a dynamic e-commerce landscape.

This report was declassified by the OECD Committee on Digital Economy Policy (CDEP) on 15 November 2018 and prepared for publication by the OECD Secretariat.

Acknowledgements

Unpacking E-Commerce: Business Models, Trends and Policies *was written by Jan Tscheke, Angela Attrey and Molly Lesher from the Digital Economy Policy Division of the OECD Directorate for Science, Technology and Innovation. Andrew Wyckoff, Dirk Pilat and Anne Carblanc provided overall guidance and direction.*

Several OECD colleagues provided valuable comments and input: Brigitte Acoca, Anna Barker, Sarah Box, David Bradbury, Antonio Capobianco, Lucia Cusmano, Michael Donohue, Janos Ferencz, Fabienne Fortanier, Pedro Gonzaga, Javier López González, Mariarosa Lunati, Caroline Malcolm, Anna Milanez, Pierre Montagnier, David O'Sullivan and Liliana Suchodolska. Toby Bateman, Charlotte Cheynard, Adam Hemphill, J. Welby Leaman and Nicole Primmer provided additional insights from the business perspective.

This report was prepared under the guidance of the OECD Committee on Digital Economy Policy. Nagwa Ebrahim El-Shenawy (Ministry of Communications and Information Technology, Egypt) and Alexandra Koval (the Russia-OECD Center, RANEPA) provided data and information on e-commerce in Egypt and Russia, respectively. This report also benefited from input and comments received at meetings of the OECD Working Party on the Measurement and Analysis of the Digital Economy; the OECD Committee on Consumer Policy; OECD Working Party 9 on consumption taxes; and the Working Group on E-Commerce at the World Customs Organization.

Kila Walser provided valuable research assistance. Editorial input and publication assistance by Janine Treves and Christopher Lomax is gratefully acknowledged.

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Abbreviations and Acronyms

AI	Artificial intelligence
APEC	Asia-Pacific Economic Cooperation
B2B	Business-to-business
B2C	Business-to-consumer
B2G	Business-to-government
BEPS	Base erosion and profit shifting
BIAC	Business at OECD
EDI	Electronic data interchange
EPR	Extended producer responsibility
FDI	Foreign direct investment
G20	Group of 20
GATT	General Agreement on Tariffs and Trade
GATS	General Agreement on Trade in Services
GDP	Gross domestic product
GDPR	General Data Protection Regulation
GST	Goods and services tax
GVC	Global value chain
IaaS	Infrastructure-as-a-service
ICT	Information and communication technology
ICPEN	International Consumer Protection Enforcement Network
IoT	Internet of Things
IP	Internet protocol
IXP	Internet exchange point
KBC	Knowledge-based capital
M2M	Machine-to-machine
MNO	Mobile network operator
MSMEs	Micro, small and medium-sized enterprises
NFC	Near-field communication
P2P	Peer-to-peer
PaaS	Platform-as-a-service
PPP	Public-private partnership
QR	Quick response
SaaS	Software-as-a-service
SCM	Supply-chain management
SMEs	Small and medium-sized enterprises
TCP/IP	Transmission control protocol/Information protocol
TUAC	Trade Union Advisory Committee
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
VAT	Value-added tax
WTO	World Trade Organization

Executive Summary

As digital transformation has accelerated, the e-commerce landscape has become increasingly dynamic. New players have emerged at the same time that established actors have taken on new roles; some barriers to e-commerce at the firm, individual and country levels have been overcome, while new barriers have emerged. New business models have transformed buyer-seller relationships and pushed out the frontier of what is possible to buy and sell online. *Unpacking E-Commerce: Business Models, Trends and Policies* analyses new and emerging e-commerce business models, examines e-commerce trends along a range of dimensions, and identifies how policies may need to adapt to remain fit for purpose in a fast-moving e-commerce landscape.

E-commerce is increasing in size and scale, but gaps remain

More firms are buying and selling online than ever before, including across borders, and the absolute value of the e-commerce market is growing. This is true across industries, including in traditionally consumer-facing sectors. In 2017, more than one in five firms in OECD countries participated in e-commerce, with the share reaching 40% in some countries. However, large firms are more than twice as likely as small and medium-sized enterprises (SMEs) to participate in e-commerce in a majority of countries, and this gap is widening on average.

Consumers also increasingly buy online, benefitting from the convenience and increasing product variety of e-commerce. In 2018, more than half of all individuals in OECD countries made online purchases over the last 12 months, a rise of more than twenty percentage points since 2009. But not all consumers are equally likely to participate in e-commerce: older individuals, people with lower levels of education and income, as well as those living in rural areas, are less likely to buy online.

E-commerce business models are evolving

Many firms are innovating in the ways in which they sell products online. Firms can make use of a range of digital technologies, including artificial intelligence, blockchain, the Internet of Things and autonomous delivery devices like drones or robots to facilitate e-commerce, while new payment services like mobile money and digital wallets widen the scope of e-commerce.

Online platforms match buyers and sellers, including across borders, to facilitate online transactions. Online platforms enable more and different products to be sold, but often require mechanisms that match buyers and sellers, boost trust among unknown e-commerce participants, and encourage more firms to enter the marketplace. Also growing are subscription service business models (e.g. music streaming). Such models enable the continuous provision of products in exchange for recurring payments. Consumers may find such models convenient, particularly for goods that require replenishment, while firms may benefit from lower marginal costs, reduced frictions and longer-term revenue streams. A third business model includes those that use offline or physical features to sell online (e.g. omni-channel models). From automated supermarkets to skip-the-queue mobile application ordering, more firms are experimenting with mechanisms that enable e-commerce while removing the frictions associated with offline ordering.

Targeted, flexible and co-ordinated policies can unlock the potential of e-commerce

The rise of the Internet in the 1990s fuelled the growth of e-commerce and put it on the agenda of policy makers worldwide. But the rapid pace at which digital transformation has progressed and the dynamism of e-commerce markets requires a fresh look at policy frameworks to ensure that they support further e-commerce innovations. In particular, three policy considerations should be taken into account.

E-commerce must be better measured and e-commerce policy more co-ordinated to unlock the potential of e-commerce for all

Technological change is altering the e-commerce landscape, and these new developments affect policy frameworks along several dimensions. Some of the challenges identified in the early days of e-commerce remain relevant (e.g. related to data protection), but new challenges have also emerged (e.g. the rise of tradeable services and their implications for trade policy). These developments require a holistic approach to e-commerce policy making, including co-operation and collaboration across policy areas. In particular, consumer protection, taxation, competition, trade and environmental policies should be co-ordinated, including at the highest levels of government and at the global level, to ensure that trade-offs are carefully considered and to guard against unintended consequences of misaligned policy action. Many such rules are local, which further underscores the need for a consistent and co-ordinated whole-of-government approach to e-commerce policy making at all levels of government.

At the same time, a lack of e-commerce data limits the ability of policy makers to determine the need for policy action and calls for more focus on the e-commerce measurement agenda. On the one hand, the harmonisation of available data on e-commerce across countries (e.g. ICT usage surveys) should continue and adjust in response to an evolving technological environment. Changing technologies and business models might eventually also warrant a reconsideration of the current OECD e-commerce definition. At the same time, the limitations of ICT usage surveys requires governments to foster the inclusion of e-commerce related questions in other official data sources, such as structural business or household expenditure surveys, as well as the use of non-standard data sources.

Targeted policies can address e-commerce divides

Those who do not or cannot engage in e-commerce may find themselves on the wrong side of a potentially persistent and harmful digital divide as digital transformation progresses. SMEs lag behind larger firms in terms of e-commerce participation, but policy can help by addressing bottlenecks that might result in high costs associated with delivery and returns. Reducing regulatory uncertainty and fostering an inclusive business environment can help small firms trade online and across borders, as well as integrate successfully with larger service providers, such as online platforms.

E-commerce gaps for individuals remain significant along a range of dimensions, including education, income, age and gender, as well as for those living in rural areas. Factors that reduce participation of these groups are often related to economic and social conditions that reach far beyond e-commerce, including rural-urban divides, income distribution, unequal access to education and an aging society. With regard to e-commerce, these conditions may manifest themselves in low connectivity, a lack of digital skills, low levels of trust or a lack of viable payment options, all factors that can be addressed by policy action.

Public policies can support the creation of innovative e-commerce business models

As digital transformation progresses, new business models will arise in ways that are difficult to predict, but which also challenge traditional policy frameworks. In particular, some regulatory barriers preserve artificial distinctions between online and offline commerce, even as firms increasingly pursue business models that combine both elements.

Where local zoning laws prevent multi-purpose use of brick-and-mortar stores, or planning regulations prevent the development of new last-mile logistic solutions, the potential of e-commerce diminishes.

Regulatory approaches to new e-commerce business models should focus on remaining experimental, transparent and flexible. Experimental regulatory waivers have been successfully used to test new technologies like drones and digital payment mechanisms; future applications for e-commerce could include cryptocurrencies and 3D printing. Existing rules could be made clearer to reduce uncertainty for innovative firms. Policy makers should avoid attempting to regulate particular business models. Instead, they should ensure that particular business functions conform with regulatory frameworks, while better accounting for the interlinkages across business functions.

Chapter 1
UNDERSTANDING E-COMMERCE

While new opportunities have arisen for e-commerce to boost growth and consumer welfare, unlocking this potential requires an understanding of what e-commerce is today, how it can be measured and which policies are best suited to support further innovations in the e-commerce marketplace. This chapter introduces the concept of e-commerce and the way it is defined and measured, and discusses the range of policy areas that affect e-commerce, with a particular focus on consumer policy, taxation, competition, cross-border trade and the environment. The chapter concludes by identifying key areas for policy action.

The rise of the Internet in the 1990s fuelled the growth of e-commerce and put it on the agenda of policy makers worldwide (OECD, 1997[1]).[1] In the early days of e-commerce, a number of likely benefits from e-commerce were identified, such as increasing efficiency in transaction management, including with respect to inventory, supply chain management and customer service (OECD, 1997[1]; OECD, 1999[2]). For consumers, analysts predicted that e-commerce would improve access to information and enable active participation in core business functions like the product design process (OECD, 1998[3]; OECD, 1999[2]). Researchers also saw the shrinking distance between producers and consumers as an important advantage because it cuts out some intermediaries, including traditional retailers and wholesalers, reducing costs and barriers to entry.

Nevertheless, widespread "disintermediation" was seen as unlikely as new intermediaries were required to establish trust in e-commerce transactions by providing mechanisms of authentication and certification. Analysts suggested that customer information would become an important determinant of competitiveness, involving potential privacy risks. They also predicted that network externalities and increasing returns to scale might limit competition and stifle innovation (OECD, 1998[3]; OECD, 1999[2]) .

On the other hand, hopes were high that scalability through electronic networks would offer smaller firms, including niche players, many of the advantages enjoyed by their larger counterparts. In a similar vein, analysts hoped that e-commerce would help firms access new markets, including by eroding the barriers separating one industry from another (OECD, 1998[3]; OECD, 1999[2]; Hawkins, 1998[4]).

Nevertheless, even in the early days of e-commerce, analysts recognised that increasingly decentralised commercial interactions across geographical and political boundaries would create fundamental policy challenges, exacerbated by the intangible nature of emerging products that would make it increasingly difficult to distinguish between domestic and foreign transactions. Four specific areas in which government policies were considered potentially restrictive to e-commerce were related to access, trust, regulatory uncertainty and logistical problems (OECD, 1997[1]; OECD, 1998[3]).

E-commerce analysts also suggested that the Internet could lower the costs of buyer and seller co-ordination in business-to-business (B2B) transactions by increasing the efficiency of existing business processes and reducing the costs of matching buyers and sellers (Garicano and Kaplan, 2001[5]). On the other hand, they suggested that information asymmetries could become more important if buyers could not physically evaluate merchandise before the purchase.

As digital transformation has accelerated, the expectations and predictions of analysts have largely proven true. At the same time, most of those early e-commerce analysts would neither have expected the rapid pace at which digital transformation has progressed nor the dynamism of the e-commerce landscape today. While new opportunities have arisen to unlock the potential of e-commerce to boost growth and consumer welfare, realising such benefits requires understanding what e-commerce is today, how it is measured and which policies support further innovations in the e-commerce marketplace.

What is e-commerce?

E-commerce takes place through a range of different commercial relationships, involving any possible pairing of consumers (C), businesses (B) or governments (G). These include classical B2B transactions, which still account for the lion's share of turnover resulting from private sector e-commerce, as well as business-to-government (B2G) transactions (e.g. government procurement). E-commerce transactions increasingly involve consumers directly, most notably business-to-consumer (B2C) transactions. Additionally, emerging business models involve consumer-to-business (C2B) and peer-to-peer relationships, which take place between two or more individuals.

This report defines e-commerce as the sale or purchase of goods or services, conducted over computer networks by methods specifically designed for the purpose of receiving or placing orders, in line with the OECD definition established in 2001 and revised in 2009 (OECD, 2011[6]).[2] Accordingly, whether a commercial transaction qualifies as e-commerce is determined by the ordering method rather than the characteristics of the product purchased, the parties involved, the mode of payment or the delivery channel.

At the same time, this understanding of e-commerce is not universal, and the usage of the term varies in different contexts. With respect to the evidence presented in Chapter 2 on e-commerce trends, it is particularly important to underscore that the underlying data comes from distinct sources that often rest on slightly different and sometimes vague definitions of e-commerce. Some examples of alternative definitions are discussed in Box 1.1.

1.1. Defining e-commerce

Most sources used in this report rely on definitions of e-commerce that are consistent with the OECD definition, particularly with respect to the focus on the ordering process as the defining characteristic, the coverage of both goods and services, and the wide range of network types considered. The Eurostat *Methodological Manual for Statistics on the Information Society* (Eurostat, 2017[8]) outlines how information and communication technology (ICT) usage surveys should be conducted and explicitly recommends that the OECD definition of e-commerce should be used to ensure the broadest international comparability of e-commerce statistics. The United Nations Conference on Trade and Development (UNCTAD) also relies on the OECD definition in a number of recent studies (UNCTAD, 2016[7]).

The Eurostat manual (Eurostat, 2017[8]) provides further clarifications with respect to potential interpretation issues. Accordingly, bookings and reservations are used for some economic sectors (e.g. accommodation) to describe an "order". The manual also specifies that orders placed by electronic data interchange (EDI) messages in principle characterise B2B e-commerce, while B2C interactions typically take the form of Internet transactions. Furthermore, online sales can take place via an online store (website, e-commerce marketplace), web forms on a website or extranet, or "apps" regardless of how the Internet is accessed (computer, laptop, mobile phone, etc.).[3]

The US Census Bureau (2018[9]) uses a similar definition but adds that e-commerce might also include sales where the price and terms of the sale are negotiated over the Internet, a mobile device (m-commerce), extranet, EDI network, e-mail, or other comparable online systems. As with the OECD and Eurostat definitions, a payment may or may not be made online. While the definition is slightly wider, the focus is still on how the purchase is initiated rather than on the form of delivery or nature of the product.

Statistics Canada (2016[10]) defines e-commerce as all sales of goods and services in which the order is received and the commitment to purchase is made via the Internet, although payment can be made by other means. It further specifies that this definition includes orders made over the Internet, through an extranet, or by EDI, and excludes orders made by telephone calls, facsimile or e-mail.

Similarly, the Japanese Ministry of Economy, Trade and Industry (METI) (2016[11]) defines e-commerce in both a narrow sense and in a wider sense in line with the original OECD definition. In a narrow sense, e-commerce comprises transactions that are conducted (i.e. purchase orders that are issued) via computer network systems using Internet technologies and whose contract amounts are captured via such systems. In a wider sense, "Internet" is replaced by "computer network systems".

In private sector surveys, the term e-commerce is often not defined at all or only relates to a subset of the transactions that would be covered by the OECD definition, reflecting the particular interest of the source. For example, in a recent survey DHL (2017[12]), a logistics provider, defines e-commerce as involving the shipment of physical products from the warehouse in the selling company directly to consumers in another country as an individual parcel. Ambiguities in the definition also arise in the business literature and the media where, depending on the audience, e-commerce often relates to either B2B transactions, such as in the context of global value chains (GVCs), or B2C transactions, and most notably retail, rather than both.

The trade policy community tends to take a much broader view of e-commerce. The World Trade Organization (WTO) Work Programme on Electronic Commerce defines e-commerce as the "production, distribution, marketing, sale or delivery of goods and services by electronic

1.1. Defining e-commerce *(cont.)*

means" (WTO, 1998[13]) which captures many activities that would not fall under the definition of e-commerce used in this report. In the context of trade in services, the WTO defines e-commerce as: 1) the provision of Internet access services, 2) electronic delivery of services, and 3) the use of the Internet as a channel for distribution services, by which goods and services are purchased over the Internet, but delivered to consumers subsequently in non-electronic form (WTO, 1998[13]). Of these, only 3) would fall under today's OECD definition while 1) and 2) would only be captured to the extent that these services have been ordered over a computer network.

Monteiro and Teh (2017[14]) summarise e-commerce provisions in 56 regional trade agreements (RTAs) and find several interpretations that refer to electronic transmissions, including digitally delivered services, or more vaguely to transactions conducted by electronic means. These would most likely be reflected in category 2) of the WTO nomenclature.

Because of the complexities involved from a trade policy perspective, the debate in this field has substantially broadened in recent years and increasingly refers to the term "digital trade". In this context, digital trade includes digitally enabled transactions in goods and services that can be delivered digitally or physically (López González and Jouanjean, 2017[15]). This definition includes e-commerce transactions as defined by the OECD, but also includes several distinct types of cross-border transactions, including digitally delivered services, irrespective of the method by which they are ordered. This categorisation of digital trade is currently being used by the international statistics community to measure digital trade (OECD, 2017[16]) and the contribution of digital transformation to gross domestic product (GDP).

As a result, e-commerce as understood in this report is only one of the components of this broader topic when it comes to cross-border transactions. While the cross-border trade policy discussion still often uses the term "e-commerce" in line with the broader WTO understanding, when it comes to trade measurement the usage of the term is usually in line with the OECD definition and the focus on the ordering process.

Many of these definitions, and particularly those used in public and private sector surveys, are explicitly or implicitly consistent with the OECD definition as they consider the ordering process to be a crucial determinant of an e-commerce transaction. This understanding is also broadly in line with the more colloquial notion of buying (or selling) online, as opposed to buying in a physical store, where buying is usually understood as referring to the ordering process, as in ordering via a website (which might involve a store pick-up) rather than ordering over a sales desk.

Nevertheless, an e-commerce transaction as defined by the OECD does not necessarily have to happen online in a technical sense, i.e. using an open network like the Internet. Historically, the OECD (2011[6]) definition distinguishes between e-commerce transactions that make use of the Internet and a broader definition relating to transactions using any type of computer-mediated network. This relates to the frequent use of EDI for B2B transactions, which were widely carried out over custom networks before the widespread use of the Internet. E-commerce initially flourished for B2B transactions, like supply chain operations in the manufacturing sector, because the need to document recurring transactions justified the costs of setting up a private network. The rise of networks using non-proprietary protocols like the Internet enabled new forms of e-commerce that did not rely on pre-existing relationships between economic actors, while at the same time reducing the cost of participation in e-commerce for consumers and small and medium sized enterprises (SMEs) (OECD, 1999[2]).

Furthermore, the definition of e-commerce as understood in this report is not based on product characteristics, but encompasses online purchases of both goods and services. This also implies that the increasing bundling of goods and services, e.g. in the case of an iPod and iTunes, or the rising number of business models that combine both goods and services (e.g. physical books and e-books), are captured as long as they are ordered by electronic means. It should be noted, however, that in some cases, such as in the trade context, conceptual issues are likely to arise because rules are usually based on a goods and services dichotomy (López González and Jouanjean, 2017[15]).[4]

In addition, with the bundling of goods and services, smart devices bought by standard means (e.g. purchasing a smartphone in a shop) could also come with an attached online subscription, potentially invoking recurring e-commerce transactions. In these cases, the distinction between offline and online ordering is increasingly blurring, implying that a reconsideration of the definition from a measurement perspective may be warranted.

The characterisation of an e-commerce transaction is also not contingent on a specific mode of delivery or a specific format of the product. Thus, for example, any online order of music could be considered e-commerce, irrespective of whether the customer obtains musical content via a compact disc, download or streaming service. This definition of e-commerce accordingly accommodates a wide variety of new and emerging delivery options, including not only streaming of digital content but also 3D printing, delivery drones or local store pick-ups.

Furthermore, this definition of e-commerce does not hinge on a specific mode of payment. Payment methods have undergone massive changes in recent years, including in emerging markets. Digital wallets are increasingly gaining ground in the Chinese market, while many consumers in developing countries still use cash on delivery to settle payments for online purchases (see Chapter 3).[5]

Finally, and of crucial importance, intermediaries like online platforms, discussed in more detail in Chapter 3, are also covered by the definition of e-commerce used in this report and are captured as a sub-group of web sales in some official statistics (Eurostat, 2017[8]). The term "online platform" in the context of e-commerce usually relates to a multi-sided marketplace that allows third-party sellers to interact with customers without taking ownership of the products being offered (OECD, 2019[18]). However, some online platforms also engage in sales to customers as online retailers themselves. Both types of online sales are considered e-commerce if ordering happens online, irrespective of whether the seller is a third party platform user or the platform provider. Firms that use online platforms dominate e-commerce sales in several countries, but may also derive turnover from activities beyond e-commerce (e.g. via brick-and-mortar book sales or grocery stores).

In spite of the apparent flexibility of this e-commerce definition, it is important to highlight that not every digitally-enabled commercial transaction falls within this definition of e-commerce. As a result, e-commerce transactions according to the OECD definition only include orders conducted through methods specifically designed for the purpose of receiving or placing orders (OECD, 2011[6]). The interpretation guidelines associated with the OECD definition accordingly exclude transactions realised by manually typed e-mails, telephone or fax.

An extension of this limitation is the exclusion of orders transmitted via manually typed short message services (SMS) or instant online messaging services and social networks. These are often used for purchases from smaller firms and in the informal economy. As these methods are usually not specifically designed for the purpose of receiving or placing orders, such transactions are therefore not considered a form of e-commerce according to the OECD definition. However, they may still be relevant from a policy perspective. To the extent that some social networks have specifically designed templates and functionalities for commerce, transactions conducted using such applications would fall within the boundaries of the OECD e-commerce definition.

Importantly, this also implies that some digitally delivered services are not covered by the OECD definition. For example, highly personalised digital services, such as professional design services or customised ICT solutions, are less likely to be sold via e-commerce as defined in this report because the ordering process requires complex interactions that are currently not easily captured by automated ordering methods. Furthermore, some emerging firms of bundled product and service purchases, as well as omni-channel selling strategies, might make it increasingly difficult to distinguish e-commerce from non-e-commerce transactions.

Measuring e-commerce

Measuring e-commerce is complex. As pointed out early by Fraumeni (2001[19]), part of the problem arises because economic data typically does not record how firms do business. E-commerce breakdowns, particularly with respect to quantities such as shipment volumes or values, are therefore often not available and must be estimated.

One approach used by several government agencies is to include specific questions on e-commerce in firm, household and individual surveys. However, in practice these surveys often relate to participation only. Information on quantities is more difficult to obtain from surveys because firms often do not record turnover by sales channel and because individuals might not recall how much or how often they have bought online.

With respect to cross-border transactions, evidence for Europe suggests that individuals tend to significantly underestimate their participation in cross-border e-commerce (European Commission, 2015[20]). About 40% of individuals that had purchased from a seller in another country in the European Union (EU) incorrectly assumed that their latest online purchase was from a domestic seller. Furthermore, only 26% of respondents with purchases from countries outside the EU correctly identified the source of their purchase and 33% wrongly identified the seller as being domestic.

Another concern is that results are often not comparable across countries due to different methodologies in the data collection process, including with respect to the definition of e-commerce (see Box 1.1), imputation methods, as well as the treatment of outliers or multinational enterprises (OECD, 2011[6]). This concern is particularly troublesome for many private sector surveys, which often do not provide information about the underlying survey methodology. As private sector surveys and published estimates may also target an audience of potential customers, it is particularly important to question the credibility of such data (OECD, 1999[2]).

With respect to cross-country coherence, the OECD established an Expert Group on Defining and Measuring E-commerce as early as 1999.[6] A definition of e-commerce was first provided in 2002 (updated in 2009) and two model surveys on ICT access and usage by households and individuals and ICT usage by businesses were devised (last updated in 2014), which are now widely applied by government agencies, albeit virtually never in private sector surveys.

Apart from survey data, several other data sources have been used to approximate e-commerce shipments, including across borders. These include the aggregation of data from company reports, payment data, parcel shipments or Internet traffic, among others (UNCTAD, 2016[7]). However, each of these sources usually only provides a partial and potentially biased perspective on e-commerce transactions. As a result, the aggregation of company reports mostly cover only a limited number of large firms, sometimes restricted to pure online retailers. Payment data are typically limited to a specific method of payment or might contain certain transactions that are not related to e-commerce (e.g. payments via near-field communication).

In addition, the geography of cross-border payments does not always reflect the geography of cross-border e-commerce because the payment processing might have been outsourced to a third country. Parcel shipments only relate to physical products and usually do not provide detailed information on the value of shipments. More importantly, not all parcel shipments are due to e-commerce transactions. Similarly, Internet traffic, sometimes used as a proxy for cross-border transactions, is influenced by non-commercial transactions and rarely indicates the value of the transaction.

Measurement challenges related to e-commerce are similar to the challenges of measuring digital transformation more broadly (OECD, 2019[21]). As noted in Fraumeni (2001[19]), issues such as the lack of quality-adjusted price data, particularly for services; the difficulty of measuring intangibles; the blurring distinction between goods and services; and the treatment of free services, often cross-financed by advertising revenues, are particularly important. In addition, challenges might also arise as firms strive for integrated omni-channel sales strategies, eventually leading to a convergence of the different sales channels over time (see Chapter 3).

Such measurement challenges are becoming more pressing as digital transformation progressively deepens across economic sectors. To address them, several international initiatives are currently underway to improve the measurement of digital transformation, including with respect to cross-border activities where the challenges are often exacerbated (OECD, 2017[22]). Two recent expert groups closely related to the measurement of e-commerce include the Inter-Agency Task Force on International Trade Statistics and the Partnership on Measuring ICT for Development.

To better understand how the conditions for B2C e-commerce are changing, UNCTAD has further developed an indicator, first introduced in 2015, that measures the readiness of countries to participate in online commerce for 144 countries (UNCTAD, 2017[23]), using data on Internet users, secure servers, financial account penetration and postal reliability.

A wide range of policy areas impact e-commerce

Despite challenges related to defining and measuring e-commerce, the e-commerce policy agenda continues to evolve. A wide range of policy areas affects e-commerce and e-commerce developments, and they must all be considered to support further innovations in the e-commerce marketplace. Five of these policy areas – consumer policy, taxation, competition, cross-border trade and the environment – are briefly discussed below.

Consumer policy

E-commerce is a core interest of policy makers concerned with consumer protection. The OECD has contributed significantly to addressing many issues related to consumer protection and e-commerce; the ambition in this sub-section is to provide a brief summary of some of this work as well as research done by other organisations. A detailed consideration of the consumer policy aspects of e-commerce however is beyond the scope of this report.

In 2016, the OECD adopted a *Recommendation on Consumer Protection in E-commerce* (OECD, 2016[24]), updating the original Recommendation from 1999 that had been adopted following the OECD's 1998 Ottawa Ministerial. The OECD e-commerce Recommendation covers B2C e-commerce including business practices by online platforms that enable consumer-to-consumer transactions. The Recommendation underscores that people buying online are entitled to the same level of protection as those who make conventional transactions. It calls on governments to work with business and consumer groups to determine legal changes that could improve consumer trust in e-commerce.

In particular, the Recommendation suggests that consumer protection laws should cover online apps and services offered for "free" in exchange for gaining access to a user's personal data (OECD, 2016[24]), themes that have been recently echoed by the EU (European Commission, 2018[25]). The OECD Recommendation also indicates that businesses should take special care in marketing targeted at children or other vulnerable consumers. Provisions should also be made to ensure consumers understand the terms and conditions relating to the acquisition and use of digital content, and consumers should have access to easy-to-use mechanisms to resolve domestic and cross-border e-commerce disputes. The Recommendation also calls on governments and stakeholders to work together to develop minimum levels of consumer protection across payment mechanisms, given that the level of payment protection can vary depending on the type of payment mechanism used. Better trust in payment services is essential to boosting consumer engagement in e-commerce.

The OECD has further conducted work on remedies for consumers engaging in e-commerce. For example, new work on the use of behavioural insights to improve online disclosures in OECD countries has been undertaken with the aim of ensuring that consumers remain informed in the digital age (OECD, 2018[26]). Similarly, the OECD is also exploring the challenge of ensuring adequate product safety in online purchases (OECD, 2016[27]).[7]

More generally, cross-border e-commerce challenges the enforcement of national, and sometimes regional, consumer protection regimes. In particular, international co-operation on the enforcement of consumer issues, including in relation to product safety and recalls, becomes more important. To boost e-commerce across borders, the OECD (2013[28]; 2018[26]) recommends that policy makers ensure interoperability of legal frameworks in relation to consumer protection, commercial practices and product labelling and certification rules.

Other work on consumer protection in an international context has been undertaken by UNCTAD in accordance with the United Nations Guidelines for Consumer Protection. The revised *UN Guidelines for Consumer Protection* – adopted by the UN General Assembly in December 2015 – sets out the main characteristics of effective consumer protection legislation, enforcement institutions and redress systems. The UN Guidelines include a specific section covering e-commerce that highlights some of

the key considerations for ensuring that consumers are as protected in their online activities as in other types of commerce (United Nations General Assembly, 2015[29]). UNCTAD also considers issues specific to e-commerce, including redress measures, consumer education, good business practices and international co-operation (UNCTAD, 2017[30]).

The International Consumer Protection Enforcement Network (ICPEN), a network of consumer protection law enforcement authorities from across the globe, has several initiatives focused on consumer protection. The overall aim of ICFPEN is to improve international information sharing as well as co-ordination and co-operation on consumer protection enforcement matters and the exchange of best practices. Other related international and regional co-operation networks include the Global Privacy Enforcement Network (GPEN), the Unsolicited Communications Enforcement network (UCENet) and the Ibero-American Forum of Consumer Government Agencies (OECD, 2018[31]).

Taxation

Tax policy is high on the e-commerce agenda. With regard to direct taxation, new digital business models, including for e-commerce, have raised issues around how and where value is created, particularly through their heavy reliance upon intangible assets and increased levels of data collection and user engagement. As intangible assets are highly mobile, new e-commerce business models challenge existing income taxation systems, which rely predominantly on physical factors to determine a taxable presence and allocate profits.

While the delivery in 2015 of the OECD/G20 (2015[32]) base erosion and profit shifting (BEPS) initiative has significantly contributed to realigning income from intangibles with value creation, some more systematic tax challenges remain that go beyond the issue of how to tackle BEPS and double non-taxation. These issues typically relate to the question of how taxing rights on income generated from cross-border activities in the digital age should be allocated among countries. The OECD/G20 Inclusive Framework on BEPS is currently conducting work on these broader direct tax issues, including an analysis of value creation across different digitalised business models, such as those related to e-commerce (OECD, 2016[33]).

A recent Interim Report (OECD, 2018[34]) reflects the progress made by the Inclusive Framework since 2015. The report discusses the main features frequently observed in certain highly digitalised business models and analyses value creation in the digital age, as well as the potential implications for the existing international tax framework. It describes the complexities of the issues involved, the positions that different countries have in regard to these features and their specificity to highly digitalised business models as well as the resulting implications for possible solutions.

With regard to indirect taxation, one of the significant tax challenges arising from digitalisation, and specifically from the growth in e-commerce, is the challenge associated with the collection of value-added tax (VAT) or goods and services tax (GST) on B2C cross-border trade in goods, services and intangibles. Considering that digitalised foreign sellers may not have a presence in the market of a consumer and that this jurisdiction may have limited means to require a foreign seller to apply and remit VAT on services and intangibles supplied to final consumers in that jurisdiction, the result is that no or an inappropriately low amount of VAT may be collected on these supplies by such sellers. This can have adverse effects on countries' VAT revenues, and can result in an uneven playing field between domestic suppliers and foreign suppliers.

Against this background, new guidelines and VAT collection mechanisms were agreed in the BEPS Action 1 report (OECD, 2015[32]). In accordance with the destination principle, they allow a jurisdiction's tax authorities to collect VAT on services and intangibles supplied cross-border by foreign suppliers to final consumers (i.e. B2C supplies) in that jurisdiction (i.e. the jurisdiction where the customer is located). For efficient and effective collection by tax administrations, foreign suppliers can benefit from being allowed to register for VAT in the destination country under a simplified registration and compliance regime. Implementation of these measures enables the country of destination to secure the VAT revenues arising from B2C digital supplies to market country consumers and can help ensure a level playing field between domestic and foreign suppliers.

Evidence suggests that this has already greatly enhanced compliance levels by promoting more consistent and effective implementation of the agreed approaches (OECD, 2018[34]). To date, over

50 jurisdictions, including the overwhelming majority of OECD and G20 countries, have adopted rules for the VAT treatment of B2C supplies of services and intangibles by foreign suppliers in accordance with the International VAT/GST Guidelines.

Additionally, the Action 1 report outlined options to facilitate the collection of VAT on the importation of low-value goods from online sales. Based on reducing or removing VAT exemption thresholds, these approaches rely on the intervention of online vendors or other parties involved in the supply chain for online sales, such as e-commerce platforms or express couriers. A number of countries have announced or are actively considering the removal of their VAT exemption thresholds for the importation of low-value goods from online sales and the implementation of approaches for a more efficient collection of VAT for low-value imports.[8]

Ensuring the efficient and effective collection of VAT on online sales remains a priority for the OECD.[9] The need for coherence and consistency in the implementation of the VAT rules across countries resulted in the development of further guidance in 2017[10] to support governments in the implementation of best practices in the design and operation of the collection mechanisms. Tax administrations and the business community have welcomed this guidance as a significant step in supporting enhanced compliance levels while limiting compliance costs for digital suppliers.

The OECD continues its work to promote the consistent implementation and operation of the recommended rules across jurisdictions focuses on the role of online platforms and other intermediaries in the VAT collection process. The focus of this work has now turned to the design and implementation of measures to secure the efficient and effective collection of VAT on online trade generated and executed by platforms and intermediaries. It is anticipated that this work will result in guidance and approaches based on good practice. This work is scheduled to be completed in 2019.

Competition

E-commerce often takes place via online platforms, which are often characterised by multi-sided markets (see Chapter 3). Multi-sided markets typically benefit from indirect network effects that increase overall returns to scale. A range of different competition dynamics come into play for online sellers as well as other actors in the brick-and-mortar space. In this context, work has been undertaken in the field of competition to determine whether traditional antitrust tools remain relevant (OECD, 2018[35]). Recent work from the OECD (2018[36]) explored the competition dimensions of e-commerce in more detail, with a focus on the antitrust enforcement mechanisms that have been used across the OECD.

One such area of antitrust law involves vertical restraints, which may restrict or enhance competition through agreements between actors at different levels of the production and distribution process. These can include selective distribution mechanisms by suppliers, which may privilege offline over online sales. A second form includes price-based restraints, whereby a manufacturer may indicate implicitly or explicitly the price at which retailers, online or offline, should sell to consumers. Other forms of vertical restraints could include explicit bans on online sales, or sales via online marketplaces (including online platforms), or restrictions on the engagement of retailers with price comparison websites. Many competition authorities have explored the role of vertical restraints in online retail markets in recent years, including the European Commission (2016[37]), Mexico (DLA Piper, 2018[38]) and Japan (Japanese Fair Trade Commission, 2016[39]).

A second aspect of antitrust law involves the potential for unilateral conduct by a dominant firm that may be in a position to exert market power over other actors in the marketplace. In the context of platform markets, this dominance may be the result of direct and indirect network effects. Once gained, such dominance may hold out the potential for anti-competitive unilateral conduct. Related issues include uncertainties concerning the boundaries of the market, the role of lock-in effects, and the role of cross-subsidies from indirect network effects, all of which are characteristic of multi-sided markets.

Unilateral conduct can take many forms, including predatory pricing by dominant firms, or refusal to supply, which rests on whether a firm's infrastructure or technology is "essential" to other firms. The bundling of goods and services (see Chapter 3) may also serve as a vehicle of leveraging market power from one market to another. Another concern is a potential margin squeeze that could arise if

a wholesale access provider also competes directly with other sellers. Other forms of anti-competitive conduct could include forced free-riding, discriminatory leveraging and exploitative practices, including price discrimination.

Horizontal collusion, including between competing online and offline suppliers or retailers, is a third area of antitrust law that comes into play in e-commerce markets. The role of algorithms in facilitating such collusion has recently been explored by the OECD (2017[40]). Although algorithms may offer significant efficiencies overall, online platforms that bring together multiple sellers could increasingly use them to facilitate *de facto* price co-ordination and alignment of behaviour between otherwise unrelated sellers, a practice known as "hub-and-spoke collusion". With respect to consumer welfare, these dynamics are not always clear-cut and need to be assessed on a case-by-case basis.

Cross-border trade

Digital transformation affects e-commerce – and trade more broadly – in many ways. While e-commerce simplifies access to foreign goods and services in many cases, the trade policy environment overall has become more complex (López González and Ferencz, 2018[41]). At the same time, more trade occurs in digitally enabled services and bundles of goods and services (Ferencz, 2019[42]).

The blurring of boundaries between goods and services can result in legal and regulatory uncertainties for firms participating in cross-border e-commerce under existing multilateral and bilateral trade agreements that rely on rules based on the traditional distinction between these two categories of products (López González and Ferencz, 2018[41]; Wu, 2017[43]). For example, in the ride-sharing context, it is unclear whether such a service should be classified as a transportation service or as an information service (López González and Jouanjean, 2017[15]).[11]

Local or regional rules and regulations also affect cross-border e-commerce. For example, data flows across borders have raised concerns about privacy and security. Furthermore, public authorities find it increasingly difficult to gain access to data from overseas when this seems warranted from a policy perspective. This has led some governments to restrict the cross-border transfer of data or require that data be stored locally. The implications of these measures are not well understood and have led to a polarised debate. On the one hand, there are concerns about how new and existing data localisation measures affect business activity (increased costs, technology transfer requirements) and the broader benefits of digital trade. On the other hand, there are concerns about ensuring public policy objectives, such as the protection of privacy, security or intellectual property rights. The challenge is to find a balance that enables these key objectives to be met while preserving the significant benefits of digital trade.

Firms engaging in cross-border e-commerce often face challenges resulting from different regulatory environments in areas such as consumer protection, contract law, labelling, logistics and distribution systems, taxation and technical specifications such as interoperability of payment systems (Kommerskollegium, 2012[44]; European Commission, 2015[45]; Hamilton, 2017[46]). Almost half of the respondents in a global cross-border e-commerce survey indicated that complex rules and regulations in overseas markets are their biggest hurdle (McDermott, 2016[47]).

Partly in response to these hurdles, in 2002 METI developed *Interpretative Guidelines on Electronic Commerce and Information Property Trading* which are periodically revised to take into account technological trends and changes to international trade rules (METI Japan, 2016[48]). In addition, online marketplaces sometimes provide firms with advice on the applicable rules when selling across borders (European Commission, 2017[49]).

Digital transformation also influences digitally enabled trade in physical goods. For example, the rise in trade of small value packages, mainly driven by cross-border e-commerce, has become an important topic for customs and tax organisations. The World Customs Organization (WCO) lists challenges with respect to the processing capacities of customs agencies and issues arising in areas such as fraud, illicit trade, safety, security and revenue collection (World Customs Organization, 2018[50]). Recent work also suggests that access restrictions to several enabling services can be a barrier to digital trade (Ferencz, 2019[42]).

For firms engaging in e-commerce, the low value content of small packages often implies that transportation and border costs as well as logistical hurdles are relatively more important (DHL, 2017[12]; International Trade Centre, 2016[51]). The WCO is currently exploring potential solutions to the issue of increasing trade costs, including opportunities for co-operation between e-commerce firms and customs organisations. The role of trade costs for small packages will be addressed in forthcoming OECD work. This line of analysis also touches upon the issue of *de minimis* thresholds, which set the minimum value of a traded good below which no tariffs or taxes are collected. If these thresholds are set too low, clearance times increase but set too high they can tilt the playing field in favour of foreign firms. Accordingly, with the number of small consignments crossing the border increasing, these thresholds are becoming more contentious.[12]

Moreover, cross-border e-commerce is sometimes also affected by private market participants who restrict the sale of products across borders. The EC recently released a regulation that specifically addresses several forms of unjustified geo-blocking within the EU (European Commission, 2018[53]).

The latest flagship report of the OECD-WTO Aid for Trade initiative includes two chapters on e-commerce, focusing on the size and progression of e-commerce in developing countries and its potential benefits in terms of growth, competitiveness, export diversification and trade participation (OECD/WTO, 2017[54]). Challenges to e-commerce in developing countries were also identified, including poverty, access and connectivity, skills shortages as well as traditional trade barriers and trade costs.

ITC (2016[51]) more specifically addresses policies that affect SMEs' participation in cross-border e-commerce and provides examples of best practices and new approaches to trade facilitation and regulation. The report also highlights the opportunities that e-commerce entails for SMEs, including in landlocked developing countries, and singles out high shipping costs and international payment solutions as key barriers. Online platforms and social media are discussed as important enablers. Meltzer (2015[55]) focuses on the Internet as a promoter of services exports by US SMEs, but contains several relevant references for e-commerce in other countries.

Digital trade issues have been addressed in multilateral and plurilateral trade agreements since the rise of the Internet in the mid-1990s. In 1998, e-commerce was introduced into the global trade agenda through the work programme on e-commerce launched by the WTO (WTO, 1998[13]). While progress has been measured, 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, 2017[56]). A group of 71 Members further agreed to "initiate exploratory work together toward future WTO negotiations on trade-related aspects of electronic commerce" (WTO, 2019[57]).

E-commerce provisions are also increasingly appearing in RTAs. However, these RTAs do not often specify what e-commerce relates to or e-commerce definitions are limited to products and services delivered electronically and do not apply to physical products that have been electronically ordered (Monteiro and Teh, 2017[14]). The most common types of e-commerce provisions include a suspension of customs duties (similar to the WTO moratorium), the general promotion of e-commerce, and related e-commerce co-operation activities (Monteiro and Teh, 2017[14]). Other e-commerce provisions concern the domestic legal framework as well as more specific issues, such as electronic authentication, consumer protection, personal information protection and paperless trading.

Environment

There has been little conclusive research on the net environmental impact of e-commerce. On one hand, e-commerce can reduce transportation use (and the associated negative environmental effects) to brick-and-mortar stores, as well as decrease pressure on physical infrastructures associated with brick-and-mortar stores (e.g. lower electricity use). Increasing e-commerce in intangible products including digital content like e-books, music and films can also reduce production costs in terms of resources since they may be copied at almost zero marginal cost.

On the other hand, increased residential deliveries do not benefit from the same scale effects as professional bulk purchases, reducing transportation and packaging efficiency. The transportation sector is already one of the largest contributors to greenhouse gas emissions (Environmental Protection

Agency, 2017[59]; Eurostat, 2018[60]). Advances in smart logistics and routing may mitigate some of these impacts (see Chapter 3). Increasing consumer demand and expectations with regard to same day delivery and similar options will also affect transport efficiency.

Further research is needed to understand the environmental impact of e-commerce which, due to increased use of digital technologies like computers and mobile phones, also carries costs in terms of chemical use, electricity consumption and the recycling of electronic waste. A recent Greenpeace report found that the ICT sector consumes 7% of global electricity output (Greenpeace, 2017[61]). As e-commerce increases, this share will likely grow. Similarly, as e-commerce progresses and connected devices increasingly take part in e-commerce transactions, the environmental impacts of such devices may also increase. Recent analysis has found that 17 kg of e-waste was generated per inhabitant of the OECD in 2017, the equivalent of approximately 41 kg per 100 000 USD of GDP (OECD, 2019[62]).

More generally, e-commerce might not necessarily replace, but could increasingly complement, brick-and-mortar stores (see Chapter 3). From an environmental perspective, a 2013 analysis from MIT's Centre for Transport and Logistics found that customer travel comprises up to 75% of the total greenhouse gas emissions associated with traditional shopping, indicating that e-commerce that involves brick-and-mortar shopping may not lead to any reduction in emissions (Weideli, 2013[63]). Increased reliance on delivery systems using road and freight vehicles could also heighten aggregate emissions and affect congestion (Marshall, 2018[64]).

E-commerce could also enable the sale of used and second-hand goods to increase their lifespan and promote the circular economy. Similarly, trends towards hand-made goods made at a small scale could shift demand away from cheap mass-produced "fast" forms of fashion, which are bought more regularly but have shorter lifespans and are more difficult to recycle (Greenpeace, 2015[65]).

Moreover, e-commerce enables easier trade across borders, which can challenge the application of national, regional, and local environmental protection policy regimes. For example, extended producer responsibility (EPR) mechanisms aim to make producers responsible for the environmental impact of their products throughout their lifespan. In some cases, these regimes are challenged by e-commerce. For example, because an e-commerce firm has no physical nexus with the consumer's home country, it may not be registered with national EPR schemes and as such, EPR obligations would no longer apply. Recent OECD work notes that free-riding associated with the rapid growth of online sales has compromised the viability of EPR schemes (Hilton et al., 2019[66]).

Key areas for policy action

The developments highlighted in this chapter have several important implications for policy makers. In particular, omni-channel sales strategies, the convergence of technologies (e.g. web-based EDI), blurring boundaries between goods and services, the increasing role of online platforms and payment intermediaries as well as uncertainties with regard to the geography of sales transactions in a virtual world, complicate the empirical assessment of e-commerce transactions in terms of both scale and scope. The resulting lack of data seriously limits the ability of policy makers to determine the need for policy action and calls for an intensification of the e-commerce measurement agenda.

