



E-COMMERCE EVOLUTION IN ASIA AND THE PACIFIC

OPPORTUNITIES AND CHALLENGES

NOVEMBER 2023

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Foreword

Our first report on the dynamic potential of e-commerce, *Embracing the E-commerce Revolution in Asia and the Pacific*, concluded 4 years ago that the sector could become essential for building sustainable and inclusive growth across the region. It could not foretell that digital solutions would subsequently become a lifeline for economic and social activities. This second report, *E-commerce Evolution in Asia and the Pacific: Opportunities and Challenges*, describes a different world of pushing together past a pandemic and the digital economy having more influence on people's daily lives than ever.

In 2022, Asia and the Pacific still accounts for the largest share of the world's online retail market. Yet, changes in consumer behavior caused by the COVID-19 crisis appear irreversible and are likely to propel demand well into the future, with advantages over traditional retail leading to a forecast that the e-commerce market will account for 6.1% of global gross domestic product by 2025, from 3.8% in 2019. While lockdowns and social distancing ramped up the role of digitalization, they also exposed glaring disparities in access to information technology between rich and poor places and people, and by gender. Indeed, the pandemic exposed many obstacles to building a sustainable and inclusive digital marketplace.

Policymakers across the region and beyond increasingly recognize the need to share knowledge on innovations that address e-commerce's environmental harms. Although bricks-and-mortar retailers can generate twice or more greenhouse gas emissions as e-commerce, the exponential speed of the sector's expansion is commanding attention.

This new report, in addition to assessing the environmental impact of the continuing evolution of business-to-consumer activity, highlights the need for renewed efforts to improve competition policy tailored to fast-changing digital transactions and e-commerce market structure, and the long-recognized need for comprehensive action to improve the efficacy of taxation. The goal is to help all market participants understand how to manage e-commerce activities in a responsible manner. The report focuses on timely issues for consumers seeking to grasp the scale and "green" implications of packaging waste and product returns, online sales platforms alert to the environmental footprints of their supply chains and logistics management, and policymakers looking to nurture market efficiencies while safeguarding competition and rationalizing digital taxation programs.

Harmonizing national and international e-commerce policies is critical given that the digital economy transcends national boundaries. Common frameworks and shared experiences will be critical for dealing with the common challenges facing Asia and the Pacific to develop healthy and sustainable e-commerce markets. Global cooperation and consensus on tax policy, administration, and compliance are helping fiscal authorities deal with challenges associated with cross-border e-commerce sales growing faster in Asia and the Pacific than in any other region.

With Asia and the Pacific set to remain a dominant force in online markets that increasingly are becoming the norm for consumers around the world, it is our hope that this report will bring new insights on how to ensure inclusive, sustainable, and competitive e-commerce development in the region.



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Abbreviations

| | |
|---------------------|--|
| 3PL | third-party logistics |
| ADB | Asian Development Bank |
| AI | artificial intelligence |
| APEC | Asia-Pacific Economic Cooperation |
| APPA | across platform parity agreement |
| ASEAN | Association of Southeast Asian Nations |
| B2B | business-to-business |
| B2C | business-to-consumer |
| CAGR | compound annual growth rate |
| CFA | Committee on Fiscal Affairs |
| D2C | direct-to-consumer |
| DST | digital service tax |
| EU | European Union |
| EV | electric vehicle |
| gCO ₂ e | gram of carbon dioxide equivalent |
| GDPR | General Data Privacy Regulation |
| GHG | greenhouse gas |
| GST | goods and services tax |
| IATA | International Air Transport Association |
| ICC | International Chamber of Commerce |
| ICN | International Competition Network |
| ICT | information and communication technology |
| IFC | International Finance Corporation |
| IMF | International Monetary Fund |
| kgCO ₂ e | kilogram of carbon dioxide equivalent |
| LDC | least developed country |
| MFN | most favored nation |
| MSMEs | micro, small, and medium-sized enterprises |
| OECD | Organisation for Economic Co-operation and Development |
| OSS | one-stop shop |
| PIPL | Personal Information Protection Law |
| PRC | People's Republic of China |
| RPM | resale price maintenance |
| SMEs | small and medium-sized enterprises |
| TWh | terawatt-hour |
| UK | United Kingdom |
| UKRI | UK Research and Innovation |
| UNCTAD | United Nations Conference on Trade and Development |

| | |
|---------|--|
| UNESCAP | United Nations Economic and Social Commission for Asia and the Pacific |
| UNESCO | United Nations Educational Scientific and Cultural Organizations |
| UPS | United Parcel Services |
| UPU | Universal Postal Union |
| US | United States |
| VAT | value-added tax |
| WMS | Warehouse Management System |
| WTO | World Trade Organization |

Executive Summary

E-commerce is continuing to grow in the global economy, with a share of global gross domestic product of 3.8% in 2019 and 5.4% in 2021, which is forecast to reach 6.4% by 2025. The primary drivers include increased smartphone usage, the convenience and safety of purchasing daily essentials and luxury products from home, the availability and variety of products and sellers, and rapidly evolving technology that includes voice recognition, augmented reality, and artificial intelligence. Asia and the Pacific holds the largest share of the world's business-to-consumer (B2C) and retail e-commerce market, and is expected to account for 61% of the global total by 2025.

Increasingly evolving technologies in counterfeit detection, supply chain enhancements, search and shopping methods, and connectivity have continued to build up the e-commerce network in Asia and the Pacific. These developments have allowed safer transactions, created more efficient logistics systems, and improved customer satisfaction and targeting. E-commerce technologies and business models are evolving to make businesses of all sizes more accessible. Technological progress has connected more consumers across the globe and given them the convenience and other benefits of online shopping and faster delivery.

The COVID-19 pandemic has sparked substantial and long-lasting changes in consumer behavior and digital adoption. E-commerce in Asia and the Pacific performed better than in most other regions during the pandemic with the accelerating digitalization of the region's economies. That noted, emergency measures to contain the pandemic also exposed the vulnerabilities of supply chains and logistic systems and tested the flexibility of businesses to adjust swiftly. Nevertheless, high demand in online retail in the region is expected to last beyond the crisis.

Nevertheless, many parts of the world still find it difficult to stay connected. Many potential buyers and sellers across the globe face several barriers and challenges when attempting to enter the e-commerce market.

- **One main barrier is a lack of internet access.** As of January 2022, almost 5.3 billion people were active internet users—yet that is still only 66% of the global population. Asia and the Pacific leads the world with 2.6 billion active internet users (52.8% of the global count).
- **Disparity is evident across economies in Asian e-payment platforms.** At one end, economies such as Singapore, the People's Republic of China (PRC), and the Republic of Korea have pioneered nationwide e-payment services. At the other end, most developing economies and least developed economies struggle to adopt advanced and swift e-payment systems to keep up with the rapid pace of e-commerce expansion. Some of the barriers include largely unbanked consumers with no access to formal financial services, an absence of trust from both vendors and customers, and the lack of information and communication technology (ICT) and banking infrastructure. The pandemic, however, has led to an influx of consumers and vendors shifting to digital payment options for safety and convenience.
- **For many economies—especially those participating in cross-border e-commerce—logistics and “last-mile” delivery are areas of key concern.** Geographic remoteness and lack of infrastructure connectivity add to the bottlenecks in ensuring seamless last-mile delivery services. With rural-based

service centers and personnel increasing, and amid the development of technology in automation and drone deliveries, among others, however, companies are finding more innovative solutions to bring e-commerce closer to a greater number of consumers.

- **Appropriate legislative and regulatory mechanisms protect all e-commerce market actors and can foster an inclusive and enabling environment for expansion beyond national borders.** Legislation related to e-commerce and measures that ensure the affordability and accessibility of e-commerce participation must be promoted. Most Asian economies have some form of legislation on electronic transaction and cybercrime, while many have yet to enact legislation related to consumer protection and privacy and data protection. Compared to the worldwide average, however, the region still has a lower percentage of economies with legislation on these areas.

Asia and the Pacific, despite being the fastest-growing market by global standards, experiences varied levels of development and readiness across its subregions. While pandemic measures such as lockdowns and social distancing ramped up the role of digitalization in economic activities, their enforcement also magnified glaring digital divides within and across economies. Indeed, digital technology, while improving the inclusiveness of economic opportunities, also underpins exacerbating inequality problem across and within economies.

- **Least developed countries.** One of the biggest challenges for least developed countries (LDCs) to reap the benefits of e-commerce is that they remain the most vulnerable in digital readiness, with only 27% of individuals in LDCs able to use the internet. Both rural and urban communities continue to have limited access to ICT, due either to lack of ICT infrastructure or low income, or both. This situation worsened during the pandemic, when most economies relied heavily on accelerating digitalization and ICT technologies to keep economic activities afloat.
- **Micro, small, and medium-sized enterprises.** Start-ups and micro, small, and medium-sized enterprises (MSMEs) are at a disadvantage due to having limited resources in deploying operations requiring expanded technical, financial, and human capacity. The pandemic accentuated these inefficiencies. Small consignments characteristic of small and medium-sized enterprises (SMEs) and MSME transactions must pass through the trade logistics restrictions and international trade measures instituted by governments and domestic activities to curb the spread of the coronavirus. Major international e-commerce businesses and online platforms have the financial reserves and risk management systems to better deal with the interruption in manufacturing activities. In contrast, start-ups and small businesses in developing economies and LDCs struggle to absorb these shocks along with labor shortages and supply chain disruptions.
- **Women.** The gender digital divide measured by internet user penetration rate is estimated at 17% globally, and rises to almost 43% in LDCs. Women digital entrepreneurs continue to be underrepresented in ICT and the digital economy. Preexisting barriers in the digital economy make women inherently less prepared to withstand economic shocks. Barriers such as legal and financial constraints mean that they are not properly protected from discrimination in accessing credit.

The consensus is that online shopping does less damage to the environment than traditional retail. This is based on the positive environmental impacts of e-commerce in business models, transportation, paper waste, and digital storage. E-commerce reduces the environmental impacts of driving and commuting and is generally conducted on a paperless business model. Distribution centers shipping products mostly use land near major airports. A recent study found that traditional bricks-and-mortar retailers generated 1.5 to 2.9 times the greenhouse gas emissions of online retail.

Despite the potential benefits to the environment, e-commerce is still expected to emit significant amounts of emissions because the sector continues to expand exponentially across the globe. Every one of the five stages of e-commerce operations creates some form of environmental harm, whether in (1) pre-sale

and sales, (2) order picking and assembly, (3) stock replenishment, (4) delivery, or (5) post-sale services, from customers logging in to a website to the last-mile delivery. E-commerce businesses increasingly may try to adapt to growing consumer demand at the cost of environmental impacts. Such negative effects include the growing number of delivery trucks on the road, the exponential increase in packaging waste from the explosion of online shipping, and the hazard of frequent return of orders. This is important as the e-commerce boom amplifies the environmental impact of returns in the form of increased carbon emissions from transportation, more packaging and plastic waste, and larger contributions to landfill.

Consumers and corporations need to recognize their environmental footprint online. E-commerce actors need to engage in more sustainable ways of consumption and doing business in ways previously ignored. This could lead to a gradual shift toward sustainable e-commerce shopping. From the consumer side, more shoppers are becoming conscious of sustainability issues and are willing to pay a premium for sustainable e-commerce brands and products. Policymakers and businesses need to consider alternative solutions that promote sustainability and bring down greenhouse gas emissions in e-commerce, such as (1) alternative delivery systems, (2) sustainable delivery transport, (3) common warehouse management, (4) recycling and sustainable packaging, (5) volume-rate garbage disposal, and (6) separate collection of packaging waste.

E-commerce increasingly risks fueling anticompetitive behavior because of the advantages it offers for e-commerce businesses, including dominant online platform operators, through economies of scale and exclusive access to suppliers and market information. The application of competition policy becomes challenging in e-commerce markets with multisided players where competition enforcement is highly context-specific. Competition problems in a digitalized economy need deeper exploration, and approaches for solutions require new forms of information gathering and analytical models to diagnose multisided markets and the implications of big data, with efforts to distinguish anticompetitive behaviors from innovation. Some of the risks are illustrated below.

- **Digital monopoly hampering competition and innovation.** Digital business players, in their fight to compete in a winner-takes-all game, may take measures to prevent others from being the first or “prevent entry into future markets.” Some large e-commerce market players may acquire a company with an innovative technology or service that may complement services offered by the larger firm. The risk is that the purpose of an acquisition is to eliminate the most threatening potential competitors or to block other possible routes to end-users. Competition authorities, in distinguishing between anticompetitive motives and normal business mergers and acquisitions, need to stick to the prudent enforcement of the competition law. This requires lengthier deliberation to determine whether such actions will lessen or likely lessen competition—or indeed make end-users worse off.
- **Digital monopolies to lock in customers.** The principle of interoperability itself, which leads to multi-homing, can be both beneficial to consumers and advertisers while producing lock-in effects for both parties. In behavioral terms, consumers get used to services they prefer or enjoy and become less willing to switch when such services have become integral to daily activities. The use of personal data profiles causes this effect, and any change that requires transferring data to a competitor will impose switching costs to end users. Hence, when consumers provide personal data, they may lock themselves in a certain platform.
- **Risks to privacy and data.** In their quest to monopolize multiple platforms, digital service providers collect, analyze, and market the private data of consumers who are not always aware of how it is used. Nor do consumers always know about the security risks involved when information falls into the wrong hands. Firms tend to disclose customer information not to benefit consumers but for their own interests in expanding their reach. End-users may not know how their personal information is used or whether it is safely stored. Equally important is the issue of the ownership of the data gathered by apps and services.

Fast-growing digital economy and cross-border e-commerce poses additional challenges to tax authorities in the areas of tax policy, tax administration, and tax compliance. Cross-border e-commerce is continuing its rapid growth globally and across the region. Relative to domestic e-commerce, cross-border e-commerce is gaining momentum at a much faster pace. Globally, cross-border sales are growing at two times the rate of domestic e-commerce sales, at 29% (compound annual growth rate). Asia and the Pacific continues to show much higher growth and larger volume in cross-border e-commerce than other regions. Taxation principles, including neutrality, efficiency, certainty and simplicity, effectiveness and fairness, and flexibility should still underpin the e-commerce taxation frameworks.