On the one hand, this implies that the harmonisation of available data on e-commerce across countries (e.g. ICT usage surveys), largely facilitated through international organisations including the OECD, should be continued and adjusted in response to an evolving technological environment. Changing technologies and business models might eventually also warrant a reconsideration of the current OECD e-commerce definition.

On the other hand, the limitations of ICT usage surveys, e.g. with regard to an assessment of the value of transactions, requires governments to foster the inclusion of e-commerce related questions in other official data sources, such as structural business or household expenditure surveys (OECD, 2019[21]). Additionally, national statistical offices (NSO) should foster the use of non-standard data sources. This will likely require establishing data sharing agreements with the private sector, including with online platforms, payment intermediaries or logistics service providers. Because most of these sources provide only a partial and often biased perspective on e-commerce transactions, ensuring the representativeness of these data should become a priority for NSOs.

Apart from arising measurement challenges, and as with many other facets of digital transformation, a wide range of policy areas directly affects the development of e-commerce. This includes policies related to consumers, tax, competition, cross-border trade and the environment. Some of the key e-commerce policy issues in these policy areas are briefly discussed below.

- ***Consumer protection*** has become more complex in the digital era, including for vulnerable consumers (e.g. children). At the same time, new issues have emerged, for example in relation to online apps and services offered for "free" in exchange for gaining access to the user's personal data. More generally, cross-border e-commerce challenges the enforcement of national and regional consumer protection regimes, particularly for product safety and recalls.
- ***Tax policy*** challenges have moved to the top of the global agenda, especially with respect to the taxation of intangible assets, as new digital business models, including for e-commerce, have raised issues around how and where value is created, particularly through emerging opportunities for data collection and user engagement. As intangible assets are highly mobile, new e-commerce business models further test existing income taxation systems, which are based predominantly on physical factors to determine a taxable presence and allocate profits (e.g. the definition of permanent establishment).
- ***Competition policy*** also comes to the fore with respect to e-commerce. A range of different competition dynamics have emerged for online sellers as well as other actors in the brick-and-mortar space, including for online platforms. Issues around whether traditional antitrust enforcement mechanisms are fit for the digital age have become more important, including with respect to possible horizontal collusion. The role that algorithms may play in facilitating such collusion has also been raised in competition policy circles.
- ***Trade policy*** represents another important e-commerce policy area. As more trade occurs in digitally-enabled services and bundles of goods and services, the blurring of boundaries between goods and services can result in legal and regulatory uncertainties for firms participating in cross-border e-commerce under existing multilateral and bilateral trade agreements that rely on rules based on the traditional distinction between goods and services. Rules regarding cross-border data flows also impact e-commerce.
- ***Environmental policy*** may also affect e-commerce, although the net effect is not clear-cut. On the one hand, e-commerce can reduce transportation use (and the associated negative environmental effects) to brick-and-mortar stores, as well as decrease pressure on physical infrastructures (e.g. lower electricity use). On the other hand, increased residential deliveries do not benefit from the same scale effects as professional bulk purchases, reducing transportation efficiency, while increased e-commerce may also increase e-waste. E-commerce can also raise issues with national, regional, and local environmental protection policy regimes.

Technological change and business model innovations are constantly altering the e-commerce landscape, and these new developments are increasingly challenging several policy areas simultaneously. While many of the challenges identified in the early days of e-commerce remain relevant (e.g. related to data protection), new challenges have emerged (e.g. the rise of tradeable services and their implications for trade policy frameworks).

These developments imply that a holistic approach to e-commerce policy making is essential, including co-operation and collaboration across policy domains. Policy makers should ensure that policy action is not unilateral, but instead developed with thoughtful consideration of the impacts across policy domains, particularly those identified in this report. A periodic review of policy settings may be useful in ensuring that the benefits of e-commerce can be maximised while addressing the related challenges.

Notes

1. Several high-level meetings on e-commerce were held, including the G7 Ministerial Conference on the Information Society 1995 in Brussels and the Ministerial Conference on Global Information Networks in Bonn 1997. The OECD held a conference in 1997 on "Dismantling the Barriers to Global Electronic Commerce" in Turku followed by its Ministerial Conference on E-Commerce in 1998 in Ottawa.
2. An order is understood as a commitment to purchase goods or services, irrespective of how the payment is made (OECD, 2011[6]).
3. More specifically, Eurostat defines e-commerce as "as the sale or purchase of goods or services, whether between businesses, households, individuals or private organizations, through electronic transactions conducted via the internet or other computer-mediated (online communication) networks. The term covers the ordering of goods and services which are sent over computer networks, but the payment and the ultimate delivery of the goods or service may be conducted either on- or off-line." (See the Eurostat Glossary on E-Commerce (Eurostat, 2017[69]) for further details.)
4. The blurring distinction between goods and services poses challenges for the multilateral trade system, where policy makers need to determine whether emerging product bundles are to be treated according to the rules under the General Agreement on Tariffs and Trade (GATT) or the General Agreement on Trade in Services (GATS) (Magdeleine and Maurer, 2016[70]).
5. The recent update of the *OECD Guidelines for Consumer Protection in the Context of Electronic Commerce* (OECD, 2016[24]) highlights that increasingly non-monetary transactions must be considered in the context of e-commerce.
6. The OECD Working Party on Indicators for the Information Society (WPIIS, now WPMADE) led the measurement work related to e-commerce.
7. The work on consumer protection, particularly in relation to e-commerce, is led by the OECD Working Party on Consumer Product Safety (WPCPS).
8. For example, the 28 EU member states have recently approved proposals for modernising VAT collection in cross-border e-commerce. These proposals provide for the extension of the mini-one-stop-shop (MOSS) registration system to cover imports of low-value goods and all cross-border services to final users and to remove the exemption for low value consignments with effect from 2021. Australia has already enacted legislation on the GST treatment of low-value imported goods, with effect from 1 July 2018. Switzerland changed its rules regarding the treatment of low-value imports as of 1 January 2019. Singapore is also considering implementing a simplified registration regime for both the taxation of cross-border services and low-value goods and is currently consulting affected stakeholders.
9. The work on consumption taxes, including in relation to e-commerce, is led by the OECD Working Party No. 9 on Consumption Taxes (WP9).
10. The report, "Mechanisms for the effective collection of VAT/GST where the supplier is not located in the jurisdiction of taxation" was developed with the active involvement of both a broad range of jurisdictions beyond the OECD and the global business community, notably through the OECD Global Forum on VAT and the Technical Advisory Group to the WP9. It provides a general description of basic policy questions and design issues concerning the collection of VAT on supplies of services and intangibles by foreign suppliers together with an overview of key policy and design issues for tax authorities to consider when designing and implementing a registration-based collection regime with or without simplification measures. It also provides more detailed guidance on the design and practical operation of a simplified registration and collection regime as recommended by the VAT/GST Guidelines and by the Action 1 report. It does not aim at detailed prescriptions for national legislation. Jurisdictions are sovereign with respect to the design and application of their laws. Rather, the report seeks to present a range of possible approaches and discuss associated policy considerations. The report is evolutionary in nature and will be reviewed regularly in light of the rapid development of technology and online sales and delivery processes.
11. See also the recent European Court of Justice ruling related to Uber (European Court of Justice, 2017[71]).
12. The 2015 BEPS Action 1 Report (Annex D) indicates that countries could consider if they wish to remove VAT exemption thresholds applying to imports of small consignment (parcels). Further work is currently being developed with respect to the role of digital platforms in the collection of VAT/GST on online sales (see Chapter 3 for more discussion of online platforms in e-commerce).

References

DHL (2017), "The 21st century spice trade – A guide to the cross-border e-commerce opportunity", DHL Express, *http://www.dhl.com/content/dam/downloads/g0/press/publication/g0_dhl_express_cross_border_ecommerce_21st_century_spice_trade.pdf*. [12]

DLA Piper (2018), "Cofece launches abuse of dominance investigation on e-commerce platforms in Mexico", *https://www.dlapiper.com/en/mexico/insights/publications/2018/02/cofece-launches-abuse-of-dominance-investigation-on-e-commerce-platforms-in-mexico* (accessed on 6 March 2018). [38]

Environmental Protection Agency (2017), "Fast Facts on transportation greenhouse gas emissions", *https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions* (accessed on 6 March 2019). [59]

European Commission (2018), "A new deal for consumers: Commission strengthens EU consumer rights and enforcement", European Commission, Brussels, *https://ec.europa.eu/newsroom/just/item-detail.cfm?item_id=620435*. [25]

European Commission (2018), *Regulation 2018/302 of the European Parliament and the Council of 28 February 2018 on Addressing Unjustified Geo-blocking and Other Forms of Discrimination based on Customer's Nationality, Place of Residence or Place of Establishment*, European Commission, Brussels, *http://data.europa.eu/eli/reg/2018/302/oj*. [53]

European Commission (2017), "Final report on the e-commerce sector inquiry, report from the commission to the Council and the European Parliament", European Commission, Brussels, *http://ec.europa.eu/competition/antitrust/sector_inquiry_final_report_en.pdf*. [49]

European Commission (2015), "A digital single market strategy for europe - Analysis and evidence", European Commission, Brussels, *https://ec.europa.eu/digital-single-market/en/news/digital-single-market-strategy-europe-com2015-192-final*. [45]

European Commission (2015), "Provision of two online consumer surveys as support and evidence base to a Commission study: Identifying the main cross-border obstacles to the Digital Single Market and where they matter most", *https://ec.europa.eu/info/sites/info/files/digital-single-market-final-report_en.pdf*. [20]

European Court of Justice (2017), *C-434/15 - Asociación Profesional Elite Taxi*, *http://curia.europa.eu/juris/liste.jsf?num=C-434/15*. [70]

European Union (2016), *Commission Decision of 16/02/2016 – Case no. COMP/M.7726*, *http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32016M7726* (accessed on 6 March 2019). [37]

Eurostat (2018), "Greenhouse gas emission statistics – Emission inventories", *http://ec.europa.eu/eurostat/statistics-explained/index.php/Greenhouse_gas_emission_statistics_-_emission_inventories* (accessed on 19 April 2018). [60]

Eurostat (2017), *Glossary: E-Commerce*, *https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:E-commerce*. [68]

Eurostat (2017), *Methodological Manual for Statistics on the Information Society*, Luxembourg: Office for Official Publications of the European Communities, *https://circabc.europa.eu/sd/a/d88ef865-c2a2-4f83-a9d1-671adc8bf477/MM2018_Part_I_Enterprise%20survey.zip*. [8]

Ferencz, J. (2019), "The OECD Digital Services Trade Restrictiveness Index", *OECD Trade Policy Papers*, No. 221, OECD Publishing, Paris, *https://doi.org/10.1787/16ed2d78-en*. [42]

Fraumeni, B. (2001), "E-commerce: Measurement and measurement issues", *https://www.jstor.org/stable/2677781*. [19]

Garicano, L. and S. Kaplan (2001), "The effects of business-to-business e-commerce on transaction costs", *Journal of Industrial Economics*, Vol. 49/4, pp. 463-485, *http://dx.doi.org/10.3386/w8017*. [5]

Greenpeace (2017), "ClickClean: Who is winning the race to build a green internet?, *http://www.clickclean.org/international/en* (accessed on 19 April 2018). [61]

Greenpeace (2015), "Timeout for fast fashion", *https://www.greenpeace.org/archive-international/Global/international/briefings/toxics/2016/Fact-Sheet-Timeout-for-fast-fashion.pdf* (accessed on 19 April 2018). [65]

Hamilton, D. (2017), "The transatlantic digital economy 2017: How and why it matters for the United States, Europe and the World", Washington, D.C.: Center for Transatlantic Relations, 2017, *https://archive.transatlanticrelations.org/wp-content/uploads/2017/05/TDE-2017.pdf*. [46]

Hawkins, R. (1998), "Creating a positive environment for electronic commerce in Europe", SPRU, University of Sussex. [4]

Hilton, M. et al. (2019), *Extended Producer Responsibility (EPR) and the Impact of Online Sales*, OECD Publishing, Paris, *https://doi.org/10.1787/cde28569-en*. [66]

International Trade Centre (2016), *Bringing SMEs onto the e-Commerce Highway*, International Trade Centre, Palais des Nations, Switzerland, *http://www.intracen.org/uploadedFiles/intracenorg/Content/Publications/Bringing%20SMEs%20onto%20the%20e-Commerce%20Highway_final_250516_Low-res.pdf*. [51]

Japanese Fair Trade Commission (2016), *Guidelines Concerning Distribution Systems and Business Practices under the Anti-monopoly Act*, *http://www.jftc.go.jp/en/legislation_gls/imonopoly_guidelines.files/DistributionSystemsAndBusinessPractices.pdf*. [39]

Kommerskollegium (2012), *E-commerce – New Opportunities, New Barriers: A Survey of E-commerce Barriers in Countries Outside the EU*, Kommerskollegium 2012:4, National Board of Trade, Copenhagen, *https://www.wto.org/english/tratop_e/serv_e/wkshop_june13_e/ecom_national_board_e.pdf*. [44]

López González, J. and J. Ferencz (2018), "Digital trade and market openness", *OECD Trade Policy Papers*, No. 217, OECD Publishing, Paris, *http://dx.doi.org/10.1787/1bd89c9a-en*. [41]

López González, J. and M. Jouanjean (2017), "Digital trade: Developing a framework for analysis", *OECD Trade Policy Papers*, No. 205, OECD Publishing, Paris, *http://dx.doi.org/10.1787/524c8c83-en*. [15]

Magdeleine, J. and A. Maurer (2016), *Understanding Trade in Digitized Ideas: What Are the Statistical Challenges?*, World Trade Organization (WTO), Geneva, *http://dx.doi.org/10.30875/6a1b6a37-en*. [69]

Marshall, A. (2018), "If you hate traffic, curb your love for online shopping", *Wired*, *https://www.wired.com/story/online-shopping-traffic-delivery-efficiency* (accessed on 17 April 2019). [64]

McDermott, K. (2016), "Key business drivers and opportunities in cross-border e-commerce – A data-driven landscape 2016", Payvision, *https://www.payvision.com/cross-border-ecommerce-report-survey-2016*. [47]

Meltzer, J. (2015), "Using the Internet to promote services exports by small- and medium-sized enterprises", Brookings Institution, Washington, D.C., *https://www.brookings.edu/wp-content/uploads/2016/06/Internet-WP_WEB-Final.pdf*. [55]

METI Japan (2016), "Results compiled of the e-commerce market survey", Ministry of Economy, Trade and Industry, Press Release, *http://www.meti.go.jp/english/press/2016/0614_02.html*. [48]

METI Japan (2016), "Retail e-commerce in Canada", Ministry of Economy, Trade and Industry, Canada, *http://www.meti.go.jp/english/press/2016/0614_02.html* (accessed on 5 March 2019). [11]

Monteiro, J. and R. Teh (2017), "Provisions on electronic commerce in regional trade agreements", WTO Staff Working Paper, No. ERSD-2017-11, *https://dx.doi.org/10.2139/ssrn.3005148*. [14]

OECD (2019), *An Introduction to Online Platforms and their Role in Digital Transformation*, OECD Publishing, Paris, *https://doi.org/10.1787/53e5f593-en*. [18]

OECD (2019), *Going Digital: Shaping Policies, Improving Lives*, OECD Publishing, Paris, *https://doi.org/10.1787/9789264312012-en*. [62]

OECD (2019), *Measuring the Digital Transformation: A Roadmap for the Future*, OECD Publishing, Paris, *https://doi.org/10.1787/9789264311992-en*. [21]

OECD (2018), "Consumer protection enforcement in a global digital marketplace", *OECD Digital Economy Papers*, No. 266, OECD Publishing, Paris, *https://doi.org/10.1787/f041eead-en*. [31]

OECD (2018), "Implications of e-commerce for competition policy - Background note", *https://one.oecd.org/document/DAF/COMP(2018)3/en/pdf*. [36]

OECD (2018), "Improving online disclosures with behavioural insights", *OECD Digital Economy Papers*, No. 269, OECD Publishing, Paris, *http://dx.doi.org/10.1787/39026ff4-en*. [26]

OECD (2018), "Rethinking antitrust tools for multi-sided platforms", *http://www.oecd.org/competition/rethinking-antitrust-tools-for-multi-sided-platforms.htm*. [35]

OECD (2018), *Tax Challenges Arising from Digitalisation – Interim Report 2018: Inclusive Framework on BEPS*, OECD/G20 Base Erosion and Profit Shifting Project, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264293083-en*. [34]

OECD (2017), "Algorithms and collusion: Competition policy in the digital age", *http://www.oecd.org/competition/algorithms-collusion-competition-policy-in-the-digital-age.htm*. [40]

OECD (2017), "Measuring digital trade: Towards a conceptual framework", OECD, Paris, *https://one.oecd.org/document/STD/CSSP/WPTGS(2017)3/en/pdf*. [22]

OECD (2017), "Summary of responses of the advisory group: Survey on digital economy typology", OECD, Paris, *http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=STD/CSSP/WPNA(2017)1&docLanguage=En*. [16]

OECD (2016), *BEPS Project Explanatory Statement: 2015 Final Reports*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264263437-en*. [33]

OECD (2016), *OECD Recommendation of the Council on Consumer Protection in E-Commerce*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264255258-en*. [24]

OECD (2016), "Online product safety: Trends and challenges", *OECD Digital Economy Papers*, No. 261, OECD Publishing, Paris, *http://dx.doi.org/10.1787/5jlnb5q93jlt-en*. [27]

OECD (2015), *Addressing the Tax Challenges of the Digital Economy, Action 1 - 2015 Final Report*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264241046-en*. [32]

OECD (2015), *Government at a Glance 2015*, OECD Publishing, Paris, *https://doi.org/10.1787/gov_glance-2015-44-en*. [67]

OECD (2013), "Electronic and mobile commerce", *OECD Digital Economy Papers*, No. 228, OECD Publishing, Paris, *http://dx.doi.org/10.1787/5k437p2gxw6g-en*. [28]

OECD (2011), *OECD Guide to Measuring the Information Society 2011*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264113541-en*. [6]

OECD (1999), *The Economic and Social Impact of Electronic Commerce: Preliminary Findings and Research Agenda*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264172081-en*. [2]

OECD (1998), "Dismantling the barriers to global electronic commerce, Turku (Finland): 19-21 November 1997 - Conference report", *OECD Digital Economy Papers*, No. 38, OECD Publishing, Paris, *http://dx.doi.org/10.1787/236647320075*. [3]

OECD (1997), "Sacher Report", *OECD Digital Economy Papers*, No. 29, OECD Publishing, Paris, *http://dx.doi.org/10.1787/237058611046*. [1]

OECD (forthcoming), "Trade in small packages", *OECD Trade Policy Papers*, OECD Publishing, Paris. [52]

OECD/WTO (2017), *Aid for Trade at a Glance 2017: Promoting Trade, Inclusiveness and Connectivity for Sustainable Development*, OECD Publishing, Paris/WTO, Geneva, *https://doi.org/10.1787/aid_glance-2017-en*. [54]

Statistics Canada (2016), "Retail e-commerce in Canada", *http://www.statcan.gc.ca/pub/11-621-m/11-621-m2016101-eng.htm* (accessed on 5 March 2019). [10]

UNCTAD (2017), "Consumer protection in electronic commerce", *http://unctad.org/meetings/en/SessionalDocuments/cicplpd7_en.pdf* (accessed on 19 April 2018). [30]

UNCTAD (2017), *UNCTAD B2C E-Commerce Index 2017*, United Nations, Geneva, *http://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d09_en.pdf*. [23]

UNCTAD (2016), *In Search of Cross-Border E-Commerce Trade Data*, United Nations, Geneva, *https://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d06_en.pdf*. [7]

United Nations General Assembly (2015), *United Nations Guidelines for Consumer Protection*, United Nations, Geneva, *https://unctad.org/en/Pages/DITC/CompetitionLaw/UN-Guidelines-on-Consumer-Protection.aspx*. [29]

US Census Bureau (2018), "E-commerce statistics (E-STATS)", *https://www.census.gov/programs-surveys/e-stats/about/faqs.html* (accessed on 5 March 2019). [9]

Weideli, D. (2013), "Environmental analysis of us online shopping", MIT Centre for Transportation and Logistics, *https://ctl.mit.edu/sites/ctl.mit.edu/files/library/public/Dimitri-Weideli-Environmental-Analysis-of-US-Online-Shopping_0.pdf* (accessed on 19 April 2018). [63]

World Customs Organization (2018), *Cross-Border E-commerce: Framework of Standards*, World Customs Organization, Brussels, *http://www.wcoomd.org/-/media/wco/public/global/pdf/topics/facilitation/activities-and-programmes/ecommerce/wco-framework-of-standards-on-crossborder-ecommerce_en.pdf?la=en*. [50]

WTO (2019), *Joint Statement on Electronic Commerce*, World Trade Organization, Geneva, *http://trade.ec.europa.eu/doclib/docs/2019/january/tradoc_157643.pdf*. [57]

WTO (2017), *Work Programme on Electronic Commerce: Ministerial Decision of 13 December 2017*, World Trade Organization, Geneva, *https://www.wto.org/english/thewto_e/minist_e/min_declaration_e.htm*. [56]

WTO (1998), *Work Programme on Electronic Commerce*, World Trade Organization, Geneva, WT/L0274, Geneva, *https://www.wto.org/english/tratop_e/ecom_e/wkprog_e.htm* (accessed on 25 September 1998). [13]

Wu, M. (2017), "Digital trade-related provisions in regional trade agreements: Existing models and lessons for the multilateral trade system", International Centre for Trade and Sustainable Development (ICTSD) and Inter-American Development Bank (IDB), Geneva. [43]

Chapter 2
TRACKING E-COMMERCE TRENDS

As digital transformation has accelerated, the e-commerce landscape has become increasingly dynamic. New players have emerged at the same time that established actors have taken on new roles; some barriers to e-commerce at the firm, individual and country levels have been overcome, while new barriers have emerged. This chapter tracks e-commerce trends along several dimensions, presenting new evidence on broad e-commerce trends, developments for firms and consumers, and cross-border e-commerce trends. It concludes by identifying key areas for policy action.

As digital transformation has accelerated, the e-commerce landscape has become increasingly dynamic. New players have emerged at the same time that established actors have taken on new roles; some barriers to e-commerce at the firm, individual and country levels have been overcome, while new barriers have emerged; and new opportunities have emerged to unlock the potential of e-commerce to potentially boost growth and consumer welfare.

E-commerce takes place through a variety of seller-buyer relationships that have been evolving. At the same time, increasing fixed and mobile broadband penetration – in addition to the uptake of mobile devices (e.g. the smartphone) – has changed the way in which buyers and sellers participate in e-commerce transactions. To track trends in e-commerce from a firm perspective, two measures are useful to consider:

- *Firm participation* refers to the percentage of firms engaging in e-commerce. This measure captures the extensive margin of e-commerce, but yields no direct information about the percentage of e-commerce firms contributing to the overall size of the e-commerce market.
- *Turnover* reflects the percentage of total turnover (i.e. value of sales) that e-commerce firms contribute to the market. This measure provides information on the relative size of the e-commerce market. As it is an aggregate measure, it does not provide information on the intensity of e-commerce activities at the firm level. Accordingly, the share of e-commerce in total turnover can be large if: 1) there is a large number of (potentially small) e-commerce firms in the market or 2) a moderate number of e-commerce firms account for a large share of the total market (e.g. because e-commerce firms are large).

Both measures are used in this chapter. The advantage of the former (firm participation) is that its interpretation is relatively straightforward, while the latter (turnover) mixes several dimensions that cannot be disentangled easily (e.g. the relative size of e-commerce firms, share of e-commerce in individual firms' sales, and firm participation). The advantage of the latter (turnover) is that it captures a value dimension. This chapter analyses e-commerce trends along several dimensions: broad e-commerce trends, developments for firms and consumers, and cross-border e-commerce trends. It concludes with key areas for policy action.

Broad e-commerce trends

E-commerce developed primarily as a means to facilitate repeated transactions between large firms, and it relied on custom networks for the electronic exchange of data (see Chapter 1). With the expansion of open networks like the Internet, e-commerce is now spreading to smaller firms and it is increasingly used for transactions between firms and consumers. While transactions between firms still dominate the e-commerce landscape in absolute terms, the current speed of uptake is on average faster in sectors like accommodation or retail where consumers are a major player. Ubiquitous access to the Internet via mobile devices as well as new payment methods are supporting these dynamics.

B2B transactions dominate the e-commerce landscape, but B2C is on the rise

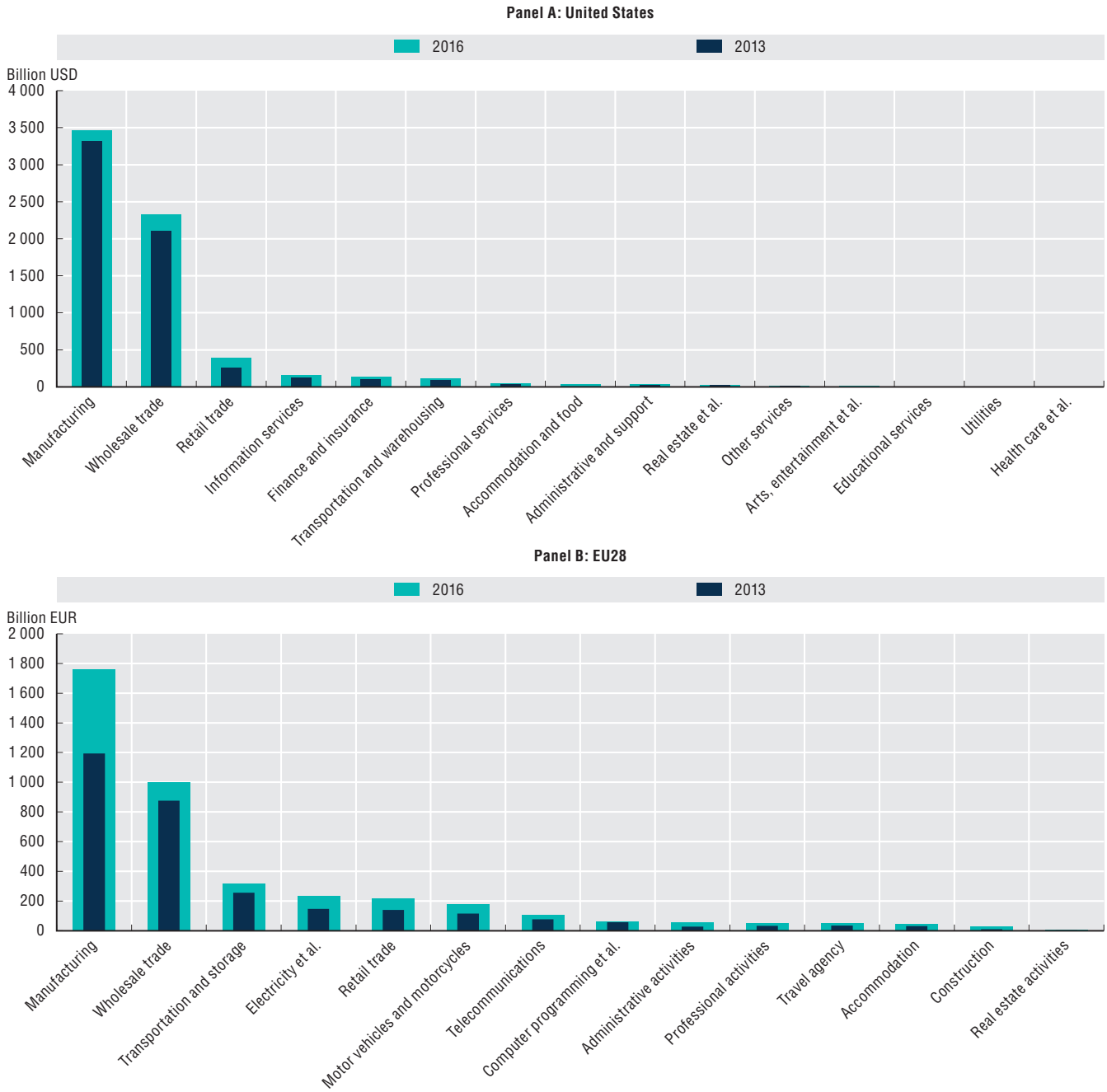
Current trends confirm that business-to-business (B2B) transactions still account for the lion's share of e-commerce transactions. With close to EUR 1.8 trillion, the manufacturing sector alone accounted for 43% of total EU28 e-commerce (EUR 4.1 trillion, up from EUR 3 trillion in 2013) in 2016 (Figure 2.1). In the same year, US manufacturing turnover from e-commerce represented 51% (USD 3.5 trillion) of total e-commerce turnover (USD 6.8 trillion, up from USD 6.1 trillion in 2013).[1] In both geographic regions, the manufacturing sector was followed by wholesale trade, accounting for EUR 1 trillion in the EU28 and over USD 2.3 trillion in the US. Together, these two sectors accounted for 67% and 85% of the captured e-commerce turnover in Europe and the United States, respectively.

On the other hand, sectors with a strong focus on end consumers accounted for much smaller shares of total e-commerce. Specifically, retail accounted for only about 5% of total e-commerce turnover in the EU28 (EUR 217.6 billion), accommodation for 1% (EUR 42.9 billion) and real estate for 0.1% (EUR 4.7 billion). The remaining turnover was captured by sectors with an intermediate share of business-to-consumer (B2C) sales in e-commerce, including electricity, gas, steam, air conditioning and water supply (EUR 234.3 billion or 6%) and transportation (EUR 318.4 billion or 8%). Similarly low shares from consumer-facing sectors can be observed in the United States, where the retail sector (excluding motor vehicles and parts dealers) accounted for USD 389.1 billion, or 6% of the total turnover from e-commerce. Service activities

beyond retail and wholesale in the United States jointly captured close to 9% of total e-commerce turnover shown (see Figure 2.1).[2] Overall, the contribution of the manufacturing and wholesale sectors to the total e-commerce transaction value has been diminishing in both regions.[3]

2.1. Value of e-commerce in the US and EU28 by sector, 2016

Absolute values in terms of turnover



Note: See Chapter notes.[4]

Source: USA: OECD calculations based on US Census (NAICS): *Annual Survey of Manufacturers* (database), *https://www.census.gov/programs-surveys/asm.html* (accessed January 2019); *Annual Wholesale Trade Survey* (database) *https://www.census.gov/awts* (accessed January 2019); *Service Annual Survey* (database) *https://www.census.gov/programs-surveys/sas.html* (accessed January 2019), and *Annual Retail Trade Survey* (database) *https://www.census.gov/programs-surveys/arts.html* (accessed January 2019). EU28: OECD calculations based on Eurostat, Annual Enterprises Statistics by size class for special aggregates of activities (NACE Rev. 2) (database) *https://data.europa.eu/euodp/data/dataset/e1USD9juizbBvCXBVLjQ* (accessed January 2019) and Eurostat, *Digital Economy and Society Statistics* (database) *https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/comprehensive-database* (accessed January 2019).

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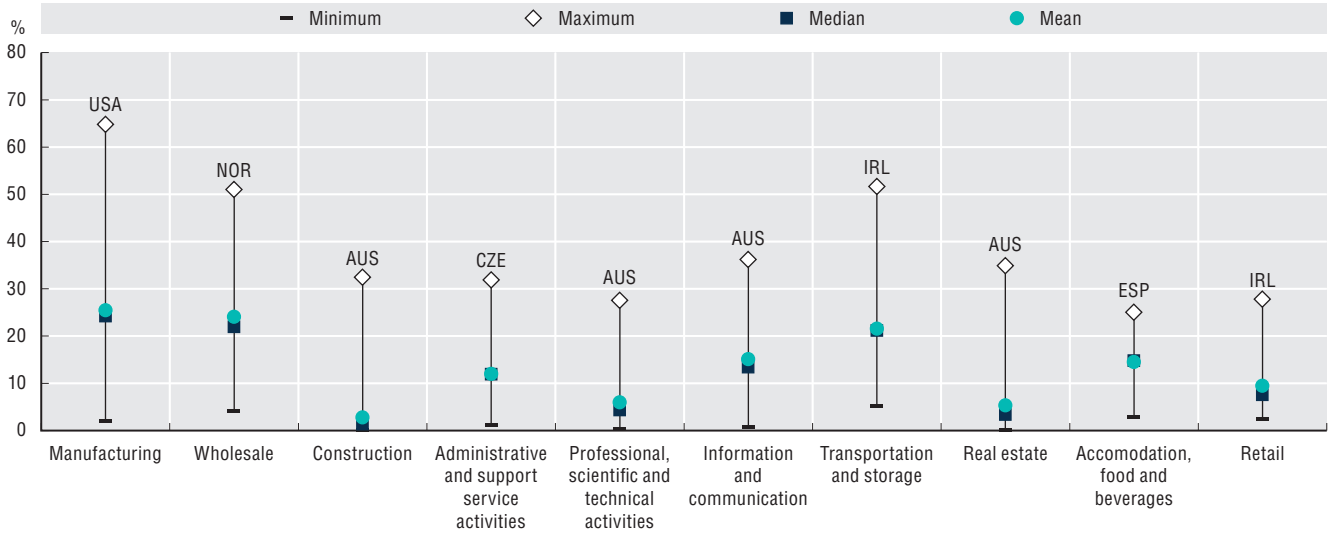
B2C sectors are not much behind in terms of e-commerce intensity, and tend to be more dynamic in terms of e-commerce uptake

For 2017, Figure 2.2 depicts the minimum, maximum, median and mean share of sales via computer mediated networks in total turnover for the OECD and some additional countries. Sectors are ordered according to the share of B2C sales in total e-commerce. The figure shows that differences between sectors are far less striking when it comes to the share of turnover that arises from e-commerce transactions. Accordingly, the figure suggests that the overall dominance of B2B e-commerce is explained to a large extent by the absolute size of sectors engaging heavily in B2B transactions, rather than a particular relevance of e-commerce for these sectors.

2.2. E-commerce intensity by sector, 2017

As a percentage of total turnover



Note: See Chapter notes.[5]

Source: OECD calculations based on OECD, *ICT Access and Usage by Businesses* (database), *http://oe.cd/bus* (accessed March 2019).

StatLink https://doi.org/10.1787/888933922785

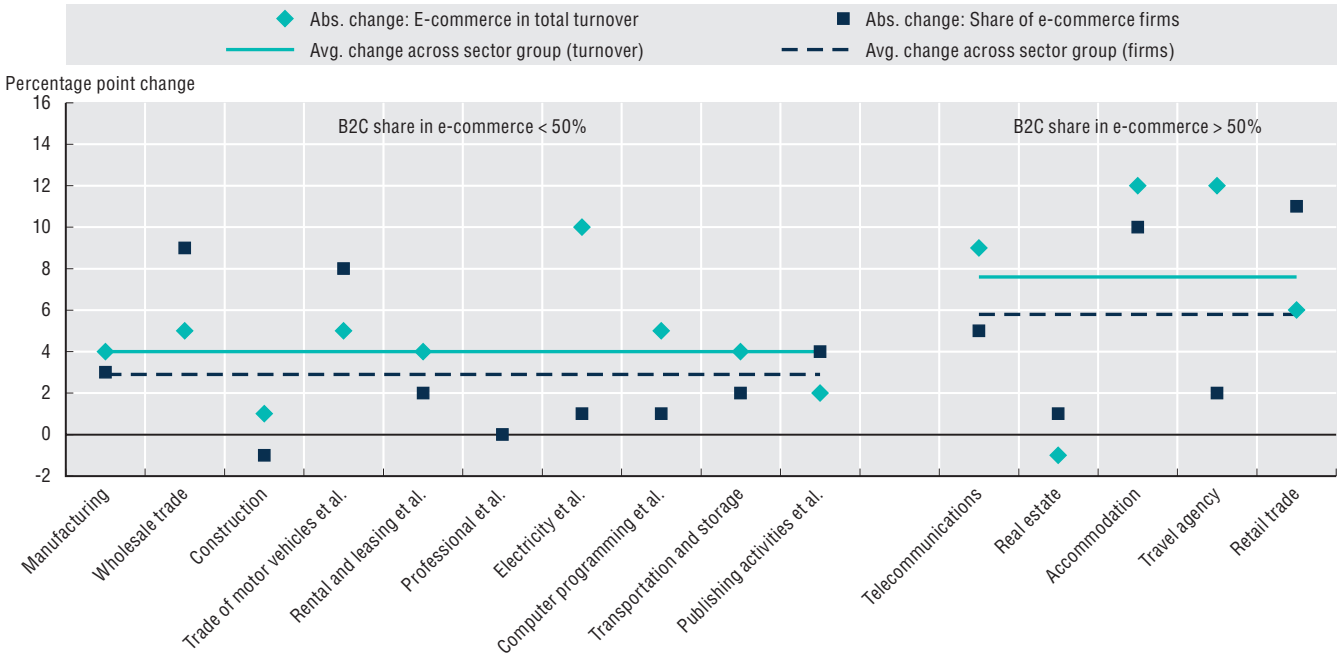
Figure 2.3 shows the absolute change in percentage points over the years 2010 to 2017 in terms of both firm participation in e-commerce (%) and the share of e-commerce in total turnover (%) for the EU28.[6] Sectors are grouped according to whether the share of B2C transactions in total e-commerce is above or below 50%. Figure 2.3 reveals that sectors heavily relying on B2C transactions have grown faster on average on both margins. The average percentage point increase in terms of firm participation (turnover) was 6 (8) percentage points in B2C sectors relative to 3 (4) percentage points in sectors heavily relying on B2B transactions.

The largest increases in terms of firm participation for sectors strongly engaged in e-commerce with end consumers occurred in retail (from 17% to 28%) and accommodation (from 58% to 68%). In terms of turnover, travel agency services (from 23% to 35%) and accommodation services (from 19% to 31%) experienced the largest increases. Among B2B sectors, the wholesale sector (from 26% to 35%) and trade of motor vehicles and motorcycles (from 18% to 26%) have seen the largest percentage point increases in terms of firm participation. The share in turnover grew strongest in the sector aggregate comprising electricity, gas, steam, air conditioning and water supply, namely 10 percentage points from 6% to 16%. The construction sector saw the share of e-commerce firms slightly reduced from 5% to 4%, and the percentage of e-commerce in turnover diminished from 3% to 2% in the real estate sector.

Across all sectors, the share of e-commerce turnover resulting from B2C transactions in the EU28 increased from 12% to 16% between 2012 and 2017.[7] These dynamics underscore the importance of ensuring that appropriate consumer policy frameworks are in place, and that they evolve as needed with changes in technologies and business models.

2.3. Growth in EU28 e-commerce – B2C- vs. B2B-intensive sectors, 2010-17

Percentage point change



Note: See Chapter notes.[8]

Source: OECD calculations based on OECD, *ICT Access and Usage by Businesses* (database), *http://oe.cd/bus* (accessed April 2019).

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Mobile e-commerce and alternative payment methods are increasing in importance

Estimates of the rise in e-commerce conducted through mobile devices for the retail sector suggest that by 2021, worldwide mobile commerce will account for USD 3.6 trillion, corresponding to 73% of total e-commerce in the retail sector (eMarketer, 2018[1]). This would result in an increase by over 20 percentage points in only five years, up from 52% in 2016. For 2016, these data imply a total volume of retail e-commerce of USD 1.8 trillion. However, according to GlobalData (2017[2]), the rise of mobile commerce is happening faster in some countries than in others. While an estimated 56% of e-commerce transactions in the People's Republic of China (hereafter "China") were carried out on smartphones and/or tablets in 2017, the corresponding share was only 23% in the United States and 26% in the United Kingdom.

Evidence from Paypal (2018[3]) confirms the regional differences for cross-border purchases. These data from 2018 suggest that Asian Pacific users relied most heavily on mobile devices for such purchases, realising about 41% of cross-border purchases in the past 12 months through either a smartphone or a tablet. The region is followed by the Middle East (37%), Africa (37%), Latin America (34%), North America (33%), Western Europe (30%) and Eastern Europe (27%). According to these data, between 56% (Asia Pacific) and 71% (Eastern Europe) of all cross-border purchases were realised through a desktop computer, laptop or notebook.

A rise in alternative payment methods is accompanying the rise in mobile e-commerce

Capgemini (2017[4]) estimates that the number of digital payments that were made over the Internet for e-commerce activities (e-payments) globally reached 40 billion in 2015, and they are estimated to increase by 18% by 2019. M-payments, defined as payments where a mobile phone is used as a payment method and not just an alternative channel to send payment instructions, had reached 49.5 billion transactions according to the same source and is estimated to grow by 22% until 2019, indicating a shift towards mobile payments. Juniper Research (2017[5]) predicts that the total annual transaction value of online, mobile and contactless payments will reach USD 3.6 trillion in 2016, up from USD 3.0 trillion in 2015.

Also with regard to payment methods, Worldpay (2017[6]) estimates that in 2016, credit card payments accounted for 29% of total e-commerce payments, followed by eWallets (18%), bank transfers (17%), debit cards (13%), cash-on-delivery (9%), charge or deferred debit cards (6%) and others (8%). By 2021, eWallets are expected to reach a market share of 46%, whereas credit cards are expected to lose ground. Worldpay also predicts that bank transfers will gain market share due to convenience and increasing access, particularly in the developing world.

Using payment data, a Payvision study estimates that around 8% of global commercial transactions involve digital payment, i.e. they are paid neither by cash nor by a physically present payment card (McDermott, 2016[7]). About 11% of these commercial transactions are accounted for by mobile sales points, e.g. using near field communication technologies. Another 36% of transactions use mobile devices from a distance (about 63% of which are SMS payments) and the remaining 53% is non-mobile. Data suggest that consumers in less developed markets have a stronger willingness to use mobile payments, and mobile technology is thriving in many middle-income economies including Indonesia. Kenya, Mexico, Turkey and Ukraine.

In line with the findings for overall mobile commerce, a GlobalData (2017[2]) report finds that the Asian Pacific markets lead when it comes to alternative payment methods, which often rely on mobile technologies. Their findings reveal that digital and mobile wallets accounted for about 47% of total e-commerce transactions in Asian Pacific countries, followed by payment cards (28%), bank transfers (13%) and cash/checking accounts (11%). Chapter 3 takes a closer look at changes in payment methods from a business model perspective.

E-commerce trends: A firm perspective

Firms drive e-commerce developments, including through innovative business models (see Chapter 3), and play a key role in spurring e-commerce innovations. The Internet and digital technologies enable firms of all sizes to enter new markets and expand their reach, allowing them to grow, scale and benefit from knowledge spillovers as they engage more easily in global value chains (GVCs).

2.1. Defining sellers in the e-commerce ecosystem

E-commerce surveys and data collections measure e-commerce depending on how the transaction takes place. E-commerce may take place over electronic data interchange (EDI), the Internet, or some combination of the two (OECD, 2011[8]). Throughout this report, the following terms distinguish which type of e-commerce is being referred to so that appropriate comparisons may be made.

- ***E-commerce firms***: All firms engaging in e-commerce, either through EDI or the Internet.
- ***E-commerce firms using EDI***: Firms that use EDI to participate in e-commerce (B2B). EDI may rely on online channels.
- ***Online sellers***: Firms that use the Internet to participate in e-commerce, not counting sales via EDI (B2B or B2C).

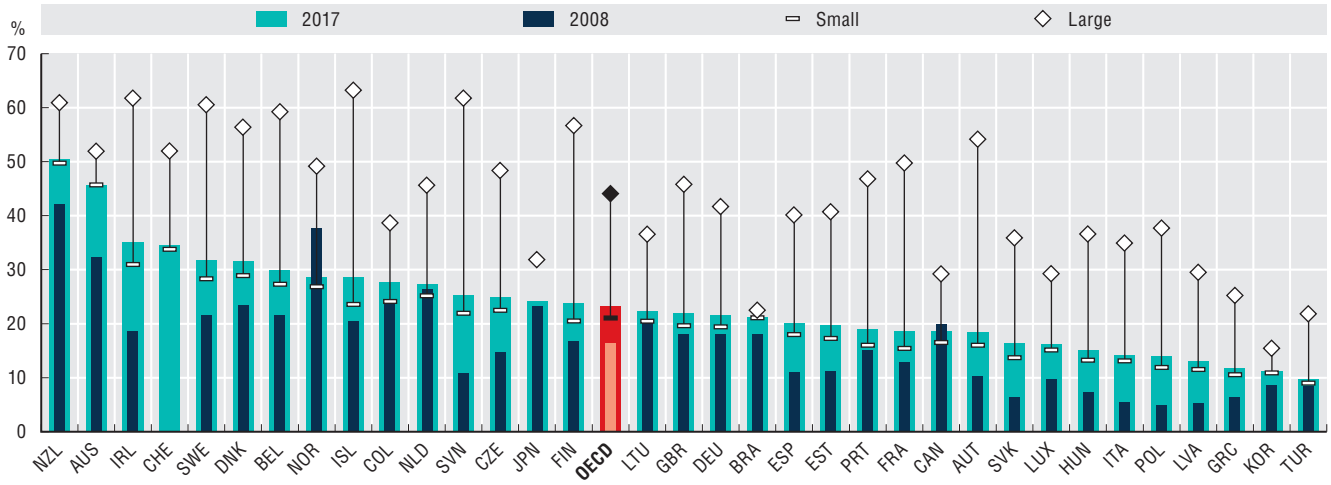
Firms increasingly participate in e-commerce, with large variations across countries and by firm size

The share of firms that participate in e-commerce sales has grown in most of the OECD area and some other countries, from an average of 16% in 2008 to about 23% in 2017 (Figure 2.4). Absolute increases of more than 10 percentage points are evident in Australia, the Czech Republic, Ireland, Slovenia and Sweden. Starting from relatively low levels in 2008, e-commerce participation in Hungary, Italy, Latvia, Poland, the Slovak Republic and Slovenia more than doubled between 2008 and 2017.