- **Consumption taxes.** One of the crucial consumption taxation issues arising from e-commerce is defining the place of consumption. Taxation at the place of consumption could promote certainty and prevent double taxation. Many Asian economies levy goods and services tax (GST) or value-added tax (VAT) on the goods imported through the cross-border e-commerce. In most jurisdictions, VAT systems typically apply an exemption for low-value imports. An exemption is adopted to minimize the transaction and administrative costs of taking in items of low value into the customs system, which generally outweigh the revenue gained from such a volume of goods imported. However, these exemptions are increasingly becoming a cause of concern as online retail sales continue to rapidly expand. Policymakers need to weigh the benefits of administrative costs relief against the need to ensure fair competitive conditions for domestic retailers.
- **Customs duties.** Another form of tax exemption is the de minimis threshold for customs duties, which is often higher than the threshold for VAT exemption. Most economies apply such a threshold for customs duties. De minimis thresholds affect economies in many ways, both positive and negative. A higher threshold helps border management become more efficient, simplifying inspection procedures, and improving the efficiency of cross-border operations. On the side of merchants—particularly SMEs—a higher threshold is crucial for minimizing the costs to businesses whose main source of revenue is low-value goods imported through cross-border e-commerce. On the other hand, higher de minimis thresholds could also hurt an economy on both the regulatory agency and local business sides. Domestic retailers would face distorted competition from overseas counterparts. While several economies are debating removing de minimis thresholds, this change must be paired with equally or more efficient collection methods.
- **Income taxes.** Some challenges in the digital economy related to direct income taxes include the accurate interpretation of the permanent establishment definition in e-commerce and place of effective management, among others. The challenges in achieving a global consensus on digital taxation led individual economies, including a few in Asia and the Pacific to make unilateral attempts to tax multinational companies active in digital business. Following the leadership of the Organisation for Economic Co-operation and Development (OECD) in harmonizing digital taxation, however, an OECD/G20 Inclusive Framework statement on 1 July 2021 noted that broad agreement had been reached on a two-pillar approach. Pillar One is expected to help ensure that the distribution of profits and taxing rights among economies are fairer with regard to the cross-border revenues generated by the largest multinational enterprises. Pillar Two, on the other hand, is expected to minimize tax competition by multilaterally setting a minimum corporate tax rate.

CHAPTER 1

E-commerce Evolution in Asia and the Pacific

Introduction

Digital technologies have driven transformational change across the globe in the past few decades. Innovations in nanotechnology, biotechnology, robotics, artificial intelligence, and the Internet of Things are among the innovations changing the way people live, work, and relate to one another. And they have been no less than historic in size, scope, and speed. As in the past, uncertainty remains about how digital transformation will unfold in the coming years, but the coronavirus disease (COVID-19) pandemic did much to solidify the role of digitization in commercial and consumer behavior. After digital solutions quickly became the lifeline for nations to carry on economic and social activities in the crisis years, its adoption will only continue to expand and evolve.

The exchange of goods and services over digital networks is predominant in transactions for trading and business activities. Retail was among the first sectors disrupted by digital transformation. Changes over the past decade mean that customers have the choice of many new and convenient options to integrate shopping and retail into their lives. Business-to-consumer (B2C) electronic commerce, or e-commerce, is now an indispensable part of the global retail framework. Over the years, it has continued to gain momentum amid the advance and expansion of digital technologies, the globalization of businesses, easier conditions for doing business, favorable government policies, increased efficiency of logistics, and better telecommunications and information technology (IT) infrastructure. In the past years, however, the world also witnessed an unprecedented and unforeseen surge in the global e-commerce market share in a widespread attempt at a safer and more convenient way to access retail goods and services during the pandemic. All e-commerce segments gained through the pandemic will continue in the years to come. The first year of the pandemic, 2020, will be seen as the moment that catalyzed an irreversible shift toward digital and e-commerce sectors worldwide. Indeed, the United Nations Conference on Trade and Development (UNCTAD) reports the strong uptake of e-commerce across regions, with its share in global trade increasing to 17% in 2020, from 14% in 2019 (UNCTAD 2021a). By 2021, the global B2C e-commerce market was valued at \$3.86 trillion. That was expected to increase to \$4.14 trillion by the end of 2022 (Precedence Research 2022).

Asia and the Pacific became the dominant force in the global e-commerce market amid the pandemic and will likely retain this competitive position. The region is poised to continue outpacing other regions and is expected to have the most rapid increase of (i) distributors and manufacturers shifting from traditional brick-and-mortar stores to online marketplaces, and (ii) consumers changing their purchasing preference to online shopping. As consumers in the region gain exposure to the internet, the online market is becoming the norm. Increased social media engagement is another significant driver, providing channels to advertise and sell goods. The region's e-commerce has continuously generated large returns that are seen as only growing larger. Of the economies in the region, the People's Republic of China (PRC) emerged as the biggest e-commerce market in 2020. Japan and the Republic of Korea come second and third in the region, while in Southeast Asia, the value of e-commerce is

expected to quadruple by 2025 (Ganbold 2021). The surge of new digital consumers and online retail traffic means that the region's e-commerce sector will continue to thrive and expand for many years to come.

While e-commerce holds great promise for a prosperous economy with the creation of new channels and opportunities, it also poses challenges beyond the scope of traditional commerce. The growth of e-commerce is procrastinated in developing economies by various hurdles. Among the barriers are the limitations on physical and digital infrastructure, finance, resources, taxation, competition policy, environmental impact, and governance. In the long term, developing economies that improve regulations, infrastructure, and technical capacity to address these challenges and establish enabling frameworks will be better placed than others to maximize the benefits of e-commerce, both domestically and internationally. Some of the benefits include building sufficient information and communication technology (ICT) infrastructure, improving digital literacy among a skilled labor force, legislating consumer and other legal protections, ensuring environmental sustainability, and minimizing the side effects of noncompetitive hurdles. Economies that fail to overcome these barriers risk falling behind in the e-commerce market—being less dynamic at home and less competitive abroad. Equally concerning is that economies that fail to embrace digital innovations will miss the opportunity to move toward a more inclusive growth.

The last e-commerce report, published in 2018, presented Asia and the Pacific as the fastest-growing e-commerce market (ADB 2018). It also presented an analytical framework for assessing the quality of e-commerce development using three key dimensions: (i) economic factors, (ii) legal and institutional environment, and (iii) social acceptance and awareness. Within each dimension, the report also discussed the barriers to e-commerce development. It found that most low-income economies in the region, among other issues, had weak foundations in ICT accessibility and affordability, online payment structures, and other infrastructure development. While most of the economies have some form of legislation in electronic transactions and cybercrime law, some had barriers in consumer protection and data protection laws. Cybersecurity in particular is emerging as a major issue in many developing economies, with many unprepared to deal with security and privacy concerns.

The goal of this new publication is to build on the technical knowledge and policy recommendations contained in the previous report and expand the framework by introducing other factors critical for e-commerce development. Building on the key topics that have been debated in the realm of e-commerce and its impact, this new report will focus on (i) how e-commerce played a key role in retail during the pandemic, (ii) the environmental impact of the rapid increase of e-commerce activity, (iii) barriers to development in competition policies, and (iv) taxation issues. For the last two topics, this report will also discuss the critical role of harmonizing national and international e-commerce policies given that the sector transcends geographic and national borders. On the one hand, this report aims to contribute to technical know-how for businesses to better understand how to manage their e-commerce activities. On the other hand, it also aims to help businesses and the public sector understand e-commerce regulations to ensure inclusive development of the sector. The report will present various approaches for best governing e-commerce. These will become critical because the decisions that public and private stakeholders make today will shape e-commerce in the future.

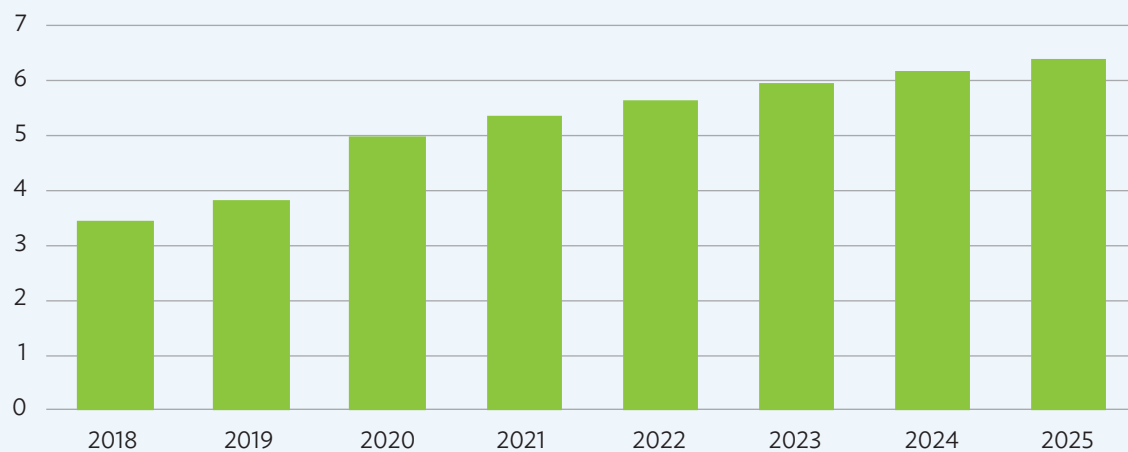
The main categories of e-commerce are in the form of business-to-business (B2B), business-to-consumer (B2C), consumer-to-consumer (C2C), and business-to-government (B2G) transactions. However, as with the previous publication, this report mainly focuses on B2C transactions. Although B2B e-commerce is by far the largest market—at over three times the size of B2C in 2019—B2C is more comprehensive, as it provides a more holistic view of the entire e-commerce ecosystem of hardware and software infrastructure, legal issues (including privacy and consumer protection), e-payment options, logistics services, and sustainability systems.

Whereas the report mostly refers to B2C e-commerce, some sections feature subsets on topics such as internet retail, mobile commerce (m-commerce), direct-to-consumer (D2C) commerce, and online-offline store convergence.

Overview

E-commerce is continuing to grow in the global economy, with a share of global gross domestic product (GDP) of 3.8% in 2019 and 5.6% in 2022, and is forecast to reach 6.4% in 2025 (Figure 1.1). By one estimate, the global retail e-commerce market sale was valued at \$5.2 trillion in 2021 and is forecast to reach \$7.5 trillion by 2025 (Chevalier 2022). The primary drivers include increased smartphone usage, the convenience and safety of purchasing daily essentials and luxury products from home, the availability and variety of products and sellers, and rapidly evolving technology that includes voice recognition, augmented reality, and artificial intelligence (AI).

Figure 1.1: Global Retail E-commerce Sales
(% GDP)



GDP = gross domestic product

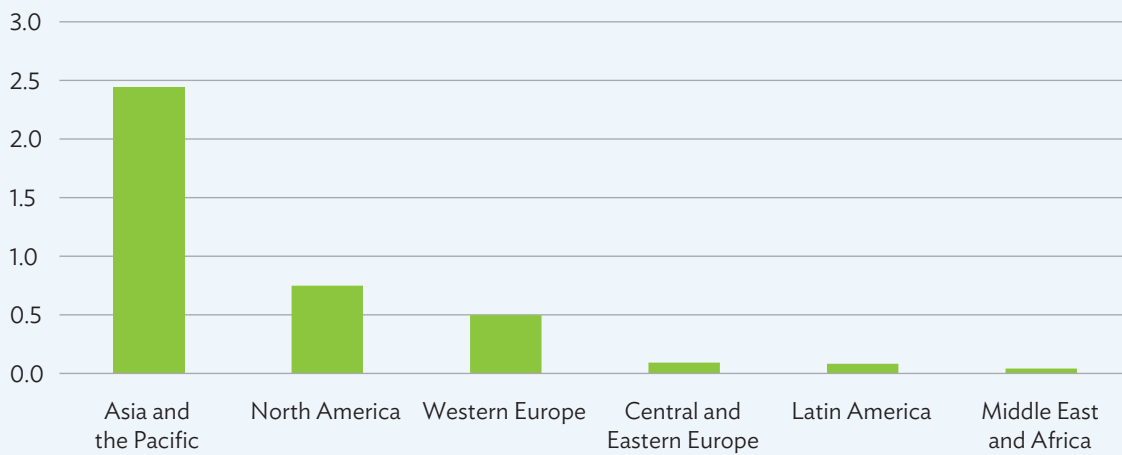
Source: ADB calculations using data from Statista. Key Figures of E-Commerce. <https://www.statista.com/statistics/379046/worldwide-retail-e-commerce-sales/>; and International Monetary Fund. World Economic Outlook Database. <https://www.imf.org/en/Publications/WEO/weo-database/2021/October> (both accessed 1 June 2022).

Asia and the Pacific continues to be a major driver of expansion in global B2C e-commerce.

Asia and the Pacific holds the largest share of the world's B2C and retail e-commerce market (Figure 1.2). United States-based eMarketer put the region's retail e-commerce spending at almost \$2.4 trillion of the \$3.9 trillion spent worldwide in 2020 (eMarketer 2020). It estimated North America's retail e-commerce sales to be the second-largest share at about \$749.0 billion, followed by Western Europe with a projected share of \$498.3 billion. Figure 1.3 illustrates

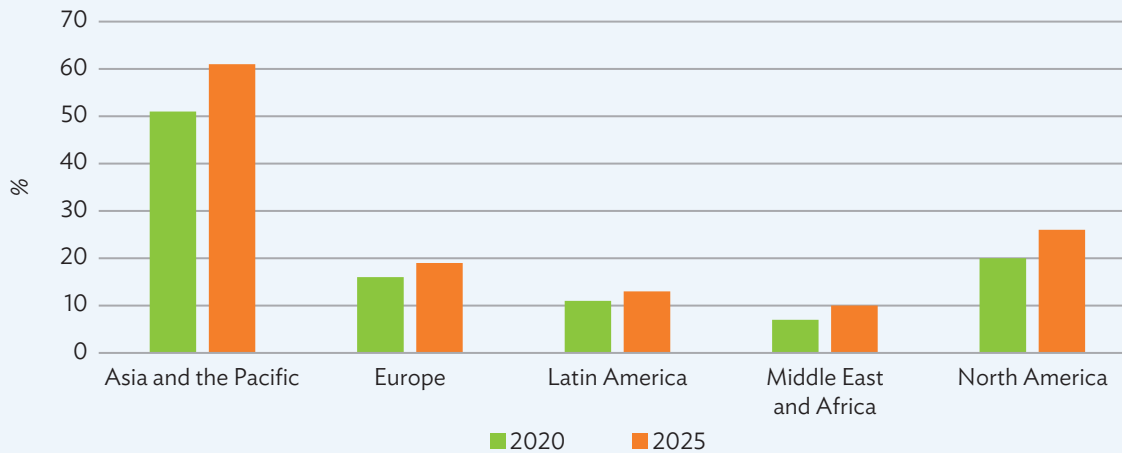
the projected distribution of retail e-commerce sales by region. In e-commerce sales, Asia and the Pacific's share in 2020 is more than half of retail sales and is expected to reach 61% by 2025. North America's share is much lower at only 20% in 2020 to 26% in 2025 followed by Europe, with a 16% share in 2020 expected to expand to 19% in 2025. Asia and the Pacific also had the highest retail e-commerce sales growth in 2019—at 25.0%, compared with global growth of 20.7% (eMarketer 2019). Though North America comes next in volume of sales, its growth rate lags regions like Latin America and the Middle East and Africa with 21.3% growth rate in 2019 (eMarketer 2019).