New Zealand and Australia had a particularly high share of e-commerce firms (above 40%) in 2017, explained in part by a large geographical distance from other countries, high Internet penetration and high-quality communications infrastructures. On the other hand, firm participation remained around 11% in the most recent data for Korea and slightly below 10% for Turkey.

2.4. Firm participation in e-commerce by size, 2017

As a percentage of enterprises with ten or more persons employed



Note: See Chapter notes.[9]

Source: OECD calculations based on OECD, *ICT Access and Usage by Businesses* (database), *http://oe.cd/bus* (accessed February 2019).

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Large firms participate in e-commerce more than small firms, and the absolute gap is widening

There is a large difference in e-commerce participation between large and small firms (Figure 2.4). In Austria, for example, the relatively low average share of 18% masks significant variation in the participation of large (54%) and small (16%) firms. While the average across firms is largely determined by the high share of small firms in the firm population, it is noteworthy that the participation rate for large firms is higher than for small firms in every single country for which data are available, and it is more than double the rate for small firms in over 60% of the countries studied.

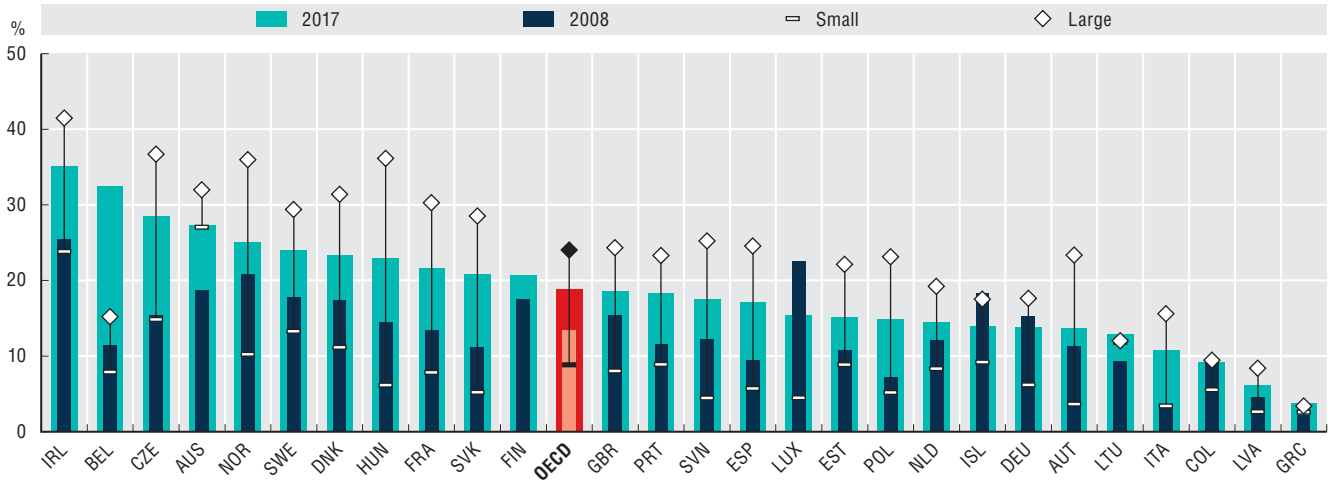
Comparing the gap in e-commerce participation rates between large firms and small firms over time, i.e. between 2017 and 2008 (not shown), reveals that for many countries this gap has widened in recent years. In absolute terms, the gap only diminished in Brazil, Canada, Germany, Korea, Luxembourg and the United Kingdom, and widened in all other countries depicted in Figure 2.4. In relative terms, the gap is still closing for most countries, because small firms in many country started from low adoption rates and adoption thus grew faster among these firms in relative terms. However, in Australia, Colombia, Finland, France, Latvia, Lithuania, the Netherlands, Norway, Portugal and the Slovak Republic, small firms lost ground relative to large firms in both absolute and relative terms, highlighting substantial and persisting imbalances across the firm-size distribution.

The general trend of rising e-commerce can also be observed when looking at e-commerce turnover. Data show that the share of e-commerce in total turnover increased from 13% to 19% between 2008 and 2017, again with a large variation across countries (Figure 2.5). In addition, there are large differences between small firms (9%) and large firms (24%) with regard to the weight of e-commerce in turnover. The largest absolute changes in terms of the e-commerce share in turnover are observed for Belgium and the Czech Republic, with an increase of 21 and 13 percentage points, respectively. Australia, France, Hungary, Ireland and the Slovak Republic also had percentage point increases of more than 8 percentage points each.

Changes over time in the share of e-commerce turnover in total turnover can be driven by two factors that are not easily disentangled without a closer look at the micro-data: the variation in the share of firms participating in e-commerce (shown in Figure 2.4) and the share of turnover that the sub-set of firms participating in e-commerce obtained from electronic sales rather than traditional sales channels.

2.5. E-commerce intensity, 2017

As a percentage of total turnover



Note: See Chapter notes.[10]

Source: OECD calculations based on OECD, *ICT Access and Usage by Businesses* (database), *http://oe.cd/bus* (accessed March 2019).

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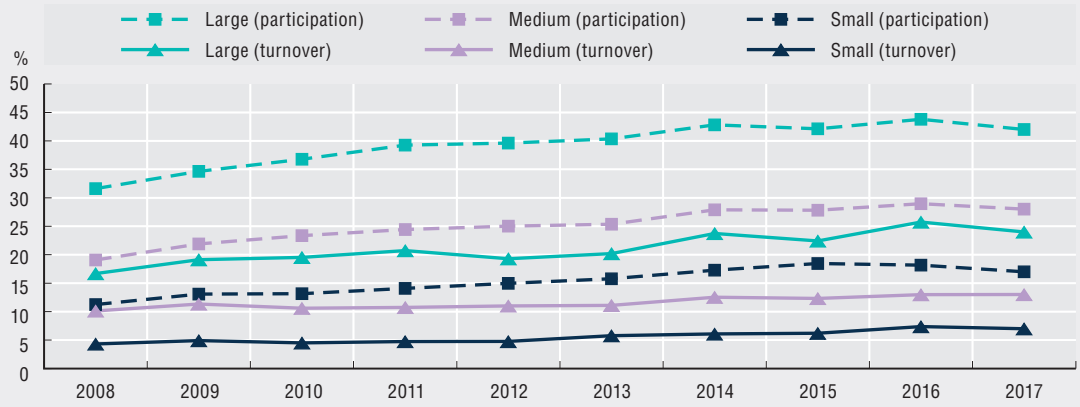
2.2. Comparison of e-commerce participation and turnover contribution suggests mixed business models and rising e-commerce intensity at the firm level

Additional insights into the relationship between e-commerce participation (the extensive margin) and the share of e-commerce sales in total sales can be gleaned from Figure 2.6. The figure reflects the share of firms participating in e-commerce and the share of e-commerce in total turnover for the EU28 average in three different size groups.

2.6. Firm participation and e-commerce turnover by size class, 2008-17

As a percentage of enterprises with ten or more people employed and as a percentage of total turnover, EU28



Note: See Chapter notes.[11]

Source: OECD calculations based on OECD, *ICT Access and Usage by Businesses* (database), *http://oe.cd/bus* (accessed April 2019) and Eurostat, *Digital Economy and Society Statistics* (database), *https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/comprehensive-database* (accessed March 2019).

StatLink https://doi.org/10.1787/888933922861

In all three size groups, the share of firms participating in e-commerce tends to be higher than the share of turnover resulting from e-commerce. There are two possible explanations for this: either the average e-commerce firm does not derive its entire turnover from e-commerce, or firms participating in e-commerce tend to be smaller in terms of turnover than the average firm in each

2.2. Comparison of e-commerce participation and turnover contribution suggests mixed business models and rising e-commerce intensity at the firm level *(cont.)*

size group. Given that larger firms tend to be faster in the uptake of new technologies, the first interpretation seems more likely. Accordingly, Figure 2.6 reflects the fact that many e-commerce business models still depend on a mix of electronic and more traditional sales channels, as discussed in more detail below.

In addition, comparing across groups, it is noteworthy that from 2008 to 2017 both the share of firms participating in e-commerce and the share of turnover resulting from e-commerce sales grew faster in large firms (10 and 7 percentage points, respectively) than in medium sized firms (9 and 3 percentage points, respectively) and small firms (6 and 3 percentage points, respectively), confirming a widening gap on average. However, as a large majority of firms in OECD countries are small firms, the group of small firms is still likely to account for the largest entry into the e-commerce market in absolute numbers.

Comparing relative changes in both time trends, the ratio of participation share over turnover share increased for all size-groups between 2008 and 2012. In simple terms, this suggests that by 2012 a larger share of e-commerce firms accounted for a relatively lower share of e-commerce in total turnover (from both e-commerce and offline sales). This dynamic holds within each size group and could be driven by two effects: either the average share of e-commerce in turnover has fallen per e-commerce firm or, what seems more likely, e-commerce firms have on average become smaller (e.g. because online platforms facilitated market access for small firms). After 2012, the ratio between participation and turnover share decreased on average, likely explained by rising shares of e-commerce in total turnover for the average e-commerce firm. In addition, there could have been an increase in the average size of e-commerce firms.

Small e-commerce firms are significantly more likely than large firms to participate in web sales

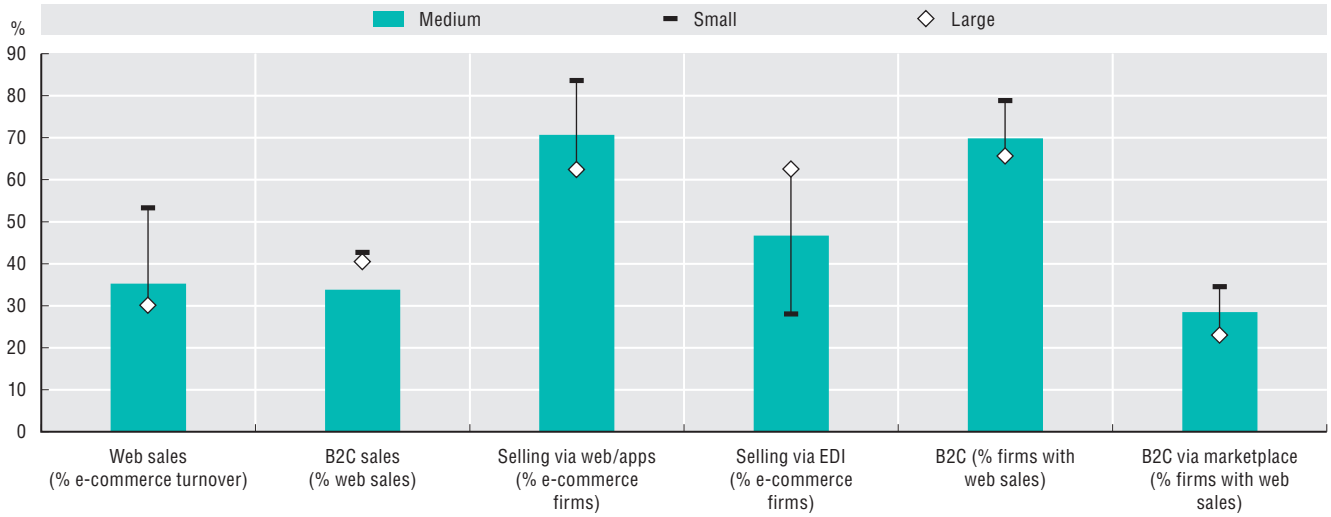
As argued in OECD (1999[9]), the rise of networks using non-proprietary protocols, like the Internet, enables new forms of e-commerce that no longer rely on costly and customised private networks and EDI, which enabled the first wave of B2B e-commerce between large firms.[12] Accordingly, the share of e-commerce turnover that firms attributed to web sales rather than sales via EDI increased from 26% to 39% between 2010 and 2017 in EU28 countries.[13] This trend reflects technological change, as the expansion of the Internet allows SMEs to more easily participate in the market and removes the need to set up a costly EDI network.

Over the years 2010 to 2017, small e-commerce firms on average tended to have significantly higher shares of e-commerce turnover resulting from web sales (53%), rather than EDI, both compared to medium sized (35%) and large firms (30%) in the EU28 (Figure 2.7). Within web sales, small firms further derived a slightly higher share of turnover (43%) from end consumers (B2C), compared to 41% for large firms and 34% for medium sized firms. These data suggest that overall small firms obtain a significantly higher share of e-commerce turnover from consumers. The share of B2C transactions for small firms is about 23%, or almost double the share for both medium sized and large firms (around 12%).[14]

The overall finding that web sales, and particularly B2C sales, are more common among small firms is supported by data at the extensive margin, i.e. the share of firms that participate in a specific sales channel. About 84% of small e-commerce firms in Europe participate in e-commerce through web sales, of which 79% report sales to consumers. This implies that around 66% of all small firms are using e-commerce to sell to end consumers (B2C). Less than a third (28%) was involved in traditional B2B sales via EDI.[15] Among large firms, 62% used the Internet for e-commerce, of which 66% engaged in sales to end consumers, implying a B2C share in e-commerce firms of only 41%. The corresponding share was 49% for medium sized sellers. The fact that among large firms both the share of firms using EDI and the share of firms using web sales are relatively high suggests that adding web sales to an existing EDI setup might not be a major challenge for most large firms.

2.7. E-commerce engagement in web sales and EDI by firm size, 2010-17

As a percentage, averages over time, EU28



Note: Values represent averages over the survey years 2011 to 2018 to identify structural differences. See Chapter notes.[16]

Source: OECD calculations based on Eurostat, *Digital Economy and Society Statistics* (database) *https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/comprehensive-database* (accessed April 2019).

StatLink https://doi.org/10.1787/888933922880

Small firms engaging in web sales also more frequently sell to consumers via online platforms (35%), compared to 29% for medium sized and 23% for large firms. Considering all e-commerce sellers (including those selling via EDI), the share of small e-commerce firms selling via an electronic marketplace to end consumers is 29%, i.e. more than twice the share for large firms (14%), both because small firms rely on the Internet for sales more frequently and because a larger share of these sales goes to end consumers via online platforms.[17]

The Internet has enabled B2C transactions in all sectors and provides business opportunities for SMEs in some classical B2B sectors

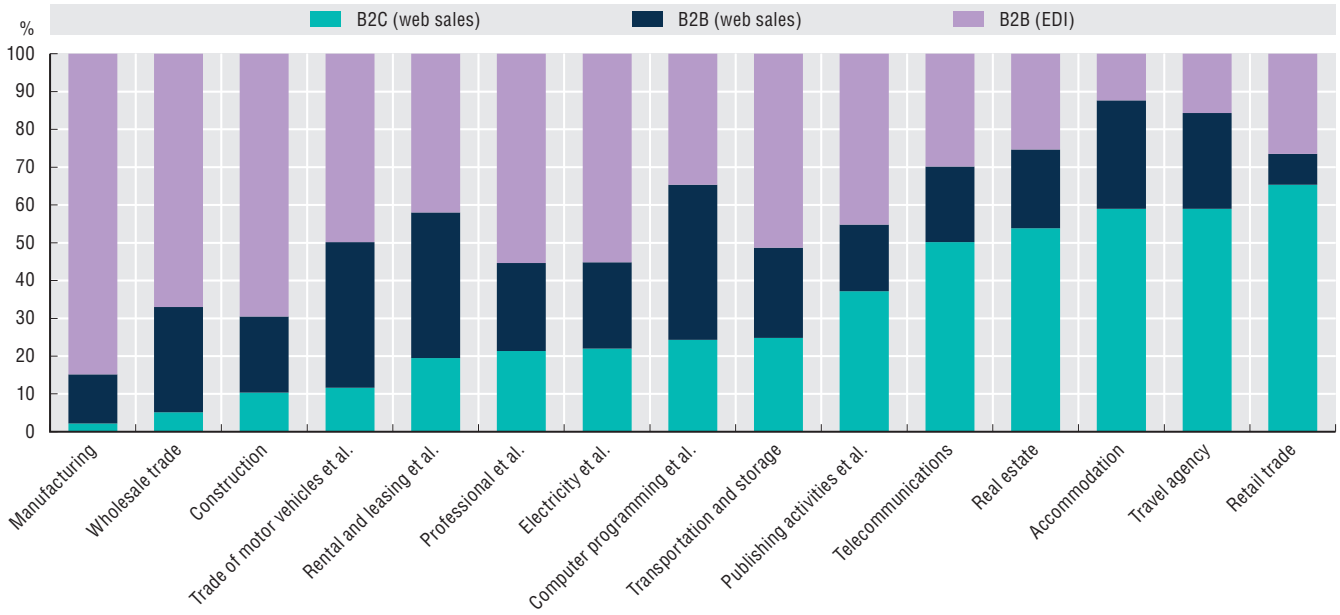
Figure 2.8 shows several sectors in the order of their average share of B2C sales in total turnover from e-commerce based on data from Eurostat (2012-17).[18] These data provide information on e-commerce transactions only and are not representative of offline sales in each sector. Almost all sectors posted at least some sales to final consumers, with the share being lowest for the manufacturing sector (2%), the wholesale sector (5%) and the construction sector (10%). The sectors with the highest share of B2C transactions in e-commerce were retail (excluding motor vehicles and motorcycles) (65%), accommodation (59%) and travel agency services (59%).

While information on firm size within sectors is unavailable in the Eurostat data, the previous findings of the importance of B2C transactions and the low attractiveness of EDI technology for small firms (see Figure 2.7) suggest that sectors heavily engaging in transactions with end consumers currently provide the best opportunities for SMEs.

Figure 2.8 also shows that web sales have replaced EDI sales in many sectors with a high share of B2B transactions. In particular, some B2B sectors dealing with services seem to use web technologies more than others, and thus provide additional opportunities for SMEs. For example, web sales account for 54% of B2B transactions in the sector comprising computer programming, consultancy and related activities and information services activities. Other B2B-intensive sectors that rely heavily on web sales include the aggregate of activities related to rental and leasing, employment, security and investigation, services to buildings and landscape, office administration, office support and other business support (48%) as well as trade of motor vehicles and motorcycles (44%).[19]

2.8. Sales channels and B2C sales by sector, 2012-17

As a percentage of all e-commerce firms, averages over time, EU28



Note: Values represent averages over the years 2012 to 2017 to identify structural differences. See Chapter notes.[20]

Source: OECD calculations based on Eurostat, *Digital Economy and Society Statistics* (database) *https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/comprehensive-database* (accessed April 2019).

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Factors that influence firms' participation in e-commerce

This section provides evidence on factors that firms have identified as obstacles that limit or prevent sales via a website or an app.[21] The data mostly stems from Eurostat and is representative for the EU28 countries. Although there is little to no representative data for other countries, patterns that stand out in the large diversity of countries within the EU are likely to provide some useful insights for policy makers in other developed countries. By the same token, changes over time are often driven by the same business model innovations affecting several countries, such as the proliferation of online platforms (see Chapter 3).[22]

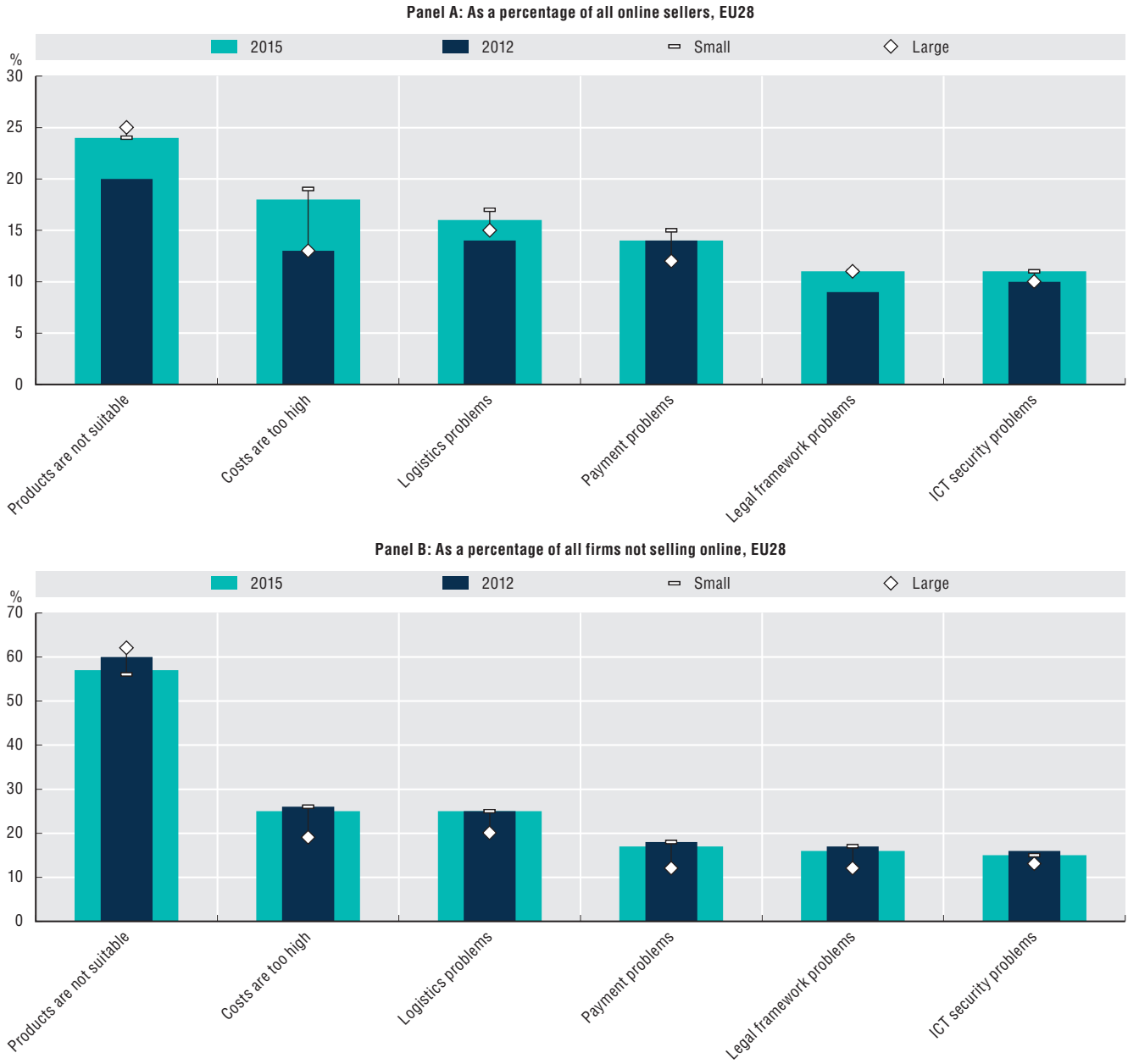
Product suitability is a major e-commerce challenge, particularly for large firms and B2B sectors

Figure 2.9 shows the percentage of firms that indicated that they faced specific obstacles that limited or prevented sales via a website in 2015. Panel A shows the responses from firms that received orders via websites or apps and thus have participated in sales via e-commerce. Panel B shows the responses from firms that did not receive orders via websites or apps.[23]

The figure, but particularly Panel B, indicates that the major perceived obstacle limiting or preventing sales via a website appears to be the suitability of the product offered for sale online. According to these data, 57% of offline sellers mentioned product suitability as an obstacle to e-commerce (down from 60% in 2012), while the percentage was significantly lower, though still sizeable, among online sellers (24%, up from 20% in 2012).

Interestingly, this challenge was mentioned more often by large firms, whereas all other obstacles, including costs, logistics, payments, the legal framework or ICT security were more of an issue for small firms. This finding could be explained by evidence presented earlier that shows that large firms tend to participate in e-commerce activities more intensively overall. Assuming that firms active in markets that lend themselves more easily to e-commerce transactions are the first to enter the online market, the overall higher participation of large firms would imply that remaining large offline sellers are not selling online because they perceive that their products are less suitable for e-commerce, while relatively more small firms remain offline due to firm rather than market conditions.

2.9. Obstacles to selling on the web cited by firms, 2015



Note: See Chapter notes.[24]

Source: OECD calculations based on Eurostat, *Digital Economy and Society Statistics* (database) *https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/comprehensive-database* (last accessed April 2018).

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Entry barriers appear to have fallen, but challenges related to high costs of delivery and returns persist

The fact that SMEs consider the suitability of products to be less of an issue for e-commerce could also be related to the sectors these firms are particularly active in, namely sectors with a high share of B2C transactions. Thus, while the percentage of offline sellers that referred to suitability as an obstacle to e-commerce participation was lowest in the accommodation (33%), travel agency (40%) and retail sector (42%), it was significantly higher in sectors with high shares of B2B customers, including wholesale (49%), manufacturing (58%) and the construction sector (64%) (not shown).

Nevertheless, it is noteworthy that even in sectors like retail trade, travel agencies and accommodation, which are rapidly opening up to e-commerce, the share of offline sellers that cite product suitability as an obstacle to e-commerce participation is not negligible. Contrary to the overall trend depicted in Panel B of Figure 2.9, this share actually increased in four sectors: travel agencies (4 percentage points), real estate (2 percentage points), trade of motor vehicles and motorcycles (2 percentage points) and retail (1 percentage point).

While it might seem trivial that product suitability is a major challenge to e-commerce, this finding is interesting for two reasons. First, it illustrates again that products vary in terms of the ease with which they can be sold online. Second, it highlights the additional potential to unlock e-commerce at the extensive margin, namely through technological or business model innovations that allow new types of products to be sold online. As this area is often overlooked in the literature, Chapter 3 takes a closer look at business models that help firms to increase e-commerce at the extensive margin.[25]

Figure 2.9, Panel B further reveals that firms that do not sell online perceived most obstacles slightly less important than in 2015. Only logistics were perceived as problematic in 2015 as in 2012. While the changes are relatively small and reductions for the most part did not exceed one percentage point, these changes are nevertheless noteworthy, given that the share of e-commerce firms selling via the Internet increased from 14% to 16% over the 2012-15 period.

It is also likely that those firms that entered e-commerce markets during these years faced relatively lower entry barriers to begin with, implying that the pool of remaining offline sellers would have perceived obstacles at the extensive margin as more challenging on average. Considering this potential selection effect, entry conditions might actually have improved by more than the absolute changes suggest. To some extent, this could reflect how online platforms and other business model innovations have reduced entry barriers, e.g. by offering new solutions like e-payment methods or e-fulfilment (OECD, 2013[10]). A longer time horizon is needed to better evaluate these trends.

At the same time, all obstacles (except for payment issues) were mentioned more frequently in 2016 compared to 2013 by those firms that actually engaged in web sales during in the previous year. Again, this could be explained by a selection effect regarding the firms that entered the online market between 2012 and 2015. Specifically, some new entrants might have entered the market with products less suitable for e-commerce, facing more difficulties to flourish online. Furthermore, increasing competition from new entrants might have reduced the profit margin of incumbent online sellers, implying increasing vulnerability of these firms. Whether due to these or other reasons, the percentage of e-commerce firms that identified high costs as an obstacle increased significantly from 13% to 18%, surpassing the share of firms that identified logistical problems or issues related to payments as obstacles.

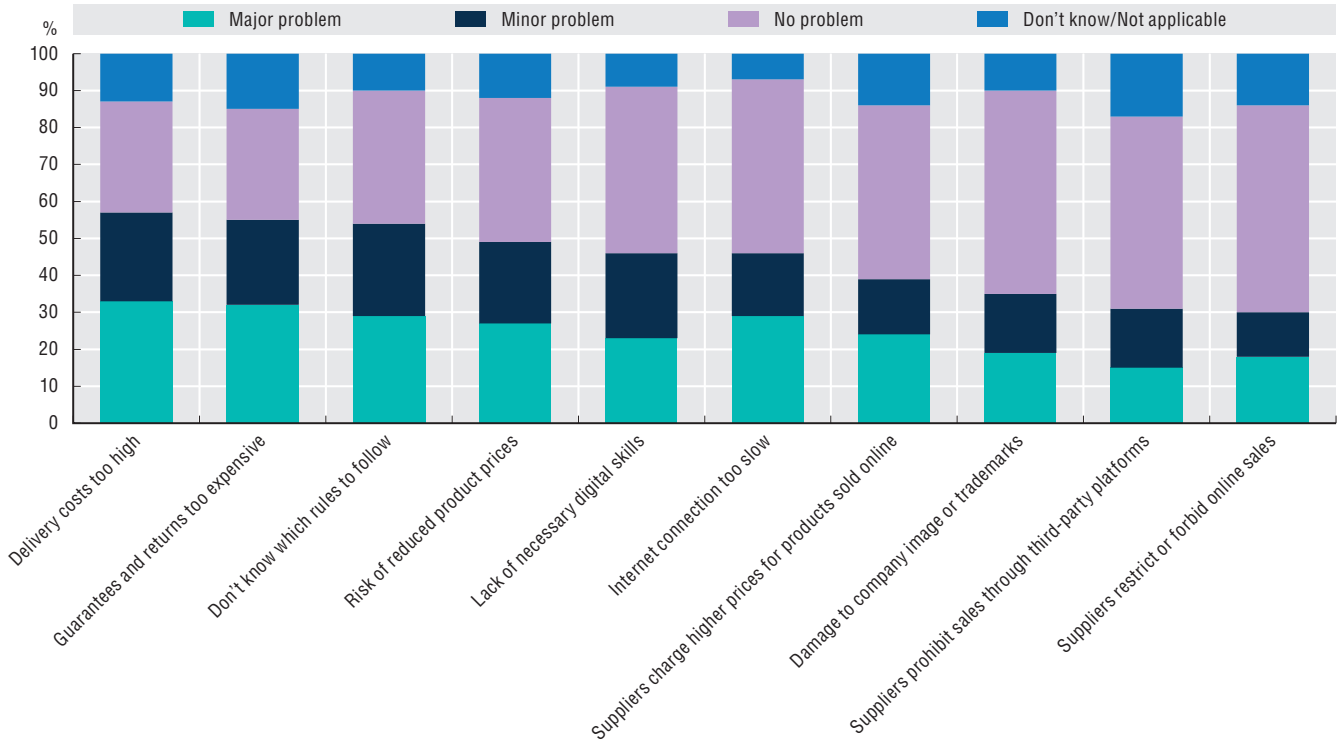
A Eurobarometer (2015[11]) report provides some more detailed information about the difficulties that offline sellers in 26 countries in the European Union (EU) expected to face when selling products online. The survey (8 705 respondents) allows firms to identify obstacles according to their relevancy; Figure 2.10 depicts the aggregate responses across countries.

The data reveal that almost a third of firms (33%) expected high delivery costs to cause major problems with respect to e-commerce participation, with an additional 24% expecting minor problems in this regard. Delivery costs were followed by expensive returns and guarantees as a major (32%) or a minor (23%) concern. Insecurity about the rules that have to be followed represented another major (29%) and minor (25%) concern, as did a slow Internet connection, which was a major concern for 29% of firms and a minor concern to another 17%. Other problems that were frequently identified as major problems related to the risk that online sales would bring down product prices (a major concern for 27% and a minor concern for 22%) and a lack of the necessary information and communication technology (ICT) skills (a major concern for 23% and a minor concern for another 23%).

Overall, over a third of all firms expected additional problems (major and minor) related to suppliers charging higher prices for products sold online (39%) and the risk that online sales would damage the image of the company or its trademarks (35%). In addition, 31% of respondents feared that suppliers would not allow them to use third party platforms to sell their products and/or services and 30% feared that suppliers would restrict or forbid the sales of products online.[26]

2.10. Problems that EU28 firms expect if they were to sell products online, 2015

As a percentage of all firms not selling online



Note: See Chapter notes.[27]

Source: OECD calculations based on European Commission (2015) "Flash Eurobarometer 413: Companies engaged in online activities", *http://ec.europa.eu/commfrontoffice/publicopinion/flash/fl_413_en.pdf*.

StatLink https://doi.org/10.1787/888933922937

Cross-border disputes, language skills, tax rules and other regulations create additional cross-border e-commerce challenges

The Eurobarometer (2015[11]) survey asks similar questions to EU firms that sell online to other EU countries or that used to do so in the past. In this case, responses relate to actual problems encountered in cross-border e-commerce transactions within the EU. In line with the expectations of offline sellers, Figure 2.11 shows that high delivery costs and expensive guarantees and returns are the most frequently mentioned challenges for online exporters, with delivery costs resulting in problems for over half of all surveyed firms; major problems for 27% and minor problems for 24% of all firms. Guarantees and return costs also generated problems for 42% of all firms (19% major problems). Both problems tend to be related to exports of physical products and highlight the importance of improving the logistics infrastructure connecting European countries.

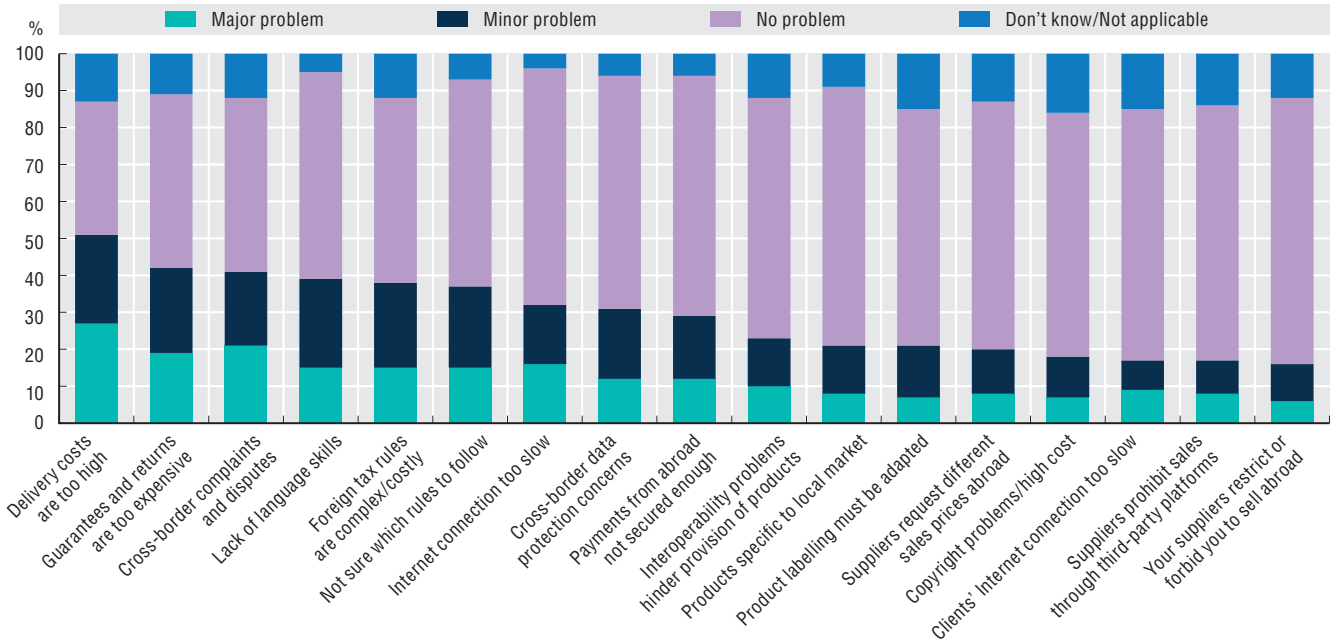
These problems were followed by the high cost of having to deal with cross-border complaints and disputes (41%), a lack of language skills (39%), having to deal with foreign tax rules (38%) and insecurity about which rules must be followed (37%). Specifically, the latter two imply that over a third of all European exporters might benefit from a further harmonisation of the European Single Market. Issues related to suppliers that requested different prices to be charged abroad (20%), prohibited sales through online platforms (17%) or more generally restricted sales abroad (16%), were mentioned less frequently.

High delivery and return costs particularly affect SMEs, while product labelling and restrictions from business partners are more important for large firms

Figure 2.12 provides less detailed but more recent and representative data on difficulties faced by European firms with web sales to other European countries. It also allows a closer look at challenges of particular relevance to SMEs.

2.11. Difficulties that EU28 firms encountered when selling to other European countries, 2014

As a percentage of firms that sold, used to or tried to sell products online in another EU country



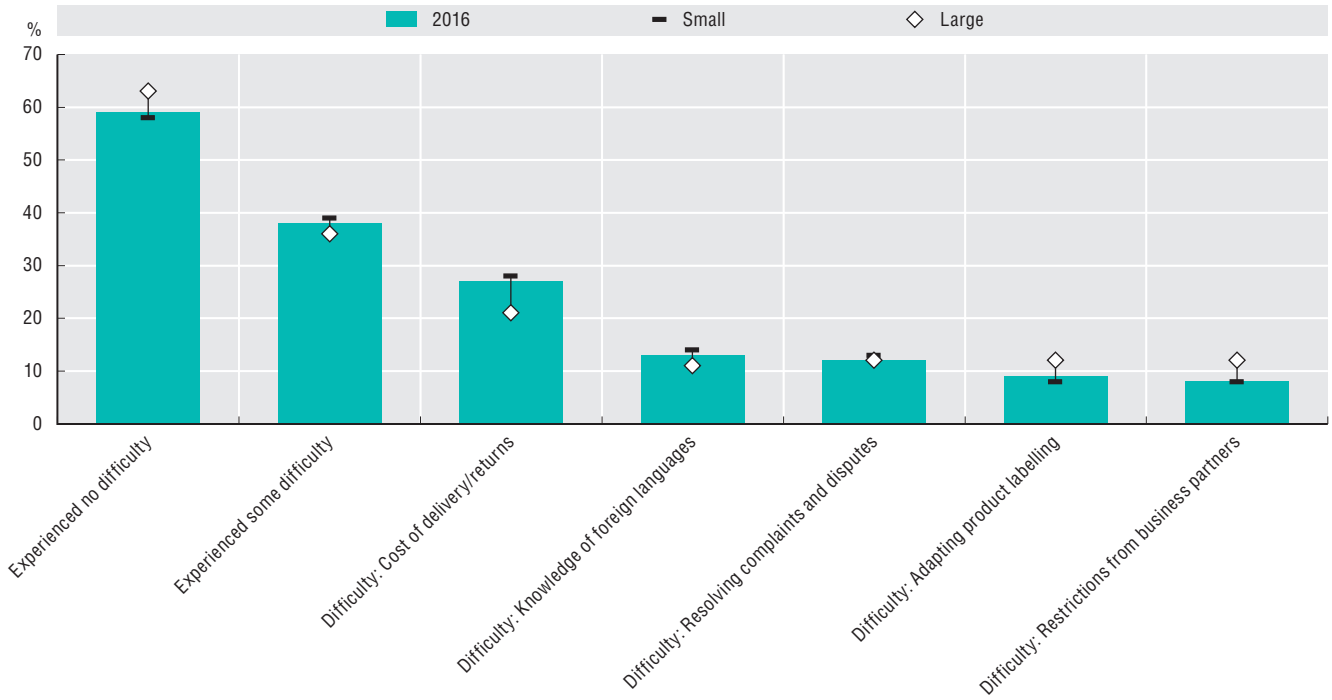
Note: See Chapter notes.[28]

Source: OECD calculations based on European Commission (2015) "Flash Eurobarometer 413: Companies engaged in online activities", *http://ec.europa.eu/commfrontoffice/publicopinion/flash/fl_413_en.pdf*.

StatLink https://doi.org/10.1787/888933922956

2.12. Difficulties experienced when making web sales to other EU countries, 2016

As a percentage of firms with web sales to other EU countries, EU28



Note: See Chapter notes.[29]

Source: OECD calculations based on Eurostat, *Digital Economy and Society Statistics* (database) *https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/comprehensive-database* (last accessed April 2018).

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While the relative importance of problems is broadly in line with Figure 2.11, the more recent survey responses provide a more optimistic picture of challenges faced by European exporters. Thus, while high delivery and return costs are still the challenge most frequently faced by exporting firms, the absolute share of firms facing these challenges is significantly lower. Furthermore, 59% of all firms indicate that they did not face any of the selected difficulties when engaging in e-commerce exports to other EU countries. To some extent, this may reflect the limited number of response options, but it could also be indicative of the improved functioning of the Digital Single Market in areas such as product labelling and the increasing efficiency of online dispute resolution mechanisms put in place by the European Commission (EC).

The data further reveals that fewer small firms (58%) than large firms (63%) encountered none of the listed difficulties. In relative terms, the difficulties more important to small firms were high delivery and return costs (28% compared to 21% for large firms) and the lack of knowledge of foreign languages (14% compared to 11% for large firms). Adapting product labelling or restrictions from business partners were more often encountered by large firms (12%) than small firms (8%).[30]

E-commerce trends: A consumer perspective

This section considers the consumer side of B2C e-commerce, although it is important to highlight that this captures only part of the demand side for the transactions covered in the previous sections. It is also important to underscore that the distinction between B2C and B2B e-commerce is increasingly blurring, as businesses begin to make purchases through consumer-oriented online platforms and manufacturers can engage with consumers directly through the same channels. As a result, this section considers sectors beyond retail, potentially including more business-oriented sectors (e.g. manufacturing).

Consumer participation is rising, but varies by age, gender, income and education

It is clear that consumer participation in e-commerce continues to increase. Figure 2.13 shows that by 2018, the percentage of individuals in OECD countries that had participated in online purchases during the last 12 months increased by about 61% compared to 2009 (from 35% to 57%). At least three quarters of individuals recently purchased online in Denmark (84%), the United Kingdom (83%), the Netherlands (80%), Norway (79%), Sweden (78%), Switzerland (77%), Germany (77%) and Iceland (75%). Of the countries where data are available, only Mexico (13%) and Colombia (8%) recorded participation shares of less than 15%.

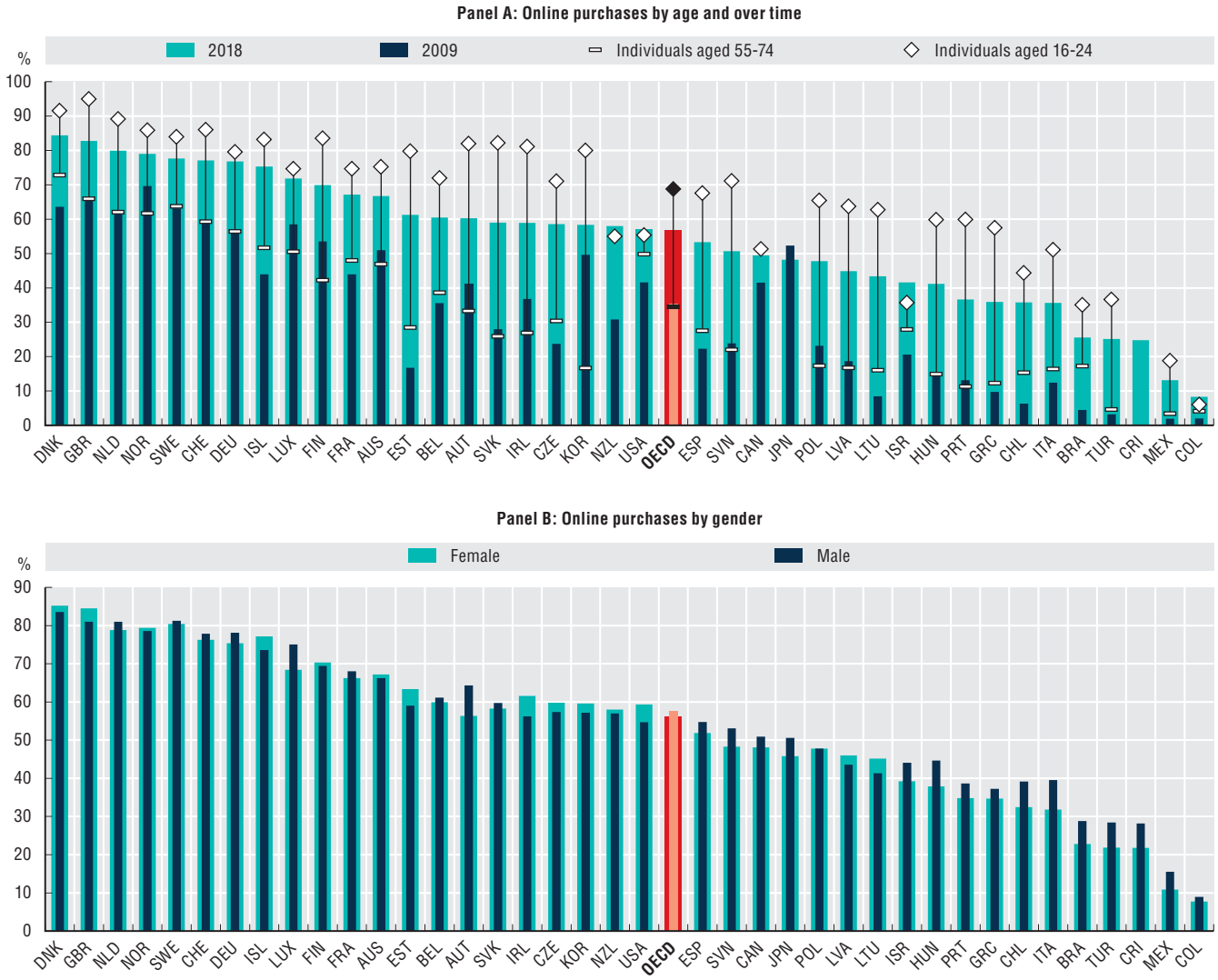
Compared to 2009, the largest increase of e-commerce participation occurred in Estonia, where the percentage of individuals participating in e-commerce increased by 44 percentage points from 17% to 61%. Other countries with percentage point increases of over 30 percentage points include the Czech Republic and Lithuania (35 percentage points each) as well as Iceland, the Slovak Republic and Spain (31 percentage points each). The lowest increases in absolute terms were observed in Colombia (6 percentage points), Canada (8 percentage points), Korea and Norway (9 percentage points each). Participation in Japan diminished by 4 percentage points.[31] Considering relative changes over time reveals that the percentage of e-commerce participation by individuals increased close to eight-fold in Turkey, close to seven-fold in Mexico and close to six-fold in Chile and Brazil.

Older people are significantly less likely to participate in e-commerce and the gender gap persists in some countries

Overall consumer participation in e-commerce is rising, but participation still varies widely by age. Comparing the sub-sample of individuals aged 16 to 24 in 2018 ("Generation Z") with the group of individuals aged 55 to 74 ("Baby Boomers") shows that a person from the younger cohort is roughly twice as likely to have purchased a good or a service online during the past 12 months than a person from the older cohort.[32] Thus, while the percentage of e-commerce users was only 34% among older users (slightly below the average level of 2009), approximately 70% of younger users had made purchases online.[33] The absolute age gap was above 50 percentage points in Estonia, Ireland, Korea and the Slovak Republic. It was lowest in Colombia, Israel and the United States (below 10 percentage points).[34] Comparing the age gap in absolute terms over time reveals a substantial increase from 26 percentage points in 2009 to 37 percentage points in 2018, indicating that the older cohort is falling behind in terms of usage when compared to the young cohort.[35]

2.13. Individuals who participated in e-commerce by age and gender, 2018

As a percentage of all individuals aged 16 to 74



Note: See Chapter notes.[36]

Source: OECD calculations based on OECD, *ICT Access and Usage by Households and Individuals* (database), *http://oe.cd/hhind* (accessed April 2019).

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Recent results from a survey by the EC (2017[12]) suggest that there might be a role for policy makers when it comes to establishing trust and consumer confidence in e-commerce among older individuals. Thus, while in 2016 the percentage of young consumers (aged 18 to 34) feeling confident about purchasing goods or services via the Internet from retailers or service providers in their country was relatively high (86%), this confidence significantly decreases with age, namely to 67% for 55 to 64 year-olds to 43% for people age 65 or older.

There also remains a moderate gender gap across OECD countries on average, but in contrast to the age gap it is narrowing in most countries. Specifically, with a participation rate of 58% in 2018, men still tend to be slightly more likely to participate in e-commerce than women (56%). But there has been some improvement over time, with the absolute gap narrowing from 4 percentage points in 2009 to 2 percentage points in 2018. However, the adoption of e-commerce was higher among women than among men in only 14 out of the 39 countries surveyed. In Estonia, Ireland, Latvia, Lithuania and the United States, women participated over 5% more frequently in e-commerce than men. Nevertheless, in a number of countries the gender gap is still striking, particularly in some Latin American countries. In Mexico, the average man was almost 45% more likely than the average woman to participate in

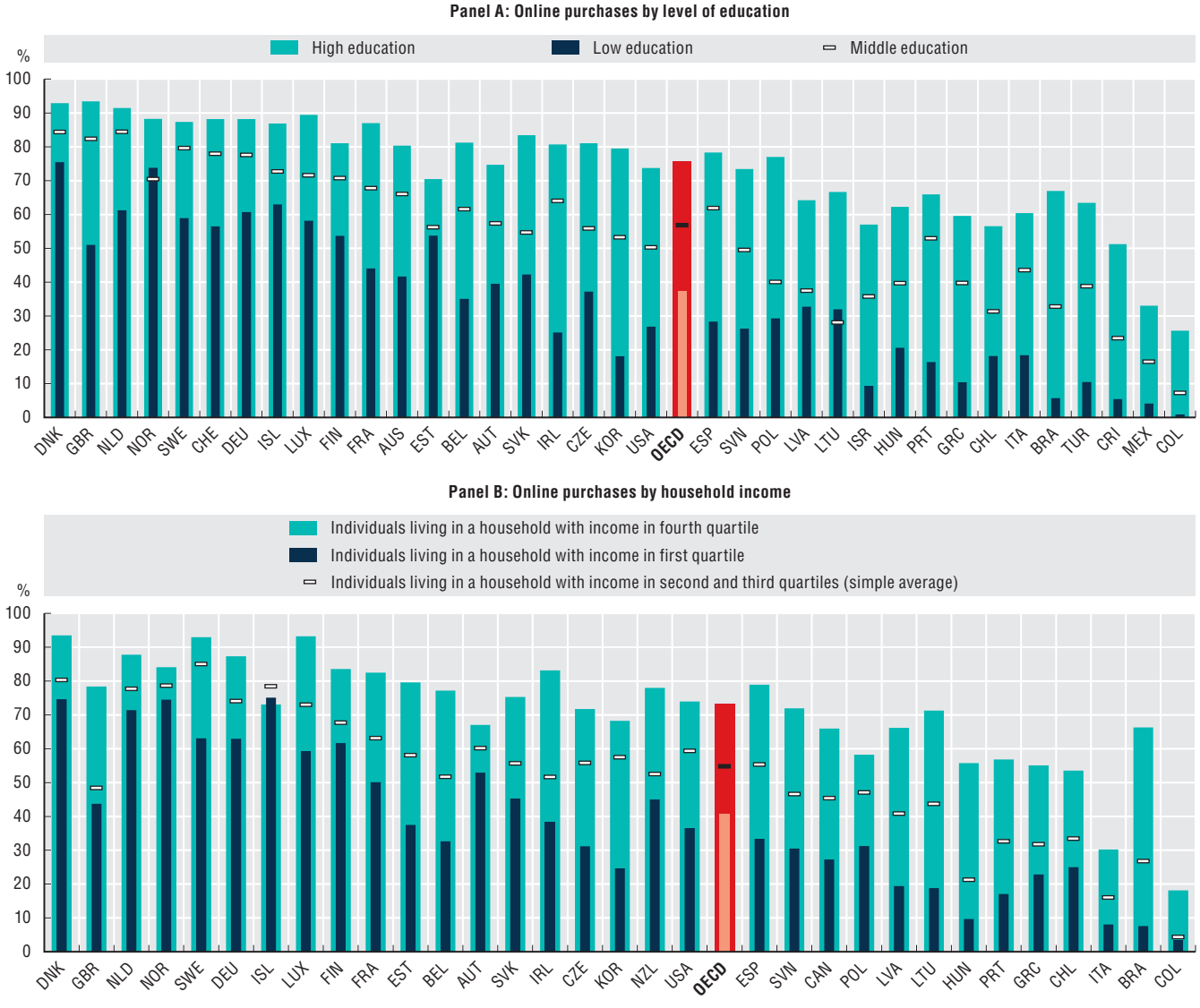
e-commerce in 2018 (16% vs. 11%). In relative terms, Mexico was followed by Turkey (30%), Costa Rica (29%), Brazil (26%), Italy (24%) and Chile (21%). In absolute terms, the gap in participation rates between men and women was above 6 percentage points in Austria, Brazil, Chile, Costa Rica, Hungary, Italy, Luxembourg and Turkey.[37]

E-commerce participation varies substantially by levels of income and education

There are much higher gaps when it comes to different income groups and levels of educational attainment. Panel B of Figure 2.14 shows the percentage of individuals who have purchased online in the last 12 months by income quartile. Across OECD countries, the data reveal that individuals that live in households at the top income quartile are about 79% more likely to have participated in online purchases over the last 12 months, with an absolute gap between the two groups of over 30 percentage points (73% vs. 41%). This implies that low income can be a very strong deterrent to e-commerce participation of an order of magnitude that is comparable to the role of age.

2.14. Individuals who participated in e-commerce by household income and educational level, 2018

As a percentage of all individuals aged 16 to 74



Note: See Chapter notes.[38]

Source: OECD calculations based on OECD, *ICT Access and Usage by Households and Individuals* (database), *http://oe.cd/hhind* (accessed March 2019).

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The absolute percentage point gap between the highest and the lowest income percentile group was larger than 50 percentage points in Brazil (59 percentage points) and Lithuania (52 percentage points). In Iceland, the percentage of individuals who made online purchases was slightly higher in the lowest income percentile than in the top percentile (75% vs. 73%). In a number of other countries, including Austria, Colombia, Denmark, the Netherlands and Norway, the gap was below 20 percentage points. It should be noted, however, that in Colombia the overall participation is very low, implying that individuals in the top income quartile were still more than 5 times as likely to participate in e-commerce than individuals in the bottom quartile.[39]

Data for 2009 show that in absolute terms the income gap increased over time in OECD countries, from about 28 percentage points in 2009 to 32 percentage points in 2018 (not shown).[40] This increase in the income gap in absolute terms is particularly worrisome because it occurred despite decreasing costs of digital technologies and connectivity and despite the increasing scope of products that can be purchased online. These products include an increasing number of everyday products like clothing, medicine or groceries, which tend to be relatively more relevant to households at the bottom of the income distribution than classical e-commerce products like books or computer games (see Chapter 3). The fact that these dynamics did not help to reduce the income gap likely implies that there are additional forces at play that interfere with the participation rates of low-income households.

One candidate in this regard is educational attainment, which is closely related to income and thus could explain the persistence in the gap across income quartiles despite falling prices and increasing product variety. Panel A of Figure 2.14 shows the percentage of individuals that made online purchases in the past 12 months for individuals with high, middle or low education levels.[41] Across OECD countries, the data reveal that individuals with high educational attainment are about 33% more likely to participate in e-commerce than those with a medium level of educational attainment (76% vs. 57%) and more than twice as likely as individuals with no or only a low level of education (37%). This implies that individuals with low levels of education in 2018 still had e-commerce participation rates close to the aggregate participation rate of 2009 (35%).

The gap between individuals with high and low education levels was particularly large in Latin American countries, and especially Colombia, where less than 1% of individuals with low education had participated in e-commerce in 2018. The share was more than 8 times higher for individuals with medium levels of education (7%) and 29 times higher for the highly educated (26%). In Brazil, 67% of individuals with high educational attainment participated in e-commerce, as compared to only 33% of individuals with medium educational attainment and 6% of individuals with low levels of educational attainment. Large gaps are also noticeable in Costa Rica (51%, 23% and 5%) as well as in Mexico (33%, 16% and 4%). In Chile, individuals with high educational attainment (57%) were about three times as likely to have participated in e-commerce than individuals with low levels of education (18%).[42] But even in the countries with the most equal distribution like Denmark, Estonia and Norway (i.e. where the gap in usage between the highest and lowest educational attainment group is less than 20 percentage points), highly educated individuals were on average about 25% more likely to have participated in e-commerce during the past 12 months.

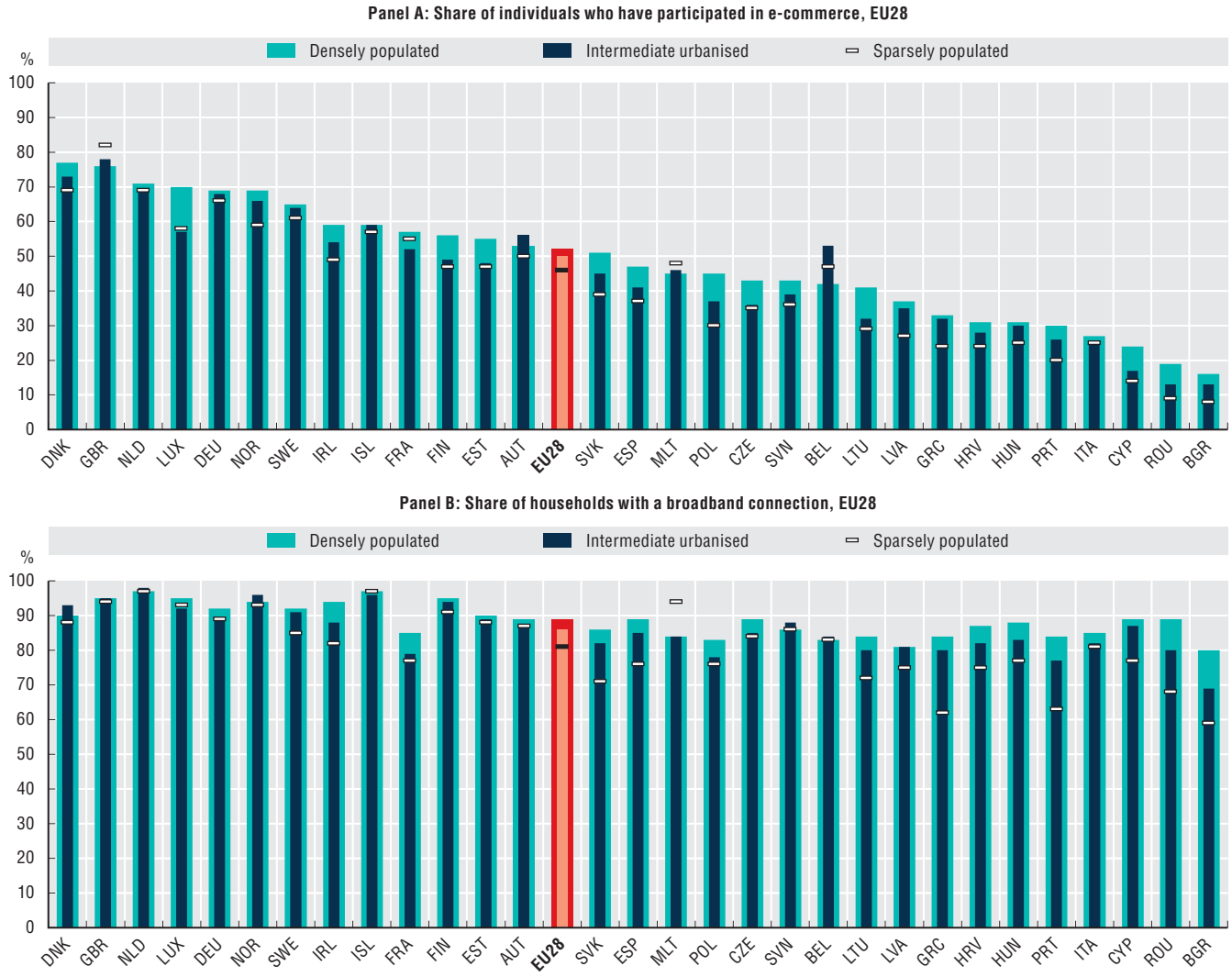
These data suggest that compared to income, educational attainment has an even larger effect on e-commerce participation in many countries. As with income, the gap in e-commerce participation between individuals with high and low education respectively further increased over time in absolute terms, from 35 percentage points in 2009 to 38 percentage points in 2018.[43] Education itself can be a powerful policy tool to diminish the large and persistent gaps in e-commerce uptake discussed in this section. However, governments should carefully analyse the specific situation in their country to assess whether additional factors are hindering certain subgroups of the population to engage in e-commerce. While challenges related to a lack of payment mechanisms and consumer trust have improved overall in OECD countries (see Chapter 3), they may still be important inhibitors of e-commerce at the bottom end of the income distribution or for the older cohort of individuals.

A range of factors contribute to the urban-rural e-commerce divide

E-commerce usage varies between rural and urban areas. In particular, available data for the EU28 show that individuals in areas with a greater degree of urbanisation are more likely to participate in e-commerce than their counterparts in more rural areas (Figure 2.15). According to the 2018 Eurostat

survey, of those who live in densely populated areas (at least 500 inhabitants per square kilometre), 52% completed at least one online purchase within the past three months. This compares to 50% for intermediate urbanised areas (between 100 and 499 inhabitants per square kilometre) and 46% for sparsely populated (fewer than 100 inhabitants per square kilometre) on average. Among the EU28, Poland (15 percentage points), Lithuania, Luxembourg and the Slovak Republic (12 percentage points each) show the largest gap between e-commerce usage in densely populated and rural areas.

2.15. Broadband access and participation in e-commerce by rural and urban areas, 2018



Note: See Chapter notes.[44]

Source: OECD calculations based on Eurostat, *Digital Economy and Society Statistics* (database) *https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/comprehensive-database* (accessed March 2019).

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Over time (not shown), it is further noteworthy that for the EU28, the absolute size of the gap with respect to e-commerce usage between densely populated and sparsely populated areas has only marginally fallen between 2009 and 2017 (from 11 percentage points in 2009 to 10 percentage points in 2017). Between 2017 and 2018, the survey indicates a more significant drop in the gap to only 6 percentage points.

One potential explanation for this urban-rural divide is broadband access. Access to the Internet is a prerequisite for e-commerce participation, and as such one should expect a correlation between

broadband access and e-commerce participation. Indeed, broadband access in EU countries is highest in densely populated areas, second-highest in intermediate urbanised areas and lowest in sparsely populated areas for 19 out of 28 countries, as Panel B of Figure 2.15 shows.

However, a closer look at the country level reveals that broadband access cannot fully account for patterns of e-commerce participation. For example, Poland, which has the highest gap in terms of e-commerce participation between households living in densely populated and households living in sparsely populated areas (15 percentage points), has a comparatively modest gap between urban and rural areas when it comes to broadband access. With 7 percentage points, this gap is slightly below the cross-country average of 8 percentage points. For Norway, there is almost no gap between households living in densely and sparsely populated areas in terms of broadband access (1 percentage point), but e-commerce is significantly more common for individuals from households in densely populated areas (69% vs. 59%). These data suggest that additional factors need to be considered when trying to understand rural-urban divides, such as the availability of postal services in rural areas or socio-economic factors, including age, education or income, which are likely to differ across rural and urban areas.

An additional factor might be at play in the cases of Belgium, Malta and the United Kingdom, where residents in sparsely populated areas are in fact more likely than residents in densely populated areas to participate in e-commerce. When looking at the differences between intermediate urbanised and sparsely populated areas, this list of countries also includes Estonia, France and the Netherlands. These patterns could be explained by the so-called "efficiency hypothesis" proposed by Farag et al. (2006[14]), which argues that individuals living in rural areas participate in e-commerce at a higher rate than those in urban areas because of a lack of access to brick-and-mortar stores as well as a more limited product variety in rural areas. As these limitations are likely to be less severe for intermediate urbanised areas, the efficiency hypothesis could also explain why these areas have fallen behind when compared to rural areas.

Outside of the EU, this efficiency hypothesis appears particularly relevant in contexts such as rural China, where e-commerce is becoming increasingly prevalent. In rural China, e-commerce firms are taking a hybrid approach to reaching rural populations, combining online ordering with brick-and-mortar drop-off points where e-commerce customers can retrieve packages. This method allows rural dwellers access to greater product variety while cutting costs for e-commerce firms by centralising delivery points. As disposable income in rural China has grown at a higher rate than that of urban China – between 2012 and 2016 disposable income grew by 36% in rural areas as compared to 29% in urban areas – firms are increasingly looking to rural areas as the next high potential market (Liao, 2018[15]). Similar hybrid models with brick-and-mortar drop-off points combined with online ordering are also being developed in other rural regions, such as rural Pakistan and India, suggesting that the urban-rural divide may represent potential business opportunities in certain contexts (Ranipeta, 2017[16]).

What consumer are buying online is changing, with clothing, footwear and sporting goods in high demand

In 2018, about 64% of individuals who purchased online in the EU28 purchased in the category of clothing, footwear and sporting goods. These goods were also most frequently bought in many other OECD countries, and in particular Korea, where 83% of online buyers have purchased clothing and footwear.[45] The second most frequently purchased product category across EU28 countries was travel products, including tickets, accommodation or vehicle hires among other things (53%), followed by tickets for entertainment events (39%) and books, magazines and newspapers (35%). A quarter of all e-commerce customers purchased movies, films, images and music products; photographic, telecommunications or optical equipment; and food, groceries, alcohol, tobacco and cosmetics. The least purchased product categories were computer games or video games, and computer software (23%), ICT services (20%), computer equipment (17%) and medicine (14%).

The overall averages mask variation across countries. In particular, less than 50% of online purchasers ordered clothing and related goods in Italy (44%), Latvia (47%) and Slovenia (46%). Beyond EU borders, clothing and related products were also relatively less popular in Australia (48%), where travel products and related services, including tickets or vehicle hires (51%), but also movies, images and music

products (50%) were in higher demand. Travel services were the most frequently purchased product category in several countries, but in particular in Norway (79%), Switzerland (78%), Denmark (75%), Iceland (74%), Sweden (73%) and Ireland (72%). On the other hand, travel services were purchased by less than 25% of online buyers in Latvia (23%), Poland (22%), Costa Rica (20%) and Chile (9%). In Chile, the most purchased product categories were computer equipment, movies, films, images and music products, as well as online tickets for entertainment events (each 12%). In Japan, the most purchased product categories were movies, films, images and music products (54%), as well as books, magazines and newspapers (43%).

Consumption patterns are shifting towards new types of products, reflecting new business models and a larger consumer base

Comparisons over time are difficult because the availability of response categories varies across countries and years. Focusing only on the average for EU28 countries, for which data is more consistent across time, reveals several noteworthy changes between 2009 and 2018. First, the share of individuals reporting online purchases of clothing, footwear and sporting goods rose from 45% to 64%, significantly outstripping online purchases of travel products, which experienced only a small increase from 50% to 53%. Furthermore, the share of online sellers buying food, groceries, alcohol, tobacco or cosmetics almost doubled, reaching 25% in 2018, up from 13% in 2009. Large relative increases were also observed for medicine, with the share of online purchasers increasing from 9% to 14% between 2009 and 2018. Small absolute decreases in the average share of online shoppers were observed for movies, films, images and music products (7 percentage points), computer and video games and computer software (6 percentage points), computer equipment (1 percentage point) as well as photographic, telecommunication and optical equipment (1 percentage point).

These changes indicate a broadening of the scope of goods and services purchased online. In relative terms, products whose fit is relatively more difficult to evaluate from a distance, such as clothing, have become more important relative to items that were first sold via online transactions, including through innovative businesses models like Amazon (books) or Booking.com (travel products). The changes observed are also in line with a new generation of online buyers. Goods of general interest, including food, groceries and medicine, have become relatively more important in the e-commerce landscape. Chapter 3 shows how new business models are supporting the expansion of e-commerce at the extensive margin by fostering the entry of new products and by attracting new types of customers.

Convenience, price and availability explain why many individuals participate in e-commerce, but certain impediments persist

When the EC (2015[21]) asked consumers to select up to five main reasons for shopping online, 49% referred to being able to order at any time of the day, 49% said they were finding cheaper products online, 42% said they were saving time, 37% found it easier to compare prices online, 36% referred to more choice online, 25% found it easier to find certain products online, and about 24% referred to delivery being more convenient. Information related reasons, such as the availability of reviews (21%), product comparisons (20%) or general information (18%) seemed to be slightly less important.[46]

Evidence from a Paypal (2018[3]) survey seems to confirm these benefits for cross-border e-commerce relative to domestic e-commerce. Asked why they had chosen to buy from a foreign website, about 72% of consumers referred to better prices, 49% referred to access for items that were not available in their home country, 34% referred to the discovery of new and interesting products, 29% mentioned higher product quality and 24% indicated that shipping was more affordable. This confirms earlier findings from the Google Consumer Barometer, suggesting that the major reasons for individuals to purchase from abroad rather than from within their country relate to appealing offers (36%), better availability (33%) and better conditions (33%), followed by a broader range of products (24%), better quality of products (11%), recommendations by others (10%) and the least on trustworthiness of the (online) shop (8%).[47]

2.3. Tapping into new data sources: BBVA credit card data

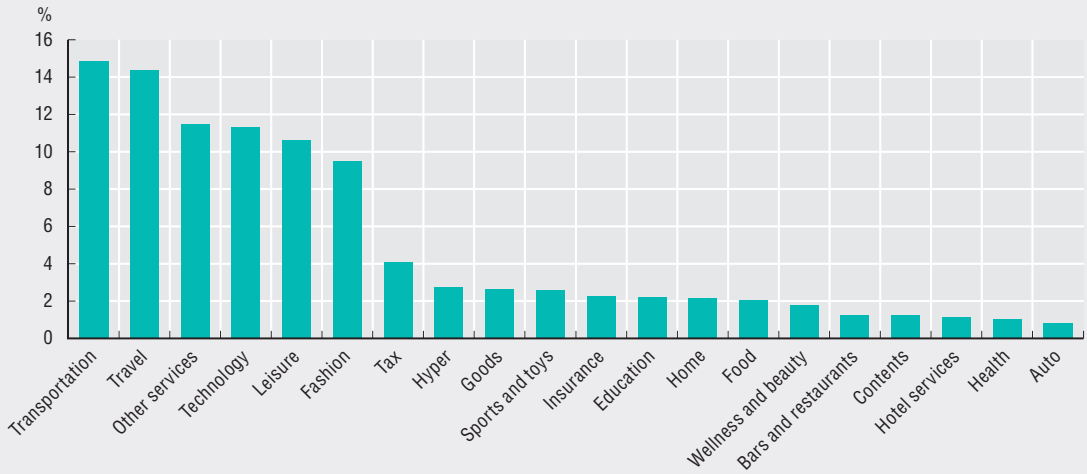
The OECD and the Spanish Bank BBVA have analysed credit card transactions of Spanish customers, providing novel insights into the consumption patterns of consumers online (OECD, 2019[18]) and the determinants of domestic and cross-border expenditure flows (OECD, 2018[20]).

In absolute terms, the number of online credit card transactions from BBVA has grown from 11 million in 2012 to 76 million in 2016, an almost seven-fold increase. As total online and offline transactions only slightly more than doubled, this implies that the share of online transactions increased from 2% to 8% over this time period. In value terms, rarely available in official statistics, online transactions increased from EUR 814.8 million in 2012 to EUR 4.6 billion in 2016. This represents an increase in online expenditures as a share of total expenditures from 3% to 8% and a decrease in the average value per transaction from EUR 73 to EUR 61, potentially due to an increasing share of low-cost digital products, including apps (OECD, 2019[18]).

Considering only private customers, the data reveal that the online share in total credit card usage reached between 15% (women) and 20% (men) for individuals aged 25 or younger, but remained as low as 4% (women) and 5% (men) for individuals aged 56 or older. On the other hand, the average amount spent per transaction increases with age (from EUR 42 for young individuals irrespective of gender, to EUR 68 and EUR 74 for older women and men, respectively. Individuals aged 26 to 35 are the biggest spenders in absolute terms, with an average yearly expenditure of EUR 1 218 (men) and EUR 968 (women).

2.16. Domestic online credit card expenditure in Spain by product category, 2016

As a percentage of total domestic online credit card expenditure, BBVA customers



Note: "Hyper" refers to large supermarkets. See Chapter notes.[48]

Source: OECD (2019[18]), "BBVA big data on online credit card transactions: The patterns of domestic and cross-border e-commerce", *https://doi.org/10.1787/8c408f92-en*.

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The average amount spent varies widely across sectors, with potentially important implications for consumer protection. For example, the highest average amounts were spent in the travel sector (EUR 248), implying relatively high financial risks in case of disputes. In contrast, in the fashion sector transactions had a much lower value of EUR 62 on average. This is below the average value across all domestic transactions (EUR 70). The corresponding value was only EUR 46 for international transactions, suggesting that customers are relatively more cautious when making purchases from abroad.

As the data also capture refunds from merchants to customers, additional insights can be gained with respect to product returns or failed transactions. For almost every 20 purchases, there is one refund transaction in the data (5%). The ratio is only slightly lower for international

2.3. Tapping into new data sources: BBVA credit card data *(cont.)*

transactions (4%) and implies a potentially substantial amount of deadweight loss in terms of transportation, both domestically and across borders. Approximately 57% of all domestic refunds were related to the fashion sector, highlighting how important the right fit is for this sector. This is clearly an online phenomenon, given that the data reveals a corresponding share of only 6% for offline transactions, where the customer can try on clothes before buying.

Furthermore, BBVA identified and categorised the individual merchant for 75% of all transactions that involve a merchant with fiscal headquarters outside of Spain – transactions for which merchant information is not available in the original data. Of the transaction value that these identified merchants represent (i.e. the explained transactions), BBVA found close to 38% to be accounted for by B2C retail online platforms like Amazon and AliExpress. Relative to all cross-border transactions (explained and unexplained) these online platforms accounted for at least 29% of the number of transactions and close to 22% of the total transaction value. Another 24% of the explained transaction value is accounted for by car rental websites, airlines or travel booking portals, whereas major high-tech firms, including Apple, iTunes and Google, accounted for more than 7% of the explained value. Overall, it is noteworthy that the contribution of a handful of prominent online players (excluding payment intermediaries such as Paypal) can account for at least one third of the total online cross-border expenditure (explained and unexplained) by Spanish BBVA customers in the given year.

Recent OECD (2019[18]) work applies a gravity model of trade to the same data and takes a closer look at some of the determinants of intra-regional, inter-regional and cross-border expenditure flows. The analysis reveals that free trade agreements, borders and distance are still important determinants of trade flows in the era of e-commerce. Nevertheless, it appears that the role of distance is less pronounced than for classical trade flows and, as the analysis of domestic purchases reveals, in particular for products like clothing, where a limited regional offer might drive people to purchases from other regions. The results also suggest that customers are more willing to purchase from other Spanish regions if they live in regions with a high average level of education, high consumer prices or a high dissemination and use of digital technologies.

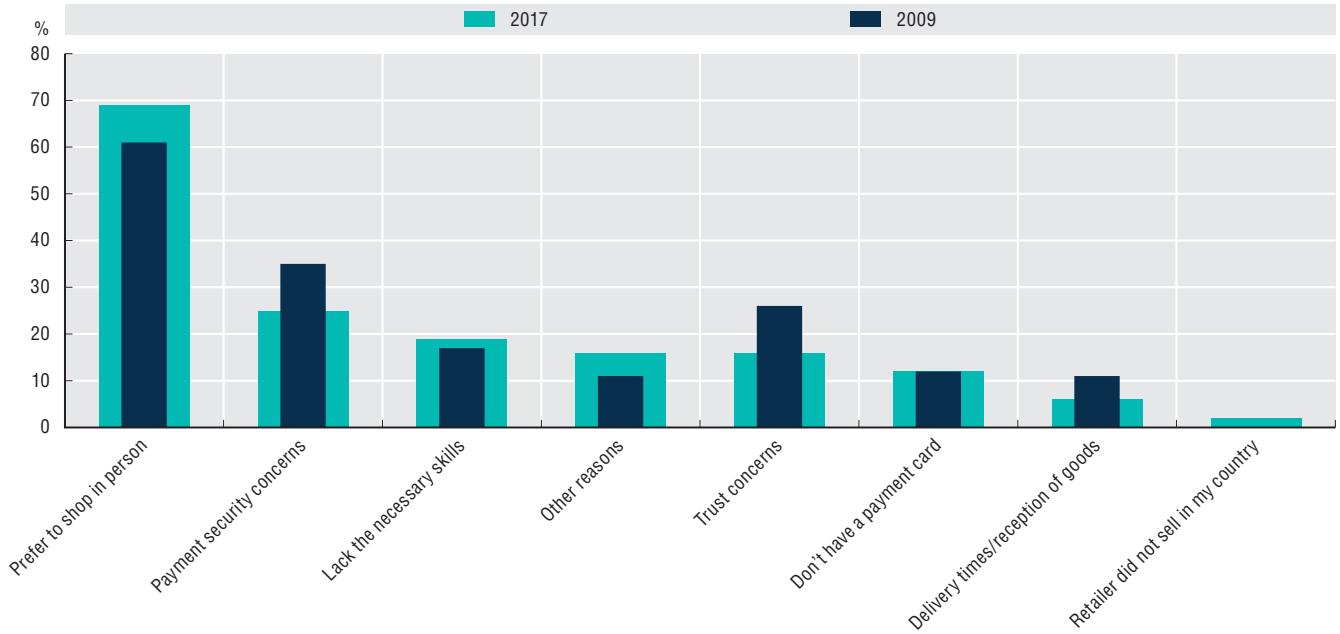
The analysis of cross-border purchases further reveals that customers still tend to be significantly less likely to purchase from other countries. Nevertheless, the results also confirm that the enabling environment for e-commerce in a potential partner country, measured by credit card penetration, the number of secure servers or quality of the logistical system, is an important determinant of the bilateral transaction value. Additionally, factors like the regulatory quality or the existence of a legal framework for e-commerce (e.g. cybercrime prevention) turn out to be good predictors of e-commerce transactions. Finally, the explanatory power of the gravity model increases when large online players are excluded from the data, illustrating how digital multinationals might have an impact on the applicability of well-established trade models.

Preferences, habits and skills are important barriers to individuals' participation in e-commerce

There is limited information from official statistics that assesses why individuals do not purchase through the Internet. The most recent data available from Eurostat is presented in Figure 2.17. According to these data, the primary reason individuals do not engage in e-commerce relates to preferences. An estimated 69% of individuals who have not ordered goods or services online during the past 12 months mentioned that they prefer to shop in person, see the product, remain loyal to brick-and-mortar shops, or simply were not willing or able to change their habits. Even in 2009, this was the single most important reason (among those mentioned) for purchasing offline (61%) and indicates that the transformation of habits remains one of the biggest challenges for B2C e-commerce. These data suggest that relative to other factors, habits are becoming increasingly important as determinants of e-commerce participation. It also highlights the increasingly important role that innovative business models will likely play in convincing remaining offline consumers of the benefits of e-commerce.

2.17. Reasons for not shopping online, 2017

As a percentage of individuals who ordered products online more than a year ago or never did, EU28



Note: See Chapter notes.[49]

Source: OECD calculations based on Eurostat, *Digital Economy and Society Statistics* (database) *https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/comprehensive-database* (accessed April 2018).

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Apart from the unspecified category, there is only one other reason for not engaging in e-commerce that was more frequently mentioned in 2017 than in 2009, namely the lack of necessary skills (19% vs. 17%). Furthermore, the share of individuals that mentioned a lack of a payment mechanisms, associated in most OECD countries with income and other socio-economic variables, has not decreased from its 2009 level of 12%.[50] The fact that reasons related to skills and available payment mechanisms have become relatively more important impediments for those currently not engaging in e-commerce indicates how crucial it might become for policy makers to address the gaps highlighted in Chapter 3 on the demand side of the market. The rise of new payment mechanisms, discussed in more detail in Chapter 3 might provide viable market solutions in this regard.

Other factors, including payment security concerns (from 35% in 2009 to 25% in 2017), trust concerns about receiving or returning goods as well as redress concerns (from 26% in 2009 to 16% in 2017) and concerns related to long delivery times or problematic reception of products ordered at home (from 11% in 2009 to 6% in 2017) appear to have become considerably less important over time. To some extent successful policy interventions (e.g. with respect to consumer protection) and business innovations, including same-day delivery and alternative payment mechanisms, may help to explain these results.

Cross-border e-commerce trends

E-commerce enables an increasing number of firms to sell across borders, including many small firms, and increases the product choice for consumers. While e-commerce firms are more likely to sell across borders than average offline firms, cross-border e-commerce is still often limited to geographically close trading partners.

B2C e-commerce is essential for SME exports and has spurred the rise of the Chinese market for e-commerce

While it is difficult to estimate global B2C e-commerce because of a lack of detailed official statistics, several sources suggest that global B2C e-commerce reached around USD 2.3 to 3.9 trillion in 2015, with the Asia Pacific region growing fastest (UNCTAD, 2017[22]); (GlobalData, 2017[2]); (E-Commerce Foundation, 2016[23]). Indeed, China appears to be the largest e-commerce market (accounting for

about 75% of e-commerce in the Asian Pacific region), followed by North America, Latin America and the Middle East and North Africa (MENA) region (GlobalData, 2017[2]).

The World Customs Organization (2015[24]) indicates that cross-border e-commerce in goods may have accounted for 10% to 15% of the total goods e-commerce volume. It is estimated that by 2025, Asia may well account for about 40% of this volume, with Europe potentially accounting for 25% and North America for 20%. The United Postal Union (2018[25]) provides further evidence of the increasing role that the Asian Pacific region plays for cross-border e-commerce, in particular with respect to border crossings of small packages up to 2 kilogrammes.[51]

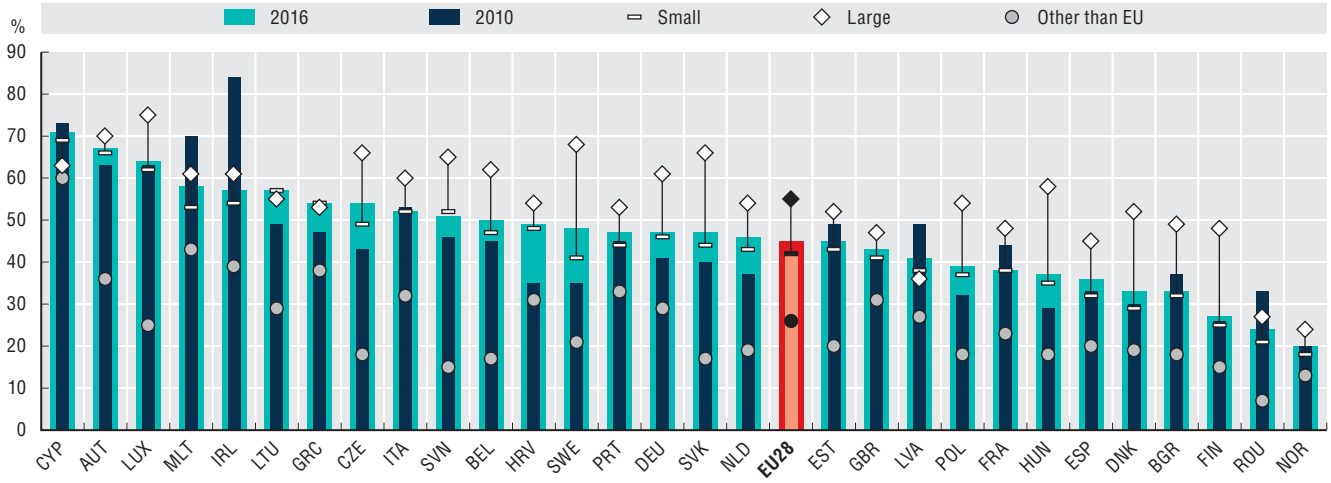
Furthermore, so-called ICT-enabled services (i.e. services that can potentially be delivered remotely over ICT networks (UNCTAD, 2015[26])), were estimated to have accounted for 56% of all services exports from EU member states to non-EU countries and 52% of all service imports from non-EU countries in 2014. The corresponding numbers for the United States are 54% of services exports and 48% of imports (US Department of Commerce, 2016[27]). In this context, it should be noted, however, that while e-commerce as understood in this report captures all digitally-delivered services that have been ordered online (e.g. a Netflix subscription), not all potentially ICT-enabled services lend themselves easily to e-commerce, given that they might be difficult to specify in an online order.[52]

Many European e-commerce firms export, but the share has been decreasing in some countries and large gaps remain between large firms and small firms

In 2016, 45% of all online sellers in EU28 countries received orders from other EU countries or the rest of the world, compared to 42% in 2010 (Figure 2.18).[53] The countries with the highest percentage point increases for the export share were Croatia (from 35% to 49%), Sweden (from 35% to 48%), and the Czech Republic (from 43% to 54%).

2.18. Enterprises that participated in e-commerce sales to other countries, 2016

As a percentage of enterprises that received e-commerce orders over the last calendar year, EU28



Note: See Chapter notes.[54]

Source: OECD calculations based on Eurostat, *Digital Economy and Society Statistics* (database) *https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/comprehensive-database* (last accessed April 2018).

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Norway had the lowest share of cross-border e-commerce sellers, with only 20% making sales in other countries, the same level as in 2010. Other countries experienced significantly higher reductions in the share of firms participating in cross-border e-commerce, such as Ireland (from 84% to 57%), Malta (from 70% to 58%), Romania (33% to 24%), Latvia (from 49% to 41%), France (44% to 38%), Bulgaria (37% to 33%) and Estonia (from 49% to 45%).[55]

At the same time, the overall average is largely determined by small firms (42%), while the export share among large firms participating in e-commerce was significantly higher (55%). The difference was highest for Sweden (27 percentage points) as well as Denmark, Finland and Hungary (23 percentage

points each), including some of the most advanced economies in terms of e-commerce uptake. The share of exporters was higher among small firms than among large firms for Cyprus,[56] Greece, Lithuania and Latvia, which might be driven by sectoral differences.

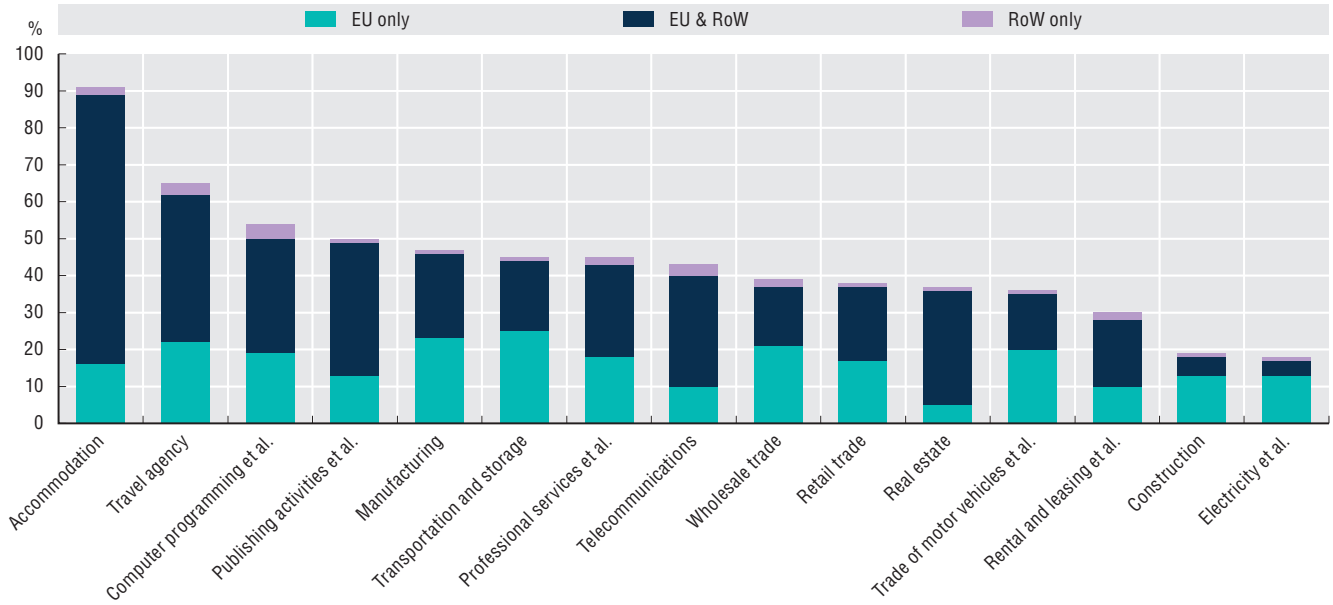
Importantly, exporting activity among e-commerce firms was much less frequent beyond the borders of the European Union. On average, only 26% of all firms analysed exported to countries other than EU countries. The share was relatively high for economies like Cyprus,[57] where roughly 85% of all exporters indicated to have exported to countries beyond the EU. The corresponding share was still above 65% for Greece, Ireland, Latvia, Malta, Norway, Portugal and the United Kingdom. For other countries, including the Czech Republic, Romania and Slovenia, the share of exporting e-commerce firms that went beyond European borders remained below 33%.[58]

Sectoral differences drive exports from European e-commerce firms

The share of exporters is depicted again in Figure 2.19 as a cross-country average across sectors. The figure distinguishes exporters according to whether they export to other EU countries only; to the rest of the world (RoW) but not to EU countries; or to both other EU countries and the RoW. Across sectors, this division reveals that of the 45% of exporters, 19% export to the EU only, 24% to both EU and the RoW, and 2% only to the RoW.[59]

2.19. Enterprises that participated in e-commerce sales to other countries by sector, 2016

As a percentage of enterprises that received e-commerce orders over the last calendar year, EU28



Note: RoW = rest of the world. See Chapter notes.[60]

Source: OECD calculations based on Eurostat, *Digital Economy and Society Statistics* (database) *https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/comprehensive-database* (last accessed April 2018).

StatLink https://doi.org/10.1787/888933923108

There is significant variation between sectors in terms of exporting behaviour. Accommodation, a sector where about 57% of total e-commerce is directed to end consumers, showed the highest trade intensity across all sectors, with 91% of all active e-commerce firms exporting their services to customers in other countries. Of these, more than 82% (75% of total) reported sales to customers in countries other than the EU. The travel agency sector follows with 65% of exporters, of which two-thirds exported to RoW countries (43% of all e-commerce firms). Both the manufacturing and the wholesale sector had lower shares of exporters, 47% and 39% respectively, indicating how open some consumer-facing sectors have become relative to B2B sectors that are at the core of GVCs. The highest share of exporters to RoW among all exporting e-commerce firms are found in the real estate sector, where 86% of exporters sell beyond European borders, even if the share of exporters in all e-commerce firms remained below average (37%). With only 38% of firms exporting and only 21%

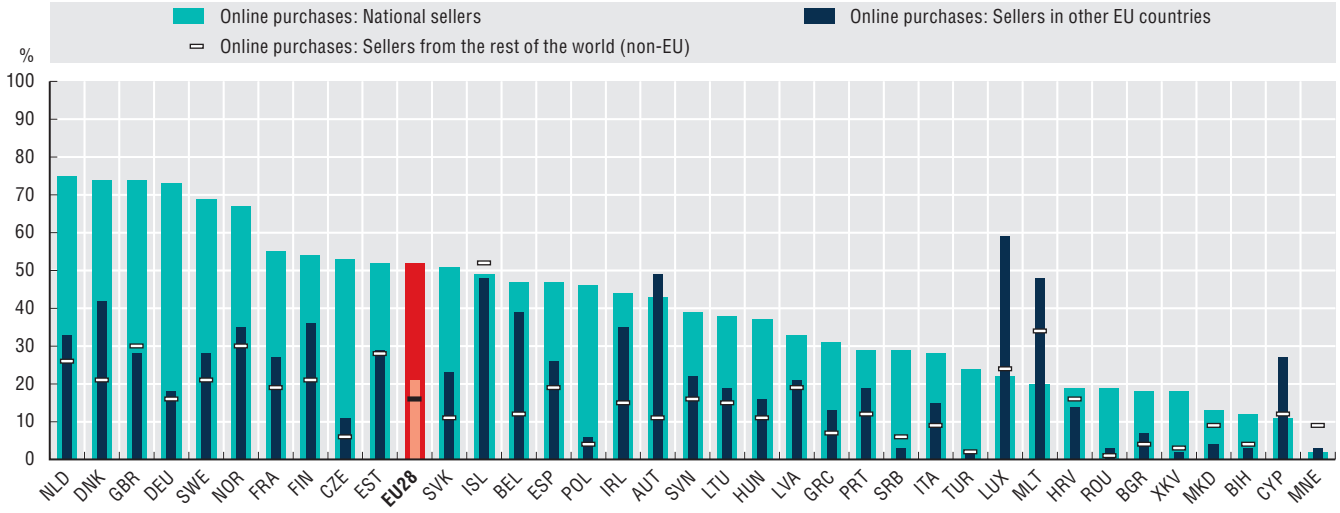
exporting to countries other than EU members, the retail sector seems to remain below potential when it comes to export performance even though the export intensity is relatively high when compared to offline firms as mentioned before.