Figure 1.2: Global E-commerce Sales 2020 Estimate, by Region
(\$ trillion)



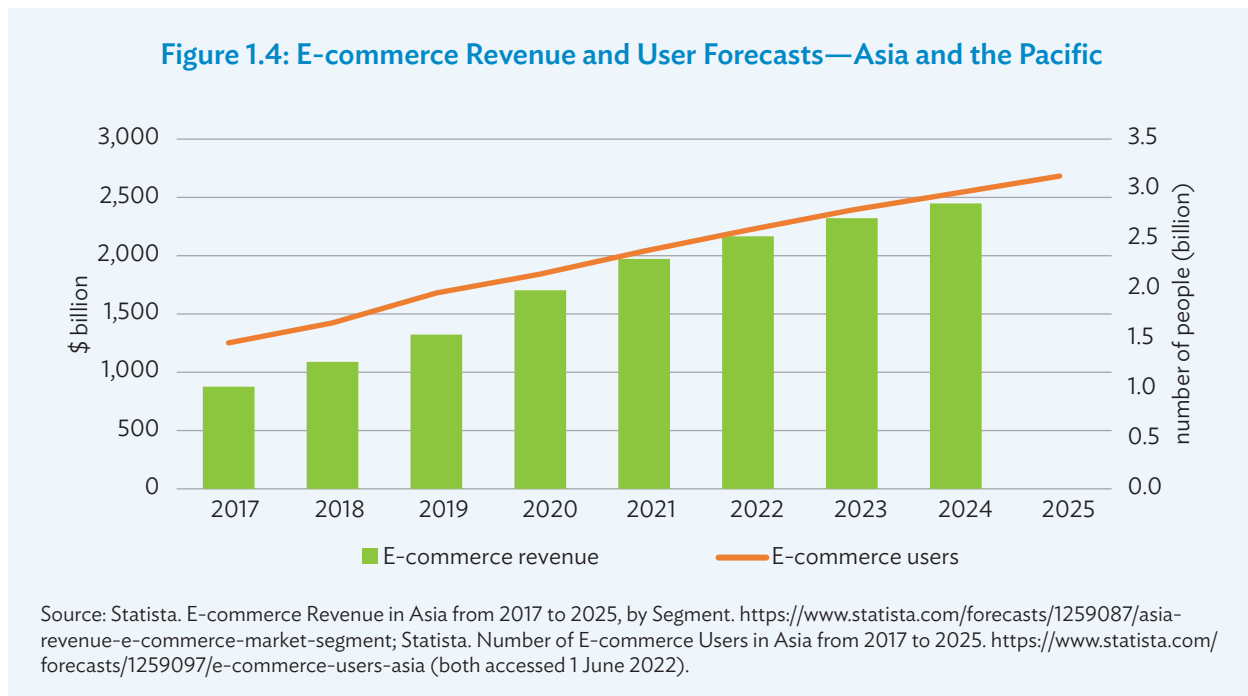
Source: eMarketer. Global Ecommerce 2020. <https://www.emarketer.com/content/global-ecommerce-2020> (accessed 1 October 2020).

Figure 1.3: E-commerce Share of Retail by Region
(%)



Source: Statista. Key Figures of E-commerce. <https://www.statista.com/statistics/1192717/ecommerce-share-of-retail-by-region/> (accessed 1 June 2022).

About 2.15 billion people were using e-commerce in Asia and the Pacific in 2020. This is expected to increase to 3.13 billion by 2025 (Figure 1.4). The jump speaks to the potential of economies in the region—led by retail shoppers in the PRC, which eShopWorld has characterized as a cash-rich market of technologically savvy millennials who covet high-end goods. E-commerce revenue in the region is projected to reach \$2.5 trillion by 2024.



Southeast Asia is leading the digital transformation.

Meanwhile, a recent report by Facebook and Bain & Company sees Southeast Asia as the subregion at the forefront of digital transformation (Meta 2021). The report says that within 5 years, Southeast Asia's e-commerce gross merchandise value is expected to reach \$254 billion, nearly double its \$132 billion end-2021 value. In another survey by e-Marketer, 5 of the 10 fastest-growing economies in e-commerce retail are in Southeast Asia (Figure 1.5). Singapore and Indonesia are among the economies with online sales increasing by more than 30%.

E-commerce is contributing to inclusive economic development in Asia and the Pacific.

Online marketplaces and major e-commerce players have enabled many small and medium-sized enterprises (SMEs) to expand their businesses to a nationwide or even global scale. SMEs play a key role in Asia and the Pacific, accounting for more than 90% of companies and employing half of the workforce (Faye and Goldblum 2022). Initiatives like the PRC's Alibaba Taobao Villages have helped facilitate e-commerce transactions for SMEs in rural areas. Taobao Villages, which encourage online sales of farm produce and local specialties, began with just three villages in 2009. In August 2019, that had risen to 4,310—with each one's sales exceeding CNY10 million (about \$1.4 million)—across 25 provinces (Wang 2019b). Participating villages sold CNY700 billion

(about \$100 billion) of goods and created 6.8 million jobs in the 12 months to June 2019. It included 660,000 active online shops in 2018, from only 70,000 in 2014 (Wang 2019b). The initiative has also helped close gender gaps in employment—AliResearch and the World Bank found that about a third of e-shop owners and nearly half of Taobao Village employees were women (Wang 2019b). The influx of e-commerce transactions, growing at 30.4% year-on-year in 2018 outpaced the PRC’s overall e-commerce growth (24% nationwide in 2018).



In the wake of the COVID-19 pandemic, SMEs are placing increased efforts on online operations, while physical, bricks-and-mortar stores continue to lose revenue. Governments, online marketplaces, and larger e-commerce players have rolled out several initiatives to help SMEs transition to e-commerce platforms, as have financial services companies. Singapore’s E-commerce Programme, administered by Enterprise Singapore, will cover 90% of setup costs for companies opening stores on Amazon, Lazada, Qoo10, and Shopee (Enterprise Singapore 2020). Platforms like Amazon and Lazada will also waive subscription fees, provide seller support and training. Shopee has also created a “#SGUnited Support Local” campaign that directs online traffic to local sellers and launched their Seller Support Package, providing local businesses with free shipping, fulfillment aid, and marketing support (Markets Insider 2020). The Malaysian government is also collaborating with big e-commerce platforms to encourage and support local SMEs to join the digital ecosystem. Lazada Malaysia CEO Leo Chow noted that Cameron Highlands farmers, who were unable to sell produce on the onset of the pandemic, sold 1.5 tonnes of vegetables per day—two days after they joined the platform (Mashable SE Asia 2020).

Variations in e-commerce development persists across the region.

Asia and the Pacific, despite being the fastest-growing market by global standards, experiences varied levels of development and readiness across its subregions. Table 1.1 lists the e-commerce readiness across a range of economies, based on the United Nations Conference on Trade and Development (UNCTAD) 2020 B2C E-commerce Index.

This index measures an economy's readiness to support e-commerce based on four indicators: (i) individuals using the internet, (ii) the Postal Reliability Index, (iii) secure internet servers, and (iv) account ownership at a financial institution or with a mobile-money-service provider (UNCTAD 2020a). Scores highlight big differences.

Table 1.1: E-commerce B2C Readiness Score—Selected Asian Economies, 2020

| Global Rank | Economy | Score | Global Rank | Economy | Score |
|-------------|-----------------------------|-------|-------------|-------------|-------|
| 4 | Singapore | 94.4 | 63 | Viet Nam | 61.6 |
| 10 | Hong Kong, China | 91.8 | 71 | India | 57.1 |
| 11 | New Zealand | 91.8 | 83 | Indonesia | 50.1 |
| 16 | Australia | 90.6 | 96 | Philippines | 44.7 |
| 18 | Korea, Republic of | 89.8 | 113 | Nepal | 34.3 |
| 20 | Japan | 88.7 | 114 | Bhutan | 33.6 |
| 30 | Malaysia | 81.3 | 115 | Bangladesh | 33.3 |
| 42 | Thailand | 76.0 | 116 | Pakistan | 32.5 |
| 55 | China, People's Republic of | 70.1 | 117 | Cambodia | 31.1 |
| 61 | Mongolia | 65.0 | | | |

B2C = business-to-consumer.

Source: United Nations Conference on Trade and Development. 2020. *The UNCTAD B2C E-Commerce Index 2020*. https://unctad.org/system/files/official-document/tn_unctad_ict4d17_en.pdf (accessed 1 June 2022).

Singapore, which has 89% of its population using the internet, 98% of its population aged 15+ owning accounts at financial institutions, 97 secure internet servers (normalized) per 1 million people, and a 97 Universal Postal Union (UPU) postal reliability index (out of 100), ranks 4th in the world with an index of 94.4 in 2020. It is joined in the global top 20 by Hong Kong, China (91.8, 10th); New Zealand (91.8, 11th); Australia (90.6, 16th); the Republic of Korea (89.8, 18th); and Japan (88.7, 20th). The contrast is stark to some of the least developed economies in the region.

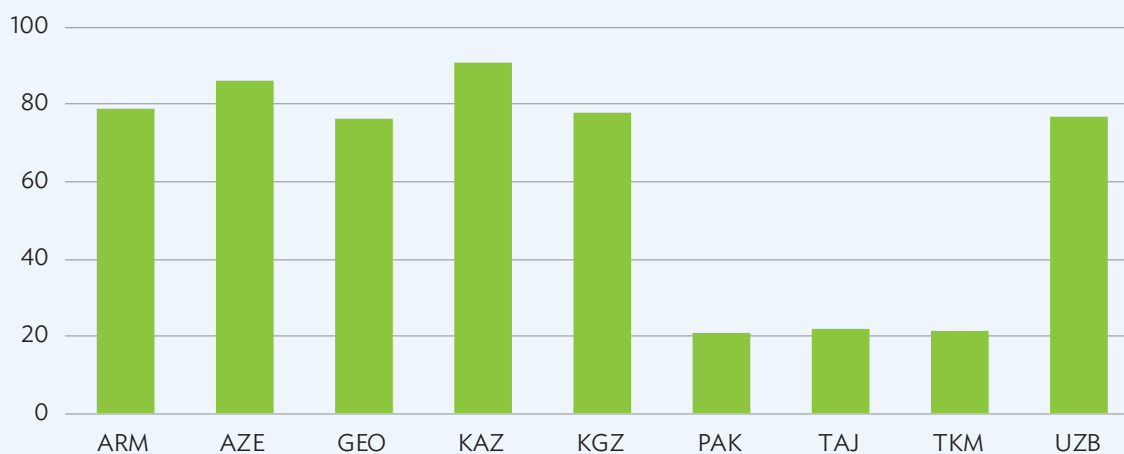
The variation in e-commerce readiness and overall e-commerce market development within Asia and the Pacific can be attributed to several factors. One is the state of cross-border transactions within the region, which includes logistical, legal, and financial issues that affect the market. With cross-border e-commerce projected to account for one-fifth of overall online retail sales volume by 2022, the region's economies are looking to bolster operations (yStats 2018). Another major factor is the state of technology within each market, including broadband, smart device, and other connectivity capabilities and preferences. For instance, consumers in the PRC lead the world in mobile commerce, where 80% of e-commerce spending was generated from mobile devices, compared with a 64.4% global average (Wang 2019a). In terms of broadband speeds, markets in East Asia (including Hong Kong, China; Japan; the PRC; the Republic of Korea; and Taipei, China) have significantly higher mobile and fixed broadband speeds than the global average. Economies in Central and West Asia and South Asia, however, are below the global averages on both mobile and fixed broadband. Technological developments have exponentially sped up the growth of e-commerce, especially within Asia and the Pacific, with blockchain technology, machine learning, AI, virtual and augmented reality, the Internet of Things, voice recognition, and 5G wireless systems all enabling consumers to maximize their e-commerce experiences.

Subregional Overview

Central and West Asia

Figure 1.6. presents an update of internet penetration in Central and West Asia, represented by the number of internet users per 100 inhabitants. Notable changes to the 2016 figures in the previous report have taken place in the subregion. While the top two performing economies remain unchanged, namely Kazakhstan and Azerbaijan, four other economies show significant progress and are almost at a similar level, namely Armenia, the Kyrgyz Republic, Uzbekistan, and Georgia. Kazakhstan and Azerbaijan have the highest internet-use rates, at 91% and 86% of population, followed by Armenia at 79%, the Kyrgyz Republic at 78%, Uzbekistan at 77%, and Georgia at 76%.

Figure 1.6: Internet Penetration—Central and West Asia, 2021
(% of population)



ARM = Armenia, AZE = Azerbaijan, GEO = Georgia, KAZ = Kazakhstan, KGZ = Kyrgyz Republic, PAK = Pakistan, TAJ = Tajikistan, TKM = Turkmenistan, UZB = Uzbekistan.

Note: 2017 data for TAJ and TKM.

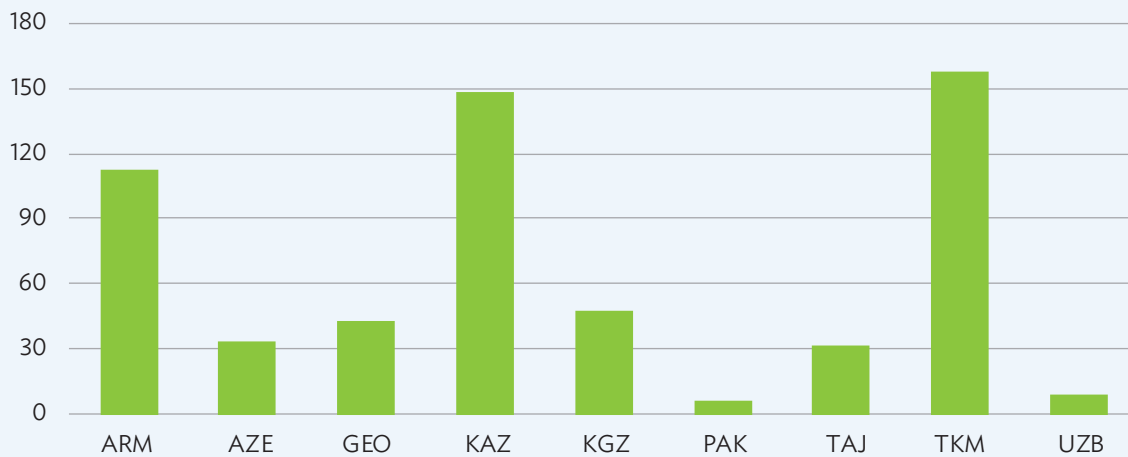
Source: International Telecommunications Union. International Telecommunications Union Datahub. <https://datahub.itu.int/> (accessed 24 February 2023).

In terms of e-commerce growth, most of the subregion's economies experienced an unprecedented surge in internet retail spending per capita, averaging at almost 70% (Figure 1.7). Azerbaijan recorded the largest expansion of e-commerce spending, from only \$2.31 per capita in 2016 to \$33.77 per capita in 2022. Turkmenistan posted the highest level in e-commerce spending at \$158 per capita in 2022 from only \$44.85 per capita in 2016. Kazakhstan follows closely at \$148 per capita in 2022 from only \$27.89 per capita in 2016. Kazakhstan, however, has the region's largest B2C e-commerce market. By the end of 2023, the country is forecast to generate about \$3.45 billion in B2C sales—up by \$573 million from 2022 (Statista 2023).¹ Kazakhstan's postal service, Kazpost, reported over 14 million e-commerce parcels delivered in 2021 (Assaniyaz 2022).

¹ The 2023 data from Statista use current exchange rates and reflect market impacts of the Russian invasion of Ukraine.

The pandemic also boosted Georgia’s e-commerce market as lockdowns forced local consumers and companies to buy and sell online. Internet retail spending increased from \$20 per capita in 2019 to \$43 per capita in 2022 (Figure 1.7). The size of the e-commerce market in the country increased to 33% year-on-year to the equivalent of about \$560 million in 2021. The e-commerce share in total (local and cross-border) retail was up from 11% in 2018 to 23% in 2020 (Yerevan 2021). In Azerbaijan, B2C e-commerce in Azerbaijan is in its infancy but rapidly developing, having one of the region’s highest internet-user penetration rates. Internet retail spending jumped from \$9.89 per capita in 2019 to \$33.77 per capita in 2022.

Figure 1.7: Internet Retail Spending per Capita—Central and West Asia, 2022
(\$)



ARM = Armenia, AZE = Azerbaijan, GEO = Georgia, KAZ = Kazakhstan, KGZ = Kyrgyz Republic, PAK = Pakistan, TAJ = Tajikistan, TKM = Turkmenistan, UZB = Uzbekistan.

Source: Euromonitor. Euromonitor International Passport Database. <https://www.euromonitor.com/our-expertise/passport> (accessed 22 February 2023).

Overall, the B2C e-commerce in the subregion is still at its early stages for economies lagging behind. For the more developed economies in the region, the growth prospect of e-commerce will improve as e-commerce retail value and internet penetration rates continue to expand.

International e-commerce vendors and platforms are the major players in the Central and West Asian e-commerce market. In Uzbekistan—the most populous country in the subregion—big e-commerce players such as Aliexpress.com, eBay.com, and Amazon.com dominate (yStats.com 2015). In Azerbaijan, young internet users prefer international platforms such as eBay (yStats.com 2015). Meanwhile, in Kazakhstan, foreign online vendors are also dominant.

Meanwhile, some economies have also introduced specific local online platforms and differing systems for e-commerce activities. In Kazakhstan, as an example, the Mundus Agri platform is a unique online information and trading platform in the global agri-food and agricultural market (Republic of Kazakhstan 2021). The country aims to expand and simplify possible access of Kazakh producers to trading platforms. Georgia’s local e-commerce websites such as Adjara.com and Tbconline.ge surpass the top global online platforms (Glopal 2022). Azerbaijan, meanwhile, has established a national platform called Azexport, a more common marketplace for local products and an intermediary platform that lists goods of local businesses and represents local sellers free of charge.

This platform has agreements and several registered accounts on global e-commerce marketplaces including Amazon, Alibaba, eBay, and Wish (EU4Digital 2021).²

The EU4Digital initiative supported by the European Union introduces another system—so-called virtual warehouses in Armenia, Azerbaijan, and Georgia. The online system allows sellers to store key information about their products, which helps retailers place such products for international sale and assists delivery operators and customs in making cross-border delivery as seamless as possible (EU Neighbours East 2021). The Central Asia Regional Economic Cooperation (CAREC) Digital Strategy 2030, launched in February 2022, aims to establish a common CAREC Digital Space to enable the development of new digital products and services, initiate digital transformation, and foster data sharing across the subregion (ADB 2022c). Under the digital strategy, CAREC member countries will work together to eliminate legal barriers in cross-border trade and harmonize policies to enable e-commerce development (including e-payments) across CAREC sectors (ADB 2022c).

East Asia

East Asia remains the world's largest and most advanced e-commerce market in Asia and the Pacific with the PRC, Japan, and the Republic of Korea leading the market. Internet and mobile penetration across the subregion averages 87% (2021) and 149% (2022). The Republic of Korea takes the lead in terms of internet penetration, posting 97.6% of internet users in 2021. Japan, on the other hand, surpasses the rest of the economies in terms of mobile penetration with a record of 227% users in 2022 (Figure 1.8).

Figure 1.9 shows the per capita internet retail spending for economies in East Asia in 2022. The Republic of Korea far exceeds the rest of the economies with a record of \$2,580 internet retail spending per capita followed by Hong Kong, China at \$1,407 per capita. The PRC is still at a relatively low level with \$779 spending per capita. Nevertheless, with its massive population, the PRC has maintained its 2016 position as the biggest market. The e-commerce market accounted for nearly 40% of the country's gross domestic product (GDP) in 2021, where more than a quarter of its physical goods were sold online, far above the 19% global average (Ma 2023a). Revenue is expected to reach \$1,487 billion by 2023 (Statista 2023b). Demand was driven by a huge population of cash-rich millennials with a keen desire to shop online and across borders (eShopWorld 2020). In eShopWorld's 2019 Global E-commerce Market Rankings, the PRC consistently scored first in two key metrics (out of eight): market size and cross-border shopping (Table 1.2).

Table 1.2: eShopWorld Global E-commerce Market Rankings, 2019

| Rank | Overall | Revenue per Shopper | Largest Markets | Logistics | Cross-Border Shopping | Growth | Markets to Watch | Peak Season Uplift |
|------------|---------|---------------------|-----------------|-----------|-----------------------|-------------|------------------|--------------------|
| 1st | US | US | PRC | Germany | PRC | India | Thailand | Ireland |
| 2nd | PRC | Norway | US | Sweden | US | Malaysia | South Africa | Italy |
| 3rd | UK | UK | Japan | Belgium | India | Indonesia | New Zealand | Poland |
| 4th | Japan | Denmark | UK | Austria | Russian Federation | Philippines | Romania | Denmark |
| 5th | Germany | Austria | Germany | Japan | Mexico | Viet Nam | Estonia | Netherlands |

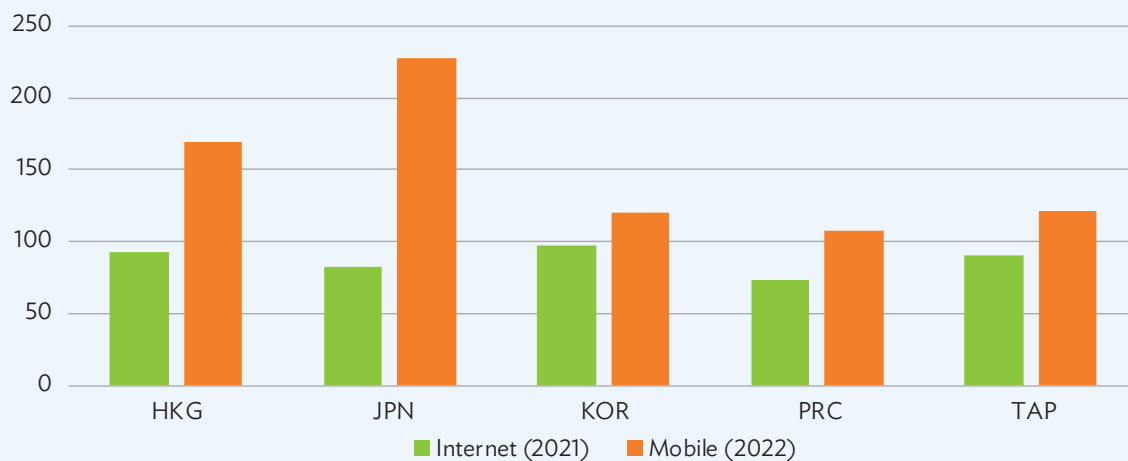
PRC = People's Republic of China, UK = United Kingdom, US = United States.

Source: eShopWorld. 2020. *Global Ecommerce Market Ranking*. https://www.worldretailcongress.com/___media/Global_ecommerce_Market_Ranking_2019_001.pdf (accessed 15 January 2021).

² In Azerbaijan, B2B is the most common transaction type, while B2C is possible in principle.

UNCTAD reports that 25% of PRC retail sales were done online in 2020, up from 19% in 2019 (UNCTAD 2021b). In 2021, more than half of global e-commerce retail sales were to the PRC's customers, surpassing the sales value of Europe and the United States combined. By 2025, the PRC's e-commerce revenue is expected to reach \$2 trillion (Statista 2023b). The PRC is home to the world's most prominent e-commerce platforms, such as Alibaba, Pinduoduo, and JD.com. The potential for further expansion of the PRC's e-commerce market is shown by its internet retail spending per capita, at \$780 in 2022, and internet penetration rate of 73% being lower than most economies in East Asia (Figures 1.8 and 1.9).

Figure 1.8: Internet and Mobile Penetration—East Asia
(% of population)



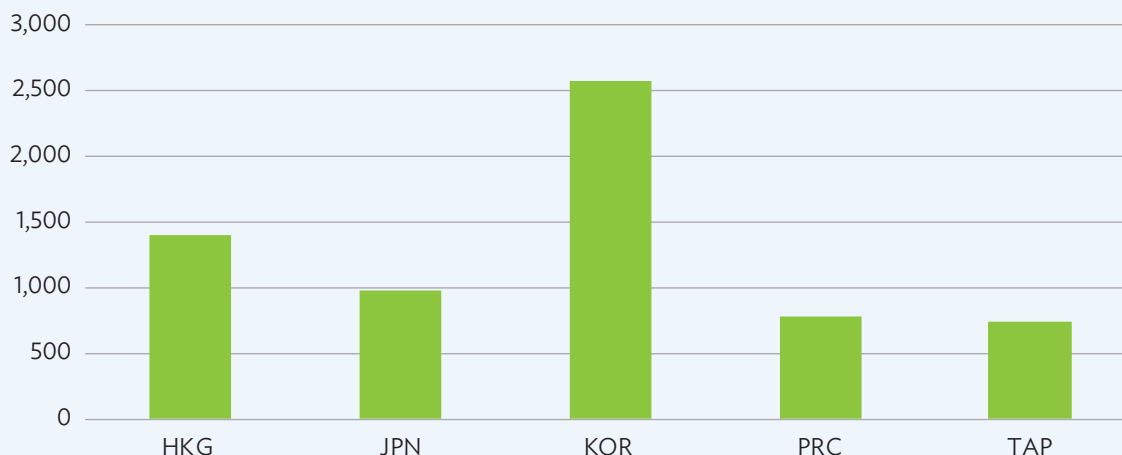
HKG = Hong Kong, China; JPN = Japan; KOR = Republic of Korea; PRC = People's Republic of China; TAP = Taipei, China.

Source: Euromonitor. Euromonitor International Passport Database. <https://www.euromonitor.com/our-expertise/passport> (accessed 23 February 2023); International Telecommunications Union. International Telecommunications Union Datahub. <https://datahub.itu.int/> (accessed 24 February 2023).

Japan, meanwhile, is the world's fourth largest e-commerce market following the PRC, the United States, and the United Kingdom (Digital Marketing For Asia 2022). The country's B2C online market size has increased steadily from \$99 billion in 2019 to \$165 billion in 2021, and \$154 billion in 2022 (Statista 2023c). Japan's per capita internet retail spending is \$980 in 2022 and 83% of its population have internet access (Figures 1.8 and 1.9). However, despite having excellent logistics infrastructure—ranked 5th worldwide by eShopWorld through an aggregated rating of delivery experience and supply chain efficiency—the market tends to be overlooked due to its atypical low cross-border purchase rate and limited and narrow approach to online shopping (Kaplan 2020). The profile of Japanese consumers is marked by a rapidly aging population (older people comprising 30% of the total in 2021), and they have a high average order spend. Shopify's merchant survey and study on global sales data report that Japanese consumers spent the most per transaction at \$141.72, followed by Canada at \$100.66, and Singapore at \$91.09 (Shopify 2019).

Although Japan generated significant gains in the e-commerce market for tangible products during the national lockdown, its service industry shrank notably, particularly for services linked to tourism, such as travel bookings, food and beverages, and ticket sales (Digital Marketing For Asia 2022). This caused the size of the B2C market

Figure 1.9: Internet Retail Spending per Capita—East Asia, 2022
(\$)



HKG = Hong Kong, China; JAP = Japan; KOR = Republic of Korea; PRC = People's Republic of China; TAP = Taipei, China.

Source: Euromonitor. Euromonitor International Passport Database. <https://www.euromonitor.com/our-expertise/passport> (accessed 22 February 2023).

to contract moderately from ¥19.36 trillion in 2019 to ¥19.28 trillion in 2020.³ Japan's B2C market still has a lot of room for growth given its low rate of online retail adoption. The share of e-commerce sales is only 6.8% and is smaller than in other large markets such as the United States, where the share was estimated at close to 14% by the end of 2021 (Digital Marketing For Asia 2022). This is attributed to local consumers still choosing to buy from retail stores since online shopping limits the chance to inspect goods for size and defects (Diep 2022). Rakuten is Japan's most popular B2C e-commerce platform as it allows merchants to create their own digital storefronts and customize their design (Digital Marketing for Asia 2022). Because of their inclination toward the local market, non-American foreign companies wishing to sell on e-commerce platforms, such as Rakuten and Yahoo Shopping, need to either start a local company or partner with a local intermediary (Rakuten 2021).