EU consumers increasingly purchase online from abroad, but it has become more difficult to determine the origin of online goods and services

While there is relatively little evidence as to whether and how much individuals purchase online from other countries, Figure 2.20 provides insights into the percentage of individuals in EU countries who indicated they had purchased online from abroad in 2018. For the EU28, the data reveal that the percentage of individuals who made purchases from e-commerce firms in other EU countries had reached 21% (16% for RoW) by 2018.[61]

2.20. Individuals who purchased online from sellers in other countries, 2018

As a percentage of all individuals aged 16 to 74



Note: See Chapter notes.[62]

Source: OECD calculations based on Eurostat, *Digital Economy and Society Statistics* (database) *https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/comprehensive-database* (accessed March 2019).

StatLink https://doi.org/10.1787/888933923127

The share of individuals who made online purchases from abroad (either countries in the EU or non-EU countries) was highest in Iceland (65%), Luxembourg (63%) and Malta (53%), probably due to the relatively small domestic market in these countries. In all three countries, the share of individuals who had purchased from sellers abroad was significantly higher than the share of individuals who had purchased domestically (49% for Iceland, 22% for Luxembourg, and 20% for Malta), underscoring the important role that e-commerce plays in accessing products unavailable in the domestic market. More than 45% of individuals report buying abroad in Austria, Denmark and Norway. The countries with the lowest shares of importing individuals were Turkey (3%) and Romania (3%).

The figure reveals that imports from the RoW were equally or more important than imports from other European countries to consumers in Bosnia and Herzegovina, Croatia, Iceland, Kosovo, Montenegro, the Republic of North Macedonia, Serbia and the United Kingdom, whereas RoW imports were relatively less important in Austria, Belgium and Romania.

Although overall these numbers seem to suggest significant potential for improvements in the international scope of online purchases, it is noteworthy that across the EU28 about 27% of individuals had purchased from e-commerce firms in other countries in 2018.This is surprising, given that imports at the individual level were relatively rare before the digital transformation.

The underlying data can also be used to analyse time trends (not shown).[63] In particular, the data reveal a significant increase in cross-border purchases from only 6% for sellers from other EU countries (4% RoW) in 2008 to 21% in 2018 (16%). While these increases in the percentage of individuals who completed foreign purchases fell behind the increase in domestic purchases in absolute terms (i.e. percentage point changes), the relative increase of individuals that imported via e-commerce from other countries is nevertheless astonishing, with the share of importing individuals more than tripling for both the EU28 and the RoW.

Comparing the relative size groups over time implies that while there were roughly 4.7 domestic purchasers for every EU importer in 2008 and 7 domestic purchasers for every individual purchasing from the RoW, these relationships had fallen to 2.5 for EU imports and 3.3 for RoW imports only 10 years later.[64]

Importantly, though, the data also reveal a significant increase over time in the percentage of individuals reporting purchases from sellers with an unknown country of origin (from 2% to 7% over the 2008-18 time period). Accordingly, insecurity about a seller's origin is rising at more or less the same rate at which individuals are increasingly purchasing from other countries. This has important implications for consumer protection and shows that multinational business models, often involving local websites or warehouses, are contributing to an increase in the complexity of the e-commerce landscape.

The products most frequently purchased across borders tend to be physical goods

Figure 2.21 provides some insights into the type of goods that consumers in the EU28 purchased from abroad in 2017. The figure shows the percentage of all individuals engaging in e-commerce imports that have purchased a certain type of product. The data reveal that 80% of individuals purchased physical goods from abroad. Interestingly, the corresponding numbers are significantly lower for intangible products including travel arrangements and accommodation (34%) and downloaded products including e-books, videos or music (25%). The relatively high percentage of individuals purchasing physical goods is surprising, given that they involve transportation costs. Several of the less frequently imported services on the other hand can be digitally purchased, even if they might require travel to other countries in order to be consumed (e.g. accommodation services). What this potentially indicates is that consumers might encounter difficulties in finding domestic providers for certain physical products, whereas digital content tends to be more readily available from domestic suppliers. One explanation for this could relate to the fact that it is significantly cheaper to set up a website in several countries to distribute digital content domestically than it is to set up a local distribution centre for physical goods, which often requires storage facilities and warehousing.[65]

2.21. Products that individuals purchased online from sellers abroad, 2017

As a percentage of individuals that purchased online from sellers abroad, EU28

Note: See Chapter notes.[66]

Source: OECD calculations based on Eurostat, *Digital Economy and Society Statistics* (database) *https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/comprehensive-database* (database) (accessed March 2019).

StatLink https://doi.org/10.1787/888933923146

There are very few official sources for statistics on countries outside of the EU, but private sector survey data from the Google Consumer Barometer 2014/15 (Google, 2015[28]) suggest that the overall ranking of product categories that the official statistics indicate for domestic sales also apply to international sales. Unfortunately, the categories included in the Google data relate almost exclusively to goods (not services).[67]

Key areas for policy action

As digital transformation progresses, the economy will continue to digitalise, with positive impacts on economic efficiency and convenience in many cases. As a result, those who do not engage in e-commerce may find themselves on the wrong side of a potentially persistent and harmful digital divide. Policy can help foster the participation of actors, from SMEs to older individuals, that still do not buy or sell online.

Innovative business models can help address the specific needs of some of these groups, for example by offering solutions that help SMEs to sell online or by providing alternative payment mechanisms. However, there are a number of challenges to business innovation due to either low incentives to invest or cumbersome regulation. For example, complex rules can leave customers responsible for unforeseen duties, taxes or burdensome return requirements. Transparent rules, consistently applied at the border across both digital and brick-and-mortar firms, can reduce some of the resulting uncertainties.

With respect to individuals, significant gaps remain with respect to education, income and age, but also gender and for households in rural areas. Factors that inhibit participation of these groups are often related to economic and social conditions that reach far beyond e-commerce, including urban-rural divides, income distribution, unequal access to education or an aging society. With regard to e-commerce, these conditions may manifest themselves in low connectivity, a lack of ICT skills, low levels of trust or a lack of viable payment options – factors that can all be addressed by policy action. Relevant measures in this regard include targeted information campaigns, trust building initiatives, adult training, as well as public-private partnerships that target the participation of low-income households and those in rural areas.

In the case of firms, data suggest that SMEs still lag behind in terms of e-commerce participation. This is true despite the emergence of web-based and standardised solutions specifically targeting these firms. In many cases, this is related to high costs of delivery and returns, a problem that SMEs face significantly more often than other firms (European Commission, 2015[11]). Some business models have emerged that aim to boost firm participation in e-commerce (see Chapter 3). Updating regulations to overcome bottlenecks in areas such as postal services or custom clearance may help in this respect.

In addition, SMEs are likely to struggle more with regulatory uncertainty, as they often lack the financial means to obtain the required legal expertise. This carries over to the relationships between SMEs and larger service providers, such as online platforms. In particular, the EC recently proposed new rules on transparency and fairness to foster a predictable and trusted business environment for both SMEs and online platforms.[68] With respect to cross-border e-commerce, governments should also be open to emerging multi-stakeholder initiatives such as the Electronic World Trade Platform (eWTP), a public-private sector dialogue that could foster a more effective policy environment, providing better access to online trading opportunities in particular for SMEs.

Notes

Israel

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

1. Both percentages and total only relate to the sectors depicted in Figure 2.1. As the sectors included and the classification of sectors are not identical for both regions, numbers should not be directly compared. European figures relate to firms with 10 or more employees. Total sector level turnover was not available for some sectors. 2016 was the last available year in Eurostat's Structural Business Statistics and for US census data at the time of drafting. Data from the Digital Economy and Society database come from the 2017 survey and relate to e-commerce turnover in 2016.
2. The service sector in the US data captures slightly more activities than the European data. Activities related to electricity, gas, steam, air conditioning and water supply on the other hand are not captured in the US data.
3. For Japan, the total e-commerce data is broken down into B2C and B2B transactions. Data from the Ministry of Economy, Trade and Industry suggest that B2C e-commerce in 2016 accounted for JPY 15.1 trillion, while B2B transactions (including web sales and EDI) reached JPY 291 trillion in the same year. By 2017, B2C e-commerce had risen to JPY 16.5 trillion and B2B sales to JPY 317.2 trillion, implying a B2C contribution of 5.2%, up from 4.6% in 2015. See METI Japan (2016[31], 2018[33]).
4. Figure 2.1: US: Professional services include scientific and technical services. Administrative and support include waste management and remedies. Real estate et al. includes rental and leasing. Other services excludes public administration. Arts, entertainment et al. includes recreation. Health care et al. includes social assistance. EU28: Firms with more than 10 employees. Total turnover is calculated multiplying turnover or gross premiums written from Eurostat Annual Enterprises Statistics with enterprises' turnover from EDI-type sales and web sales as percentage of turnover from the Digital Economy and Society database. Wholesale and retail trade exclude motor vehicles and motorcycles; electricity et al. includes gas, steam, air conditioning and water supply; professional activities include scientific and technical activities; publishing et al. includes motion picture, video and television programme production, sound recording, and music publishing, programming and broadcasting.
5. Figure 2.2: Retail trade excludes motor vehicles and motorcycles; professional et al. includes scientific and technical activities; accommodation et al. include food and beverage service activities. Based on available data for Australia, Austria, Belgium, Colombia, the Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, the United States and the United Kingdom. Some countries do not provide information on all sectors and only reported data is used to calculate averages. Data from the 2018 survey was not available for some countries and the most recent data was used instead (earliest: 2012). For Australia, data for a given year refers to the fiscal year, ending in June of that year. Data are from 2016 instead of 2018. The Australian definition of e-commerce includes any transaction where the commitment to purchase was made via the Internet, including via email. Data has large standard errors. For Austria, data for manufacturing are from 2017. For Colombia, data are from 2016 and data for construction are not available. For Iceland, data are from 2012 and data for real estate services are not available. For Italy, data for wholesale are not available. For Luxembourg, data for administrative and support services are from 2017, data for manufacturing are from 2012, and data for professional services are from 2016. Data for real estate activities, retail and wholesale trade are not available. For Slovenia, data for information and communication services are from 2016, data for professional services are from 2012, and data for construction, real estate activities and wholesale are not available. For the United States, data by sector are not limited to firms with 5 or more employees. They relate to all employment firms, regardless of size. The North American Industry Classification System (NAICS) was used instead of ISIC Rev.4. Data for administrative and support services are from 2015. For other sectors, data are from 2016. Data for construction are not available.

6. Data for the EU28 is used because of the greater consistency in terms of coverage and reporting over time.
7. OECD calculations based on Eurostat, Digital Economy and Society: ICT Usage in Enterprises (database) (last accessed April 2019). Data across industries is available from 2013 onwards only. Survey data on e-commerce activities by firms relates to the previous year (e.g. data from the 2013 survey relates to activities in 2012).
8. Figure 2.3: Data for enterprises with 10 or more employees. Sectors are grouped by the average (2010-17) share of B2C web sales in total e-commerce (survey waves 2011-18). Telecommunications (50%), real estate (54%), accommodation (59%), travel agencies (59%) and retail (65%) obtain equal to or more than half of e-commerce orders from private customers. The figure shows absolute changes in percentage points. Averages represent the average absolute percentage point change for each group. Wholesale and retail trade exclude motor vehicles and motorcycles. Computer programming et al. includes consultancy and related activities and information service activities, rental and leasing et al. includes activities for employment, security and investigation, services to buildings and landscape, office administrative, office support and other business support. Professional et al. includes scientific and technical activities. Electricity et al. includes gas, steam, air conditioning and water supply. Publishing activities et al. includes motion picture, video and television programme production, sound recording and music publishing, programming and broadcasting.
9. Figure 2.4: Firm participation is the percentage of all businesses employing more than 10 employees receiving orders over computer networks. Data from for 2017 comes from the 2018 survey (and equally for other years). Unless otherwise stated, only enterprises with 10 or more employees are considered, small firms are defined as companies with between 10 and 49 employees, and large firms as companies with 250 or more employees. For Australia, data for a given year refers to the fiscal year, ending in June of that year. Data are from 2016 and 2010. The Australian definition of e-commerce includes any transaction where the commitment to purchase was made via the Internet, including via email. For Canada, data are from 2013 and 2012; medium-sized enterprises have 50-299 employees and large ones have 300 or more employees. Sales online over the Internet may include EDI sales over the Internet as well as website sales, but do not include sales via manually typed e-mail or leads. For Colombia, data are from 2016 and 2012. For Iceland, data are from 2010 instead of 2009. For Japan, data are from 2016 instead of 2018. Data refer to businesses with 100 or more employees instead of 10 or more. Medium-sized enterprises have 100-299 employees and large firms have 300 or more employees. For Korea, data are from 2016 instead of 2018. For New Zealand, data are from 2016 and 2008. For Switzerland, data are from 2011 instead of 2018. For Turkey, data are from 2010 instead of 2009. For Brazil, data are from 2017 instead of 2018. Data do not exclude manually typed emails or any other such channels after 2010.
10. Figure 2.5: Percentage of e-commerce in total turnover is the percentage of orders received over computer networks. Data from for 2017 comes from the 2018 survey (and equally for other years). Unless otherwise stated, only enterprises with 10 or more employees are considered, small firms are defined as companies with between 10 and 49 employees and large firms as companies with 250 or more employees. For Australia, data for a given year refer to the fiscal year, ending in June of that year. Data are from 2016 instead of 2018. The Australian definition of e-commerce includes any transaction where the commitment to purchase was made via the Internet, including via email. For Belgium, data for large firms is from 2012 instead of 2018. For Colombia, data are from 2016 and 2012. For Denmark and Estonia, data are from 2010 instead of 2009. For Greece, data are from 2008 instead of 2009. For Iceland, data is from 2012 and 2010. For Luxembourg, data are from 2012 instead of 2009.
11. Figure 2.6: Percentage of e-commerce in total turnover is the percentage of orders received over computer networks. Firm participation is the percentage of firms receiving orders over computer networks. Data for 2017 comes from the 2018 survey (and equally for other years). Data for 2017 were added from Eurostat and include a break in series for Germany. Only enterprises with 10 or more employees are considered, small firms are defined as companies with between 10 and 49 employees and large firms as companies with 250 or more employees.
12. See also Chapter 1.
13. OECD calculations based on Eurostat data. Eurostat data is used for greater coherence.
14. The Eurostat survey design attributes sales via EDI in general to either B2B or B2G transactions. All B2C transactions are therefore stemming from web sales. See Box 1.1.
15. Firms can engage in both EDI and web sales at the same time.
16. Figure 2.7: Data for 2017 comes from the 2018 survey (and equally for other years). Values are averaged over the survey years 2011 to 2018 to identify structural differences. Only enterprises with 10 or more employees are considered. Small firms are defined as companies with between 10 and 49 employees and large firms as companies with 250 or more employees. Web sales capture all e-commerce turnover other than EDI-type sales. Firms with web sales are a subset of e-commerce firms. B2C sales are a subset of web sales. Selling via the Internet/apps (% e-commerce firms) is the share of enterprises having received orders via a website or apps (web sales) in all enterprises receiving

e-commerce orders over the last calendar year (accordingly for EDI). E-commerce marketplaces are websites or apps used by several enterprises for trading products. Data for B2C as percent of firms and percent of turnover are averaged over the years 2013 to 2018 due to limited data availability. Data for sales via marketplaces are averaged over the years 2017 and 2018 due to limited data availability.

17. While 94% of large EU28 firms with web sales also realised sales through their own website in 2017, the corresponding percentage is 86% for small firms.
18. The average across time is used to highlight more structural sector level differences. Data is not available for most OECD countries outside of the European Union.
19. Among the sectors that focus mostly on final consumers (share of B2C transaction is larger than 50% of total e-commerce transactions), the retail sector sticks out with a relatively high share of EDI transactions (76%) in total B2B transactions, probably reflecting a higher share of physical goods compared to sectors like accommodation or travel agencies, where the corresponding EDI shares in B2B sales are around 30% and 38%, respectively.
20. Figure 2.8: Data for enterprises with 10 or more employees. Values are averaged over the years 2012 to 2017 (survey waves 2013-18) to pick up structural differences. Wholesale and retail trade exclude motor vehicles and motorcycles. Trade of motor vehicles et al. includes trade of motorcycles. Computer programming et al. includes consultancy and related activities and information service activities, rental and leasing et al. includes activities for employment, security and investigation, services to buildings and landscape, office administrative, office support and other business support. Professional et al. includes scientific and technical activities, electricity et al. includes gas, steam, air conditioning and water supply, publishing activities et al. includes motion picture, video and television programme production, sound recording and music publishing, programming and broadcasting.
21. An important limitation of survey evidence on e-commerce challenges is that in most cases respondents can choose from a closed set of possible responses only, restricting the scope of challenges that are represented in the data. In addition, perceived challenged might be different from actual challenges encountered.
22. See also UNCTAD (2015[26]).
23. As the web is specified as the sales channel for these survey questions, Panel B of Figure 2.9 may contain some responses from firms that have received sales via EDI.
24. Figure 2.9: Products not suitable refers to goods and services. Costs are too high: the costs of introducing web sales too high compared to the benefits. Logistics problems apply to shipping of goods or delivery of services. ICT security problems also relate to data protection. Responses are from the 2016 and the 2013 survey respectively and relate to sales activities in the previous year, i.e. 2015 and 2012.
25. The data also confirm earlier findings for SMEs in the United Kingdom, where 80% of the sampled firms with a website but no plans to introduce any form of e-commerce (521 firms) indicated that they were not selling goods or services that can be ordered directly as a reason. The number was particularly high for the business services sector (92%) but still identified by 60% of SMEs active in the retail, transport and the food sector. Other reasons identified were lack of relevancy (4%), high cost (3%), other reasons (6%) or no particular reason (5%), see Allinson et al. (2015[58]).
26. See European Commission (2015[11]) for significant cross-country differences.
27. Figure 2.10: Questions: If you were to sell your products and/or services online, tell me if each of the following difficulties would be a major problem, a minor problem or not a problem at all for your company? Base: Companies that do not sell online (N = 5122).
28. Figure 2.11: Questions: for each of the following difficulties that may present itself when selling or trying to sell online to other EU countries, can you tell me if it has been a major problem or not a problem at all? Base: Companies that sold their products and/or services online in another EU country in 2014 and those that used to do so or tried to do so (N = 1903).
29. Figure 2.12: Percentage of enterprises with web sales to other EU countries. Responses are from the 2017 survey and relate to sales activities in the previous year, i.e. 2016.
30. Restrictions from business partners could involve for example producers that prohibit sales via online platforms for downstream retailers.
31. In Canada, Colombia and Japan there was a break in survey methodology over time, which might be partly responsible for this result.
32. There is no generally acknowledged definition of the terms “Baby Boomers” or “Generation Z”. As the age groups captured in the figure roughly coincide with the birth years typically associated with both groups the terms are used for illustrative purpose. In a statistical sense, all findings should be understood as related to the stated age groups only.
33. Average for younger users excludes data for Canada and New Zealand to allow for comparison with older users.

34. In Colombia, Israel, New Zealand and the United States, e-commerce penetration was below the country average for the youngest generation, driven largely by a higher penetration for intermediate age groups.

35. Due to missing data for 2009, the comparison over time excludes data for Australia, Canada, Chile, Israel, Japan and New Zealand.

36. Figure 2.13: Unless otherwise stated, data refer to the percentage of individuals (age 16 to 74) that purchased online over the last 12 months. OECD average by age group excludes Canada and New Zealand due to missing data for the age group 55 to 74. For Australia, data refer to the fiscal years 2016/17 and 2008/09 ending on 30 June. In 2016/17, the information provided is taken from a question wording that differs slightly from other countries: "In the last 3 months, did you personally access the Internet for any of the following reasons: Purchasing goods or services?" In 2008/09, the recall period is 12 months. For Canada, data are from 2012 instead of 2018. Data for 2009 refers to all individuals aged 16 and over instead of 16 to 74. Data for 2012 refers to all individuals aged 16 to 74. For Chile, data are from 2017 instead of 2018. In 2014 there has been a break in series. Source and methodology differ. For Colombia, data are from 2017 instead of 2018. Between the years 2007 to 2011, the survey module was inserted into the Great Integrated Household Survey (GEIH) and as of 2012 it was inserted into the Quality of Life Survey (ECV). The information is not comparable between 2009 and 2017. For Israel, data are from 2016 instead of 2018. Data refer to individuals aged 20 and over instead of 16 to 74 and 20 to 24 instead of 16 to 24, having used the Internet for purchasing goods or services in the last three months. This includes all types of goods and services. For Japan, data are from 2016 instead of 2018. Until 2010 included, data received by OECD include individuals aged 6 and over (instead of individuals aged 16 to 74). From 2011 onwards, data received by OECD include individuals aged 15 to 69 (instead of individuals aged 16 to 74). Age brackets 16 to 24 refer to 15 to 19. Age bracket 55 to 74 refers to 50 to 69. For Korea, data are from 2017 instead of 2018. For Mexico, data are from 2017 instead of 2018. From 2015, the information is collected through an independent thematic survey, unlike previous years in which the information was obtained through a module raised in various surveys. This methodological change must be taken into account when comparing data prior to 2015. For New Zealand, data are from 2012 and 2006. In 2012, data include individuals who have made a purchase through the Internet for personal use, which required an online payment in the last 12 months. For Switzerland, data are from 2017 and 2010. For 2017, data originate from Eurostat. Before 2017, data have been provided by the Swiss Federal Statistical Office (OFS). For 2010, data originate from Enquêtes Omnibus TIC. For the United States, data are from 2017 and 2013. Supplements to the Current Population Survey (CPS) have been conducted during varying months. The 2013 survey went into the field in July, and the 2017 survey was conducted in November. It is unknown to what extent seasonal variations may play a role in survey responses. The CPS Supplement uses the previous six months as the reference period. Prior to 2015, no reference period was specified. For Brazil, data are from 2016 instead of 2018. From 2008 to 2010: quota sampling approach for the selection of the respondent at the household level. For Costa Rica, data are from 2017 instead of 2018. Data for 2017 correspond to individuals aged 18 to 74.

37. Recent data from the Ministry of Communications and Information Technology in Egypt in co-operation with UNCTAD (UNCTAD, 2017[32]) suggest that the gender gap is potentially more striking in other countries. In Egypt, about 5% of individuals age 15 or older that had used the Internet in the last three months had participated in the purchase or ordering of goods or services via the Internet over the past year. Of these purchasers, more than two-thirds were male (69%) whereas less than one third was female (31%).

38. Figure 2.14: Ordering of countries follows Figure 2.13. Unless otherwise stated, data by educational achievement and household income refer to the percentage of individuals (age 16 to 74) that purchased online over the last 12 months. Educational attainment is measured according to the International Standard Classification of Education (ISCED) maintained by UNESCO. The OECD Model Survey breaks down education into three groups: High education refers to tertiary education (ISCED 5 or above), middle education refers to upper or post-secondary, but not tertiary education (ISCED 3 or 4), and low education refers to at most lower secondary education. Data was unavailable for many countries. For Australia, data refer to the fiscal years 2016/17 ending on 30 June. In 2016/17, the information provided is taken from a question wording that differs slightly from other countries: "In the last 3 months, did you personally access the Internet for any of the following reasons: Purchasing goods or services?". In 2008/09, the recall period is 12 months. There was a methodology change between 2014 and 2016 in the low level of education category. In 2016, persons with no educational attainment and an undefined vocational certificate were included in this category and totals for the first time. This had a negligible impact on data. For Canada, data are from 2012 instead of 2018. For the 2012 data, the lowest quartile is defined as less than or equal to CAD 30 000, the second quartile is from CAD 30 000 to CAD 55 000, the third quartile is from CAD 55 000 to CAD 94 000 and the highest quartile is CAD 94 000 or higher. In order to obtain equal weighted counts in each category, cases with incomes equal to the category cut-offs were randomly assigned to one of the two categories on either side of the cut-off. For Chile, data are from 2017 instead of 2018. In 2014 there was a break in series. Source and methodology differ. For 2009, low or middle level of education have been surveyed in a single category (which refers to "No formal education completed,

primary or lower secondary education" and "Upper secondary education") and are therefore not available separately. High level of education (ISCED-97: 5 or 6) refers to "tertiary education". For Colombia, data are from 2017 instead of 2018. Between the years 2007 to 2011, the survey module was inserted into the Great Integrated Household Survey (GEIH) and as of 2012 it was inserted into the Quality of Life Survey (ECV). The information is not comparable between 2009 and 2017. For Iceland, data by income refers to 2017 instead of 2018. For Israel, data are from 2016 instead of 2018. Data refers to individuals aged 20 and over instead of 16 to 74, having used the Internet for purchasing goods or services in the last three months. This include all types of goods and services. For Italy, data on income are from 2013 instead of 2018. For Korea, data are from 2017 instead of 2018. For Mexico, data are from 2017 instead of 2018. From 2015, the information is collected through an independent thematic survey, unlike previous years in which the information was obtained through a module raised in various surveys. This methodological change must be taken into account when comparing data prior to 2015. For New Zealand, data are from 2012 and 2006. In 2012, data include individuals who have made a purchase through the Internet for personal use, which required an online payment in the last 12 months. For Switzerland, data are from 2017 and 2010. For 2017, data originate from Eurostat. Before 2017, data have been provided by the OFS. For 2010, data originate from Enquêtes Omnibus TIC. For the United Kingdom, data on income are from 2008 instead of 2018. For the United States, data are from 2017 and 2013. CPS Supplements have been conducted during varying months. The 2013 survey went into the field in July, and the 2017 survey was conducted in November. It is unknown to what extent seasonal variations may play a role in survey responses. The CPS Supplement uses the previous six months as the reference period. Prior to 2015, no reference period was specified. Income quartiles are approximate because family income is a categorical variable. The fully allocated income variable is unavailable prior to 2010. For Brazil, data are from 2016 instead of 2018. From 2008 to 2010: quota sampling approach for the selection of the respondent at the household level. Income data are collected using ranges in minimum wages. Reported data were aggregated in a way that best fit the distribution into 4 balanced categories. Income nonresponse are not included. From 2008 to 2009: Respondents were provided no reference period, indicator refers to having ever purchased online. For Costa Rica, data on education are from 2015 instead of 2018.

39. A detailed analysis of the Colombian e-commerce market is provided by the national telecommunications regulator, highlighting factors like transportation infrastructure, a lack of payment methods and trust as the main barriers to e-commerce. See (CRC, 2017[34]).

40. Due to missing data for 2009, comparison over time excludes data for France and Ireland.

41. Education is grouped by individuals with at most lower secondary (ISCED 0, 1 or 2), individuals with upper or post-secondary, but not tertiary (ISCED 3 or 4) and individuals with tertiary (ISCED 5 or above) education.

42. Data for Costa Rica relates to 2015, Brazil to 2016, Chile, Colombia and Mexico to 2017.

43. Due to missing data for 2009, comparison over time excludes data for New Zealand.

44. Figure 2.15: Highly urbanised are areas with at least 500 inhabitants per square kilometre. Intermediate urbanised are areas with 100 to 499 inhabitants per square kilometre. Rural areas have fewer than 100 inhabitants per square kilometre. Panel A shows the percentage of individuals that had purchased online during the last 3 months. Data for the United Kingdom is from 2017. Panel B shows the share of households with a broadband connection. A broadband connection implies Internet access for both desktop and mobile devices at speeds at or greater than 256 Kbps. Data for Luxemburg contains break in series due to change in the survey methodology. This figure contains data for "Cyprus".

    Note by Turkey:

    The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

    Note by all the European Union Member States of the OECD and the European Union:

    The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

45. OECD calculations based on OECD, ICT Access and Usage by Households and Individuals (database). Data from the 2018 survey. For Chile, Costa Rica, Korea, Mexico and Switzerland, data are from 2017. For Australia, data are from 2016 and wording of some questions differs slightly to that requested. For Japan, data are from 2015. For Japan the age range is 15 to 69 and data is "in the last 12 months". In Korea, medicine can't be traded online and alcohol and tobacco are not included. For Mexico, wording of some questions differs from that requested. For Switzerland, the data provided correspond to individuals aged 18 to 74.

46. The remaining categories were: dislike going to shops (12%), ability to return products easily (9%) and the ability to find better quality products online (5%).
47. See note 67 for details on the survey.
48. Figure 2.16: Domestic online expenditure is the sum of all "card not present" transactions using a BBVA credit card by customers in Spain. Product categories are assigned to merchants (online sellers) by BBVA. "Hyper" relates to large supermarkets.
49. Figure 2.17: Reasons for not shopping online, as percentage of individuals who ordered goods or services, over the Internet, for private use, more than a year ago or who never did. Prefer to shop in person also relates to: like to see product and loyalty to shops or force of habit. Trust concerns relate to receiving or returning goods or complaint or redress concerns. Reception of goods relates to problems receiving the ordered goods at home.
50. Evidence for the US shows that credit cards are disproportionately prevalent among households with higher levels of income, more education and among non-hispanic white adults (Federal Reserve Board, 2017[32]).
51. International parcel deliveries have been proposed as a proxy for the increase in cross-border e-commerce although the data does usually not allow distinguishing deliveries by ordering mode. See (UNCTAD, 2016[32]) for a discussion.
52. For instance, while an architectural design file can in principle be provided over ICT networks, the ordering process typically involves complex demand specifications that often require ongoing communication via e-mails, phone calls, video conferences or actual meetings – and thus would not comply with the characteristics of an e-commerce transaction. Nevertheless, innovations in both technology and business models might increasingly lead to an overlap between services that can be delivered and ordered online.
53. Includes 43% of firms that have undertaken electronic sales to other EU countries and 2% that have undertaken electronic sales to the rest of the world but not to other EU countries.
54. Figure 2.18: Enterprises having undertaken electronic sales to other EU countries or the rest of the world as percentage of enterprises receiving e-commerce orders over the last calendar year. This figure contains data for "Cyprus".

    Note by Turkey:

    The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

    Note by all the European Union Member States of the OECD and the European Union:

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55. From the available data it is impossible to infer what drives these results at the country level. Structural changes, including at the sectoral level as well as issues related to data consolidation might be responsible for the results.
56. Note by Turkey:

    The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

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57. Note by Turkey:

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58. For a proper interpretation of these numbers a comparison with offline firms would be required.

59. The breakdown can deliver interesting results from a country perspective. In Sweden for example, the share of exporters among e-commerce firms increased from 36% to 48% between 2010 and 2016. This increase was exclusively driven by exporters that only sold to RoW (from 2% to 15%), while the share of exporters to the EU slightly diminished from 34% to 33%.

60. Figure 2.19: RoW = Rest of world. Wholesale and retail trade exclude motor vehicles and motorcycles. Computer programming et al. includes consultancy and related activities and information service activities, rental and leasing et al. includes activities for employment, security and investigation, services to buildings and landscape, office administrative, office support and other business support. Professional et al. includes scientific and technical activities, trade of motor vehicles et al. includes motorcycles, electricity et al. includes gas, steam, air conditioning and water supply, publishing activities et al. includes motion picture, video and television programme production, sound recording and music publishing, programming and broadcasting.

61. Surveyed individuals were asked whether they purchased goods or services from sellers in any of four possible regions: domestic sellers, sellers in other EU countries, sellers in the rest of the world (RoW) or sellers abroad (other EU or RoW). The former three are depicted in Figure 2.20. Additionally, respondents were able to select a separate option when they were not sure about the seller's location. The responses are not mutually exclusive and thus individuals could choose several options simultaneously.

62. Figure 2.20: Percentage of individuals who have purchased online from domestic sellers, sellers in other EU or sellers in non EU countries, i.e. rest of world (RoW). Data for Latvia is from 2017. This figure includes data for Kosovo. This designation is without prejudice to positions on status, and is in line with United Nations Security Council Resolution 1244/99 and the Advisory Opinion of the International Court of Justice on Kosovo's declaration of independence. This figure contains data for "Cyprus".

    Note by Turkey:

    The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

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63. In this context, it is important to highlight the extent to which dynamics that are true for the EU might also be true for other OECD countries. A comparison with regard to domestic e-commerce can provide some insights in this regard. Overall, the trends for European and OECD countries seem to be quite aligned, driven not least by the significant weight that EU countries have in the OECD average. Thus, according to the Eurostat data, the percentage of domestic online customers in the EU28 increased from 36% in 2009 to 60% in 2018. Figure 2.13 shows that the corresponding value was 35% across OECD countries and confirms a similar increase to 57% by 2018. Considering only the non-EU countries in Figure 2.13 (Australia, Brazil, Canada, Chile, Colombia, Iceland, Israel, Japan, Korea, Mexico, New Zealand, Norway, Switzerland, Turkey and the United States) implies an increase from 30% to 45%. These numbers are lower than for the EU partly due to the relatively low uptake in countries like Brazil, Chile, Colombia, Mexico and Turkey and partly because data for non-EU countries is often less up-to-data than the data provided by Eurostat, dating back to 2012 in some cases (e.g. for Canada and New Zealand).

64. This comparison is not precise and illustrative only. In particular, while most individuals with imports from RoW will also show up in the group of domestic purchasers or EU importers, others might not. Thus, the Eurostat data reveal that while in 2018 roughly 21% had purchased from other EU countries, the total percentage of individual importers from anywhere was as high as 27%, implying at least 6% of individuals that had purchased from countries outside of the European Union but not from within.

65. In the light of the findings presented earlier, suggesting that individuals are increasingly less confident about the location of an online seller, it is noteworthy that transportation costs can be an important indicator of transactions involving foreign sellers. It is therefore likely that customers relatively more often mistake cross-border purchases for domestic purchases, when the purchases involves digital services rather than goods. This would imply that cross-border purchases of digital imports have a higher probability of being underrepresented in the data than goods.

66. Figure 2.21: Percentage of individuals that has purchased online from sellers abroad (other EU or non-EU countries). Physical goods: e.g. electronics, clothes, toys, food, groceries, books and CDs/DVDs. Travel, accommodation or holiday arrangements (e.g. tickets and documents by mail or printed by oneself). Products downloaded or accessed from websites or apps (e.g. films, music, e-books, e-newspapers, games and paid applications). Other services (e.g. tickets for events received by mail and telecom subscriptions).
67. See Consumer Barometer Survey 2014/15 with Google (*www.consumerbarometer.com*). Survey evidence based on 56 391 respondents in Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Japan, Korea, Latvia, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. (Question: What type of product have you ever purchased online from abroad?)
68. *https://ec.europa.eu/growth/content/online-platforms-commission-sets-new-standards-transparency-and-fairness_en*.

References

Allinson, G. et al. (2015), "Digital capabilities in SMEs: Evidence review and re-survey of 2014 small business survey respondents", Department for Business, Innovation and Skills, *BIS Research Paper*, No. 247, London. [58]

Capgemini (2017), "World payments report 2017", *https://www.capgemini.com/fr-fr/wp-content/uploads/sites/2/2017/10/world-payments-report-2017_year-end_final_web-002.pdf* (accessed on 19 April 2018). [4]

CRC (2017), "El comercio electronico en Colombia", *https://www.crcom.gov.co/recursos_user/2017/ComElecPtd_0.pdf* (accessed on 23 April 2019). [34]

E-Commerce Foundation (2016), "Global B2C e-commerce report 2016", *https://www.ecommercewiki.org/wikis/www.ecommercewiki.org/images/5/56/Global_B2C_Ecommerce_Report_2016.pdf* (accessed on 19 April 2018). [23]

eMarketer (2018), "Worldwide retail and ecommerce sales: EMarketer's updated forecast and new mcommerce estimates for 2016-2012", *https://www.emarketer.com/Report/Worldwide-Retail-Ecommerce-Sales-eMarketers-Updated-Forecast-New-Mcommerce-Estimates-20162021/2002182* (accessed on 19 April 2018). [1]

European Commission (2017), "Final report on the e-commerce sector inquiry", *http://ec.europa.eu/competition/antitrust/sector_inquiry_final_report_en.pdf* (accessed on 22 April 2019). [12]

European Commission (2015), "Flash Eurobarometer 413: Companies engaged in online activities", *http://ec.europa.eu/commfrontoffice/publicopinion/flash/fl_413_en.pdf*. [11]

European Commission (2015), "Provision of two online consumer surveys as support and evidence base to a Commission study: Identifying the main cross-border obstacles to the Digital Single Market and where they matter most", *https://ec.europa.eu/info/sites/info/files/digital-single-market-final-report_en.pdf*. [21]

Eurostat (2017), "Digital economy and society: ICT usage in households and by individuals", *https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/comprehensive-database*. [13]

Farag, S. et al. (2006), "E-shopping in the Netherlands: Does geography matter?" *Environment and Planning B: Planning and Design*, Vol. 33, pp. 59-74, *https://dx.doi.org/ 10.1068/b31083*. [14]

Federal Reserve Board (2017), "Report on the economic well-being of U.S. households in 2016", *https://www.federalreserve.gov/publications/2017-economic-well-being-of-us-households-in-2016-banking-credit.htm*. [30]

GlobalData (2017), "Online consumer payments: Seizing the opportunity", Report Code: GDF0009IA, GlobalData UK Ltd, *https://www.globaldata.com/store/report/gdf0009ia--online-consumer-payments-sizing-the-opportunity*. [2]

Google (2015), "Consumer barometer from Google", *https://www.consumerbarometer.com/en/insights/?countryCode=IE* (accessed on 20 April 2019). [28]

Jabri, P. (2016), "Low broadband connectivity areas to have e-commerce easy shops soon", *Business Recorder*, *https://www.thenewsminute.com/article/ecommerce-goes-rural-startup-helping-villagers-buy-amazon-70580* (accessed on 13 July 2018). [17]

Liao, R. (2018), "Journey to the West: How China's online retailers are taking the battle to the rural front", *Techinasia*, *https://www.techinasia.com/china-ecommerce-rural-small-cities* (accessed on 13 July 2018). [15]

McDermott, K. (2016), "The mobile payments report 2016 – An omnichannel evolution", *https://www.payvision.com/downloads/mobile-payments-report-2016-an-omnichannel-evolution.pdf* (accessed on 20 April 2019). [7]

METI Japan (2016), "Results compiled of the e-commerce market survey", *http://www.meti.go.jp/english/press/2016/0614_02.html*. [31]

METI Japan (2018), "Internet buying boom: METI releases results of FY2017 e-commerce market survey", *https://www.meti.go.jp/english/press/2018/0425_002.html*. [33]

OECD (2019), "BBVA big data on online credit card transactions: The patterns of domestic and cross-border e-commerce", *OECD Digital Economy Papers*, No. 278, OECD Publishing, Paris, *https://doi.org/10.1787/8c408f92-en*. [18]

OECD (2018), "Consumer protection enforcement in a global digital marketplace", *OECD Digital Economy Papers*, No. 266, OECD Publishing, Paris, *http://dx.doi.org/10.1787/f041eead-en*. [20]

OECD (2013), "Electronic and mobile commerce", *OECD Digital Economy Papers*, No. 228, OECD Publishing, Paris, *http://dx.doi.org/10.1787/5k437p2gxw6g-en*. [10]

OECD (2011), *OECD Guide to Measuring the Information Society 2011*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264113541-en*. [8]

OECD (1999), *The Economic and Social Impact of Electronic Commerce – Preliminary Findings and Research Agenda*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264172081-en*. [9]

Paypal (2018), "PayPal cross-border consumer research 2018", *PayPal*, *https://www.paypalobjects.com/digitalassets/c/website/marketing/global/shared/global/media-resources/documents/PayPal_Insights_2018_Global_Report.pdf* (accessed on 19 April 2019). [3]

Payvision (2017), "Payvision's annual report reveals cross-border e-commerce trends - In 2017, with online marketplaces and consumer technology leading the way for growth", *https://www.payvision.com/edit-press-release-payvision%E2%80%99s-annual-report-reveals-cross-border-ecommerce-trends-2017* (accessed on 19 April 2018). [5]

Ranipeta, S. (2017), "Ecommerce goes rural: This startup is helping villagers buy on Amazon", *The News Minute*, *https://www.thenewsminute.com/article/ecommerce-goes-rural-startup-helping-villagers-buy-amazon-70580* (accessed on 13 July 2018). [16]

UNCTAD (2017), "Consumer protection in electronic commerce", TD/B/C.I/CPLP7, Note by the UNCTAD Secretariat, *http://unctad.org/meetings/en/SessionalDocuments/cicplpd7_en.pdf* (accessed on 19 April 2018). [22]

UNCTAD (2017), *ICT Policy Review: National E-commerce Strategy for Egypt*, UNCTAD/DTL/STICT/2017/3, United Nations Publishing, Geneva, *https://unctad.org/en/pages/PublicationWebflyer.aspx?publicationid=1956*. [29]

UNCTAD (2016), "In search of cross-border e-commerce trade data", *UNCTAD Technical Notes on ICT for Development*, United Nations Publishing, Geneva, *https://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d06_en.pdf*. [32]

UNCTAD (2015), "International trade in ICT Services and ICT-enabled services: Proposed indicators from the Partnership on Measuring ICT for Development", *UNCTAD Technical Notes on ICT for Development*, *https://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d03_en.pdf*. [26]

United Postal Union (2018), "Postal economic outlook 2018", *http://www.upu.int/uploads/tx_sbdownloader/postalEconomicOutlook2018En.pdf*. [25]

US Department of Commerce (2016), "New BEA estimates of international trade in digitally enabled services", *http://www.esa.doc.gov/economic-briefings/new-bea-estimates-international-trade-digitally-enabled-services* (accessed on 22 April 2018). [27]

World Customs Organization (2015), "Annual Report 2014-2015", *http://www.wcoomd.org/-/media/wco/public/global/pdf/media/annual-reports/wco_annrep_en_2014_2015.pdf*. [24]

Worldpay (2017), "Global payments report 2017", Worldpay LLC, *https://www.worldpay.com/global/insight/articles/2017-11/global-payments-report-2017* (accessed on 22 April 2019). [6]

Chapter 3

EVOLVING E-COMMERCE BUSINESS MODELS

E-commerce facilitates trade across borders, increases convenience for consumers, and enables firms to reach new markets. Despite its short history, the e-commerce landscape has rapidly evolved through the development of new business models, which often integrate new and emerging digital technologies as well as new online payment mechanisms. This chapter analyses evolving e-commerce business models, focusing in particular on business-to-consumer (B2C) e-commerce, and includes examples from existing businesses to highlight firm-level innovations. It concludes by identifying key areas for policy action.

3. EVOLVING E-COMMERCE BUSINESS MODELS

E-commerce has emerged as an economic and social phenomenon over the last 25 years, facilitating trade across borders, increasing convenience for consumers, and enabling firms to reach new markets. Over that short history, the e-commerce landscape has rapidly evolved through the development of new business models, which often integrate new and emerging digital technologies as well as new online payment mechanisms. This change has occurred in tandem with the wider social and economic implications of digital transformation.

Many e-commerce business models use online platforms, facilitating purchases between often unknown and dispersed buyers and sellers. Another emerging trend is the growth of subscription e-commerce business models, whereby users access goods and services in a continuous, recurring stream. Firms are also developing online-offline e-commerce business models that integrate digital ordering mechanisms alongside physical infrastructures, including within brick-and-mortar stores. This chapter discusses these business models as well as the digital technologies and payment mechanisms that enable them.

3.1. What is a business model?

A business model is a "term of art" without precise definition that has emerged from the business and economics literature (Ovans, 2015[1]). Broadly, the term describes the strategies and mechanisms firms use to succeed in competitive marketplaces. The *Oslo Manual*, a statistical manual for the measurement of innovation, defines a business model as "all core business processes … as well as the main products that a firm sells, currently or in the future, to achieve its strategic goals and objectives" (OECD/Eurostat, 2018[2]).

A variation on this definition includes "the rationale of how an organization creates, delivers and captures value" (Osterwalder and Pigneur, 2010[3]). Notably, this lens of value creation has been used across the OECD, including in analyses of taxation and environmental policy (OECD, 2018[4]; Hilton et al., 2019[5]).

In this chapter, "business models" refer to commonly observable business processes, purposes, strategies and means of generating revenue through e-commerce, although the precise formulation of these features differ. The chapter also highlights the role of new and emerging digital technologies and online payment mechanisms in these business models.

New business models push out the e-commerce frontier in two ways (see Chapter 2). First, new business models can enable more transactions to move online in a given market or for a given set of participants, an effect known as the *intensive margin* of e-commerce. Second, new business models can enable whole new markets to emerge for goods and services that previously could not have been bought or sold online, or allow new participants to enter the market. This effect is referred to as the *extensive margin* of e-commerce.

Digital technologies enable e-commerce innovations and often serve as the backbone of business model developments. Some of these technologies, like smart assistants enabled by artificial intelligence (AI), constitute new channels for selling or purchasing products over electronic networks. Other emerging technologies, like big data analysis, foster the growth of new data-driven business models for e-commerce and can support transactions moving online.

Similarly, online payment innovations can help to unlock e-commerce potential by promoting trusted online transactions between unknown parties. Such innovations make e-commerce more convenient and can facilitate trade online along the intensive margin. Similarly, innovations that enable new groups to participate in e-commerce can facilitate more trade online along the extensive margin. This chapter considers evolving e-commerce business models, focusing in particular on the business-to-consumer (B2C) space, and uses examples from existing businesses to highlight firm-level innovations.

3.2. Data: Enabling innovation in e-commerce

Data are both an input and an output of e-commerce transactions. Online transactions provide some actors with the ability to collect a range of detailed data, including:

- Individual data (e.g. name, gender, age, location, place of residence),
- Customer history (including, in some cases, the ability to track transactions over time and across multiple vendors),
- In-store movements (in the case of some of the online-offline interactions) and other spatial information, and
- Browsing history, Internet Protocol (IP) address, and data from connected devices (discussed further below).

As e-commerce is undertaken through digital means, such data can be more easily captured and utilised than they would have been for an offline transaction.

Data generated and gathered in the course of an e-commerce transaction are often particularly lucrative because they can help target product offerings, improve matching and create a better consumer experience. This data can also drive firm-level strategies to increase and extend user participation. As e-commerce expands, these flows are increasingly large and rich, yielding combinatorial insights and innovations (OECD, 2015[6]) and creating new sources of value (OECD, 2018[4]). The private use of data is sometimes controversial and is the focus of past and future work across the OECD (OECD, 2017[7]; OECD, forthcoming[8]).

Online platform e-commerce business models

An analysis of e-commerce would be incomplete without a discussion of online platforms, which act as both retailers and providers of digital marketplaces that bring buyers and sellers together online. Online platforms have become significant actors in the e-commerce landscape, facilitating a range of interactions between disparate actors. In the context of e-commerce, online platforms typically bring together buyers and sellers for the sale/purchase of either digital or physical products, a phenomenon known as a multi-sided market. Ongoing OECD work analyses online platforms and the resulting multi-sided markets that facilitate interactions between multiple groups or users, or "sides" (OECD, 2019[9]).

Increased scale and scope of goods and services

As multi-sided markets, online platforms benefit from both direct and indirect network effects, whereby economies of scale benefit users on both sides of the market. In the context of e-commerce, these sides can be understood as buyers and sellers. Typically, buyers gain utility from the presence of more sellers, assuming there is an expansion in the scope and/or variety of products for sale. Similarly, sellers are attracted to buyers to whom they can sell their products. As digital services, platforms are characterised by relatively higher fixed costs and comparatively lower marginal costs, meaning that the additional cost of hosting another buyer or seller can be close to zero.

In the context of e-commerce, online platforms act as intermediaries between buyers and sellers to facilitate the exchange of goods and services over the Internet. The large number of actors in a digital marketplace allows a potentially infinite variety of goods and services available for sale, in contrast to the more limited scope of products available in physical stores. For example, the average physical "super centre" store of the American retail chain Walmart typically holds approximately 120 000 items for sale while Walmart's online store offers 35 million items for sale (Bloomberg, 2017[10]). As additional products can be added to online platforms at very low marginal cost, the scope and variety of previously unprofitable products increases, pushing out the extensive margin of e-commerce (Ellison and Ellison, 2018[11]).

The sheer scope of the goods and services that can be made available on online platforms can also enable the provision of so-called "long-tail" goods and services (Anderson, 2004[13]), namely very niche

products with small markets where it might be otherwise unprofitable for offline sellers to operate. Further academic work identifies the consumer surplus resulting from increased scope and variety of product offerings from online platforms (Brynjolfsson, Hu and Smith, 2003[12]).

3.3. Transforming back-end operations using digital technologies

The sheer abundance of products available for purchase through some online platforms creates significant back-end logistical, distributional and supply-chain challenges for online retailers. Digital technologies can transform back-end operations to increase efficiency and enable efficient delivery, despite increasing volumes and rates of processing and production. Machine learning algorithms that improve with use can also optimise autonomous machines and robotics to improve the warehousing, fulfilment and logistics processes.

Online retailers have a range of applications for machine learning, including optimising back-end scheduling and optimal resource allocation, predicting product demand, classifying products and identifying keywords, and developing ideal inbound and outbound logistics. Machine learning can also help in the parcel sorting process. For example, the Chinese retailer JD.com has incorporated robotics into logistics centres and warehouses to improve parcel sorting, packaging and distribution. The company unveiled a fully automated sorting centre in 2018, which features the completely automated processing of 16 000 packages per hour with an accuracy rate of almost 100% (JD.com, 2018[14]).

Connected devices are also extensively used throughout the inventory, logistics and fulfilment systems of e-commerce firms. For example, radio frequency identification (RFID) is a technology that enables the transmission of information over radio waves to Internet-connected devices, while a variety of sensors can be embedded in products to help to track items for transit. These can help optimise the supply chain process, predict shipping times and provide real-time monitoring of levels of stock. Nonetheless, RFID technologies have yet to be widely adopted by enterprises, suggesting unrealised potential (OECD, 2017[18]).

In other cases, online platforms have created new markets for goods and services that were previously not traded online, again increasing the extensive margin of e-commerce. For example, new business models like the American company Uber and the Chinese company Didi Chuxing enable online ride-sharing services, a market that did not exist prior to 2011. Similarly, home-sharing platforms like Airbnb enable access to accommodation in a novel sharing arrangement that would otherwise not take place, particularly on a global scale, without the existence of an online platform.

Matching buyers and sellers

As online platforms scale, they must provide some form of matching mechanism to enable buyers and sellers to find each other in a way that is satisfactory to both parties. Reducing friction, as well as transaction and search costs for both buyers and sellers, is essential to improving utility on both sides, and thereby increasing the chance of a successful online sale/purchase. Notably, these matches can take place between both local and geographically dispersed actors, and for the sale of both physical and digital goods and services.

Where a firm's business model is based on user engagement (revenue from advertising) or on successful sales (a commission for intermediating services), the firm has incentives to develop mechanisms to ensure successful matches. Unsuccessful matches also cause actors on both sides to leave the marketplace, thinning out the market (Fradkin, 2017[19]; Horton, 2014[20]).

The type of matching mechanism differs across online platforms, and typically relates to the nature of the good or service on offer and the ability of the buyer to form or express a preference for a good or service. For homogenous, non-differentiable services where buyers have few preferences (or difficulties in assessing and expressing preferences), some online platforms have had success with centralised matching.

Uber, for example, algorithmically offers rides to drivers based on location and the buyer's preferences (e.g. a private limousine or a ride shared with others). As noted by Einav et al. (2016[24]), this choice rests on the on-demand nature of Uber's services which prioritises safe transportation with few transaction costs, low prices and short wait times. Customers indicate their preferences and their destination, and an algorithm matches the customer with a driver. While customers are not given a choice about specific drivers or car model, they have the option to reject their match. Other inputs to the matching algorithm include passenger and driver location, as well as supply (number of drivers) and demand (number of passengers), which influences the price.

In contrast, search and filter mechanisms may be more effective in decentralised marketplaces with more heterogeneous goods and services for sale for which customers may have a range of preferences (Fradkin, 2017[19]). For example, those looking for an apartment to rent on Airbnb will typically have different preferences for location, room characteristics and price in a given area.

3.4. Using big data analytics and AI to improve matching

To match buyers and sellers, or indeed consumers and content, e-commerce firms can make use of data gleaned from their customers to algorithmically optimise and personalise matching and product recommendations. These data could include browsing patterns, the length and nature of user engagement with particular features, responsiveness to design or format changes, or the behaviour of other similar users.

For example, Amazon uses AI, in the form of neural networks (Amazon, 2016[21]), to train algorithms to generate recommendations based on user purchase history, product recommendations and ratings history. Personalised recommendations play a large part in steering consumer behaviour online – for example, some have estimated that 80% of Netflix activity is driven by algorithmic recommendations (Financial Times, 2016[23]).

Academic work has found that changes in algorithmic design can alter the rate of matching between buyers and sellers in the context of online platforms (Fradkin, 2017[19]), thereby improving overall engagement and the likelihood of matches. This is particularly important where online platforms earn revenue through successful transactions, as failed matches can cause actors to exit the marketplace.

Consumers typically express an initial preference by outlining core characteristics of the product or service they wish to buy (e.g. a product name or a location). The online platform's search algorithm then offers a set of results for consideration for the consumer. This set of results may be derived from the online platform's indexed knowledge of product and seller characteristics (see Box 3.2), and could be personalised based on the online platform's existing knowledge of the buyer. The consumer will then typically use features in the search interface, including filter mechanisms, to refine the search results to determine the product or service that best matches their preferences. A range of academic work finds that the ranking of search results influences a consumer's choice of what to purchase (Ursu, 2016[25]).

In general, when the online platform only benefits from user engagement (advertising revenue) or from a successful transaction (commission or selling fee), matching mechanisms are essential for the platform's business model. Matching mechanisms are also often associated with pricing arrangements (see Box 3.5).

3.5. Pricing on online e-commerce platforms

Pricing strategies on online platforms differ in accordance with the nature of the good or service on offer and buyer and seller characteristics. Some pricing arrangements are closely associated with the matching process on online platforms.

For example, Uber uses a pricing mechanism that operates in tandem with the process of centralised matching. Uber acts as the price-setting agent, dynamically changing prices in response to market conditions to facilitate matches in real time. "Surge pricing" of this nature can help clear markets faster and minimise transaction costs for buyers and sellers, thereby

3.5. Pricing on online e-commerce platforms *(cont.)*

enabling e-commerce, although some consumers have complained about such practices (Riley, 2017[26]). Dynamic pricing is evident in other markets, including the airline industry.

As noted above, e-commerce enables the online sale of goods and services in niches that were previously unprofitable to offer for sale offline. However, as these goods and services typically also have comparatively smaller markets, pricing such goods is not necessarily obvious. Auction mechanisms are useful as a means of price discovery in these cases, particularly for unique or used products (Einav et al., 2017[27]), although transaction costs for buyers typically increase. Auctions are also often used for heterogeneous services, such as task-mediating services like Upwork and Thumbtack, where the specificity of the task results in a lack of an alternative price-setting mechanism with lower frictions (Fradkin, 2017[19]).

In the early days of e-commerce, auction mechanisms were prevalent on online platforms. Today, they have declined in use in the retail market, particularly for standard goods with large markets. On eBay, an e-commerce platform and online auction house, the share of auctions in the active listings declined from over 90% in January 2003 to just approximately 15% in January 2013 (Einav et al., 2017[27]). A notable exception is the use of advertising placement auctions for digital marketing purposes, as used by Google and Yahoo, and the use of bidding and auction systems to determine the ranking of products on many price comparison platforms.

The simplest and most common prices found on online platforms are those determined and posted by the seller. Seller-determined prices remove the physical and cognitive transaction costs associated with bidding in an auction. Seller-determined prices enable sellers to change easily their prices in accordance with their preferences (e.g. Airbnb hosts can easily change prices in accordance with their own schedule or requirements). The decline in the relative share of auctions on retail e-commerce platforms, and the growth in seller-determined prices, suggest that buyers may also prefer this format in many cases.

Online intermediaries are in a unique position to collect data about users on both sides of the market, including but not limited to transaction data, demographic data, and data on user behaviour, among others. This data may be offered, observed or inferred. When used in combination and potentially matched with other data, the price-setting agent may be in a better position to determine the consumer's reserve price – namely, the highest possible price that each individual may be willing to pay.

This practice is known as personalised pricing, whereby some consumers may pay less for a given product and others may pay more than they would have done if all consumers were offered the same price (OFT, 2013[28]). While there is little empirical evidence of the use and extent of personalised pricing, by virtue of being personalised, such practices may be difficult to detect and monitor. Nonetheless, recent OECD work suggests that firms have the technical potential to personalise prices, and consumers report having experienced the practice, including on online platforms (OECD, 2018[29]). Personalised pricing practices have uncertain impacts of overall competitive conditions and consumer welfare.

The *OECD Recommendation on Consumer Protection In E-Commerce* (OECD, 2016[30]) notes that businesses should "provide information about the … costs associated with a transaction that is sufficient to make an informed decision." When firms personalise prices, they should therefore disclose to consumers that they are doing so. However, such disclosures may have uncertain impacts on consumer behaviour (OECD, 2018[31]). Future experimental work from the OECD will aim to identify which approaches to disclosure are effective in enabling consumers to identify and comprehend personalised pricing, and the extent to which disclosure has a material impact on consumer decision making.

Approaches to increase trust

E-commerce platforms bring together buyers and sellers who may be dispersed geographically and involve parties that have not met before. Some sellers on online platforms are large and may have established brands that buyers may trust. In contrast, smaller, potentially unknown vendors may have

more difficulty establishing conditions that would lead buyers to transact willingly with them. Third-party providers and sellers operating on multi-sided markets may be further unsure about payment or reliability from buyers who purchase their products.

Online platforms can provide mechanisms that help to resolve this essential information asymmetry, build trust on both sides of the market, and ensure that transactions are safe and reliable to foster e-commerce. Online platforms have the ability to easily collect, store and communicate information to both sides of the market in a verifiable way, particularly when there have been repeat transactions. This enables the entirety of the engagement with the platform, and not simply transaction history with a single seller on the platform, to build trust for online transactions.

In general, analysis on peer platform markets finds that consumers generally trust platforms, sometimes to a greater extent than conventional businesses in the same market (OECD, 2017[32]). Notably, this analysis finds that consumer trust in an online platform is generally higher than trust in unknown third-party sellers that may operate on the platform, and that consumer trust in the platform is the most commonly cited reason for proceeding with transactions even when the buyer may not trust the seller. This indicates that trust mechanisms developed by online platforms can enable more transactions, pushing out the extensive margin of e-commerce.

For many online platforms, a significant ex ante mechanism for building trust includes the performance of verification checks of the identity and/or the credentials of either buyers or sellers. For example, Uber, Lyft and other ride-sharing platforms confirm the identities of drivers through government-issued documentation like a valid driver's license, vehicle registration, reviews of criminal records, and checks of the suitability of the vehicle. Airbnb verifies the identity of both guests and hosts on the platform through passports, while other online platforms confirm professional certifications and licenses. The verification of identities online can enable e-commerce (see Box 3.6).

3.6. Digital identity and its potential for e-commerce

Digital identity refers to the set of information used by a computer to authenticate an identity. This identity could be anonymous or pseudonymous, and relate to a civil identity, a corporate identity, or be linked to information provided by a user (age, gender, etc.), or established through browsing, selling or purchasing history. As such, it is possible for individuals or organisations to have multiple digital identities across various platforms and websites that may or may not be connected.

In response to this fractured digital identity landscape, both public and private schemes that seek to create unified digital identities are becoming increasingly prevalent. Government digital identity efforts usually consist of a unique number that links a digital profile to civil information like demographic or biometric data. For example, India's Aadhaar programme issues a unique number to every Indian citizen which is a valid means of identification *vis-à-vis* the government as well as private Internet sites including Airbnb, Uber and digital wallet services (Nadadhur, 2018[33]).

Private firms also offer digital identity authentication services. Similar to government schemes, private firms provide users with online identities through mechanisms like unique numbers or accounts that verify a user's identity across a variety of Internet sites. In contrast to centralised government efforts, this identity may be separate from a user's civil identity or may be linked to only certain aspects. Facebook is one such private actor that increasingly acts as a digital identity provider. For example, many sites give users the option to use Facebook account information as identity verification instead of creating a new username and password.

Digital identities present a number of opportunities for buyers and sellers alike. For one, when sellers have access to information about buyers' diverse tastes through their digital identity, they can make better use of algorithms that tailor their advertising and content specifically to the buyer's needs. Such tailoring decreases bounce rates (the proportion of users that leave a website without making a click) and reduces cart abandonment (the phenomenon of placing an item in a digital checkout cart but not carrying out the sale), while increasing overall conversion rates (the proportion of users that make a purchase) (Deloitte, 2017[34]). Overall, digital identity schemes that share information with e-commerce firms can make sellers more efficient and profitable.

3.6. Digital identity and its potential for e-commerce *(cont.)*

For consumers, these digital identity mechanisms can also represent an advantage in terms of ease-of-use and security. When users have a digital identity across many sites, they do not need to manually re-enter personal data such as shipping details, and are less likely to make mistakes when filling out online forms. With a unified digital identity, users also no longer need rely on an ever-growing list of passwords or the individual security systems of many different and potential unsecure sites to protect sensitive data (Deloitte, 2017[34]; Eggleton, 2016[35]).

Digital identities also pose certain drawbacks, particularly for buyers. Privacy issues and lack of control of personal data may be exacerbated by digital identity schemes, which could share personal information with e-commerce sites. For example, those taking part in the Aadhaar digital identity scheme have been reticent to link this data to certain functions like their digital wallets (see below) due to privacy concerns (Nadadhur, 2018[33]). To a large extent, the real impact of digital identity on e-commerce will depend on the nature of the digital identity systems adopted as well as how much user information is deemed appropriate to share with e-commerce firms. Policy makers therefore play a pivotal role in the development of digital identity in e-commerce and the level of control that buyers have over how their personal data is shared.

Security risks are another potential drawback of digital identities. Although digital identity schemes may offer buyers the opportunity to consolidate password data, these mechanisms themselves are not impervious to digital security threats. Particularly in the case that data associated with a digital identity are not anonymised, digital identities may be easily linked to sensitive administrative information like social security numbers or national identification data, and then exploited by third parties. Even when data are anonymised, digital identity schemes could in fact leave users more vulnerable. If a data breach of a centralised digital identity occurs, third parties could access users' most sensitive data all in one place (Domingo and Enriquez, 2018[36]).

Beyond these potential advantages and disadvantages, interoperability issues create further challenges for the relevance and efficiency of digital identity initiatives. As both centralised government initiatives and private digital identity firms multiply, the ability of these systems to interact with one another influences the role that digital identity can play in e-commerce. Namely, the relevance of the benefits (and risks) of digital identity in the e-commerce sector may be muted if interoperability issues are not resolved.

Another significant *ex-ante* mechanism for building trust includes the imposition of minimum quality standards. Drivers wishing to participate as sellers with Uber in its American marketplace must pass a 19 point vehicle inspection test with a registered mechanic before their account can be activated (Uber Partner Help, 2018[37]). Third-party sellers on online platforms may be required to meet a minimum standard of service as a condition of using the platform; for example, some third-party sellers on Amazon must meet minimum requirements for returns and delivery times (Levy, 2016[38]; Levy, 2017[39]).

The most common ex post trust-building mechanism on online platforms is the use of reputation and review systems, whereby one or both sides of the transaction is able to rate or review the transaction through a mechanism that can be viewed by other users in the marketplace. Both reputation and review systems are a form of public good. Recent OECD work on trust in peer platform markets finds that reviews and ratings are important for consumer engagement with online platforms (OECD, 2017[32]).

Reputation systems track the performance of a user over time and help other users determine whether they wish to transact with them. They are an important mechanism of reducing moral hazard and information asymmetry between different sides of the market. Reputation systems were initially pioneered by eBay but have subsequently spread to most online platforms (Luca, 2016[40]), indicating their utility as a trust-building tool in e-commerce.

Research on online platforms like eBay and Amazon finds that the reputation of a seller impacts demand from buyers (Tadelis, 2016[41]). In the case of Airbnb, analysis suggests that incentivising reviews by offering a USD 25 coupon could improve the usefulness of the review (Fradkin et al., 2017[43]), while other research on Alibaba's Taobao platform found that rewarding feedback with a coupon could

be used as a signal of the quality of the seller (Li, Tadelis and Zhou, 2016[44]). However, there is a risk that reviews that are compensated could be biased (Cabral and Li, 2014[45]). Sellers may also have perverse incentives to manipulate their reviews (Mayzlin, Dover and Chevalier, 2014[42]).

Product reviews are another form of feedback often used by online platforms. They enable buyers to review the quality and utility of the product (as opposed to the seller). These ratings are a means of ensuring that product quality on online platforms remains high, as low ratings impact sales (Chevalier and Mayzlin, 2006[46]), particularly when the ratings have been judged as useful by others (Chen, Dhanasobhon and Smith, 2008[47]). Private surveys also find that consumers trust online reviews to a similar degree as personal recommendations (Bright Local, 2017[48]).

Product reviews have significant impacts on offline behaviour as well. Pew Research finds that 45% of consumers check reviews before purchasing in a physical store (Pew Research Centre, 2016[49]), while Google finds that mobile searches for product reviews increased by 35% from 2015 to 2017 (Google, 2018[50]). This underscores the degree to which digital technologies are embedded in offline purchasing (see below).

Consequently, online platforms have experimented with mechanisms to ensure the review system's quality, including using machine learning to display reviews that are more useful to other consumers (Rubin, 2015[51]). Some online platforms have also taken action against third-party sellers over attempts to manipulate ratings with fake or misleading reviews (Perez, 2016[52]; Broida, 2019[53]; Statt, 2019[54]).

Some online platforms have used other features to improve trust between unknown parties. Airbnb and Uber offer insurance to sellers for property damage that occurs during the course of a booking or transaction. In addition, some online platforms act as an mediating party should a dispute occur between the buyer and seller in a transaction, while others have customer service and return options for dissatisfied buyers. Some online peer-to-peer lending platforms, including Lending Club and Prosper, use algorithms to detect and protect against fraud (Xu, Lu and Chau, 2015[55]).

3.7. Disintermediating e-commerce: The potential of blockchain to enable trusted transactions

Blockchain is a technology that enables applications to authenticate ownership and carry out secure transactions for a variety of asset types (OECD, 2019[56]). For so-called public or unpermissioned blockchains, actors are able to verify transactions without the need of an existing trusted relationship through both cryptographic and market-designed incentives. Blockchain technologies are emerging and have yet to be applied in many domains or integrated into policy frameworks. However, as a radical means of facilitating disintermediated transactions, Catalini and Gans (2017[58]) note that blockchain could significantly bring down the costs of verification and networking associated with economic transactions, including e-commerce.

In the context of e-commerce, blockchain removes the need to use an intermediary for third party verification for trusted transactions. This could facilitate the development of distributed, peer-to-peer networks with multiple sides without the need for a centralised online marketplace. One emerging peer-to-peer marketplace of this nature is OpenBazaar, which features no fees for listings, selling or commissions, and accepts over 50 cryptocurrencies as payment (OECD, 2017[18]). Marketplaces like this could theoretically challenge the business model of firms that act as intermediaries between different sides of a market.

Other potential applications of blockchain related to trust could involve the development of a portable and decentralised reputation system. As noted above, reputation and review mechanisms have emerged as important enablers of e-commerce by increasing trust through the publication of previous transaction history. However, these rankings are not transferable from marketplace to marketplace, which could theoretically increase switching costs for users. Chlu, a new start-up, aims to provide a transferable record of a vendor's reputation, using the immutable and public nature of blockchain, while also keeping them private using advanced cryptographic solutions (Chlu, 2018[59]). Such a system could also be used to aggregate rankings and performance from multiple online platforms or communities.

Mechanisms to facilitate firm participation

While the specific design of online platforms differ, each platform has incentives to add users, meaning that the entry costs for sellers that wish to participate on online platforms are typically low. This gives small and medium-sized enterprises (SMEs) and, in some cases sole traders, the ability to compete alongside more established firms on online platforms. When online platforms operate in multiple international markets, being active on the platform can give sellers access to new markets overseas.

However, there are a range of complementary investments that sellers may need to make to effectively buy and sell online. Trading at a distance, including potentially across borders, requires significant upstream and downstream investments in supply chain management, secure payment systems, delivery and fulfilment mechanisms, and customer-facing services like dispute resolution mechanisms and customer service. For e-commerce across borders, these activities may need to be conducted in foreign languages. Notably, these are all factors mentioned by firms as influencing their decision not to participate in e-commerce (see Chapter 2).

As a result, online platforms have begun to offer complementary services for firms that trade on their platform, including fulfilment, logistics, customer service and software-as-a-service (SaaS) offerings. SMEs disproportionately benefit from these services because they would otherwise require significant upfront fixed costs, while platform-enabled services can transform this fixed cost into a variable cost. These new solutions push out the extensive margin of e-commerce, enabling new participants to enter the marketplace.

Many major online platforms such as Amazon, Alibaba and Rakuten, offer fulfilment services to sellers that operate on the marketplace. These services are often integrated with the broader sales management interface of the platform and compete with other international fulfilment service providers, including Shipwire, Whiplash and Cloud Fulfilment. Such fulfilment services may be particularly useful in countries without a well-developed postal system or with a limited number of third party logistics service providers (see Chapter 2).

In the case of Amazon, there are over 2 million active sellers worldwide on Amazon Marketplace, and they are responsible for over half of the sales made on Amazon's platform (Amazon Investor Relations, 2015[60]). Amazon's fulfilment service, known as "Fulfillment by Amazon", enables these sellers to use Amazon's supply chain for downstream services including storage, packaging, shipping and foreign language customer services. Membership in the Fulfillment by Amazon programme enables third-party sellers to gain access to Amazon's lucrative Prime subscriber base (discussed below).

In 2016, Amazon shipped more than 2 billion items for third-party vendors through Fulfilment by Amazon (Amazon, 2018[61]). In 2017, Amazon reported a 70% year-on-year increase in vendors using Fulfillment by Amazon. Revenues from services provided to third-party sellers, which includes commissions and any related fulfilment and shipping fees, and other third-party seller services, had grown to almost USD 43 billion by 2018, more than triple its value in 2014 (Amazon, 2018[61]).

Other online platforms include services that are specifically aimed at cross-border e-commerce, thereby enabling SMEs to access international markets. This appears to be a notable feature of online platforms that operate multiple, country-specific marketplaces. Thus, Amazon operates over 11 marketplaces in different legal jurisdictions and regions (Amazon, 2018[62]). Amazon customers from over 180 countries are then able to purchase through these marketplaces. Amazon sellers must meet certain listing and registration requirements prior to operating on an international marketplace (Amazon, 2018[62]). Amazon also provides legal and regulatory information specific to each jurisdiction for sellers, and directs international sellers to third-party solutions providers for advertising, customs brokerage and tax assistance.

Another large firm using an online platform is eBay, which operates almost 30 international websites, but offers no formal restrictions on listing in overseas marketplaces aside from the buyer's indication of willingness to ship overseas. For US and UK-based sellers, eBay has developed an export logistics service for international sales, shipping and customs clearance, called the eBay Global Shipping Programme. Sellers send goods purchased on the platform to a domestic intermediary, who then handles the customs, taxes, tracking, insurance and shipping associated with the export process to over 80 countries

(eBay, 2018[63]). This service also enables sellers to avoid any negative feedback (see the sub-section above on reputation mechanisms) or any damage that results from international shipping.

An analysis of the impacts of this programme finds that cross-border trade increased exports at the extensive margin by targeting SMEs, for whom export costs were otherwise prohibitive (Hiu, 2016[64]). The analysis also finds that the programme increased trade in products with smaller price-to-shipping ratios, while foreign consumers benefited from an increase in marketplace quality and product variety.

Other online platforms have pursued similar cross-border strategies for SMEs in other parts of the world. For example, the Chinese online platform Alibaba recently announced plans to open an electronic world trade platform in Malaysia. This online resource aims to provide Malaysian SMEs support with tariffs, customs and logistics associated with international trade. The electronic resources are complemented by a regional distribution centre established by Alibaba's partners, and additional co-operation with respect to payment mechanisms (Alibaba, 2017[65]).

More generally, an analysis by eBay found that among the micro, small and medium-sized enterprises (MSMEs) from 18 advanced and developing economies operating on its platform, about 90% to 100% sold internationally, and were also likely to serve multiple markets (eBay, 2016[66]). Recent analysis by the OECD and the World Trade Organization (WTO) also identified online platforms as useful mechanisms for enabling international trade for SMEs in developing countries (OECD/WTO, 2017[67]).

Subscription e-commerce business models

Another business model that is of increasing interest in e-commerce is the subscription model. This business model is characterised by regular and recurring payments for the repeated provision of a good or a service. In the e-commerce context, this encompasses a range of new and emerging businesses, from streaming services like Netflix to recurring purchases of consumer products like Dollar Shave Club. The subscription business model can relate to recurring purchases of digital goods and services, or a combination of both digital and tangible products (such as a newspaper subscription that includes access to digital content).

Subscription e-commerce business models typify a broader trend towards more continuous, digitally-enabled access to or provision of goods and services. Digital technologies enable easy ordering of goods and services, removing transaction costs associated with the purchasing process, thus improving convenience for consumers. Firms benefit from regular and ongoing revenue streams. The OECD E-Commerce Guidelines recognise the increasing importance of subscription models to e-commerce, and note that firms should disclose to consumers: "terms, conditions, and methods of payment, including … recurring charges, such as automatic repeat purchases and subscription renewals, and ways to opt out from such arrangements" (2016[30]).

Access to digital products by subscription

One aspect of the emerging trend of e-commerce subscription business models is subscription access to digital products. This encompasses the ordering of intangible products that can be delivered online, including software, media and services like cloud computing. These services increasingly form part of larger supply chains for some firms, or are bundled or complementary to other purchases.

Subscription models have become a feature of successful media companies, and provide a means of diversifying revenue streams away from advertising. As digital media is easily reproducible and shared, subscription services are predicated on access to a wide range of media content rather than individual purchases of specific content.

Many emerging subscription services offer access to digital products that are only tradeable as a result of digital transformation, like software services. As noted in economic literature, the pricing of non-rivalrous digital goods with low or zero marginal costs is not always obvious for firms. One solution is bundling many digital products and charging a single price (Bakos and Brynjolfsson, 1999[68]; Bakos and Brynjolfsson, 2000[69]). Some current e-commerce subscription business models, such as Spotify or Netflix, are practical examples of this theoretical insight (Goldfarb and Tucker, 2017[70]).

3.8. Using blockchain for digital rights management

Blockchain enables new kinds of decentralised and radically transparent markets and business models. For example, business models that aim to monetise content creation, like traditional music labels or film studios, have been negatively impacted by easy duplication and sharing of digital products. Some firms have created new digital media business models that earn revenues through subscription access to bundles of digital products, who funnel a share of revenues to content creators.

As the use of assets and transactions can be automatically captured in a detailed and transparent way on a blockchain, it becomes increasingly easy to price and deliver access to information and digital goods with a high degree of precision. This in turn may provide a new business model for the purchase and sale of digital content. For example, the Open Music Initiative (2018[72]) is an example of a start-up that aims to use blockchain technologies to promote and enforce digital rights management to enable compensation for artists.

Some digitalised subscription models pursue a so-called "freemium strategy" whereby usage of or access to content is provided with some limitations, or only when users accept exposure to advertising. Those who pay the relevant subscription fee may enjoy a more extensive level of service, which may include additional content or the absence of advertising. This model can help new and small firms gain market share by enabling the consumer to experience the service without initial up-front costs. As those users who pay for premium services are also likely to use the service more, firms are able to scale up responsively (European Commission, 2015[73]).

An example of the freemium model is used by The New York Times, which aims to convert revenues from subscriptions of printed newspapers into digital subscription services. In this model, there is a a paywall that emerges after a user accesses a certain amount of free content (Kumar et al., 2011[74]). The New York Times' digital subscription revenues exceeded USD 1 billion in 2017 (Ember, 2018[75]).

In 2018, the United States Recording Industry Association estimated that music streaming accounted for 75% of American music industry revenues (RIAA, 2018[76]). At the end of 2018, the music streaming firm Spotify, one of the vanguards of the streaming business model, had 207 monthly active users, of which 116 million were freemium (ad-supported users). Approximately 96 million users had subscribed to a full subscription package (Spotify, 2018[78]). Consistent growth in premium subscriptions enabled Spotify to make a profit at the end of 2018 for the first time in its history. However, the company's business model relies on paying royalties to content holders, which amounted to approximately 70% of its revenues in 2018 (Financial Times, 2018[79]).

Software and information technology applications are other intangible products that are increasingly ordered online as an ongoing service through a subscription business model. Typically, the model includes the licensed provision of software and other information technology applications over the Internet. Ubiquitous computing and the extensive use of cloud hosting underpin this business model (see Box 3.9).

Subscription e-commerce business models for software and information technology applications increasingly replace legacy pricing arrangements, which typically involved a single, perpetual license for a specific version of a product. One example is Adobe, a software provider that converted its full service offering into the cloud-based Adobe Creative Cloud suite (Sanitago, Gnanasambandam and Bhavik, 2018[81]). This enables dynamic service provision with ongoing updating and re-versioning of features and functionality, rather than a two- or three-year production cycle. Ongoing collection of data on customer use and preferences enables more tailoring to specific user needs.

Such business models are also more scalable, and in some cases can be offered at a price point competitive enough to attract new customers. This could include SMEs which may be able to convert the cost of investing in ICTs into an ongoing operating cost. Downward trends in information and communication technology (ICT) investment in OECD countries over time suggest that firms may indeed be using cloud computing to substitute for other kinds of investment (OECD, 2019[56]).

3.9. Cloud computing underpins digital service models

Cloud computing refers to a service model that provides clients with flexible on-demand access to a range of computing resources (OECD, 2014[80]; OECD, 2019[56]). As a set of combined technologies, cloud computing provides individuals and organisations with the ability to access resources, including software applications, storage capacity, networking and computing power) through an online interface. Some well-known variants of the cloud computing service model (OECD, 2018[4]) include:

- Infrastructure-as-a-service (IaaS): IaaS refers to the delivery of infrastructure such as computing capacity. Also known as hardware-as-a-service, IaaS encompasses all of the physical computing resources that support delivery of applications as a service, such as computing services, database storage and networking capabilities. IaaS provides major cost savings to customers, as it provides access to additional computing capacity on demand, without the need for major capital investments in additional hardware.
- Platform-as-a-service (PaaS): PaaS is a method by which an entire computing platform can be utilised remotely over the Internet via cloud computing. PaaS refers to a broad collection of application infrastructure, including operating systems, application platforms and database services. PaaS provides a way for customers to outsource their platform infrastructure needs and therefore avoid the need to purchase and implement a new platform. This service model typically allows cloud computing companies to charge customers only for the share of the resources they use, which is especially useful for a business that requires a specific application it would only use on occasion.
- Software-as-a-service (SaaS): SaaS is a software model that incorporates the delivery and management of a software application to a remote client via the Internet. SaaS relies on the centralised hosting of a software application that is typically accessed via a web browser application. SaaS can be configured to allow public access or private access, where only users with the proper credentials are granted access to a particular hosted software application.

These computing resources can be priced on-demand and used in a flexible, scalable and adaptable manner, enabling users to reduce the costs of fixed investment in ICTs. Cloud computing therefore increases the availability, capacity and ubiquity of computing resources in a way that enables other digital technologies, including AI and autonomous machines like drones (OECD, 2015[6]; OECD, 2017[18]). It also allows users, like SMEs and individuals, to access computing resources that would otherwise be prohibitively expensive.

An interesting extension of this trend is the growing competitive marketplace of PaaS models for businesses wishing to sell online – namely, a form of e-commerce that has emerged from the growth of e-commerce itself. Shopify, BigCommerce, Lemonstand and Magento are all PaaS solutions for businesses that wish to build online stores. While they range in features, these packages typically offer website hosting, thematic design options, payment gateway services, analytics, as well as inventory and fulfilment integration, and they tend to integrate with multiple online sales channels, including social media. Shopify, one of the earliest and best-known e-commerce PaaS vendors, hosts more than 600 000 active online stores and has facilitated USD 55 billion of gross merchandise volume (Shopify, 2018[82]). In 2015, Amazon closed its own native PaaS offering (Amazon Webstore) and directed its merchants to Shopify, which remains the case today.

Subscription access to tangible and bundled goods and services

A recent e-commerce trend has been the growth of subscription business models for tangible goods, including in categories like beauty supplies (Birchbox), minerals (Celestial Minerals), groceries (Blue Apron, Hello Fresh), snack foods (Nature Box), cosmetics and self-care products (Dollar Shave Club, Harry's), and many more.

This sector of e-commerce has grown in value over the last five years, and the largest of these retailers generated more than USD 2.6 billion in sales in 2016 (Chen et al., 2017[83]). While this space is volatile, new entrants have drawn significant interest from venture capitalists in recent years and there have been some notable success stories. For example, Dollar Shave Club, a subscription service for shaving materials founded in 2011, gained 5% of the US market share in razor cartridges within five years when it was acquired by Unilever for USD 1 billion (Cao and Mittelman, 2016[84]).

3.10. Connected devices can facilitate recurring purchases of goods that require replenishment

Many of the subscription business models for tangible goods and services relate to goods and services that deplete with use and require replenishment (Chen et al., 2017[83]). An interesting development in this space has been the use of connected devices that utilise streams of data through sensors, software and network connections associated with physical goods to make continuous or recurring purchases of tangible goods. For example, over the last five years, smart home speakers have emerged as a popular consumer good. These smart home speakers use a combination of AI and cloud computing to respond to natural language requests.

Many of the leading retailers of these devices are associated with popular online e-commerce brands, including Amazon, Google, JD.com and Alibaba. These devices are able to make digital and physical purchases in response to voice commands (Amazon, 2018[85]; Bateman, 2016[86]; Cadell, 2017[87]). Recent reports have noted that users of these devices appear to have increased their purchases of standardised products that require replenishment, including paper towels and diapers (Kim, 2017[88]; Pandolph, 2017[89]). Some firms that sell smart home speakers have encouraged this trend by offering voice-exclusive deals for specific products (Warren, 2017[90]).

An extension of this trend is the use of connected devices that automatically order goods that require replenishment. In some cases, "smart" appliances can automatically detect when they run low on essential supplies and automatically purchase additional supplies. For example, the Amazon Dash programme (Amazon, 2016[91]) enables the automatic replenishment of supplies for connected devices like dishwashers, washing machines, printers and water filters.

Other forms of e-commerce subscription services rely on a mix of bundled digital services and tangible goods and services. This has been a common form of diversification for conventional media companies – for instance, in return for a fee, many newspapers offer regular delivery of physical newspapers alongside open digital access to their website. Notable media companies who pursue this model include The Economist (The Economist, 2019[92]), Le Monde (Le Monde, 2019[93]) and the Financial Times (Financial Times, 2019[94]).

An example of this model is Amazon's subscription service know as Amazon Prime, which enables access to a range of tangible services (free shipping, food delivery) alongside access to digital services (free streaming of video and music content). Amazon Prime offers fast delivery (usually under two days) for all purchases on eligible products without additional cost. Amazon Prime subscribers in some major cities are able to receive shipping within two hours without additional cost. Depending on the country, Amazon Prime membership also offers access to additional services including free streaming of video and music content, free access to popular e-book titles, restaurant delivery and data storage. There were over 100 million paid Prime members across the world in 2017 (Amazon, 2018[95]), who had access to unlimited free shipping on over 100 million items (Amazon, 2018[95]). Amazon gains an increasing amount of revenue from retail subscription services, which have more than quintupled in revenue since 2014 to almost USD 14.2 billion in 2018 (Amazon, 2018[61]). Retail subscription services captures not only revenues from Amazon Prime but also other Amazon subscription services.

3.11. The last mile: Using technologies to make the delivery of tangible products more efficient

As more transactions go online, fast and efficient delivery of tangible products becomes more important. Many of the biggest e-commerce providers have succeeded in improving their delivery time by optimising the logistics and supply chain fulfilment process. However, consumer demand for free and fast shipping services and the high rate of returns for some items have resulted in significant costs. Amazon, for example, posted net shipping expenses of USD 27.7 billion in 2018 alone and has driven further innovations in the delivery process (Amazon, 2018[61]).

In particular, firms have attempted to innovate in the provision of delivery services for the final leg of delivery to the requested location, or the so-called "last mile". The costs of the final last mile of delivery can comprise up to half of the product's total transportation costs and is subject to considerable expenses in terms of fuel, vehicle, labour and time costs (McKinsey, 2016[97]).

Some e-commerce firms have experimented with the use of autonomous delivery devices, including the use of unmanned aerial vehicles (commonly known as drones) or autonomous ground vehicles and robots. Autonomous devices are connected devices that make use of developments in cloud computing, machine learning and data to make sense of constant streams of data from a wide variety of sensors.

In the People's Republic of China (hereafter "China"), JD.com won a national pilot for the use of its smart drone technology, which has been in development since 2015 (Meredith and Kharpal, 2017[98]). Seven types of drones are in use across four Chinese provinces to deliver packages weighing from 5 to 30 kilogrammes, with plans to test the delivery of packages up to 1 000 kilogrammes. The drones are battery powered, can fly up to 100 kilometres per hour, and could reduce shipping costs by up to 70%. JD.com has plans to open more than 200 drone airports in mostly rural areas across China (JD.com, 2017[99]), potentially driving access to a larger scope of goods and services through e-commerce. In collaboration with the Japanese e-commerce platform Rakuten, JD.com will deploy this technology for local deliveries in Japan in 2019 (Lim, 2019[100]). However, many countries and regions still ban the commercial use of drones in urban areas (ITF/OECD, 2018[101]).

Another interesting development is the use of autonomous ground vehicles and robots for last mile deliveries. Some forms of lightweight autonomous robots are being tested to make deliveries in the city of Washington, District of Columbia (D.C.). These pilot robots are approximately 70 centimetres tall, weigh approximately 23 kilogrammes and can carry approximately 10 kilogrammes of products, but are restricted to speeds of just 6.5 kilometres per hour. The robots use cameras, computer vision and artificial intelligence to navigate sidewalks and urban environments, albeit currently with human supervision (Lonsdorf, 2017[102]), and just five such robots made over 7 000 deliveries over a period of 18 months. Most transport and zoning regulations do not have provisions that enable the use or testing of such devices. Recently, a pilot program was extended to enable further testing of so-called "personal delivery devices" in Washington, D.C. (Washington DC District Department of Transport, 2018[103]).

Online-offline e-commerce business models

Consumers increasingly leverage online tools throughout the lifecycle of the commercial process, including for research, price comparison, delivery and customer service (Verhoef, Neslin and Vroomen, 2007[104]). This includes the ordering process, which is at the core of an e-commerce transaction (see Chapter 1). Digital technologies, including mobile applications, self checkouts, electronic kiosks and smart shelf technology, have become increasingly embedded in each stage of the retail process. To a large extent, the ubiquity of these tools is driven by the rise of mobile commerce and the spread of high-speed broadband in many parts of the world.

Many firms have taken advantage of the ubiquity of digital technologies to develop business models based on a combination of both online and offline features. These business models serve as extensions of e-commerce, pushing the frontier of online purchases into physical stores (see Box 3.12). Some business models combine online ordering with offline distribution, which may be useful to enable the online purchase of products whose quality may not be assessed from a distance, such as perishable

goods like groceries. Other online firms are moving offline by adding brick-and-mortar elements to enable the online sale of other goods, like clothing, where fit may be difficult to assess from a distance. Finally, some business models combine offline and online mechanisms by bringing online ordering very close to the point of purchase, including within brick-and-mortar stores.

3.12. Mobile technologies are helping e-commerce to flourish in brick-and-mortar stores

Mobile technologies enable consumers to conduct a range of digital activities, including online shopping. Consumers use digital technologies throughout the commercial process, but smartphones enable shoppers to research, compare prices, and ultimately make transactions from any networked location. A Google survey found that 82% of surveyed consumers research products on their smartphones before making purchases in brick-and-mortar stores (Google, 2016[105]). The actual act of purchasing through a smart, connected device is referred to as "m-commerce," whereby consumers complete a commercial transaction using a mobile device (OECD, 2013[106]).

OECD work highlights m-commerce is an emerging trend (OECD, 2013[106]) with ramifications for consumer protection (OECD, 2018[107]). The ubiquity of smartphones is the foundation for many of the online aspects that can be increasingly found in offline commerce. Smartphone features also enable other innovations in the retail space, including location-based offers (Grewal et al., 2016[108]). Similarly, the ability to purchase goods and services by mobile application is central to some of the business model innovations outlined in more detail below.

Online-offline distribution mechanisms

As e-commerce has become more prevalent, many conventional firms and retailers have experimented with the inclusion of online distribution channels alongside their existing brick-and-mortar operations. However, leveraging the Internet, or other electronic networks, to integrate e-commerce into an existing firm-level business model often requires a range of complementary investments and capacities. This can include, but is not limited to, supply chain and fulfilment arrangements and consolidated inventory systems.

The most common form of e-commerce consists of simple direct shipping to the customer's home after they have purchased online from a distance and without the physical inspection of the product. However, this carries delivery costs arising from dispersed fulfilment and delivery chains, or dependence on third-party logistics services (see Box 3.11). Thus, many firms are experimenting with mechanisms for fulfilment through existing physical infrastructure or retail locations.

For example, many firms have developed "click-and-collect" mechanisms to enable consumers to order and purchase online, while collecting the relevant items in a local brick-and-mortar store or another location such as a locker. This allows consumers to immediately purchase the good or service online, but to save on shipping costs, delays and inconveniences associated with delivery. Notably, this mechanism enables firms to retain their current centralised inventory system and reduces operational costs associated with physical brick-and-mortar stores, while also acquiring useful data about the user.

To the extent that click-and-collect mechanisms are located in a brick-and-mortar store, this mechanism may also allow consumers to check the quality and assess the colour, style and size of the product within the store itself. In addition, consumers are able to make returns in store, which may increase their propensity to purchase online. A survey by the United Parcel Service (UPS) finds that consumers were more willing to purchase online if they could return in a brick-and-mortar store (United Postal Service, 2018[109]).

Other interesting developments in this space include curbside fulfilment, whereby consumers can order groceries online and then drive to their local brick-and-mortar store for immediate fulfilment (Howland, 2016[110]). This model enables retailers to minimise expensive investments in home-delivery supply and logistics systems, and has been adopted by major retailers like Walmart, Amazon, Target and Nordstrom.