Across East Asian economies, the Republic of Korea has the highest per capita internet retail spending. It reached \$2,713 in 2021, almost three times the estimate for Japan. It is also the sixth-largest e-commerce market, ahead of France, according to eCommerceDB. Given the Republic of Korea's large consumer society, e-commerce holds a strong position and is supported by having the subregion's highest internet penetration, with 98% of the population having access. E-commerce sales volume has rapidly increased since 2010, growing at an annual average of 20% reaching the equivalent of \$164 billion in 2021 from only \$30 billion in 2012 (Statista 2022d). The Republic of Korea's most popular online shopping platform is [coupang.com](https://www.coupang.com), which is especially popular for offering next-day delivery. Besides e-commerce, mobile commerce has a lot of room to expand, accounting for 75% of total online shopping transaction value in 2022 (Jobst 2023). A large percentage of total online transaction value comes from mobile transactions. These are expected to continue, with surveys reporting about 37% of mobile shoppers have installed between four and six mobile shopping apps on their smartphones (Jobst 2022).

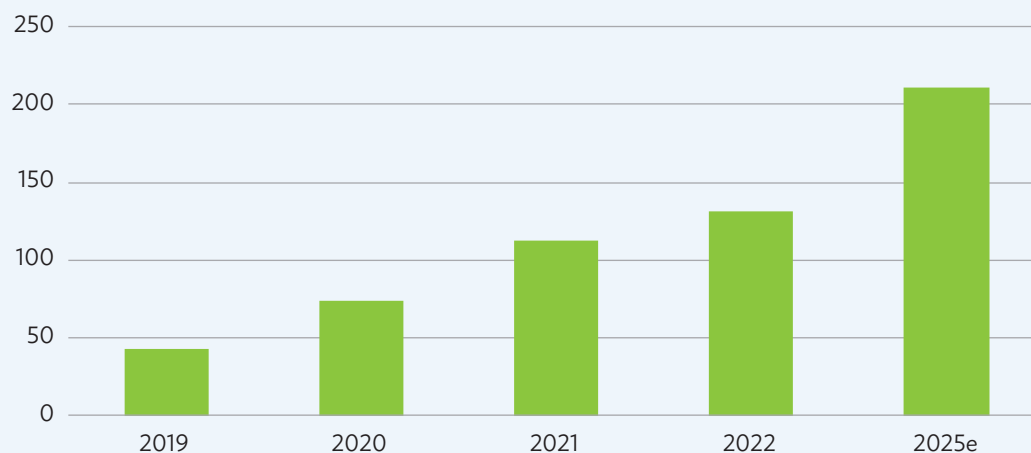
³ Converted to US dollars, the figures show an increase from \$178 billion in 2019 to \$181 billion in 2020.

Mongolia, meanwhile, remains an emerging e-commerce market with moderate development over the past years. During the pandemic, growth picked up as it got more attention from manufacturers and customers, both local and international. E-commerce market revenue is projected to reach \$516 million in 2024 and is generated mostly from the neighboring PRC (Statista 2023d). Internet user penetration was estimated at 35% in 2022, projected to rise to 44.6% in 2025 (Statista 2023d). According to one study, the Mongolian e-commerce market is expected to see tremendous growth over the next few years (Gantulga, Sampil, and Davaatseren 2021). In 2022, UNCTAD partnered with the Republic of Korea and the European Bank for Reconstruction and Development in carrying out the assessment of Mongolia's e-trade readiness including a review of the opportunities for e-commerce development and policy recommendations (UNCTAD 2022a).

Southeast Asia

Although the e-commerce ecosystem in the Southeast Asian subregion is still nascent, the market has been growing rapidly and outpaces the rest of its Asian neighboring economies. With the creation of better digital infrastructure, e-commerce business models, and digital policies, among others, the subregion has vast potential for expansion. E-commerce market value totaled \$131 billion in 2022 from only \$43 billion in 2019. This is projected to expand to \$211 billion in 2025, almost double the current value (Figure 1.10). Retail e-commerce sales, meanwhile, is at \$111 billion in 2021 and is expected to increase to \$171 billion by 2025 (Statista 2023e). The subregion's growth of 20.6% in retail e-commerce in 2022 stands out among all other economies and regions globally (Cramer-Flood 2022). In addition, only four economies reported faster growth rates than the combined figure of Southeast Asia. Two of these, however, still belong in the subregion, namely the Philippines and Indonesia.

Figure 1.10: E-commerce Market Value—Southeast Asia
(\$ billion)



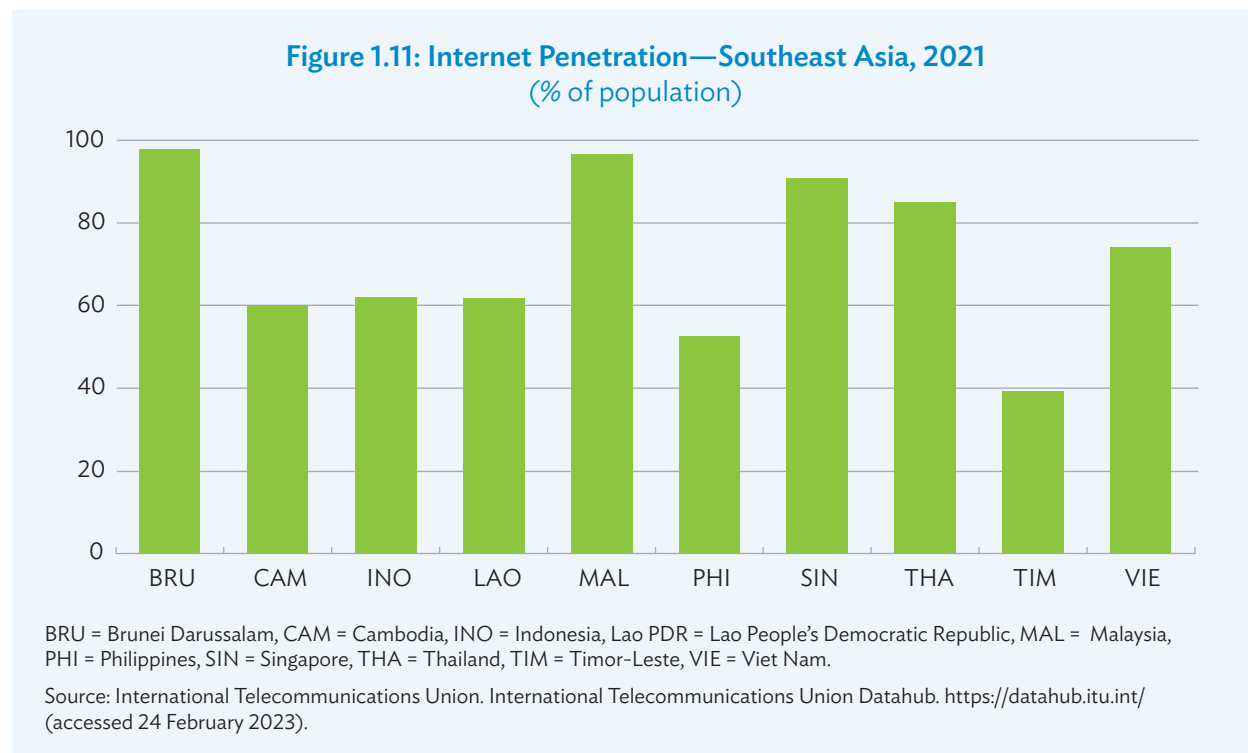
e = estimate.

Source: Statista. E-commerce. <https://www.statista.com/statistics/958414/southeast-asia-e-commerce-market-value/> (accessed 23 February 2023).

In overall market size, Indonesia leads the region with e-commerce sales of \$30.10 billion in 2020 and is projected to reach \$68.12 billion in 2025 (Statista 2023d). The country also ranks first in internet economy size valued at \$70 billion, more than twice the size of the second ranking country, Thailand, which has a market size of \$30 billion (Google 2021). The Philippines, on the other hand, ranks first in retail e-commerce growth in 2022 posting 25.9% growth. Five economies within the region—Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam—will rank among the top 10 markets worldwide measured by retail e-commerce sales growth by the end of 2022 (Cramer-Flood 2022).

The subregion’s rapid growth is largely driven by a spike in digital consumers since the pandemic began. Facebook estimates that since the start of the pandemic, 70 million people in Southeast Asia have become digital consumers, with about 30 million joining those ranks from 2020 to 2021 alone (Meta 2021). According to a Google report, the aggregate internet penetration in Southeast Asia grew to 75% by the end of 2021 (Google 2021).

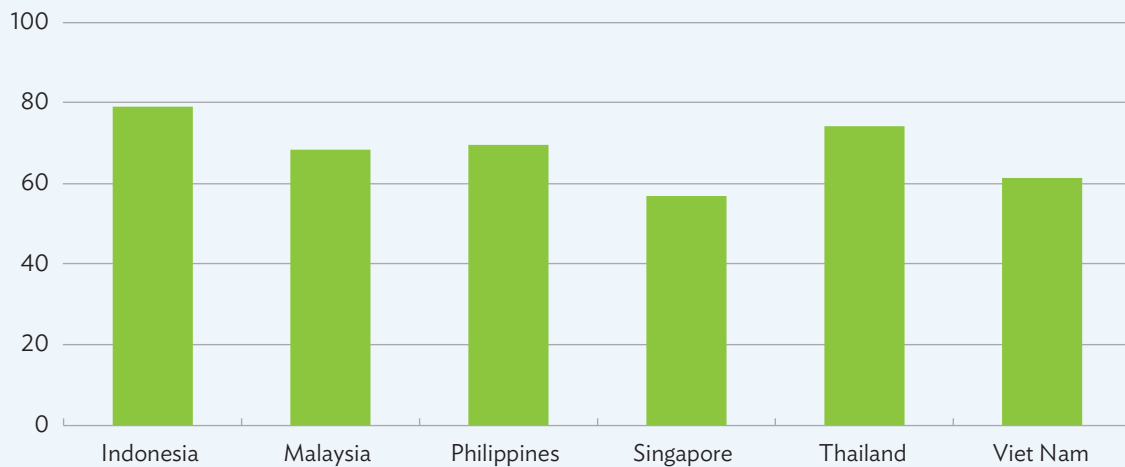
Vast room exists for growth across all economies in the subregion. Southeast Asia’s high internet and smartphone penetration have expanded the market for mobile commerce in the region. In 2022, there were about 516.5 million internet users in Southeast Asia alone (Statista 2023f). The International Telecommunication Union (ITU) found that, in 2021, 8 of the 10 Southeast Asian states had internet penetration above 60%, and leading the way were Brunei Darussalam at 98.1% and Malaysia at 96.8% (Figure 1.11). The Philippines and Thailand are also within the top five economies with the most time per day spent using the internet, with users aged 16 to 64 spending over 5 hours a day online in the Philippines and over 4 hours a day in Thailand (WeAreSocial 2019).



The region also leads the world in mobile internet connectivity, with 90% of consumers making use of smartphones. Figure 1.12 shows high m-commerce penetration in 2020 for economies like Indonesia (79%), Thailand (74%), the Philippines (70%), and Malaysia (68%). Econsultancy’s (2018) survey of online shoppers in Southeast Asia found

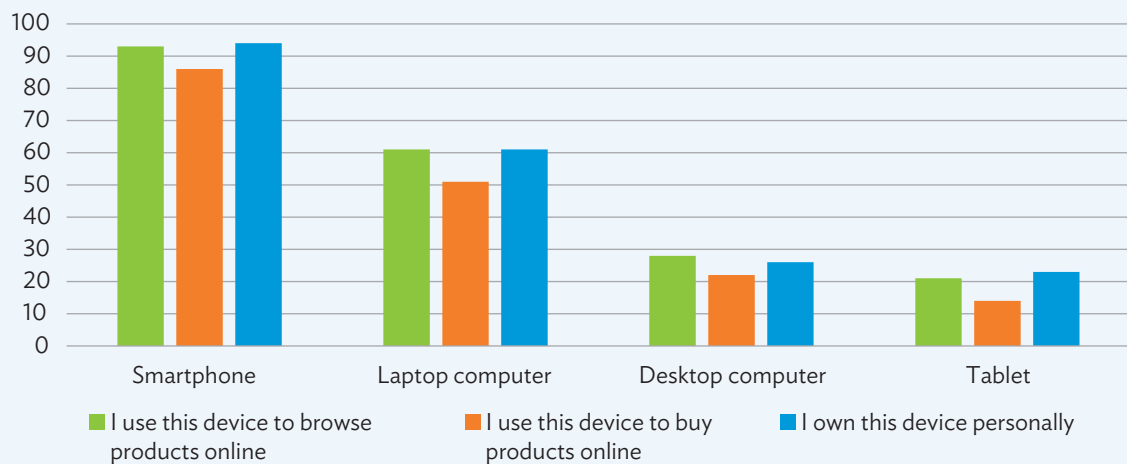
that smartphone use is far ahead of other devices like desktop computers, laptop computers, and tablets. Figure 1.13 shows that smartphones are the most widely used device for shopping, with 86% of respondents saying they have used the device to buy products online. About half (51%) of respondents used laptops for online purchases.