Online groceries – A new e-commerce frontier

In its most conventional form, e-commerce consists of committing to buy a product online, usually using a device that is not close to the product purchased. However, many products are perishable, or they may have quality characteristics that are difficult to assess online, through pictures or at a

distance. For example, private surveys have found consistently high estimates (69% to 84%) of surveyed US consumers prefer to purchase fruits and vegetables in brick-and-mortar stores in order to physically assess the quality and suitability of the product, which may be because fresh products are of variable quality and individuals have subjective tastes (Griswold, 2017[111]; Nielsen, 2017[112]). Perhaps as a result, this category of online shopping has seen comparatively little growth so far (see Chapter 2).[1]

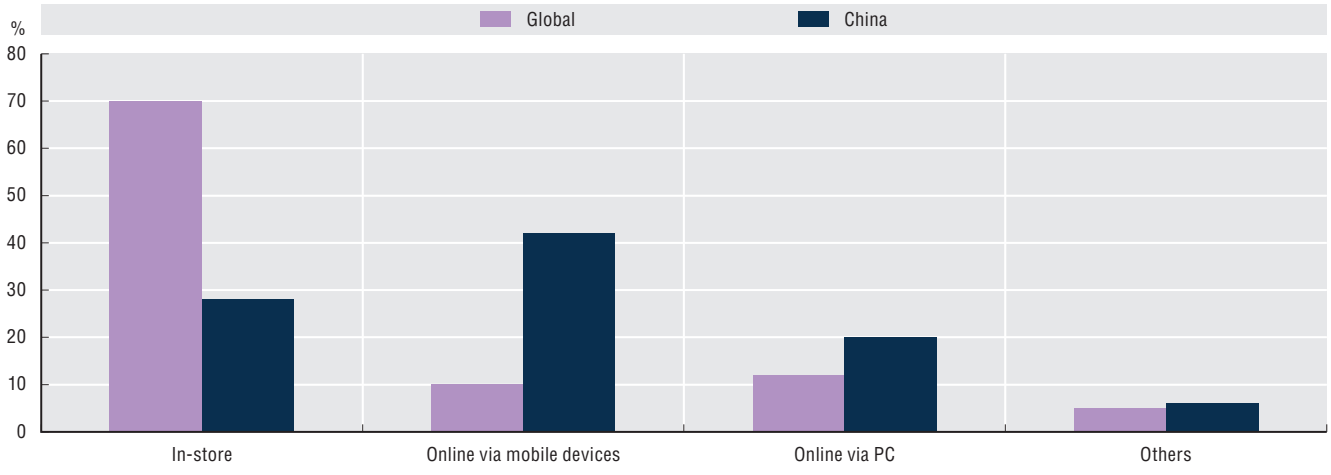
Developing an effective method of selling groceries online could be an opportunity for firms, as groceries, including food and non-alcoholic beverages, accounted for 14% of household expenditure on average across 34 OECD countries in 2017 (OECD, 2019[113]). Some private sources find that consumers take 1-2 trips to the supermarket each week, representing significant friction and inconvenience that could be mitigated through e-commerce (Food Market Institute, 2017[115]).

Many firms have attempted to develop processes to successfully sell perishable food and groceries online. Some online business models offer direct shipping of purchased groceries alongside guarantees related to quality and customer satisfaction to give consumers confidence in the purchase of perishable goods and services. However, this model typically necessitates the development of a cold-chain direct fulfilment and logistics system, which is expensive. Instacart, an emerging start-up in this space, enlists contract workers to physically select the relevant groceries ordered by the consumer and drop them off at their desired location. Instacart provides detailed instructions to its contractors about how to select produce in order to meet minimum quality standards (Griswold, 2017[111]).

Some firms include online and offline components in order to successfully sell groceries online. For example, Alibaba, a Chinese e-commerce online platform, has refined its business model to facilitate the sale of perishable goods and services by opening brick-and-mortar stores. Over 25 Hema supermarkets have been opened across China for the sale of perishable goods including live seafood, fruits and vegetables. The supermarkets also act as fulfilment centres for purchases made online through the Hema application. Customers within a 3 kilometre radius can order products online and have their orders hand-selected by store workers and then delivered to their home within 30 minutes using smart logistics technology (Xiaohan, 2017[116]).

Data and insights from its online business enable Alibaba to optimise the brick-and-mortar experience inside Hema stores, resulting in 300% to 500% more sales per unit area than other supermarkets (Najberg, 2017[117]). Customers who use the application make purchases up to 35% of the time they use the application (conversion rate), while online orders account for more than 50% of all sales from Hema. Notably, the rival Chinese e-commerce firm JD.com is following suit by opening new digitally infused brick-and-mortar experiences and also has plans to develop fully automated convenience stores (see below) (Bloomberg, 2018[118]). A global survey found that Chinese customers may be more willing than other consumers to buy groceries online (Figure 3.1).

3.1. Consumer preferences for buying groceries, 2017



Note: See Chapter notes.[2]

Source: PricewaterhouseCoopers (2017[119]) *Total Retail Report 2017, https://www.pwccn.com/en/retail-and-consumer/publications/total-retail-2017-china/total-retail-survey-2017-china-cut.pdf*.

StatLink https://doi.org/10.1787/888933923165

In Alibaba's Hema supermarkets, a companion mobile application is available to enable shoppers to determine the origin and provenance of perishable fruits and vegetables. Another new technology trialled for product safety and quality includes the use of distributed ledger technologies to track product provenance (see Box 3.13).

3.13. Distributed ledger technologies help trace product provenance

Existing applications of distributed ledger technology in e-commerce largely relate to tracking the origin and provenance of goods and services to ensure product safety and quality. For example, IBM has collaborated with a range of retailers including Walmart and Costco (Aitken, 2017[120]) to develop a permissioned distributed ledger database that tracks products from supplier to retailer, including information on production, inspection, farm of origin, factory and processing, expiry date, storage temperatures and shipping (Unuvar, 2017[121]).

This is of particular use in systems with multiple intermediaries, including producers, wholesalers, retailers, couriers and regulators, each of which have incomplete information about the upstream and downstream production process. Distributed ledger technologies transform a previously cumbersome and manual process into a system that can provide specific information about product provenance in less than 3 seconds (Unuvar, 2017[121]). A system like this could also be used to ensure that illegal products are not traded, or to ensure that foods labelled "organic" have indeed passed the requirements to be labelled as such.

Going offline to ensure the right fit

Some consumer goods, like clothing, can vary in their suitability based on their fit to the consumer. Thus, while clothing is one of the most popular products bought and sold online (see Chapter 2), the sector has struggled with significant returns. As noted in Chapter 2, approximately 5% of given online transactions were refunds, of which 57% are related to the fashion industry. Consumers may often buy multiple items of a similar size, shape or colour, with the intention of trying them on and returning those that do not fit (Orendorff, 2019[122]).

As a consequence, an interesting emerging e-commerce business model for online fashion businesses is the inclusion of offline features to enable the sale of fit-critical goods and services online. An offline distribution channel re-introduces frictions to the business model and may increase costs, but also increases the extensive margin of e-commerce by enabling new types of products to be sold online. In particular, firms that sell heterogeneous or bespoke products like clothing may benefit from this kind of business model.

For example, several online apparel retailers have opened brick-and-mortar stores that allow consumers to try on products before ordering them online. Bonobos, an American online retailer, has opened over 30 "guideshops" to enable consumers to try the product for fit and quality (Waldron, 2019[123]). Consumers then place their order online, a process that increases conversion, minimises returns and increases the average purchase value. A similar model is pursued by bespoke tailor Indochino, whose service involves an in-person suit fitting service with a second follow-up and in-person alteration. A physical component of the traditional e-commerce experience has been added by online brands including Amazon Books, Birchbox, Bonobos, Daniel Wellington, Harry's and Warby Parker.

A unique feature of the offline stores provided by these online retailers is that they are purely showrooms – that is, spaces that are purely for fitting purposes, and the clothes or goods on display at the shop cannot actually be purchased on the spot. The inventories themselves are typically highly curated with a limited selection of inventory to try on. Data from the online business regarding consumer choices and preferences facilitate this selection. This enables the online retailer to avoid complicated "balance on hand" questions about store-level inventory that typically require an extensive separate inventory and logistics chain. This also erodes the so-called institutional capability of traditional retailers to choose the optimal product mix throughout the supply chain, a previous source of comparative advantage (Hodson, Perrigo and Hardman, 2017[124]).

As the actual ordering and purchase of goods and services is typically conducted online (via application), the brand can retain a centralised inventory and distribution chain, and avoid the need for an additional payment system. Moreover, the process increases the conversion of online sales while reducing the additional costs associated with returns of unwanted products. The spaces are often smaller than other brick-and-mortar retailers, and often leased on demand. This approach also increases the productivity of the space itself – as much as five times the revenue per square foot in comparison to legacy retailers – while reducing overall overhead costs (Taggart and Granville, 2017[125]).

These initiatives are also notable as they have been adopted by vertically-integrated brands, whose low price point and value offering is predicated on the ability to cut overall production costs through the curation of the entire product production lifecycle from design to sales. While the offline features re-introduce frictions into the purchasing process for consumers, the seller is able to leverage insights from their core online service offering to maximise the utility of the offline space while minimising the expensive and inefficient burdens associated with traditional retail, like inventory management and point-of-service purchasing. Tellingly, some surveys show that consumers already use brick-and-mortar stores as showrooms in order to browse and understand product characteristics before purchasing online (Freeman, 2014[126]; Khan, 2018[127]).

Online ordering in brick-and-mortar stores

Other firms are increasingly experimenting with the inclusion of online ordering mechanisms within or very near brick-and-mortar stores themselves in order to boost sales, enable customisation and increase efficiency. This appears to be a salient trend for businesses that rely on convenience or service on demand.

Ordering, purchase and payment by application or kiosk for almost immediate pick-up has been adopted by many restaurants. For example, the American fast food chain McDonald's has installed digital self-order kiosks in all 14 000 of its US stores (Hafner and Limbachia, 2018[128]). These kiosks rely on touch-screen technology to relay information via wireless networks from customer orders to the kitchen, where the meals are made on demand. For some restaurants, the use of these kiosks has increased revenues (Hafner and Limbachia, 2018[128]; Garber, 2014[129]). Users tend to spend more time considering their options when using an automated kiosk, which can result in selecting more items for purchase (Houser, 2018[130]). Similarly, increased revenues may result because users are more likely to customise their orders, which typically carries an additional fee. Academic work also finds that online ordering resulted in 14% more customisation requests than orders made in person (Goldfarb et al., 2015[131]).

Other firms have experimented with the use of ordering by mobile application prior to almost immediate pick-up from the store. McDonald's, for example, has plans to further enable ordering and payment by mobile application, while Starbucks allows consumers to "skip the queue" by purchasing via application and picking up in store. Some reports suggest that orders made through mobile application can be up to 20% higher than other orders (Wong, 2015[132]).

An emerging and innovative example of embedding online ordering mechanisms within brick-and-mortar stores is the partially automated grocery store pioneered by Amazon (Amazon, 2018[133]). A mobile application facilitates entry into the store, after which point consumers can simply select the products they wish to buy, and then immediately leave the store without a formal checkout process. The aim of their business model is to increase the efficiency of the shopping experience by partially automating the payment process.

The partially automated grocery store, known as Amazon Go, uses geo-fencing technology, embedded sensors, computer vision, infrared detection and deep learning to automatically detect when consumers take products from shelves. Purchase and payment is undertaken automatically through the digital wallet associated with the customer's Amazon account (see section on innovative payment mechanisms below). The process is more efficient and convenient than other grocery stores (McFarland, 2018[134]), and removes frictions from the typical brick-and-mortar grocery experience by partially automating the payment process. Notably, the goods and services for sale are mostly pre-packaged (e.g. sandwiches), with few items with significant variation in quality like fresh produce. Alibaba and major online firm Tencent have also developed unmanned convenience stores that use quick response (QR) codes for entry and purchase (Soo, 2017[135]; Zhang, 2018[136]), while other automated stores in Korea have experimented with palm vein scanning for custom verification (Chang-won, 2018[137]).

On the intensive margin, the Internet of Things and connected devices have been used as mechanisms for digital marketing to boost sales within physical stores. Digital advertising via mobile phones can be used to provide shoppers with discounts based on proximity, providing personalised offers (Grewal et al., 2016[108]). For example, Coca Cola has developed new forms of digitally-interactive marketing that uses browsing history, IP address, approximate age and gender to develop custom advertising and discounts to consumers inside some American supermarkets (Darrow, 2017[138]).

Innovative payment mechanisms

Safely and remotely exchanging money online, including across borders, is fundamental to e-commerce. Safe and effective online payment mechanisms facilitate trusted online transactions, boosting the growth of e-commerce between unknown actors. Many online payment mechanisms are closely associated with the rise of e-commerce. In fact, one of the earliest online payment models – Paypal – emerged in conjunction with the pioneering online auction house and e-commerce platform eBay, to enable safe online payments between peers.

Online payment service innovations are forms of "Fintech", a broad term that encompasses the application of digital technologies and processes to financial services. Recent OECD work considers other Fintech applications at more length (OECD, 2018[139]). For consumers, safe online payment mechanisms increase convenience and trust online. Conversely, payment security concerns are among the most cited reasons for not transacting online (see Chapter 2), and these concerns remain prevalent across many countries. In the EU28, the share of people reporting not having bought online due to payment security or privacy concerns declined by almost 10 percentage points from 2017 to 2009 (OECD, 2019[52]).

For firms that sell online, enabling consumers to purchase more efficiently can help to convert and actualise payments. Some payment mechanisms may also help consumers access new markets. E-commerce firms tend to offer a mix of payment options, including through local or established payment mechanisms, to provide maximum convenience for their customers. For example, an e-commerce firm may choose to offer credit and debit card payments through a secure payment gateway on their website as well as other options, such as Paypal or other online payment mechanisms. There are also established mechanisms for enabling payments using local currencies through the establishment of local banking relationships.

Looking to the future, this section focuses on three innovative forms of holding and conducting payments that could facilitate e-commerce going forward: Digital wallets, mobile money and cryptocurrencies. These mechanisms are not necessarily discrete – indeed, mobile money and cryptocurrencies are both stored in forms of digital wallets – but together, they have the potential to drive future developments in the e-commerce landscape. Just as initial innovations in online payments facilitated the early online commercial transactions, new payment mechanisms could boost e-commerce along both the intensive and the extensive margin and drive changes to existing e-commerce business models.

Digital wallets can foster e-commerce

An online payment can be broadly considered to be a "purchase order placed using devices connected to the Internet", a definition that is relevant to many forms of e-commerce (OECD, 2018[139]). One mechanism of enabling online payments includes the use of digital wallets, also known as "e-wallets" or "electronic wallets". These wallets act as intermediating application layers that hold financial information about the relevant funding source on both sides of the transaction (e.g. credit card details) (Cheok, Huiskamp and Malinowski, 2014[140]). Essentially, digital wallets tokenise financial information such that the information does not have to be directly shared with an unknown party. Many digital wallets can hold, send and receive funds.

Digital wallets enable e-commerce by facilitating trusted transactions online, without which most e-commerce purchases would not be possible. Consumers may be more willing to undertake a transaction online using a digital wallet as opposed to directly sharing financial information with online retailers. For e-commerce firms, therefore, enabling payments through a digital wallet service can help sellers reach more potential customers.

Digital wallets vary in their service offerings and features. Some wallets directly process payments, transferring money between buyers and sellers (e.g. Paypal); others simply transfer financial details

between the payment processors of either party (e.g. Google Wallet). Digital wallets can hold a variety of currencies, including cryptocurrencies (see below).

Some digital wallets include specific features, such as deferred payment options or limited credit programmes and fraud prevention schemes. Often these specific features are closely associated with a particular business model or platform. For example, Alipay, the digital wallet associated with Alibaba, is used for payments on Alibaba's e-commerce platform, known as Taobao. Payments made through Alipay can also be held in escrow until the buyer confirms the satisfactory receipt of an order, a function also performed by other services like Paypal. Similarly, sellers on Alibaba are only required to ship the product after the payment details of the transaction have been confirmed through Alipay.

Digital wallets can be used from any connected device, including mobile phones and other smart devices, like smart watches. Mobile wallets are a sub-type of digital wallets, with mobile-specific features and services (a discussion of mobile money follows below). Some are simply existing digital wallets that have added mobile functionality through a mobile application, such as Paypal Mobile. Others are specific to the particular hardware or software of a particular mobile device, such as Google Pay, Apple Pay or Samsung Pay.

Mobile wallets can be used to make purchases online, but they are also increasingly used at point-of-sale transactions in brick-and-mortar stores using connected devices. Depending on the nature of the transaction – specifically, the nature of the ordering process – purchases using a mobile wallet may constitute e-commerce transactions (see Chapter 1). More generally, the rise of mobile wallets for payment epitomises the increasing digital transformation of all aspects of the commercial process, including payments. This is true in many areas of the world, including China (see Box 3.14).

3.14. Digital wallets: Digitalising payments in the real world

China is the world's most developed market for mobile payments through digital wallets, driven by the ubiquity and functionality of two digital wallet systems, each associated with major e-commerce platforms. Alipay is a digital wallet system developed by Alibaba, the Chinese e-commerce platform, and WeChat Pay is a digital wallet system developed by Tencent, another Chinese e-commerce platform. Purchases made on Tencent (e.g. bike sharing services) or an Alibaba platform (e.g. Taobao) are often mediated through each respective digital wallet.

Both digital wallets are notable for the scope of their functionalities beyond the simple mediation of the purchase and sale of consumer goods. For example, Alipay can be used to pay credit card bills, buy mobile top-up credit, transfer money and pay for food delivery. Alipay is also increasingly integrated with a range of Chinese public services, meaning that Alipay can be used to pay for expenses including utility bills, transportation fines and school fees. These features may help push out the extensive margin of e-commerce into transactions that were previously analogue.

But both the Alipay and WeChat Pay digital wallets are also notable for the way in which their digital wallets are increasingly used for purchases in the "real world", namely through their functionalities in brick-and-mortar stores. Both systems work in similar ways. They are typically used through a smartphone and a mobile application that is linked to an existing bank account. Transfers of money from the linked bank account can be made by using the mobile application to scan the QR code of the vendor. The success of this system has reportedly driven the wide uptake of QR codes to street food vendors, cafés, convenience stores, restaurant and retail chains

In contrast to other places with a high share of unbanked people, 85% of those who make online purchases in China also pay for them through an online payment mechanism (World Bank, 2017[141]), suggesting a degree of trust in online payment mechanisms in China. The Chinese market for mobile payments has grown to approximately USD 16 trillion (Jacobs, 2018[142]) and together Alipay and WeChat Pay are used for approximately 93% of mobile payments (Taylor, 2019[143]). Alipay has over 500 million monthly active users, while WeChat Pay boasts over 900 million monthly active users (Jacobs, 2018[142]) though anecdotal reports suggest that Chinese mobile payment users utilise both (The Economist, 2018[144]). A recent study found that 92% of people in a sample of Chinese cities used either of the two mobile wallets as their primary payment method, rather than cash.

Mobile money can help extend e-commerce to the unbanked

Another form of payment innovation that enables e-commerce is the rise of a specific form of mobile payment, also known as "mobile money", particularly for unbanked people (i.e. those without access to financial services). Mobile money differs from digital wallets insofar that the mechanism for payment is conducted via mobile communication networks, and does not necessarily require an existing relationship with a financial services provider.

Mobile money is mediated by mobile network operators who use a system of agents to accept regular (fiat) currency in the form of cash and store an equivalent value in a digital wallet, which can then be transferred to other users or withdrawn later. Mobile money is typically associated with a mobile phone number and often uses two-factor authentication through a personal identification number issued at the point of registration. Mobile money can typically be transferred to others who are also registered with the same mobile money system, exchanged with merchants for goods and services, or can be withdrawn as cash from a mobile money agent. Mobile money can therefore act as a means of storing and transferring value in a secure and convenient way for unbanked people.

Mobile money is growing in importance, particularly in places with less developed financial markets. In December 2017, there were over 690 million registered mobile money accounts (GSMA, 2017[145]). There are over 270 mobile money systems across 90 countries in the world, and 19 countries have more mobile money accounts than formal bank accounts (GSMA, 2017[145]). There are 30 mobile money systems with more than one million active mobile money customers and overall revenues of the mobile money industry rose to USD 2.4 billion in 2017 (GSMA, 2017[145]).

3.15. M-Pesa: Enabling e-commerce for the unbanked

The deployment of the mobile money service M-Pesa, used ubiquitously in Kenya, is the canonical examples of the successful take up of mobile money. M-Pesa is also one of the few mobile money systems used for e-commerce, indicating how mobile money can enable e-commerce in developing economies.

M-Pesa developed as a means of enabling microfinance payments and easier remittances through basic mobile phones with 2G cellular capability. M-Pesa has come to be used in a variety of online and offline transactions, including for point-of-sale payments. The mobile application features an additional extension known as Lipa na Mpesa, which enables mobile money payments to other users, including to enterprise bank accounts.

In addition, a competitive marketplace of payment services has emerged that enable mobile money to be used for online payments. For example, Safaricom (the mobile network operator that operates M-Pesa) and Paypal recently collaborated in order to enable the transfer of funds from Paypal accounts to M-Pesa wallets (Safaricom, 2018[146]). Safaricom has also launched an e-commerce platform that enables payments via M-Pesa (Masoko, 2018[147]).

In 2017, M-Pesa served nearly 30 million customers through 287 400 agents across 10 countries (Vodafone, 2017[148]). In Kenya, M-Pesa is the dominant form of mobile money, and it is used in 81% of transactions, while 65% of all mobile money transfer transactions related to mobile commerce payments (Communications Authority of Kenya, 2018[149]). M-Pesa can be used to purchase a variety of goods and services online, including a flight on Kenya Airways (Kenya Airways, 2018[150]). M-Pesa has also had transformative impacts on Kenya's overall economic development, driving increased long-term consumption and a reduction of the households in extreme poverty, particularly for women (Suri and Jack, 2016[151]).

Mobile money is relatively underutilised in e-commerce today, even though e-commerce is increasingly prevalent in areas where mobile money accounts are prevalent (see Chapter 2). The greatest share of transactions undertaken through mobile money was for direct person-to-person transfers, meaning that firms generally do not transact online using mobile money (GSMA, 2017[145]). Just over half of all e-commerce transactions in developing countries are paid for using cash on delivery according to a recent World Bank study, with the exception of China (World Bank, 2017[141]). This may be because

consumers in developing countries prefer to inspect the product before payment. Hortacsu et al. (2009[152]) finds that same-city sales on eBay and a Brazilian e-commerce platform known as Mercado Libre are disproportionately high because users prefer to make purchases of products that can be observed and delivered in person.

However, mobile money has the potential to facilitate e-commerce transactions and online purchases for the otherwise unbanked. To do so, better integration and collaboration will need to take place between actors in this space, including mobile network operators, banks and e-commerce firms, to ensure that mobile money can be used for other use cases (Osafo-Kwaako et al., 2018[153]). In particular, reliable integration between mobile money systems and online interfaces for e-commerce firms, for example through application programme interfaces, may better enable the uptake of mobile money as a payment mechanism for online shopping (Camner, 2016[154]).

Similarly, enabling interoperability and transactions between mobile money systems could facilitate peer-to-peer e-commerce. Efforts are underway to ensure that users of different mobile money services can transact directly with each other in Kenya (Central Bank of Kenya, 2018[155]), Bolivia (Novais and Sanin, 2018[156]), and Ghana (Ghana Web, 2018[157]), among other places.

Blockchain-enabled payment mechanisms may boost e-commerce

Another emerging payment mechanism involves the use of distributed ledger technologies as a payment mechanism, also known as cryptocurrencies. Cryptocurrencies like bitcoin operate through a distributed database independent of central banks or financial institutions and provide a means of making anonymous, validated transfers of value. However, more potential for e-commerce may lie in other extensions of blockchain-enabled payments, including the potential use of "smart contracts", namely self-executing and deterministic software protocols that only transfer value after particular conditions are met.

Cryptocurrencies can be used as fiat currency, and can be managed through digital wallets (see above) or on a connected device. All transactions are permanently recorded on a distributed ledger, thereby preventing fraud by ensuring the same currency cannot be spent twice. In general, cryptocurrencies are generated by "mining" through the use of computing power to solve increasingly difficult algorithms. Cryptocurrencies can therefore act as an algorithmically trustworthy but anonymous mechanism of transferring value online. Notably, they have been used to facilitate the online purchase of contraband or counterfeit goods and services on marketplaces like the Silk Road and TOR (OECD, 2017[18]).

The use of cryptocurrencies in more legitimate e-commerce transactions has been mixed. Notably, payment gateway service Stripe and online gaming store Steam both recently stopped supporting cryptocurrency payments, citing high transaction costs (Russell, 2018[158]). More recently, there has been an increasing uptake of payment services that convert cryptocurrencies to fiat currencies through more traditional e-commerce sites. For example, Coinbase recently announced a partnership with Shopify, an e-commerce hosting site with over 500 000 merchants worldwide (Shopify, 2018[159]), which enables these merchants to accept payments in over 300 cryptocurrencies. Coinbase argues that there are reduced processing fees and fewer risks of charge-backs for merchants who accept cryptocurrencies as payment, while shoppers enjoy more simplicity, anonymity and low transaction fees.

However, extensions of blockchain technology other than cryptocurrencies may hold more promise for enabling e-commerce. In particular, so-called smart contracts may be of use in some contexts. Smart contracts are often used to implement escrow systems, which could be useful to facilitate trusted e-commerce transactions between unknown parties. For example, escrow contracts on OpenBazaar (see Box 3.7) ensure that an e-commerce seller is only paid once the buyer confirms that they have satisfactorily received the product (OECD, 2017[18]).

On the extensive margin, smart contracts could also help to enable the safe online ordering of many different kinds of products currently outside the remit of e-commerce. For example, a blockchain-enabled smart contract could be used to execute a rental agreement, where the conditions of payment are predicated on the property owner and renter agreeing to certain rules or conditions like the rental amount or the date of the transfer of keys. To date, transactions of this nature have been carried out in person, but blockchain-enabled smart contracts could make such transactions a form of e-commerce.

Smart contracts could also hold particular promise for e-commerce when combined with connected devices. For example, a blockchain-enabled, connected washing machine could initiate an e-commerce transaction through a smart contract when it detects that it is out of detergent (OECD, 2017[18]), as an extension of the e-commerce subscription business model outlined earlier (see Box 3.10). Nevertheless, connected devices could also potentially transact with each other in an autonomous fashion using smart contracts, thereby facilitating a completely new kind of e-commerce. A bitcoin-based start-up called 21 has outlined a model whereby environmental sensors could passively collect data and sell it to other machines or institutions for micropayments of cryptocurrencies, like bitcoin (Pate, Kun and Srinivasan, 2016[160]). Blockchain technology could therefore enable e-commerce transactions between connected devices, rather than simply between individuals and firms. Such an innovation could drive new e-commerce business models.

Key areas for policy action

As digital transformation progresses, new business models will arise in ways that are difficult to predict. Business model innovations that make use of data and digital technologies often challenge traditional policy frameworks, particularly for firms that use new business models to innovate across and between sectors, new payment mechanisms, or technologies in a new and innovative way.

Remove regulatory barriers that preserve artificial distinctions between online and offline commerce

Technological changes have blurred the boundaries between online and offline activities, as well as between goods and services. This has an impact on policy settings that often rely on an increasingly artificial distinction between traditional commerce and e-commerce. Because firms are increasingly combining the most promising aspects of both worlds, the level of ambiguity will rise.

For example, the increasing use of a mix of online and offline distribution models means that brick-and-mortar stores increasingly perform functions beyond the simple point-of-service purchase of products. Instead, physical stores often act as an extension of the online experience facilitated by e-commerce, and vice versa. Innovative business models may use brick-and-mortar stores as a point of collection or return of products bought online, or as a temporary storage facility before delivery. Existing licensing, permitting or zoning rules – particularly at the local level – may not allow such functions, and in doing so constrain the development of promising e-commerce business models (e.g. omni-channel models).

As consumers choose to order tangible goods online and have them delivered to a specific location, firms come under pressure to integrate digital and physical supply chains to ensure fast and responsive delivery. Consequently, firms are experimenting with logistics and fulfilment solutions to enable the physical delivery of products over the last mile, or the final leg of the delivery journey to a particular location. Some innovations in this area, including the use of autonomous robots and unmanned aerial vehicles, may not have been anticipated in existing road and sidewalk rules. Many such rules are local, which further underscores the need for a consistent and co-ordinated whole-of-government approach to e-commerce policy making at all levels of government.

Encourage regulatory flexibility, experimentation and transparency

Regulatory uncertainty can reduce the incentive to invest, and it may constrain the ability to scale as investors may be unwilling to invest in a firm with an untested product, service or business model. Policy experimentation can help ensure a firm's ability to innovate while remaining within the spirit of existing laws. Outcome or performance-based regulations that specify required outcomes or objectives can be useful in this regard. Regulatory sandboxes are another mechanism of ensuring regulatory flexibility that enable selected firms to test innovative products or services through approaches and competences that differ from existing policy frameworks. In the e-commerce context, such sandboxes have been used to test the use of drones for delivery and digital payment mechanisms. As e-commerce business models evolve, additional applications may arise with respect to new technologies, like blockchain or 3D printing.

At the same time, policies that focus on a particular type of e-commerce business model should be avoided. Given the dynamism of the e-commerce landscape, some e-commerce business models that are dominant today may not be dominant in the future. For example, while e-commerce business

models that use online platforms are among the most prominent in the current e-commerce landscape, advances in decentralised structures like distributed ledger technologies may diminish this role in the future. An alternative approach is to ensure that particular business functions conform with the regulatory framework, while better accounting for the interlinkages across business functions.

Increased transparency, including through better communication of existing regulations and their specific application to e-commerce, is another important step in reducing uncertainty for innovative firms. The *Interpretative Guidelines on Electronic Commerce and Information Property Trading* first formulated in 2002 with regard to e-commerce activities in Japan (METI Japan, 2016[161]) provide a useful example of such an approach.

Notes

1. This may be part of the reason why Amazon, which uses a business model that features an online platform, acquired Whole Foods Market, a relatively expensive food retailer that focuses on high quality rather than low prices.
2. Figure 3.1: The total global sample was 24 073; the Chinese sample was 894.

References

Aitken, R. (2017), "IBM forges blockchain collaboration with Nestlé and Walmart in global food safety", *Forbes*, *https://www.forbes.com/sites/rogeraitken/2017/08/22/ibm-forges-blockchain-collaboration-with-nestle-walmart-for-global-food-safety/#206fb6933d36* (accessed on 19 April 2018). [120]

Alibaba (2017), "Alibaba signs MoU with Malaysia's MDEC and Hangzhou municipal government to facilitate global trade for SMEs under eWTP", *Alibaba*, *http://www.alibabagroup.com/en/news/article?news=p170512* (accessed on 19 April 2018). [65]

Alizila (2016), "Cainiao network overview", *http://www.alizila.com/wp-content/uploads/2016/09/Cainiao-Factsheet.pdf?x95431* (accessed on 19 April 2018). [16]

Amazon (2018), *Amazon Annual Report - 2018*, *https://www.sec.gov/Archives/edgar/data/1018724/000101872419000004/amzn-20181231x10k.htm* (accessed on 12 April 2019). [61]

Amazon (2018), Amazon Go website, *https://www.amazon.com/b?ie=UTF8&node=16008589011* (accessed on 23 October 2018). [133]

Amazon (2018), "Amazon letter to shareholders - 2017", *https://www.sec.gov/Archives/edgar/data/1018724/000119312518121161/d456916dex991.htm* (accessed on 19 April 2018). [95]

Amazon (2018), "Amazon services", *https://services.amazon.com/global-selling/global-selling-guide.html* (accessed on 4 April 2018). [62]

Amazon (2018), "Managing voice purchasing settings", *https://www.amazon.com/gp/help/customer/display.html?nodeId=201952610* (accessed on 19 April 2018). [85]

Amazon (2016), "Amazon Dash replenishment", *https://www.amazon.com/b?node=15426532011* (accessed on 19 April 2018). [91]

Amazon (2016), "Generating recommendations at Amazon scale with Apache Spark and Amazon DSSTNE", Amazon, *https://aws.amazon.com/blogs/big-data/generating-recommendations-at-amazon-scale-with-apache-spark-and-amazon-dsstne* (accessed on 19 April 2018). [21]

Amazon Investor Relations (2015), "Amazon sellers sold record-setting more than 2 billion items in 2014", *http://phx.corporate-ir.net/phoenix.zhtml?c=176060&p=RssLanding&cat=news&id=2002794* (accessed on 19 April 2018). [60]

Anderson, C. (2004), "The long tail", *Wired*, *https://www.wired.com/2004/10/tail* (accessed on 19 April 2018). [13]

Bakos, Y. and E. Brynjolfsson (2000), "Bundling and competition on the Internet", *Marketing Science*, Vol. 19/1, pp. 63-82, *https://doi.org/10.1287/mksc.19.1.63.15182*. [69]

Bakos, Y. and E. Brynjolfsson (1999), "Bundling information goods: Price, profits and efficiency", *Management Science*, Vol. 45/12, pp. 1613-1630, *http://dx.doi.org/10.1287/mnsc.45.12.1613*. [68]

Bateman, J. (2016), "Behold China's answer to Amazon Echo: The Linglong Dingdong", *Wired*, *https://www.wired.com/2016/11/behold-chinas-answer-amazon-echo-linglong-dingdong* (accessed on 19 April 2018). [86]

Bloomberg (2018), "Online retailer JD follows Alibaba into the supermarket game", *Bloomberg*, *https://www.bloomberg.com/news/articles/2018-01-04/online-retailer-jd-follows-alibaba-into-the-supermarket-game* (accessed on 19 April 2018). [118]

Bloomberg (2017), "Wal-Mart to discount one million online items picked up in stores", *Bloomberg*, *https://www.bloomberg.com/news/articles/2017-04-12/wal-mart-to-discount-1-million-online-items-picked-up-in-stores* (accessed on 19 April 2018). [10]

Bright Local (2017), "Local consumer review survey", *https://www.brightlocal.com/learn/local-consumer-review-survey* (accessed on 19 April 2018). [48]

Broida, R. (2019), "How to spot fake reviews on Amazon, Best Buy, Walmart and other sites", *CNET*, *https://www.cnet.com/how-to/spot-fake-reviews-amazon-best-buy-walmart* (accessed on 19 April 2018). [53]

Brynjolfsson, E., Y. Hu and M. Smith (2003), "Consumer surplus in the digital economy: Estimating the value of increased product variety at online booksellers", *Management Science*, Vol. 49/No.11, pp. 1580-1596, *http://dx.doi.org/10.2139/ssrn.400940*. [12]

Business Insider (2017), "Amazon Prime subscribers hit 80 million", *http://www.businessinsider.fr/us/amazon-prime-subscribers-hit-80-million-2017-4/* (accessed on 19 April 2018). [96]

Cabral, L. and L. Li (2014), "A dollar for your thoughts: Feedback-conditional rebates on eBay", *https://ssrn.com/abstract=2133812*. [45]

Cadell, C. (2017), "Alibaba launches low-cost voice assistant amid AI drive", *Reuters*, *https://www.reuters.com/article/us-alibaba-ai/alibaba-launches-low-cost-voice-assistant-amid-ai-drive-idUSKBN19Q0WS* (accessed on 19 April 2018). [87]

Camner, G. (2016), "Launching GSMA mobile money APIs to raise industry capabilities", *GSMA*, *https://www.gsma.com/mobilefordevelopment/programme/mobile-money/launching-gsma-mobile-money-apis-to-raise-industry-capabilities* (accessed on 11 April 2019). [154]

Cao, J. and M. Mittelman (2016), "Why Unilver really bought Dollar Shave Club", *Bloomberg*, *https://www.bloomberg.com/news/articles/2016-07-20/why-unilever-really-bought-dollar-shave-club* (accessed on 19 April 2018). [84]

Catalini, C. and J. Gans (2017), "Some simple economics of the blockchain", *http://dx.doi.org/10.2139/ssrn.2874598*. [58]

Central Bank of Kenya (2018), "Press release: Mobile money interoperability", *https://www.centralbank.go.ke/uploads/press_releases/1648360391_Press%20Release%20-%20Mobile%20Money%20Interoperability.pdf* (accessed on 10 April 2018). [155]

Chang-won, L. (2018), "7-Eleven store manned by robot equipped with palm vein scanner and AI", *Aju Business Daily*, *http://www.ajudaily.com/view/20180828142203782* (accessed on 10 April 2019). [137]

Chen, P., S. Dhanasobhon and M. Smith (2008), "All reviews are not created equal: The disaggregate impact of reviews and Rreviewers at Amazon.com", *http://dx.doi.org/10.2139/ssrn.918083*. [47]

Chen, T. et al. (2017), "Thinking inside the subscription box: New research on e-commerce consumers", *McKinsey*, *https://www.mckinsey.com/industries/high-tech/our-insights/thinking-inside-the-subscription-box-new-research-on-ecommerce-consumers?cid=other-eml-alt-mip-mck-oth-1802&hlkid=33f0e490745146d08a50a70943d86845&hctky=10178627&hdpid=7ebf8b9b-9b34-411e-9f96-cb1d* (accessed on 19 April 2018). [83]

Cheok, L., W. Huiskamp and A. Malinowski (2014), "Beyond payment – E-commerce trends and payment challenges for online merchants expanding e-commerce operations internationally", ModusLink Global Solutions, *https://www.moduslink.com/wp-content/uploads/2014/07/WhitePaper_eCommerce-Trends-and-Payment-Challenges.pdf*. [140]

Chevalier, J. and D. Mayzlin (2006), "The effect of word of mouth on sales: Online book reviews", *https://doi.org/10.1509/jmkr.43.3.345*. [46]

China Money Network (2017), "JD.Com CEO says AI will cut staff by 1/3, grow revenue 1000% in ten years", *https://www.chinamoneynetwork.com/2017/07/21/jd-com-ceo-says-ai-will-cut-staff-by-13-grow-revenue-1000-in-ten-years* (accessed on 19 April 2018). [15]

Chlu (2018), "Reviews and ratings verified by payments on blockchain", *https://chlu.io/papers/position-paper.pdf* (accessed on 19 April 2018). [59]

Communications Authority of Kenya (2018), "Second quarter sector statistics report for the financial year 2017/2018", Communications Authority of Kenya, *http://www.ca.go.ke/images/downloads/STATISTICS/SectorStatisticsReportQ22017-18.pdf* (accessed on 19 September 2018). [149]

Darrow, B. (2017), "Coca-Cola looks to Google to boost retail sales", *Fortune*, *http://fortune.com/2017/03/15/coke-google-cloud-sales* (accessed on 19 April 2018). [138]

Deloitte (2017), "Digital identity: Identity is the fabric of the digital economy", Deloitte Touche Tohmatsu Limited, *https://www2.deloitte.com/content/dam/Deloitte/us/Documents/finance/us-advisory-digital-identity-is-the-fabric-of-the-digital-economy.pdf* (accessed on 15 June 2018). [34]

Deloitte (2017), "Digital media: The subscription prescription", Deloitte Touche Tohmatsu Limited, *https://www2.deloitte.com/content/dam/Deloitte/global/Images/infographics/technologymediatelecommunications/gx-deloitte-tmt-2018-digital-media-report.pdf* (accessed on 19 April 2018). [71]

Domingo, A. and A. Enriquez (2018), "Digital identity: The current state of affairs", *https://www.bbvaresearch.com/en/publicaciones/digital-identity-the-current-state-of-affairs* (accessed on 15 June 2018). [36]

eBay (2018), "Global shipping program", eBay, *http://pages.ebay.com/seller-center/shipping/global-shipping-program.html#gsp-tip-sheet* (accessed on 19 April 2018). [63]

eBay (2016), "Small online business growth report: Towards and inclusive growth economy", *https://www.ebaymainstreet.com/sites/default/files/ebay_global-report_2016-4_0.pdf* (accessed on 19 April 2018). [66]

Eggleton, M. (2016), "Creating one digital identity could make us more secure", *Australian Financial Review*, *http://www.afr.com/news/special-reports/digital-identity/creating-one-digital-identity-could-make-us-more-secure-20161003-gru5wi* (accessed on 15 June 2018). [35]

Einav, L., C. Farronato and J. Levin (2016), "Peer-to-peer markets", Stanford Institute for Economic Policy Research, *https://ideas.repec.org/p/sip/dpaper/15-029.html*. [24]

Einav, L. et al. (2017), "Auctions Versus Posted Prices in Online Markets", *Journal of Political Economy*, Vol. 126, No. 1, pp. 178-215, *https://doi.org/10.1086/695529*. [27]

Ellison, G. and S. Ellison (2018), "Match quality, search, and the Internet market for used books", *NBER Working Paper*, NBER Working Paper No. 24197, *http://dx.doi.org/10.3386/w24197*. [11]

Ember, S. (2018), "New York Times Co. subscription revenue surpassed $1 billion in 2017", *New York Times*, *https://www.nytimes.com/2018/02/08/business/new-york-times-company-earnings.html* (accessed on 19 April 2018). [75]

European Commission (2015), "Freemium: Zero marginal cost", *https://ec.europa.eu/docsroom/documents/13421/attachments/1/translations/en/renditions/native*. [73]

Financial Times (2019), "Choose the subscription that is right for you", *Financial Times*, *https://www.ft.com/products* (accessed on 18 April 2019). [94]

Financial Times (2018), "Revenue streams: Spotify's bid to generate a profit", *https://www.ft.com/content/974206c0-2609-11e8-b27e-cc62a39d57a0* (accessed on 19 April 2018). [79]

Financial Times (2016), "The algorithms using data to suggest your next purchase", *https://www.ft.com/content/c7764ff0-00b2-11e6-99cb-83242733f755* (accessed on 19 April 2018). [23]

Food Market Institute (2017), "US grocery shopper trends 2017: Food retail implications for US grocery shopper trends", *https://www.fmi.org/docs/default-source/webinars/trends-2017-webinar-7-18-2017.pdf* (accessed on 19 April 2018). [115]

Fradkin, A. (2017), "Search, matching, and the role of digital marketplace design in enabling trade: Evidence from Airbnb", *http://ide.mit.edu/sites/default/files/publications/SearchMatchingEfficiency.pdf*. [19]

Fradkin, A. et al. (2017), "The determinants of online review informativeness: Evidence from field experiments on Airbnb", *https://dx.doi.org/10.2139/ssrn.2939064*. [43]

Freeman, M. (2014), "Showrooming: It's an opportunity for retail, not a threat", *The Guardian*, *https://www.theguardian.com/media-network/media-network-blog/2014/jan/15/showrooming-opportunity-retail-threat* (accessed on 19 April 2018). [126]

Garber, M. (2014), "Chili's has installed more than 45 000 tablets in its restaurants", *The Atlantic*, *https://www.theatlantic.com/technology/archive/2014/06/chilis-is-installing-tablet-ordering-at-all-its-restaurants/372836* (accessed on 10 April 2019). [129]

Ghana Web (2018), "What you need to know about the mobile interoperability", *https://www.ghanaweb.com/GhanaHomePage/NewsArchive/What-you-need-to-know-about-the-mobile-interoperability-652762*. [157]

Goldfarb, A. et al. (2015), "The effect of social Interaction on economic transactions: Evidence from changes in two retail formats", *Management Science*, Vol. 61/12, pp. 2963-2981, *https://doi.org/10.1287/mnsc.2014.2030*. [131]

Goldfarb, A. and C. Tucker (2017), "Digital economics", *http://dx.doi.org/10.3386/w23684*. [70]

Google (2018), *Product Reviews and Mobile Searches*, *https://www.thinkwithgoogle.com/data-gallery/detail/product-reviews-mobile-searches* (accessed on 19 April 2018). [50]

Google (2016), "5 ways consumers connect to store with mobile shopping", *https://www.thinkwithgoogle.com/marketing-resources/micro-moments/5-ways-consumers-connect-stores-mobile-shopping* (accessed on 19 April 2018). [105]

Grewal, D. et al. (2016), "Mobile advertising: A framework and research agenda", *Journal of Interactive Marketing*, Vol. 34, pp. 3-14, *https://doi.org/10.1016/j.intmar.2016.03.003*. [108]

Griswold, A. (2017), "There's still one big reason why people aren't buying their groceries online", *Quartz*, *https://qz.com/1077743/people-dont-buy-groceries-online-because-they-prefer-to-pick-things-out-in-stores* (accessed on 19 April 2018). [111]

GSMA (2017), "Distribution 2.0: The Future of mobile money agent distribution networks", GSMA Association 2018, *https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/07/Distribution-2.0-The-future-of-mobile-money-agent-distribution-networks.pdf* (accessed on 7 November 2018). [145]

Hafner, J. and D. Limbachia (2018), "McDonald's: You buy more from touch-screen kiosks than a person. So expect more kiosks", *USA Today*, *https://eu.usatoday.com/story/money/nation-now/2018/06/07/mcdonalds-add-kiosks-citing-better-sales-over-face-face-orders/681196002/* (accessed on 10 April 2019). [128]

Hilton, M. et al. (2019), *Extended Producer Responsibility (EPR) and the Impact of Online Sales*, OECD Publishing, Paris, *https://doi.org/10.1787/cde28569-en*. [5]

Hiu, X. (2016), "E-commerce platforms and international trade: A large-scale field experiment", *Management Science*, *http://idei.fr/sites/default/files/IDEI/documents/conf/Internet_2017/hui.pdf* (accessed on 19 April 2018). [64]

Hodson, N., C. Perrigo and D. Hardman (2017), "PwC Retail Trends 2017", Strategy& PwC, *https://www.strategyand.pwc.com/trend/2017-retail-trends* (accessed on 10 April 2019). [124]

Hortacsu, A., F. Martinez-Jerez and J. Douglas (2009), "The geography of trade in online transactions: Evidence from eBay and Mercadolibre", *American Economic Journal: Microeconomics*, Vol. 1/1, pp. 53-74, *http://www.stern.nyu.edu/networks/Hortacsu_Geography.pdf*. [152]

Horton, J. (2014), "Misdirected search effort in a matching market: Causes, consequences and a partial solution", *Proceedings of the fifteenth ACM conference on economics and computation*, p. 357, *https://doi.org/10.1145/2600057.2602867*. [20]

Houser, K. (2018), "Ordering food via touchscreen is so fun you spend more money when you do it", *Futurism*, *https://futurism.com/self-serve-kiosks-mcdonalds* (accessed on 10 April 2019). [130]

Howland, D. (2016), "How retailers can use curb side pickup to build customer loyalty", *Retail Dive*, *https://www.retaildive.com/news/how-retailers-can-use-curbside-pickup-to-build-customer-loyalty/418801*. [110]

ITF/OECD (2018), *(Un)certain Skies? Drones in the World of Tomorrow*, ITF/OECD, Paris, *https://www.itf-oecd.org/sites/default/files/docs/uncertain-skies-drones.pdf*. [101]

Jacobs, H. (2018), "One photo shows that China is already in a cashless future", *Business Insider*, *http://www.businessinsider.fr/us/alipay-wechat-pay-china-mobile-payments-street-vendors-musicians-2018-5* (accessed on 19 September 2018). [142]

JD.com (2018), "JD.com launches highly automated warehouse in Shanghai, sets new standard for China logistics", *http://ir.jd.com/news-releases/news-release-details/jdcom-launches-highly-automated-warehouse-shanghai-sets-new* (accessed on 4 April 2019). [14]

JD.com (2017), "Drone delivery program", *http://corporate.jd.com/resources/downloadFile/JD.com%2520Drone%2520Factsheet.pdf/20396782-2095-40a8-8c20-9524afb75115* (accessed on 19 April 2018). [99]

Kenya Airways (2018), "Mobile money payments for Kenya Airways", Kenya Airways, *https://www.kenya-airways.com/plan-and-book/payment-methods/mobile-money/en/* (accessed on 13 November 2018). [150]

Khan, H. (2018), "Consumers are showrooming and webrooming your business, here's what that means and what you can do about it", *Shopify*, *https://www.shopify.com/retail/119920451-consumers-are-showrooming-and-webrooming-your-business-heres-what-that-means-and-what-you-can-do-about-it* (accessed on 10 April 2019). [127]

Kim, E. (2017), "Amazon Alexa users buy more stuff, study shows", *CNBC*, *https://www.cnbc.com/2017/12/06/amazon-alexa-customers-buy-more.html* (accessed on 19 April 2018). [88]

Kumar, V. et al. (2011), "*The New York Times* paywall", *https://hbr.org/product/The-New-York-Times-Paywal/an/512077-PDF-ENG* (accessed on 19 April 2018). [74]

Le Monde (2019), "Abonnements", *Le Monde*, *https://abo.lemonde.fr* (accessed on 18 April 2019). [93]

Levy, A. (2017), "Amazon is telling booksellers to speed up deliery times by up to 40 percent", *CNBC*, *https://www.cnbc.com/2017/08/07/amazon-is-telling-booksellers-to-speed-up-delivery-time-by-up-to-40-percent.html* (accessed on 9 April 2019). [39]

Levy, A. (2016), "Amazon rolls out another policy that has sellers on edge", *CNBC*, *https://www.cnbc.com/2016/11/03/amazon-rolls-out-another-policy-that-has-sellers-on-edge.html* (accessed on 15 June 2018). [38]

Li, L., S. Tadelis and X. Zhou (2016), "Buying reputation as a signal of quality: Evidence from an online marketplace", *https://ssrn.com/abstract=2835822*. [44]

Lim, S. (2019), "JD.com and Rakuten combine forces to become drone powerhouse in Japan", *The Drum*, *https://www.thedrum.com/news/2019/02/21/jdcom-and-rakuten-combine-forces-become-drone-powerhouse-japan* (accessed on 12 April 2019). [100]

Lonsdorf, K. (2017), "Hungry? Call your neighbourhood robot", *NPR*, *https://www.npr.org/sections/alltechconsidered/2017/03/23/520848983/hungry-call-your-neighborhood-delivery-robot?t=1539691103087* (accessed on 16 October 2018). [102]

Luca, M. (2016), "Designing online marketplaces: Trust and reputation mechanisms", *http://dx.doi.org/10.3386/w22616*. [40]

Masoko (2018), "Masoko E-Commerce Platform", *https://www.masoko.com* (accessed on 19 April 2018). [147]

Mayzlin, D., Y. Dover and J. Chevalier (2014), "Promotional reviews: An empirical investigation of online review manipulation", *American Economic Review*, Vol. 104, pp. 2421-55, *http://dx.doi.org/10.1257/aer.104.8.2421*. [42]

Ma, Z. et al. (2018), "Blockchain for digital rights management", *Future Generation Computer Systems*, Vol. 89, pp. 746-764, *https://doi.org/10.1016/j.future.2018.07.029* (accessed on 18 April 2019). [164]

McFarland, M. (2018), "Inside Amazon Go: The camera-filled convenience store that watches you back", *CNN Business*, *https://edition.cnn.com/2018/10/03/tech/amazon-go/index.html* (accessed on 19 April 2018). [134]

McKinsey (2016), "Parcel delivery: The future of last mile", McKinsey & Company, *https://www.mckinsey.com/~/media/mckinsey/industries/travel%20transport%20and%20logistics/our%20insights/how%20customer%20demands%20are%20reshaping%20last%20mile%20delivery/parcel_delivery_the_future_of_last_mile.ashx* (accessed on 18 April 2019). [97]

McKinsey (2013), "How retailers can keep up with consumers", *https://www.mckinsey.com/industries/retail/our-insights/how-retailers-can-keep-up-with-consumers* (accessed on 19 April 2018). [22]

Meredith, S. and A. Kharpal (2017), "Chinese e-commerce giant JD.com is developing a drone that can deliver packages weighing as much as one ton", *CNBC*, *https://www.cnbc.com/2017/06/08/e-commerce-jdcom-alibaba-amazon-drone-delivery-china-asia-technology.html* (accessed on 19 April 2018). [98]

METI Japan (2016), *Results Compiled of the E-Commerce Market Survey*, Japanese Ministry of Economy, Trade and Industry, *http://www.meti.go.jp/english/press/2016/0614_02.html*. [161]

Nadadhur, S. (2018), "Linking Aadhaar with digital wallets: It's not all black and white!", *The Hindu*, *https://www.thehindu.com/sci-tech/technology/linking-aadhaar-with-digital-wallets-its-not-all-black-and-white/article22946984.ece* (accessed on 25 June 2018). [33]

Najberg, A. (2017), "Hema Supermarket offers shoppers a 'new retail' experience", *Alizila*, *http://www.alizila.com/hema-supermarket-offers-shoppers-new-retail-experience* (accessed on 19 April 2018). [117]

Nielsen (2017), "What's in store for online grocery shopping", *http://www.nielsen.com/lk/en/insights/reports/2017/whats-in-store-for-online-grocery-shopping.html* (accessed on 19 April 2018). [112]

Novais, T. and J. Sanin (2018), "Mobile money interoperability in Bolivia: A case study for Latin America", GSMA, 2018, *https://www.gsma.com/mobilefordevelopment/programme/mobile-money/mobile-money-interoperability-in-bolivia-a-case-study-for-latin-america*. [156]

OECD (2019), *An Introduction to Online Platforms and their Role in the Digital Transformation*, OECD Publishing, Paris, *https://doi.org/10.1787/53e5f593-en*. [9]

OECD (2019), *Going Digital: Shaping Policies, Improving Lives*, OECD Publishing, Paris, *https://doi.org/10.1787/9789264312012-en*. [56]

OECD (2019), "Household spending", *Household accounts*, *http://dx.doi.org/10.1787/b5f46047-en* (accessed on 5 April 2019). [113]

OECD (2018), "Consumer protection enforcement in a global digital marketplace", *OECD Digital Economy Papers*, No. 266, OECD Publishing, Paris, *http://dx.doi.org/10.1787/f041eead-en*. [107]

OECD (2018), *Financial Markets, Insurance and Pensions: Digitalisation and Finance*, OECD Publishing, Paris, *https://www.oecd.org/finance/private-pensions/Financial-markets-insurance-pensions-digitalisation-and-finance.pdf*. [139]

OECD (2018), "Improving online disclosures with behavioural insights", *OECD Digital Economy Papers*, No. 269, OECD Publishing, Paris, *http://dx.doi.org/10.1787/39026ff4-en*. [31]

OECD (2018), "Personalised pricing in the digital era", *https://one.oecd.org/document/DAF/COMP(2018)13/en/pdf*. [29]

OECD (2018), *Tax Challenges Arising from Digitalisation – Interim Report 2018: Inclusive Framework on BEPS*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264293083-en*. [4]

OECD (2017), "Algorithms and collusion: Competition policy in the digital age", OECD Publishing, Paris, *http://www.oecd.org/competition/algorithms-collusion-competition-policy-in-the-digital-age.htm*. [7]

OECD (2017), *OECD Digital Economy Outlook 2017*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264276284-en*. [18]

OECD (2017), "Trust in peer platform markets: Consumer survey findings", *OECD Digital Economy Papers*, No. 263, OECD Publishing, Paris, *http://dx.doi.org/10.1787/1a893b58-en*. [32]

OECD (2016), *Housing Related Expenditure of Households*, *https://www.oecd.org/social/family/HC1-1-Housing-related-expenditure-of-households.pdf*. [114]

OECD (2016), *OECD Recommendation of the Council on Consumer Protection in E-Commerce*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264255258-en*. [30]

OECD (2016), *OECD Science, Technology and Innovation Outlook 2016*, OECD Publishing, Paris, *https://doi.org/10.1787/sti_in_outlook-2016-en*. [57]

OECD (2015), *Data-Driven Innovation: Big Data for Growth and Well-Being*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264229358-en*. [6]

OECD (2014), "Cloud computing: The concept, impacts and the role of government policy", *OECD Digital Economy Papers*, No. 240, OECD Publishing, Paris, *http://dx.doi.org/10.1787/5jxzf4lcc7f5-en*. [80]

OECD (2013), "Electronic and mobile commerce", *OECD Digital Economy Papers*, No. 228, OECD Publishing, Paris, *http://dx.doi.org/10.1787/5k437p2gxw6g-en*. [106]

OECD (forthcoming), *Enhanced Access to Data: Reconciling Risks and Benefits of Data Re-use Across Societies*, OECD Publishing, Paris. [8]

OECD/Eurostat (2018), *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition*, Eurostat, Luxembourg/OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264304604-en*. [2]

OECD/WTO (2017), *Aid for Trade at a Glance 2017: Promoting Trade, Inclusiveness and Connectivity for Sustainable Development*, WTO, Geneva/OECD Publishing, Paris, *https://doi.org/10.1787/aid_glance-2017-en*. [67]

OFT (2013), "Personalised pricing: Increased transparency to boost trust", *https://webarchive.nationalarchives.gov.uk/20140402165101/http://oft.gov.uk/shared_oft/markets-work/personalised-pricing/oft1489.pdf*. [28]

Open Music Initiative (2018), "About Open Music", *Open Music Initiative*, *http://open-music.org/about/* (accessed on 19 April 2018). [72]

Orendorff, A. (2019), "The plague of e-commerce return rates and how to maintain profitability", *Shopify*, *https://www.shopify.com/enterprise/ecommerce-returns* (accessed on 10 April 2019). [122]

Osafo-Kwaako, P. et al. (2018), "Mobile money in emerging markets: The business case for financial inclusion", *https://www.mckinsey.com/industries/financial-services/our-insights/mobile-money-in-emerging-markets-the-business-case-for-financial-inclusion* (accessed on 11 April 2019). [153]

Osterwalder, A. and Y. Pigneur (2010), *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*, John Wiley and Sons; 1st edition. [3]

Ovans, A. (2015), "What is a Business Model?", *Harvard Business Review*, *https://hbr.org/2015/01/what-is-a-business-model* (accessed on 19 April 2018). [1]

Pandolph, S. (2017), "Amazon Echo owners are making more voice purchases", *Business Insider*, *http://www.businessinsider.fr/us/amazon-echo-owners-are-making-more-voice-purchases-2017-12* (accessed on 19 April 2018). [89]

Pate, T., J. Kun and B. Srinivasan (2016), "Sensor21: Earn bitcoin by collecting environmental data", *https://medium.com/@earndotcom/sensor21-earn-bitcoin-by-collecting-environmental-data-218a4132ca70* (accessed on 26 October 2018). [160]

Perez, S. (2016), "Amazon sues more sellers for buying fake reviews", *Tech Crunch*, *https://techcrunch.com/2016/10/27/amazon-sues-more-sellers-for-buying-fake-reviews* (accessed on 19 April 2018). [52]

Pew Research Centre (2016), "Online shopping and e-commerce", *http://www.pewinternet.org/2016/12/19/online-shopping-and-purchasing-preferences/* (accessed on 19 April 2018). [49]

PwC (2017), "E-Commerce in China – The future is already here", PricewaterhouseCoopers Limited, *https://www.pwccn.com/en/retail-and-consumer/publications/total-retail-2017-china/total-retail-survey-2017-china-cut.pdf* (accessed on 19 April 2018). [119]

RIAA (2018), *RIAA Music Revenues Report - Mid Year 2018*, *https://www.riaa.com/wp-content/uploads/2018/09/RIAA-Mid-Year-2018-Revenue-Report.pdf* (accessed on 12 April 2019). [76]

Riley, C. (2017), "Uber criticized for surge pricing after London terror attack", *CNN*, *https://money.cnn.com/2017/06/04/technology/uber-london-attack-surge-pricing/index.html* (accessed on 4 June 2017). [26]

Rubin, B. (2015), "Amazon looks to improve customer reviews system with machine learning", *CNET*, *https://www.cnet.com/news/amazon-updates-customer-reviews-with-new-machine-learning-platform* (accessed on 19 April 2018). [51]

Russell, J. (2018), "As Stripe backs away from crypto payments, Coinbase offers a new solution for e-commerce", *Tech Crunch*, *https://techcrunch.com/2018/02/15/coinbase-offers-a-new-solution-for-e-commerce* (accessed on 19 April 2018). [158]

Safaricom (2018), "Safaricom, Paypal and Transferto collaborate for international e-commerce, transfer of funds to and from M-Pesa", *https://www.safaricom.co.ke/about/media-center/publications/press-release/release/435* (accessed on 19 April 2018). [146]

Sanitago, C., C. Gnanasambandam and S. Bhavik (2018), "From box to cloud", *https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/from-box-to-cloud* (accessed on 19 April 2018). [81]

Shopify (2018), Shopify website, *https://www.shopify.ca/about* (accessed on 19 April 2018). [82]

Shopify (2018), "Shopify – Payment methods – Cryptocurrency", *https://help.shopify.com/en/manual/payments/alternative-payments/cryptocurrency*. [159]

Soo, Z. (2017), "Unmanned stores in China still working on a seamless shopper experience", *South China Morning Post*, *http://www.scmp.com/tech/china-tech/article/2123348/unmanned-stores-china-still-working-seamless-shopper-experience* (accessed on 10 April 2019). [135]

Spotify (2018), "Spotify technology S.A. announces financial results for third quarter 2018", *Spotify*, *https://investors.spotify.com/financials/press-release-details/2018/Spotify-Technology-SA-Announces-Financial-Results-for-Third-Quarter-2018/default.aspx* (accessed on 12 April 2019). [78]

Springer, C. (ed.) (2015), "P2P lending fraud detection: A big data approach", *Intelligence and Security Informatics. PAISI 2015. Lecture Notes in Computer Science*, Vol. 9074, pp. 71-81, *https://doi.org/10.1007/978-3-319-18455-5_5*. [55]

Statt, N. (2019), "Fake Amazon reviews draw fraud charges in groundbreaking FTC case", *The Verge*, *https://www.theverge.com/2019/2/26/18242303/ftc-fake-amazon-reviews-lawsuit-false-advertising* (accessed on 19 March 2018). [54]

Suri, T. and W. Jack (2016), "The long-run poverty and gender impacts of mobile money", *http://dx.doi.org/10.1126/science.aah5309*. [151]

Tadelis, S. (2016), "Reputation and feedback systems in online platform markets", *Annual Review of Economics*, Vol. 8, pp. 321-340, *https://doi.org/10.1146/annurev-economics-080315-015325* (accessed on 20 March 2018). [41]

Taggart, J. and K. Granville (2017), "From zombie malls to Bonobos: What America's retail transformation looks like", *New York Times*, *https://www.nytimes.com/2017/04/15/business/from-zombie-malls-to-bonobos-americas-retail-transformation.html* (accessed on 19 April 2018). [125]

Taylor, T. (2019), "Alipay and WeChat Pay: The quest for a cashless China", *Tech Genix*, *http://techgenix.com/alipay-and-wechat-pay* (accessed on 11 April 2019). [143]

The Economist (2019), "Subscription", *The Economist*, *https://www.economist.com/subscribe* (accessed on 18 April 2019). [92]

The Economist (2018), "Mobile financial services are cornering the market", *The Economist, https://www.economist.com/special-report/2018/05/03/mobile-financial-services-are-cornering-the-market* (accessed on 3 May 2018). [144]

The Economist (2016), "When life gives you lemons", *The Economist, https://www.economist.com/news/finance-and-economics/21698274-economics-digital-music-favour-streaming-artists-are-learning-adapt-when* (accessed on 19 April 2018). [77]

Uber Partner Help (2018), "Does my vehicle need to get inspected?", *https://help.uber.com/h/373c9b72-b09d-4604-876b-d8ce203a9b49* (accessed on 19 April 2018). [37]

United Postal Service (2018), "UPS pulse of the online shopper survey", *https://www.ups.com/assets/resources/media/knowledge-center/ups-pulse-of-the-online-shopper.PDF* (accessed on 19 April 2018). [109]

Unuvar, M. (2017), "Blockchain in food safety: The food industry gets an upgrade with blockchain", *IBM*, *https://www.ibm.com/blogs/blockchain/2017/06/the-food-industry-gets-an-upgrade-with-blockchain* (accessed on 19 April 2018). [121]

Ursu, R. (2016), "The power of rankings: Quantifying the effect of rankings on online consumer search and purchase decisions", *Marketing Science*, Vol. 37/4, pp. 530-552, *https://dx.doi.org/10.2139/ssrn.2729325*. [25]

Verhoef, P., S. Neslin and B. Vroomen (2007), "Multichannel customer management: Understanding the research-shopper phenomenon", Vol. 24/2, pp. 129-148, *https://doi.org/10.1016/j.ijresmar.2006.11.002*. [104]

Vodafone (2017), "Vodafone marks 10 years of the world's leading mobile money service," *M-Pesa*, *https://www.vodafone.com/content/index/media/vodafone-group-releases/2017/m-pesa-10.html* (accessed on 23 October 2018). [148]

Waldron, J. (2019), "Bonobos builds brick-and-mortar 'guideshops' to ecommerce", *eTail*, *https://etailwest.wbresearch.com/bonobos-guideshops-future-ecommerce-offline-ty-u* (accessed on 10 April 2019). [123]

Wall Street Journal (2014), "Zara builds its business around RFID", *https://www.wsj.com/articles/at-zara-fast-fashion-meets-smarter-inventory-1410884519* (accessed on 19 April 2018). [17]

Warren, T. (2017), "Amazon's Alexa voice deals return for this year's Prime Day", *The Verge*, *https://www.theverge.com/2017/7/5/15921238/amazon-alexa-prime-day-deals-voice-shopping* (accessed on 19 April 2018). [90]

Washington D.C. District Department of Transport (2018), *Hearing Record: Personal Delivery Device Act*, *http://lims.dccouncil.us/Download/37175/B22-0019-HearingRecord2.pdf* (accessed on 2 November 2018). [103]

Wong, V. (2015), "How Taco Bell's ordering app turns extra onions into real money", *Bloomberg*, *https://www.bloomberg.com/news/articles/2015-02-04/how-taco-bell-s-ordering-app-turns-extra-onions-into-real-money* (accessed on 19 April 2018). [132]

World Bank (2017), *The Global Findex Database, 2017*, International Bank for Reconstruction and Development/The World Bank, *https://globalfindex.worldbank.org/*. [141]

Xiaohan, T. (2017), "Alibaba's Hema supermarkets present the model for the future of retail", *ASEAN Today*, *https://www.aseantoday.com/2017/12/alibabas-hema-supermarkets-present-the-model-for-the-future-of-retail* (accessed on 19 April 2018). [116]

Zhang, M. (2018), "Tencent beats Amazon to launch unmanned shop, but lags other Chinese tech rivals", *South China Morning Post*, *http://www.scmp.com/business/companies/article/2130062/tencent-beats-amazon-launch-unmanned-shop-lags-other-chinese-tech* (accessed on 19 April 2019). [136]

Annex A

TAPPING INTO NEW DATA SOURCES

Measuring e-commerce, and digital transformation more broadly, is complex. While national statistics provide evidence on some broad trends, new tools are needed to better understand e-commerce dynamics at the micro level. One such tool is the *Future of Business Survey*, which provides monthly data on enterprises with a Facebook page. This Annex analyses e-commerce using data from businesses in 42 countries to shed new light on various dimensions of e-commerce, including with respect to firm size, gender and export dynamics.

Measuring e-commerce, and digital transformation more broadly, is complex. While national statistics provide evidence on trends and other developments, new tools are needed to better understand e-commerce dynamics. One such tool is the *Future of Business Survey*, which studies enterprises with a Facebook page monthly. It is an online survey tool designed by Facebook in co-operation with the OECD and the World Bank (Facebook/OECD/World Bank, 2019[1]).

The survey currently covers 42 countries at different levels of development, resulting in a wider geographic reach than most official statistics on e-commerce.[1] The data presented in this Annex rely on thirteen waves of the survey (March 2017 to April 2018) for a total of 205 619 firms, of which 188 077 had fewer than 50 employees (small firms), 5 351 were medium-sized (50-249 employees) and 3 630 had more than 250 employees (large firms).[2]

The data identify firms that "use online tools or platforms (e.g. websites/apps, social networks like Facebook or Google+, etc.) to sell products and services to customers" either in their country or abroad. In this Annex, firms that indicate the use of online tools for sales at home or abroad are referred to as *online sellers*.[3] Later on, the Annex considers firms that participate in international trade as exporters. Exporters that use online tools or online platforms for selling products and services to customers abroad are referred to as *online exporters*.

However, firms that use online tools or platforms to sell products and services to customers might potentially use these tools for activities not related to the ordering process. Such activities would not constitute e-commerce as defined for the purpose of this report (see Chapter 1). As a result, the data cannot be directly compared with the data presented in Chapter 2. At the same time, not all firms with a Facebook page use online tools to sell products and services. For example, large manufacturers in the car industry are likely to have a Facebook page that allows them to advertise to potential customers, yet will not use this channel for the direct sales of their products.

E-commerce is prevalent among firms with a Facebook page, but varies by sector

About 61% of surveyed firms use online tools or online platforms to sell products domestically (Figure A.1). This is considerably higher than the share of OECD e-commerce firms (23%) shown in Figure 2.4. The difference is potentially explained by a combination of three effects:

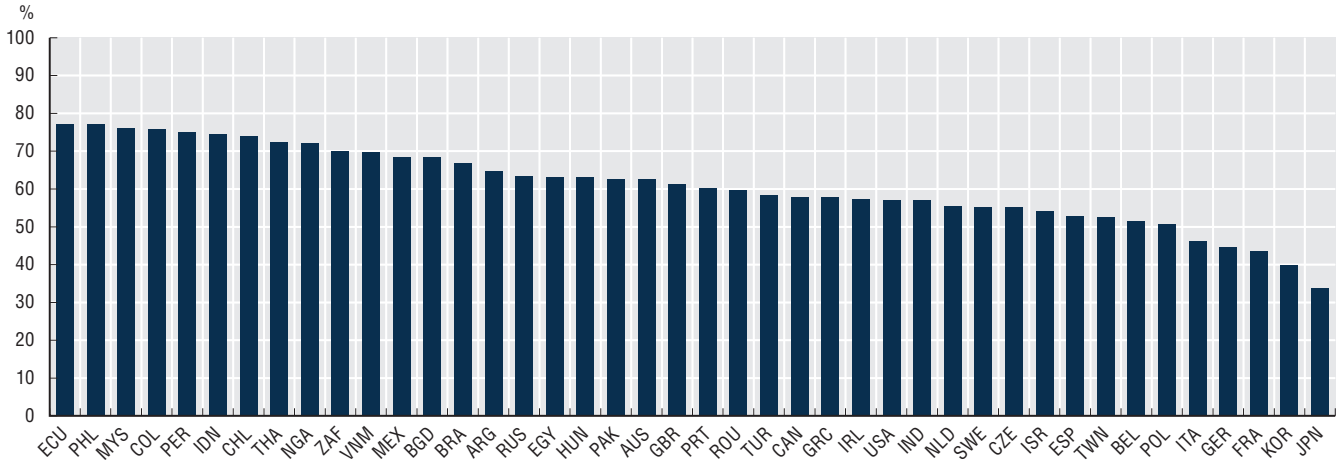
- The group of online sellers in the Facebook data contains firms that are not actually participating in e-commerce transactions as defined in this report (see above),
- The group of firms with an online Facebook presence is more likely to be participating in e-commerce than the average firm in the population, and
- Emerging economies tend to participate more in e-commerce, where the sample of firms with an online presence is likely to represent a more selected sub-sample of the total firm population.

The latter effect would explain why most OECD countries cluster towards the right side of the figure, while many emerging countries have higher shares of firms using online tools to sell products and services on average.

With 77% of all firms surveyed indicating that they have used online tools to sell products to customers either domestically or abroad, Ecuador and the Philippines had the highest share of online sellers among all countries. They were followed by Colombia (76%), Malaysia (76%) and Peru (75%). According to these data, the countries with the lowest share of online sellers in total firms (below 45%) were France, Germany, Japan and Korea. The industry breakdown depicted in Figure A.2 shows that online tools were most frequently used for sales of products or services in the retail and wholesale sector (72%), followed by real estate (69%), accommodation (65%) and manufacturing (64%).

A.1. Online sellers, 2017-18

As percentage of all firms in the sample (i.e. firms with a Facebook page)



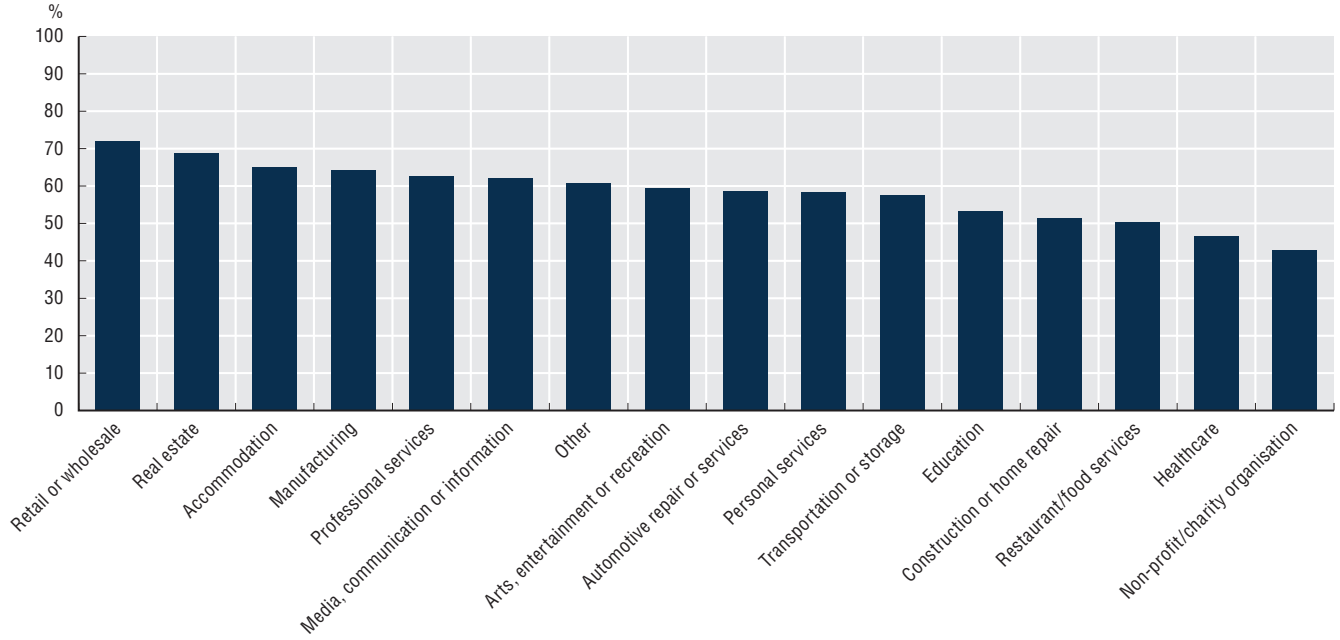
Note: See Chapter notes.[4]

Source: OECD calculations based on Facebook/OECD/World Bank[1], *Future of Business Survey* (database), *http://www.oecd.org/sdd/business-stats/the-future-of-business-survey.htm* (accessed March 2019).

StatLink https://doi.org/10.1787/888933923203

A.2. Online sellers by sector, 2017-18

As percentage of all firms in the sample (i.e. firms with a Facebook page, by sector)



Note: See Chapter notes.[5]

Source: OECD calculations based on Facebook/OECD/World Bank[1], *Future of Business Survey* (database), *http://www.oecd.org/sdd/business-stats/the-future-of-business-survey.htm* (accessed March 2019).

StatLink https://doi.org/10.1787/888933923222

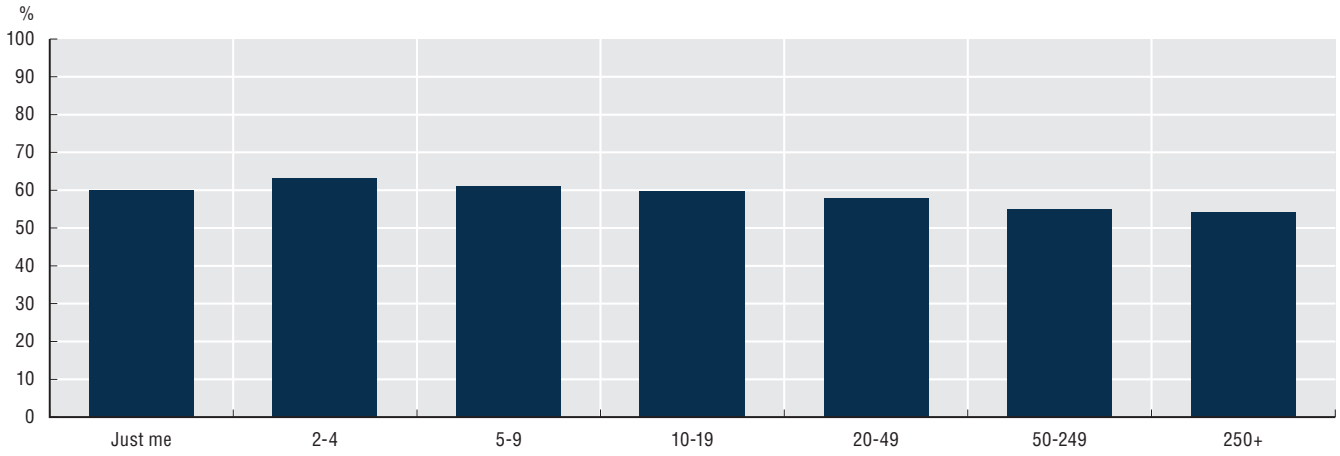
Even the smallest firms often participate in online sales, and many are managed by women

Small firms make slightly more use of online tools for product sales. With respect to the size of the firms, Figure A.3 reveals that for the sample of firms with an online presence, small firms more frequently participate in online sales than large firms on average (61% vs. 54%). This seems to contradict the statistics presented earlier, suggesting that small firms participate less often in e-commerce transactions overall (see Figure 2.4).

It should be highlighted, however, that the selective nature of the Facebook sample might partly be responsible for this result. By setting up a Facebook page, all firms in the sample have passed a certain threshold in terms of digital maturity. Thus, while larger firms tend to be faster in adopting digital technologies overall, small firms that have passed a certain threshold might be faster in adopting online tools and platforms for the sale of products.

A.3. Online sellers by firm size, 2017-18

As percentage of all firms in the sample (i.e. firms with a Facebook page)



Note: See Chapter notes.[6]

Source: OECD calculations based on Facebook/OECD/World Bank[1], *Future of Business Survey* (database), *http://www.oecd.org/sdd/business-stats/the-future-of-business-survey.htm* (accessed March 2019).

StatLink https://doi.org/10.1787/888933923241

Interestingly, there is relatively little variation in online sales within the group of small firms. Firms with 2 to 4 employees used online tools or platforms most frequently to sell goods or services (63%). The corresponding number was 58% for firms with 20 to 49 employees. Sole traders had a participation rate of 60%, highlighting how online tools and online platforms have helped even the smallest firms to sell online (see Chapter 3). The data further reveal some interesting differences with respect to the percentage of female members in the top management of online and offline sellers (excluding sole traders). At about 43%, this percentage was higher for online sellers than for offline sellers (40%).

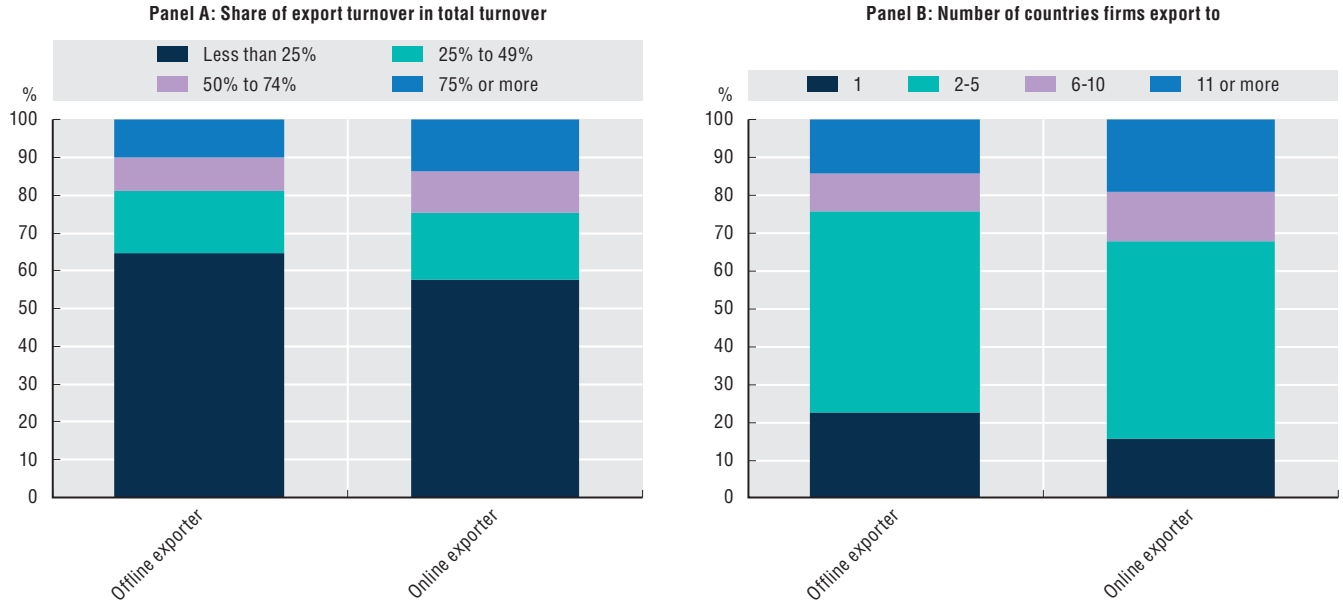
Firms using online tools are more likely to export, export to more countries and obtain larger shares of turnover from exports

The *Future of Business Survey* also provides information on cross-border e-commerce that is unavailable from official sources. First, the share of exporters among online sellers (14%) is significantly higher than the share of exporters among offline sellers (8%). Second, comparing exporters that use online tools to sell products and services to customers abroad (online exporters) with exporters that do not use online tools to sell to customers abroad (offline exporters), it becomes apparent that online exporters on average attribute a higher proportion of their revenue to exports than their offline counterparts (Figure A.4, Panel A).[7] While exports represented more than 25% of revenue for 35% of all offline exporters, roughly 42% of

online exporters generated over 25% of revenue from exports. For 14% of online exporters, exports represented more than 75% of revenue, whereas the corresponding number was only 10% for offline exporters.

A.4. Online vs. offline exporters: Export intensity and number of export destinations

As percentage of all exporters in the sample (i.e. exporters with a Facebook page)



Note: See Chapter notes.[8]

Source: OECD calculations based on Facebook/OECD/World Bank[1], Future of Business Survey (database), *http://www.oecd.org/sdd/business-stats/the-future-of-business-survey.htm* (accessed March 2019).

StatLink https://doi.org/10.1787/888933923260

Furthermore, online exporters on average exported to more countries than offline exporters (Figure A.4, Panel B). Specifically, 23% of offline exporters exported to one country only, while the corresponding share was 16% among online exporters. And while only 24% of offline exporters exported to six or more countries, the number was significantly higher for online exporters (32%).

Finally, the *Future of Business Survey* provides some insights into the challenges that firms face with regard to sales in other countries and allows for an interesting comparison between firms that use online tools or platforms to sell to customers abroad and those that do not. This comparison is not available in most official statistics and provides a perspective on the specific export challenges faced by firms using online tools to sell abroad. Figure A.5 lists several potential challenges that survey respondents were able to select from and shows the frequency of their selection among offline and online sellers. The challenges are ordered according to their importance to online sellers.

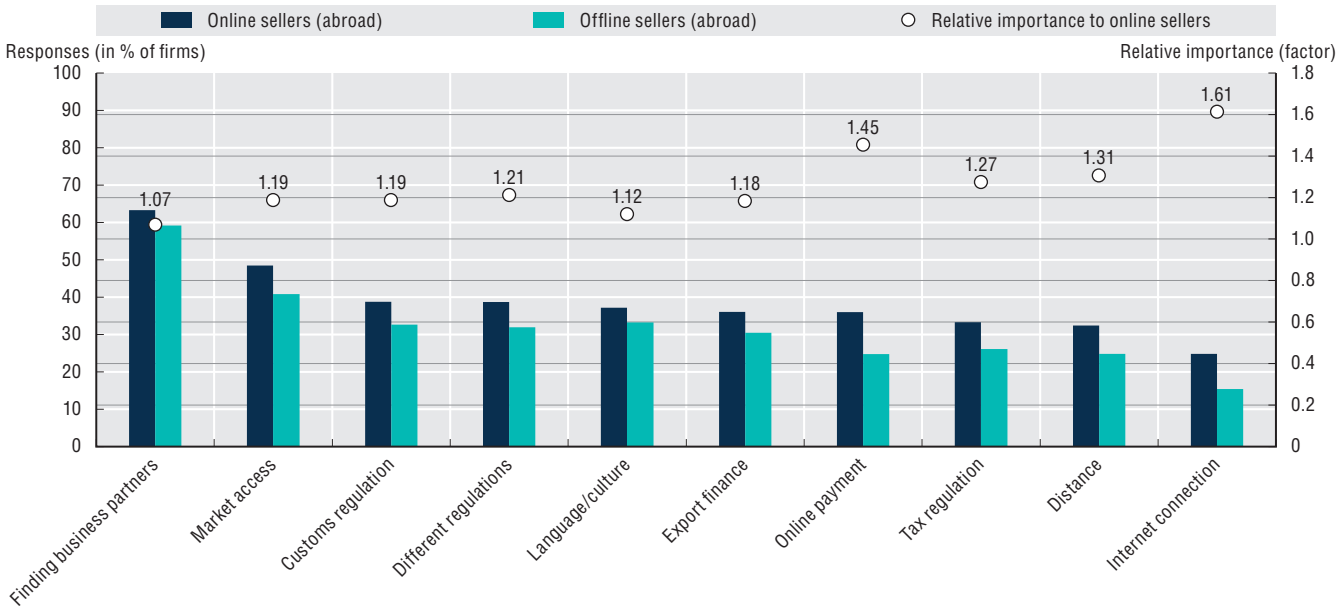
The first important finding from Figure A.5 is that online sellers tend to mention virtually all challenges more frequently than their offline counterparts do. This partly reflects that online sellers export more frequently, more intensively and to more destinations on average, implying that the propensity of facing a certain challenge is higher for these firms.

Second, classical export challenges related to finding business partners or overcoming market access restrictions are the most important challenges to both groups of firms. Language and culture are the third largest challenges for firms that do not use online tools to sell to customers abroad. Online sellers on the other hand face differences in customs regulation and domestic regulation relatively more often. This could reflect that many online sellers make use of third party services, such as online platforms, that provide standardised tools for exports to multiple countries that are readily available in several

languages. These online platforms are likely to be relatively less effective in helping firms to overcome differences in regulation, in particular because they often handle a large variety of products, each of which can face different rules in different countries.

Third, in relative terms online sellers are 21% more likely than offline sellers to cite differences in regulations as an export challenge (19% for customs regulation) whereas the corresponding value is significantly lower for language and culture (12%) (Figure A.5, right axis). The largest difference between online and offline sellers unsurprisingly occurs with respect to challenges related to the online nature of sales. Accordingly, online sellers mention export challenges related to Internet connectivity about 61% more often than firms not using online tools to sell abroad and challenges related to online payment methods about 45% more often.

A.5. Online vs. offline sellers: Challenges of selling to foreign markets



Note: See Chapter notes.[9]

Source: OECD calculations based on Facebook/OECD/World Bank[1], *Future of Business Survey* (database), *http://www.oecd.org/sdd/business-stats/the-future-of-business-survey.htm* (accessed March 2019).

StatLink https://doi.org/10.1787/888933923279

Surprisingly, however, even among offline sellers, a non-trivial number of firms indicated that they face export challenges explicitly related to online sales (15% for connectivity and 25% for online payments). One possible explanation could be that offline sellers stumble upon these challenges when deciding whether to use online tools or online platforms to sell abroad, i.e. the extensive margin of exporting. If this is indeed the case, policy interventions focused on connectivity can help to foster exports by enabling firms to take advantage of online tools for sales to other countries.

Geographical distance between the domestic and the export market also appears to pose a relatively high burden on online sellers. Accordingly, while 32% of firms using online tools to sell abroad mention distance as a challenge, the corresponding number is only 25% for offline sellers, i.e. distance is mentioned 31% more often by online sellers. This could be a reflection of the importance of small parcel trade for e-commerce, where transport costs make up a relatively large share of the total transaction value. Finally, online sellers are 27% more likely than offline sellers to mention tax regulation in other countries as a challenge for selling to foreign markets. This compares to 21% for differences in regulation more broadly and 19% for customs regulation and indicates the relatively high relevance of regulatory challenges in the area of taxation.

Notes

Israel

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

1. The 42 countries surveyed include: Argentina, Australia, Bangladesh, Belgium, Brazil, Canada, Chile, Chinese Taipei, Colombia, the Czech Republic, Ecuador, Egypt, France, Germany, Greece, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Korea, Malaysia, Mexico, the Netherlands, Nigeria, Pakistan, Peru, the Philippines, Poland, Portugal, Romania, the Russian Federation, South Africa, Spain, Sweden, Thailand, Turkey, the United Kingdom, the United States and Viet Nam.
2. The remaining 8 561 firms either did not know or preferred not to reveal information about their size. The country samples are not stratified with respect to enterprise size, age and economic activity of enterprises. The figures presented in this Annex depict unweighted averages. Cross-country variation may reflect that SMEs with a Facebook presence tend to be more representative of the total firm population in advanced economies.
3. Aside from selling products or services to customers, firms can also indicate the use of online tools or platforms to "provide information", "show products/services", "communicate with customers or suppliers", "advertise to potential new customers" or "manage internal business processes." Firms using online tools merely for advertising or the provision of information are therefore less likely to conflate the sub-sample of online sellers.
4. Figure A.1: Based on a sample of 205 619 firms with a Facebook page, surveyed over the period March 2017 to April 2018. Online sellers are firms that use online tools or platforms (e.g. websites/apps, social networks like Facebook or Google+, etc.) to sell products/services to customers in their country or abroad.
5. Figure A.2: Based on the sample of 205 619 firms with a Facebook Page, surveyed over the period March 2017 to April 2018. Online sellers are firms that use online tools or platforms (e.g. websites/apps, social networks like Facebook or Google+, etc.) to sell products/services to customers in their country or abroad.
6. Figure A.3: Based on the sample of 205 619 firms with a Facebook page, surveyed over the period March 2017 to April 2018. Online sellers are firms that use online tools or platforms (e.g. websites/apps, social networks like Facebook or Google+, etc.) to sell products/services to customers in their country or abroad.
7. According to the survey responses, "using online tools to sell products or services to customers abroad" often does not involve participation in international trade as an exporter. Specifically, only 28% of all firms using online tools to sell to customers abroad indicated participation in international trade as an exporter. Unfortunately, the survey design does not show the nature and relevance of alternative channels for sales to customers in other countries.
8. Figure A.4: Based on the subsample of exporters with a Facebook page. Subsample for the left panel: 23 501 firms that engage in international trade as exporters, surveyed between March 2017 and April 2018. Subsample for right panel: 5 416 firms that engage in international trade as exporters, surveyed between March 2017 and May 2017 (responses not available for later waves). Online exporters use online tools or platforms (e.g. websites/apps, social networks like Facebook or Google+, etc.) to sell to customers abroad. Offline exporters do not use online tools to sell to customers abroad.
9. Figure A.5: Based on the subsample of 37 769 firms with a Facebook page, surveyed over the period March 2017 to April 2018, that regard "selling to foreign markets" a challenge to their business. The sample can include non-exporters. Online sellers (abroad) are firms that use online tools or platforms (e.g. websites/apps, social networks like Facebook or Google+, etc.) to sell to customers abroad. Offline sellers (abroad) are firms that do not use online tools or platforms to sell to customers abroad. Due to data availability, responses on tax regulation in other countries are based on a smaller sample (25 574 firms, surveyed after June 2017).

Reference

Facebook/OECD/World Bank (2019), *The Future of Business Survey*, *http://www.oecd.org/sdd/business-stats/the-future-of-business-survey.htm* (accessed on 29 March 2019). [1]

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ISBN 978-92-64-91297-7