Figure 1.12: Active Mobile Commerce Penetration—Southeast Asia, 2020
(% of population)

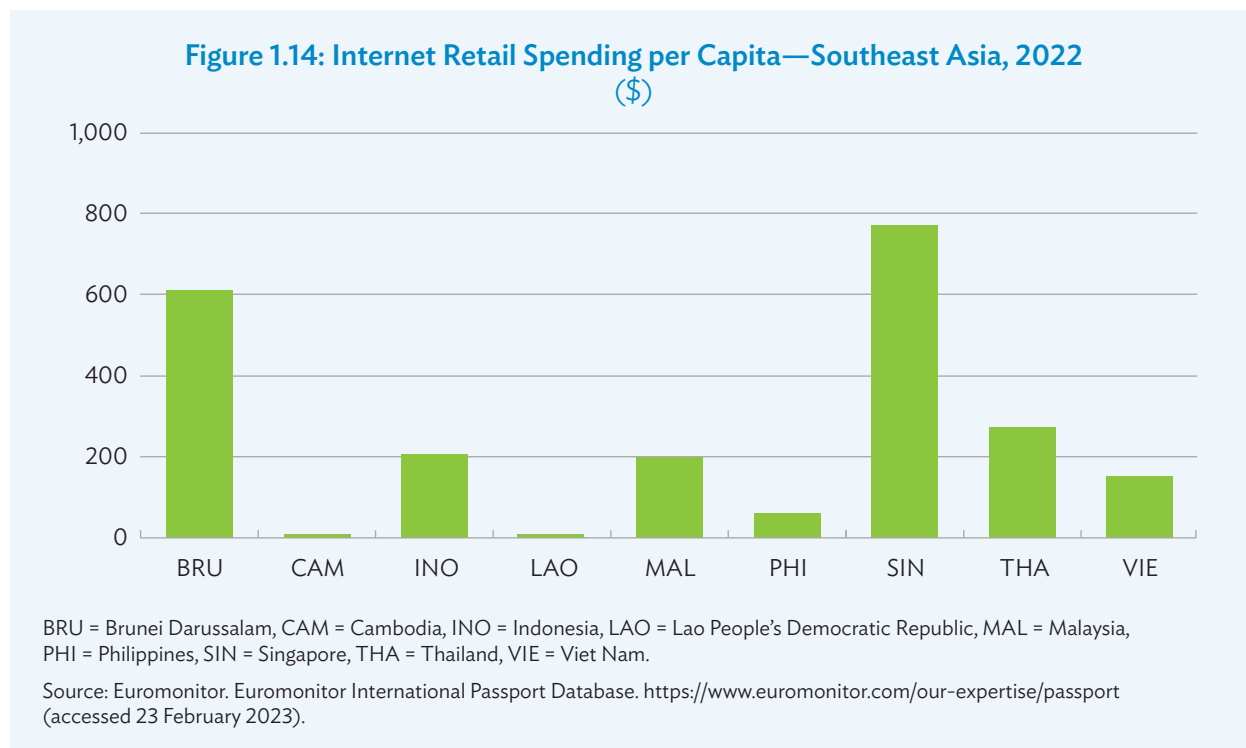


Source: Statista. 2022. E-commerce. <https://www.statista.com/statistics/255214/mobile-commerce-penetration-in-asia-pacific-countries/> (accessed 1 February 2023).

Figure 1.13: Electronic Device Used for Shopping—Southeast Asia, 2018
(% of respondents)



Source: Statista. 2021. E-commerce. <https://www.statista.com/statistics/967403/southeast-asia-shopping-from-electronic-devices-by-reason/> (accessed 1 October 2020).



In terms of retail spending, Singapore continues to pose the highest per capita e-commerce spending at \$772.25 per capita in 2022 from only \$389.8 per capita in 2019 (pre-COVID-19 pandemic) (Figure 1.14). It is almost 3 times the e-commerce spending in Thailand which is at \$273.4 per capita. Meanwhile, exponential growth from pre-pandemic levels is seen in Malaysia (\$112 per capita in 2019 to \$200 per capita in 2022) and Indonesia (\$66 per capita in 2019 to \$207 per capita in 2021). The Philippines, at \$60.3 per capita, and Viet Nam, posting \$153 per capita, lag in 2022.

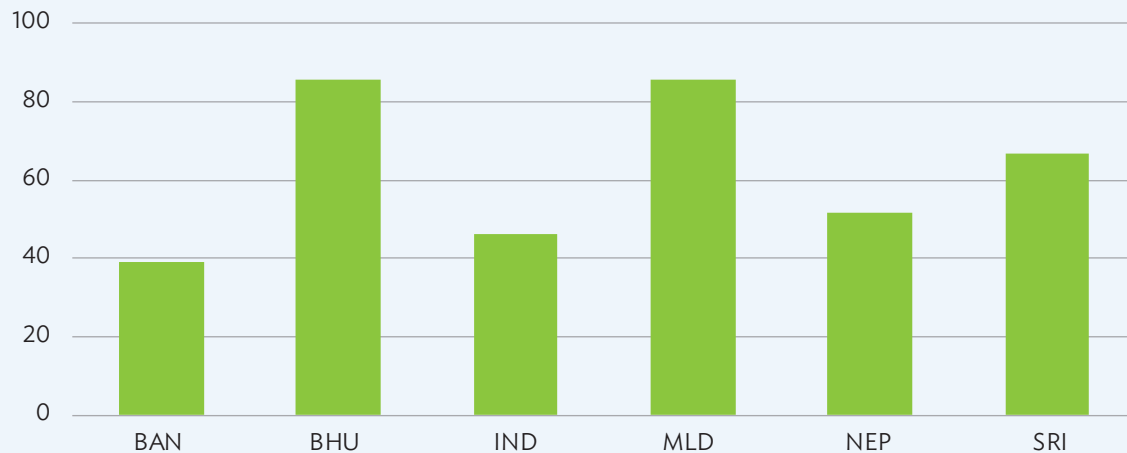
With the rapid growth of e-commerce and the potential for businesses in the subregion, the Association of Southeast Asian Nations (ASEAN) economic ministers initiated the ASEAN Agreement on Electronic Commerce in January 2019, which established common rules and regulations of e-commerce in the region. The agreement entered into force on 2 December 2021 and aims to (i) facilitate growth of e-commerce transactions in the subregion, (ii) foster a regionally integrated digital economy, and (iii) contribute to the economic recovery of the subregion following the pandemic (ASEAN 2021a). In line with the ASEAN agreement on e-commerce, the Bank Indonesia and the Bank of Thailand have implemented a cross-border QR payment linkage between the two countries with some 76 payment service providers available. The payment linkage allows consumers in Indonesia to pay for goods or services in Thailand by scanning Thai QR codes. On the other hand, Thai consumers can use their mobile applications to scan the Quick Response Code Indonesian Standard to pay for goods and services in Indonesia (Medina 2022).

Several multinational e-commerce platforms are also supporting the subregion in several areas. Lazada is supporting the Asia-Pacific Economic Cooperation (APEC) 2022 initiatives in driving the Southeast Asian subregion's digital trade and economy with the help of its core expertise and infrastructure across technology, payments and logistics (Data & Storage ASEAN 2022). In January 2023, Thailand launched its first digital free trade hub in partnership with Alibaba. The free trade hub lies within the country's Eastern Economic Corridor and is designed to boost cross border e-commerce between Thailand and the PRC (Koty 2023). Amazon also signed an agreement with Viet Nam in 2022 which covers training of 10,000 local businesses in areas such as market research, product selection and listing, brand registration, and protection (Le 2022). Such initiative is aimed toward connecting Viet Nam sellers to Amazon's global customers.

South Asia

While e-commerce has grown in South Asia over the years, it remains way below potential and is driven by the market size of India. The subregion has fallen far behind the rest of the world in reaping the benefits of e-commerce. Wide variations are seen in related indicators of e-commerce activity within the subregion. Internet penetration rates in 2021 show Maldives and Bhutan as the top-performing economies with about 86% of the population having access to the internet. (Figure 1.15). Maldives also has the highest per capita spending in internet retail at \$190.8 per capita, dwarfing the rest of the economies in the subregion, which only reached an average of \$26.8 per capita (Figure 1.16).

Figure 1.15: Internet Penetration—South Asia, 2021
(% of population)



BAN = Bangladesh, BHU = Bhutan, IND = India, MLD = Maldives, NEP = Nepal, SRI = Sri Lanka.

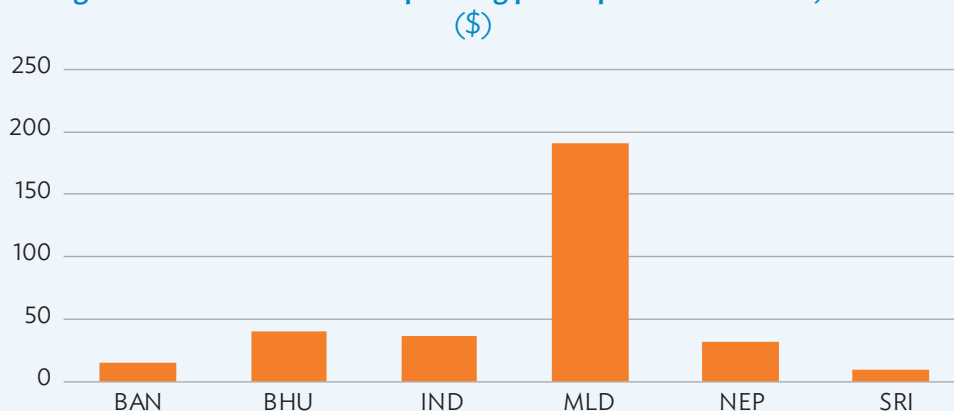
Note: 2019 for Bangladesh and 2018 for India.

Source: International Telecommunications Union. International Telecommunications Union Datahub. <https://datahub.itu.int/> (accessed 24 February 2023).

The gap is present both with shoppers and within the marketplace—only half of the firms in South Asia are connected to the internet market and sell online. The World Bank's report on South Asian e-commerce found that while intraregional trade accounts for a large part of total trade in other regions such as East Asia (50%), in South Asia it accounts for only 5%—stemming from high tariffs and nontariff barriers, logistical infrastructure and facilitation shortcomings, and the weakness of regional value chains (World Bank 2022). These issues largely hold back potential revenues for businesses in the region, especially SMEs. Another report states that SMEs could increase exports, employment, and productivity by as much as 20%–30% if the hurdles were removed (Kathuria et al. 2020). Because of this, South Asia's main trade partners in the e-commerce industry come from farther away: the PRC, the United Kingdom, and the United States.

The subregion needs massive measures to catch up. Many cite connectivity and their IT backbone as a major barrier for e-commerce, including cross-border online market. Some demonstrate very low internet access rates, and per capital internet retail spending. While there are e-commerce players, consumers rely mostly on facebook.com for their online shopping (Choudhury 2019). In Sri Lanka, the market depends on home-grown companies given that global e-commerce players such as Amazon or Alibaba are absent (Choudhury 2019).

Figure 1.16: Internet Retail Spending per Capita—South Asia, 2022



BAN = Bangladesh, BHU = Bhutan, IND = India, MLD = Maldives, NEP = Nepal, SRI = Sri Lanka.

Source: Euromonitor. Euromonitor International Passport Database. <https://www.euromonitor.com/our-expertise/passport> (accessed 23 February 2023).

Most digital reform measures in the subregion currently take place at the national level with few subregional initiatives and agreements. In Nepal, a national QR initiative was established in 2020 to improve the e-payments system (World Bank 2022). Digital payments were subsequently adopted on a wider scale through the Nepal Clearing House Ltd (NCHL), a public limited company under the guidance of the Nepal Rastra Bank, the country's central bank.⁴ The NCHL has completed the rollout of the Retail Payment Switch, which established (i) non-card-based transaction interoperability for routing and settlement transactions, and (ii) NEPALPAY QR for government payout and revenue collection. The NCHL is currently implementing the Interoperable Card Switch and Domestic Card Scheme, which enable interoperability of card-based transactions. The Royal Monetary Authority of Bhutan launched an e-commerce portal (www.bhutanmade.bt) promoting products made in the country and connecting businesses to the international market via e-commerce (SASEC 2021). To support the website, different stakeholders in the country also developed an e-commerce policy, associated regulatory frameworks, and product standardization and logistics to promote high quality products and foster trust among the website's consumers (SASEC 2021). The "Daraz Connect" in Sri Lanka was launched in October 2022, which is a national outreach initiative that aims to develop sellers to engage in e-commerce business (Daily FT 2022). The initiative focuses on digital knowledge awareness and capacity building to encourage more local producers, micro, small, and medium-sized enterprises (MSMEs), and consumers to connect via the digital platform especially in the rural areas. The United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) has also launched the project "E-Commerce Capacity Building for Women-led MSMEs in South Asia" and has initiated the National Training for Women Entrepreneurs on Promoting Business through E-Commerce and Digital Marketing in Sri Lanka in November 2022 (Colombo Page 2022).

Oceania

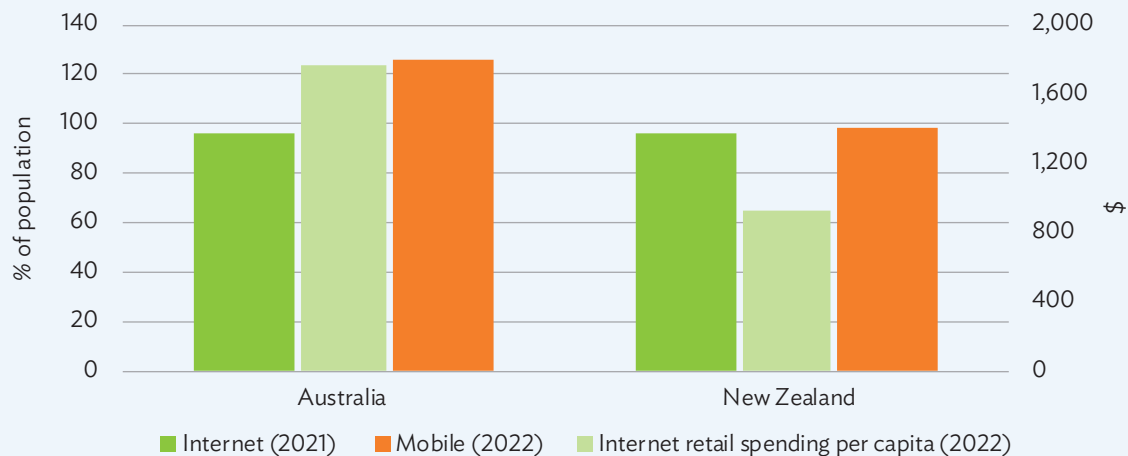
In Oceania, Australia and New Zealand both have highly developed e-commerce markets, and e-commerce has seen exponential growth in 2020. This has made Australia and New Zealand the two fastest-growing e-commerce markets in the world. Both showed a 108% growth spike in the second quarter of 2020, followed by a continued 107% jump

⁴ Nepal Clearing House Ltd. Overview. <https://nchl.com.np/about>.

in the third quarter of the year (Devanesan 2021). Multiple reports cite how online retailers in both economies are seeing rapid growth in sales volume, online traffic, and order size. Australia and New Zealand's internet penetration rates are at 96% and Australia's mobile penetration is at 126%, comparable to other major players in Asia and the Pacific such as the PRC (108%) and the Republic of Korea (120%) (Figure 1.17). New Zealand's mobile penetration, meanwhile, comes close at 98%.

In Australia, online purchase volumes soared from A\$32.1 billion in 2019 to A\$50.46 billion online in 2020, which accounts for 16.3% of retail spend, excluding cafés, restaurants, and takeaway food (Australia Post 2021). Another big winner over the increase in online spending is food delivery services, with Uber Eats coming out as the top e-commerce platform and closely followed by Menulog and Deliveroo. Amazon Australia has seen a significant increase in downloads of its mobile app (Statista Research Department 2023). The country's per capita internet spending also surged in 2022 to \$1,766, from \$887 in 2019. That was higher than that of the PRC and Japan but lower than the Republic of Korea (Figure 1.17).

Figure 1.17: Internet and Mobile Penetration and Internet Retail Spending per Capita—Oceania



Source: Euromonitor. Euromonitor International Passport Database. <https://www.euromonitor.com/our-expertise/passport> (accessed 15 March 2022).

New Zealand, meanwhile, has a relatively small e-commerce market, although with strong potential to expand given its large base of internet users. In 2021, the country's internet penetration rate was 91% while its e-commerce penetration rate was 67%, with up to 3 million e-commerce users in that year. Net e-commerce sales were estimated at \$2 billion, with food and personal care the main category. The country's e-commerce sector features high cross-border transactions, positive responses to e-commerce events, and strong growth in rural spending (JP Morgan 2019a). New Zealand's rural online shopping growth has outperformed growth in urban areas. In 2019, online spending increased by 15% year-on-year in rural areas, 12% in the metropolitan region, and 14% in urban areas. Cross-border transactions also have a large share of the e-commerce market of New Zealand, accounting for \$1.8 billion in sales and 44% of total online shopping in 2019 (JP Morgan 2019a).

Across Asia and the Pacific, the Oceania subregion has the largest share of e-commerce consumers that shop cross-border. New Zealand's e-commerce market is largely driven by cross-border transactions, accounting for a

third of the total e-commerce sales pre-pandemic (JP Morgan 2020). The sectors taking up most of cross-border online shopping in 2020 include recreation, entertainment, books (55%); clothing and footwear (42%); and health and beauty (38%), among others (New Zealand Post 2021). Australia and the PRC hold the largest share of cross-border purchases in New Zealand, with 57% of locals purchasing from Australia and 50% purchasing from the PRC. Both countries account for a third of the total international purchases in 2020 (New Zealand Post 2021).

Similarly, Australia's e-commerce market also features a large share in cross-border transactions as majority of online shoppers purchase international goods, which generated more online sales than from local retailers (JP Morgan 2019b). However, local e-commerce expanded over the years and the pandemic caused significant disruptions in international trade, which led to a contraction in cross-border e-commerce (Australia Post 2021). By 2021, only about 20% of Australians purchase products from overseas (International Trade Administration 2022). Australia is currently leading the negotiations of the ongoing World Trade Organization (WTO) Joint Statement Initiative on E-commerce (JSI) together with co-convenors Japan and Singapore. The JSI aims to address the gap in global trade rules and develop a global standard on digital trade that meets the needs and challenges of a digital economy (Department of Foreign Affairs and Trade n.d.). In December 2022, the JSI negotiation established a streamlined text on 10 articles, namely "paperless trading, electronic contracts, electronic authentication and electronic signatures, unsolicited commercial electronic messages, online consumer protection, open government data, open internet access, transparency, cybersecurity, and electronic transactions frameworks" (WTO 2023, p. 1).

Pacific

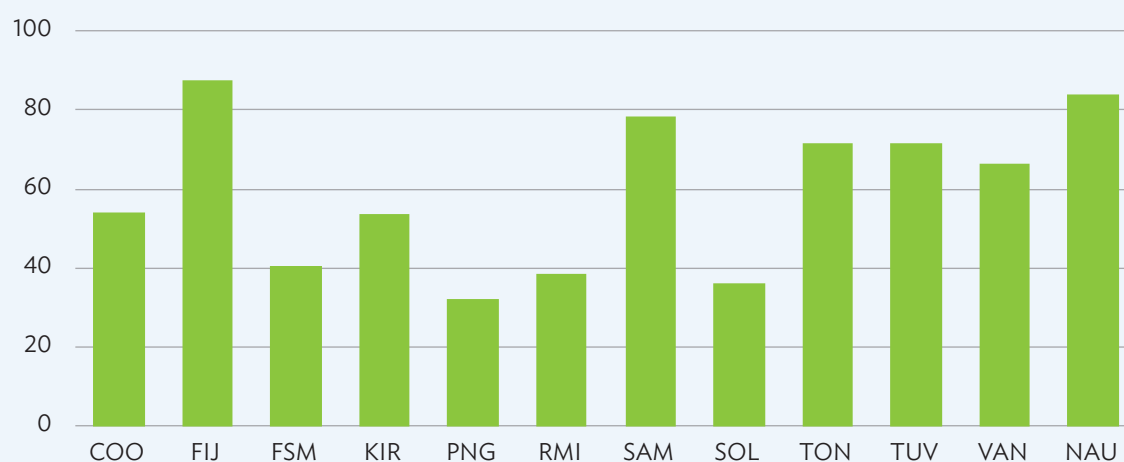
E-commerce in the Pacific subregion remains underdeveloped and must contend with hard infrastructure and institutional challenges. Fiji ranked 107th out of 176 economies in 2017 in the ICT Development Index, the highest ranking in the region. Based on the Universal Postal Union (UPU) Postal Development Index, 6 out of 8 Pacific Islands Forum countries are classified in the lowest category, which is the least developing operators (PIF Secretariat 2020). Tonga and Fiji are classified as potential performers, though still considered to be in a lower-middle category.

The subregion posted an overall internet penetration rate of 60% (average) in 2021. Four out of the 12 economies in the subregion (the Federated States of Micronesia, Papua New Guinea, the Marshall Islands, and Solomon Islands) have internet penetration rates below 50% (Figure 1.18). It is important to note that in the Pacific, internet penetration is highest in economies with a larger urban population. As an example, Nauru, which has a 100% urban population, also has one of the highest rates of internet users in the subregion at 84%. In contrast, Papua New Guinea has only 13% urban population and has the lowest internet penetration rate, at about 32% of the total population. However, the country, as the largest economy in the Pacific, has 498 secure internet servers in 2019, the highest among all the Pacific island countries (PIF Secretariat 2020). Fiji lags far behind at 187, followed by Vanuatu at 105. Mobile connectivity is also an important aspect in the Pacific since most people in the subregion access the internet through a mobile phone. Cellular subscriptions in the subregion have increased steadily from 52% in 2010 to 70% in 2017 while fixed broadband subscriptions are stagnating (PIF Secretariat 2020).

In the subregion, e-commerce activities are largely driven by tourism, as it is considered a "pillar of economic growth" (PIF Secretariat 2013). The World Bank's World Development Indicators reports that 2015 tourism receipts-to-GDP for Fiji were at 23.2%, at 32.8% in Vanuatu, and 43.1% in Palau. However, in the wake of the pandemic, the subregion's tourism sector shrank significantly. The *Asian Economic Integration Report 2022* cites tourism receipts (as % of GDP) dropping from 17.5% in 2019 to 3.6% in 2020 in Fiji; from 30.1% to 5.8% in Vanuatu; and from 23.6% to 2.9% in Samoa. A few years earlier, the South Pacific Tourism Organization, in partnership with the European Union, initiated an e-commerce project supporting SME internet use for online booking sales and processing. There were up to 7,816 enquiries and 2,345 bookings between April 2012 and December 2014 in 165 websites (WTO and OECD 2017).

Several initiatives have been implemented to assist the subregion in developing its e-commerce market. August 2021 saw the publication of a new regional strategy, the Pacific Regional E-commerce Strategy Roadmap for 2021 to 2026. The road map, which was endorsed by the Pacific Islands Forum trade ministers, provides guidance for the Pacific e-commerce business and stakeholders to employ the most effective ways to boost the region's digital trade readiness from 2021 to 2026 (Pacific Islands Forum Secretariat 2021). It prioritizes regional measures across seven policy areas such as (i) national e-commerce readiness and strategy formulation, (ii) ICT infrastructure and services, (iii) trade logistics and trade facilitation, (iv) legal and institutional framework, (v) electronic payment solutions, (vi) e-commerce skill development, and (vii) access to finance for e-commerce (Pacific Islands Forum Secretariat 2021). The strategy estimated that the measures would cost \$55 million, not including infrastructure works (Pacific Islands Forum Secretariat 2021).

Figure 1.18: Internet Penetration—Pacific, 2021
(% of population)



COO = Cook Islands, FIJ = Fiji, FSM = Federated States of Micronesia, KIR = Kiribati, PNG = Papua New Guinea, RMI = Marshall Islands, SAM = Samoa, SOL = Solomon Islands, TON = Tonga, TUV = Tuvalu, VAN = Vanuatu, NAU = Nauru.

Note: 2016 data for COO, and 2017 for RMI.

Source: International Telecommunications Union. International Telecommunications Union Datahub. <https://datahub.itu.int/> (accessed 24 February 2023).

Another subregional initiative is the Pacific Digital Economy Programme, which the United Nations Capital Development Fund, United Nations Development Programme, and UNCTAD run jointly to support the inclusive development of digital economies.⁵ The Pacific Digital Economy Programme is aligned with the Pacific E-commerce Strategy and Roadmap and works closely with the Pacific Island Forum Secretariat to implement the program. The program is funded by the Australian government and is expected to run from mid-2021 to mid-2023, with a possible extension to 2026.

⁵ UNCTAD. Pacific Digital Economy Programme. <https://unctad.org/topic/ecommerce-and-digital-economy/pacific-digital-economy-programme>.

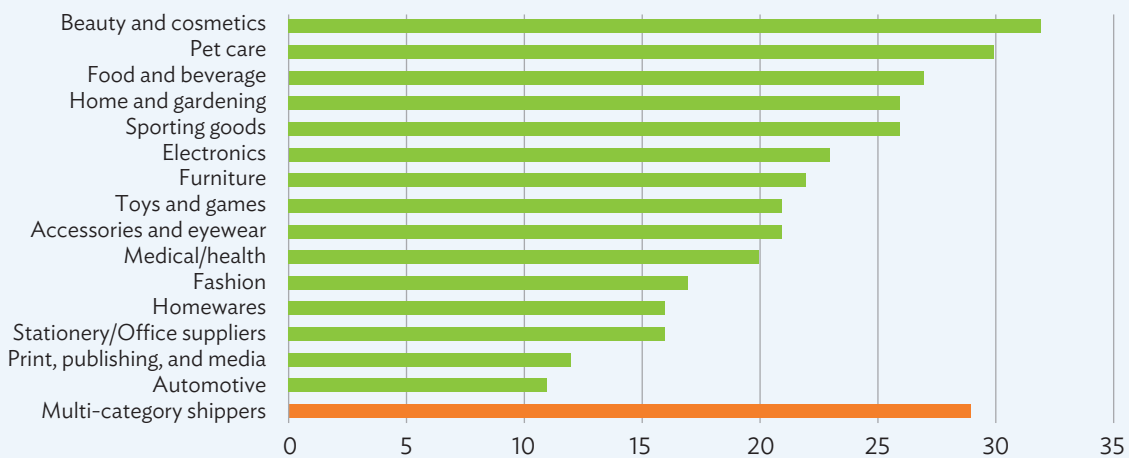
Rapid expansion of cross-border e-commerce is helping the region expand its global market reach.

Cross-border e-commerce is continuing its rapid growth globally and across the region. Statista reports on cross-border B2C e-commerce estimated market value worldwide to be at \$785 billion, and expected to reach \$7.9 trillion by the year 2030 (Pasquali 2023). However, it is important to note that estimates of cross-border e-commerce vary widely. This is because it is difficult to separate data on e-commerce shipments from traditional trade. Though various factors, such as complex border crossing procedures, regulatory burdens, logistical issues, language barriers, and differences in payment capabilities, impede cross-border e-commerce expansion, estimates still point to persisting cross-border e-commerce growth.

Around 330 million online shoppers—22.7% of the 1.45 billion online shoppers aged 15+ globally—made cross-border purchases in 2018. The share of cross-border online shoppers to total online shoppers rose 6 percentage points—from 17% in 2017 to 23% in 2018 (UNCTAD 2021b). Accenture also estimated that in 2019, cross-border e-commerce transactions represented 20% of global e-commerce (Accenture 2019).

Asia and the Pacific continues to show much more growth and volume in cross-border e-commerce compared with other regions. The region was expected to contribute about 48% of total global cross-border B2C e-commerce sales at \$476 billion, followed by Western Europe and Scandinavian countries at \$146 billion in 2020 (Ganbold 2021; Coppola 2023). In Singapore, cross-border e-commerce market totaled \$2.15 billion in 2020, which accounted for 35% of the nation’s overall e-commerce market (Oi 2022). The PRC’s cross-border e-commerce remained strong and is expected to be at the forefront of growth in cross-border transactions globally. In 2022, the country’s total trade volume from cross-border e-commerce players reached an estimated CNY15.7 trillion (about \$2.4 trillion) (Ma 2023b).

Figure 1.19: Revenue Growth per Category via Cross-Border Trade, Asia and the Pacific, 2017 (%)



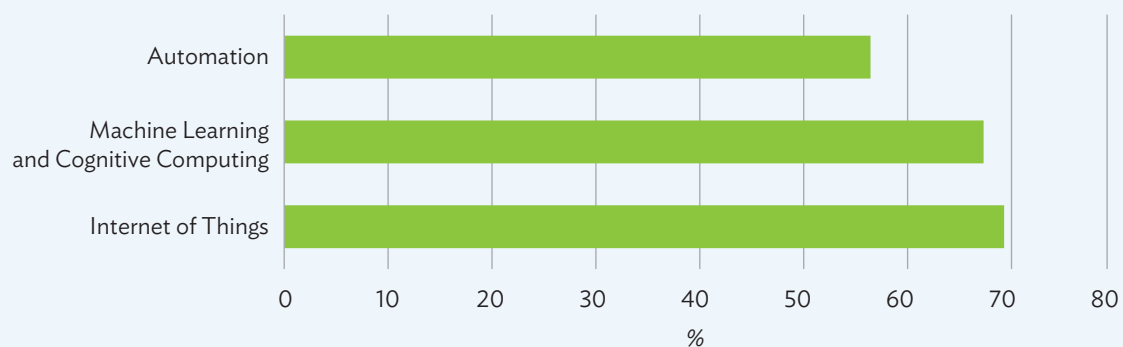
Source: McKinsey, *Exporter Survey 2017 (Single-Category E-tailers)* as cited in eTail and Vinculum. 2019. *Winning at Cross-Border eCommerce*. https://www.luxasia.com/wp-content/uploads/2019/05/11-March_eTail-Asia-Winning-at-Cross-Border-E-commerce.pdf (accessed 15 January 2021).

Relative to domestic e-commerce, cross-border e-commerce is gaining momentum at a much faster pace. Globally, cross-border sales are growing at two times the rate of domestic e-commerce sales, at 29% compound annual growth rate (CAGR) (Accenture 2019). Additionally, a report by DHL states that online retailers managed to increase sales by somewhere between 10% and 15% by catering to the international market (DHL 2016). Figure 1.19 provides the results of an exporter survey by McKinsey in 2017, showing that sellers from almost every product category expected substantial growth thanks to cross-border trade—especially in beauty and cosmetics, pet care, food and beverage, and sporting goods.

The development of technology advances all facets of the e-commerce value chain.

Increasingly evolving technologies in counterfeit detection, supply chain enhancements, search and shopping methods, and connectivity have continued to build up the e-commerce chain in Asia and the Pacific. This allowed safer transactions, creating more efficient logistics systems, and improving customer satisfaction and targeting, among other advances. Markets and firms across the world—especially in the region—have continued to implement these technologies to great effect. Statista cites that spending on intelligent process automation is estimated at \$10.9 billion in 2021 and will expand to \$13 billion by 2023. Artificial intelligence (AI) business operations expenditures are expected to expand from merely \$4 billion in 2021 to \$10.8 billion in 2023 (Statista 2023g). Global spending on robotic process automation is estimated to increase to \$10.4 billion in 2023 from \$5.4 billion in 2021 (Statista 2023g). A retail vision study by Zebra in 2017 found that by 2021, a significant share of retailers plan to invest in Internet of Things capabilities (70%), machine learning and cognitive computing (68%), and automation (57%), as shown in Figure 1.20. To lay down the foundation for these retailers and other firms, connectivity between devices, tools, and appliances are of utmost importance to companies in ensuring smoother retail and logistical operations.

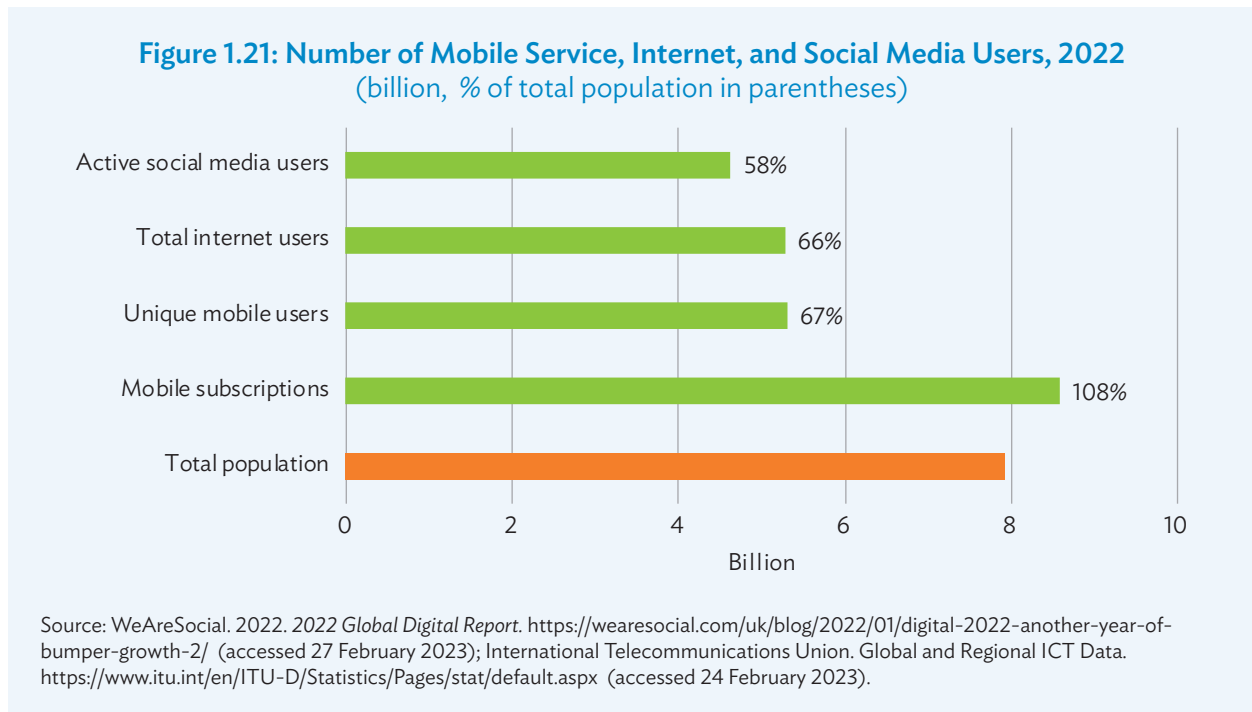
Figure 1.20: Percentage of Retailers Planning to Invest by 2021
(%)



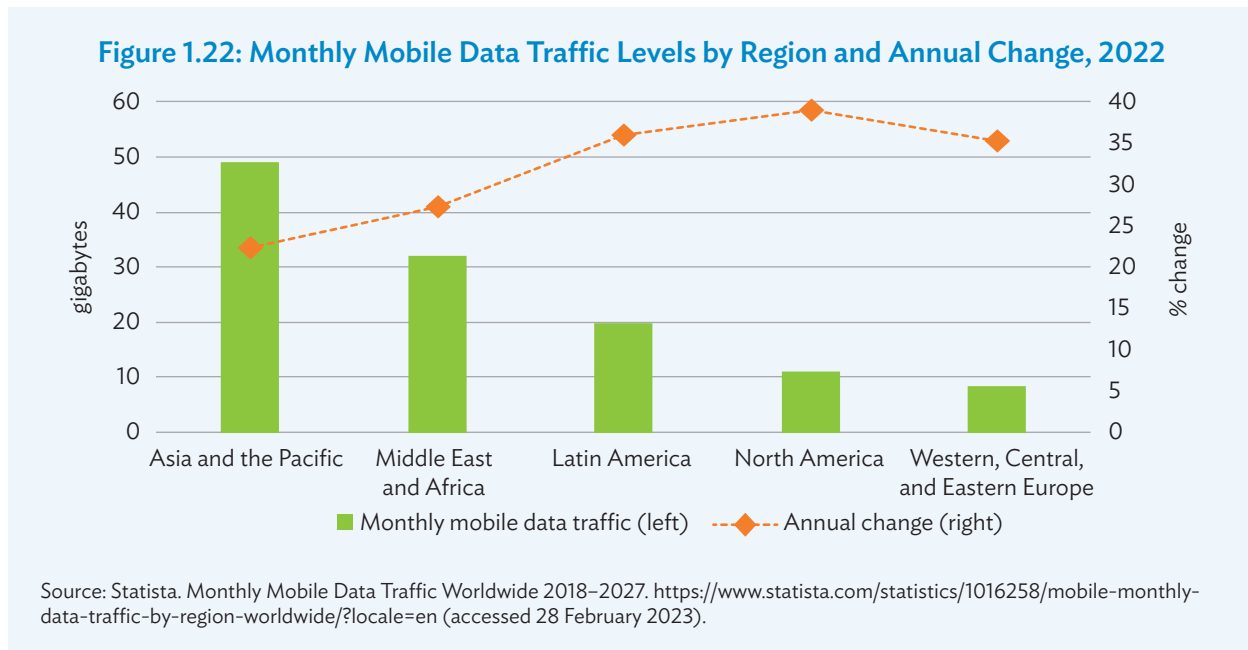
Source: Zebra. 2017. *2017 Retail Vision Study*. https://www.zebra.com/content/dam/zebra_new_ia/en-us/solutions-verticals/vertical-solutions/retail/vision-study/retail-vision-study-2017-en-us.pdf (accessed 1 October 2020).

For firms in Asia and the Pacific, the customer experience is at the center of their ventures in the digital space. According to a study by Tofugear on retailers' interest in digital initiatives, improving customer experience and understanding customer behavior are critical in the current retail landscape where customer needs continue to evolve along with advances in retail technology (Tofugear 2020).

One major aspect of technology and e-commerce that has risen in usage and innovation in recent years is m-commerce. As of November 2022, the ITU reports that across Asia and the Pacific, the number of mobile subscriptions now exceeds the population. Figure 1.21 illustrates the comparative volume of mobile service, internet, and social media use with total population worldwide. Internet users across the globe are estimated at about 66% of the total population, while mobile phone subscription accounted for 108% and active social media users are at 58%. Figure 1.22 compares regional mobile data traffic levels, with users in Asia and the Pacific largely dwarfing their global counterparts in data traffic. Total monthly data traffic to smartphones in Asia and the Pacific alone reached 49.16 gigabytes, significantly higher than the region with the second-highest data traffic level, Europe. Consumers use mobile data to research, communicate, and increasingly, make their online purchases. M-commerce has eclipsed desktop or laptop sales in Asia and the Pacific and in five out of nine major markets studied by Rakuten Advertising (Rakuten Advertising 2019).



AI, along with automation, virtual and augmented reality, natural language processing, and machine learning methods, is taking off within the region as well. The global market intelligence organization, International Data Corporation, reports that 14% of Southeast Asian organizations have adopted AI methods and strategies and that another 37% of organizations plan to introduce AI-related initiatives over 5 years (International Data Corporation 2018). In 2019, Singapore launched its National Artificial Intelligence Strategy and invested over S\$ million to fund AI-related activities and research. As more and more users transition to mobile and smart devices such as Amazon’s Echo and Google’s Nest, there have been substantial increases in interactive uses—chatbots, image search, and voice shopping. OC&C Strategy Consultants (2018) estimates that 55% of households in the United States (US) are expected to own smart speaker devices by 2022, which is a 42 percentage point increase from the current ownership of 13%. Natural language processing through chatbots and voice shopping allows companies to understand consumer needs and preferences and eventually personalize the shopping experience.



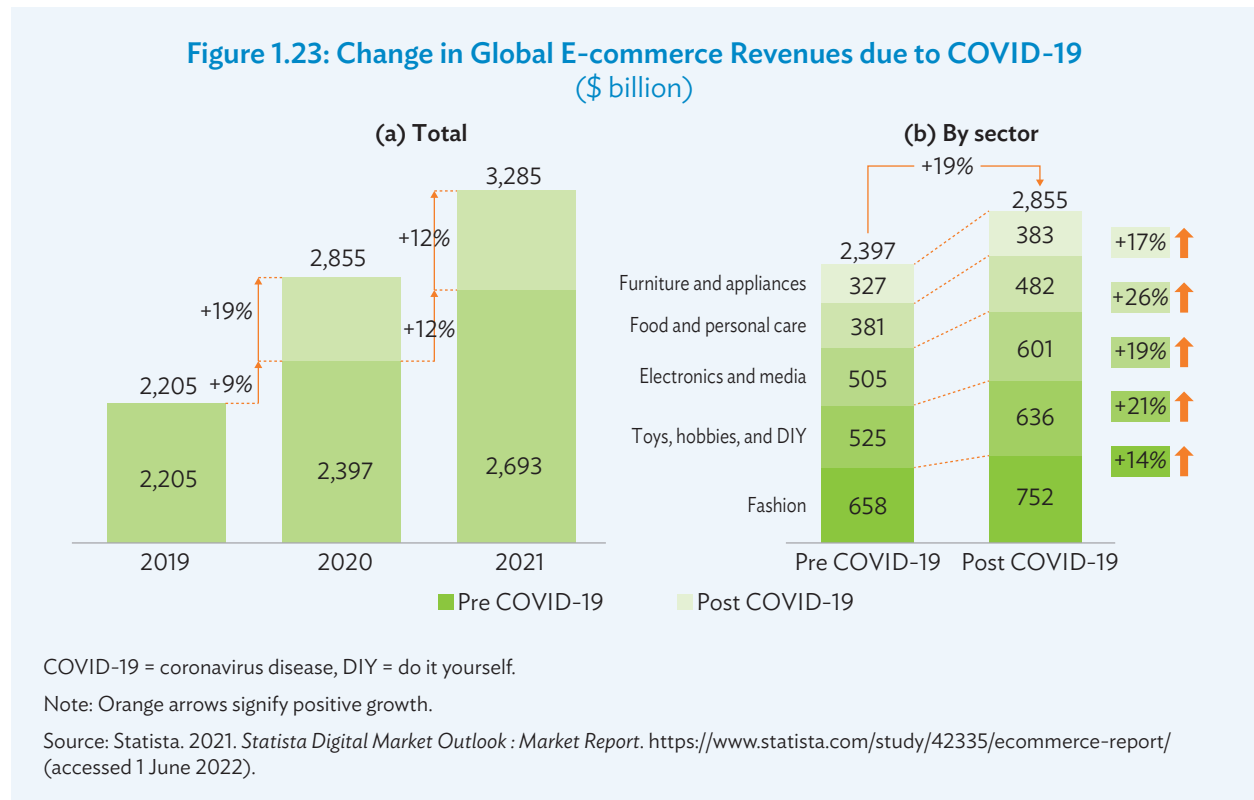
COVID-19 Pandemic: Major Impacts on E-commerce

The pandemic has, like previous worldwide crises, introduced substantial and long-lasting changes to consumer behavior and digital adoption. Past health-related threats, like the SARS epidemic in the PRC and the MERS outbreak in the Republic of Korea, increased dependence on e-commerce (Yendamuri, Keswakaroon, and Lim 2020). The 2008 global financial crisis led to the shared economy and the rise of companies like Uber and Airbnb. It may be too early to conclude how the pandemic reshaped economic activities and societal behavior in 2020, and early evidence has shown a substantial behavioral transition toward acquiring goods and services online. As a consequence, the world witnessed a sharp expansion of e-commerce at a rate much higher than previously expected. But beyond the obvious impacts observed firsthand by most consumers and online businesses during the crisis, there were underlying negative changes and events that transpired as the world struggled to keep most economic activities afloat while keeping up with COVID-19 safety measures. Such negative factors had major impact on e-commerce and the digital economy. This section will discuss some of these observations in the aftermath of the pandemic in accelerating the e-commerce growth and the potential downside of the pandemic on its impact on e-commerce.

The e-commerce sector boom is due to the extensive shift from traditional retail.

Statista's *Digital Market Outlook 2021* estimates an overall increase in growth rate of 28% for global e-commerce revenues between 2019 and 2020—19% of which is solely attributed to the post-pandemic scenario, as illustrated in Figure 1.23a. Instead of an increase to \$2.397 trillion, global e-commerce is now expected to rake in \$2.855 trillion by the end of 2020. Consequently, an increase in 2021 is also expected from 12% to 22% growth or \$2.693 trillion (pre-pandemic projection) to \$3.285 trillion (post-pandemic projection) (Figure 1.23). The report also cites food and personal care as having a large increase as online groceries and toiletries (hygiene products) proliferated.

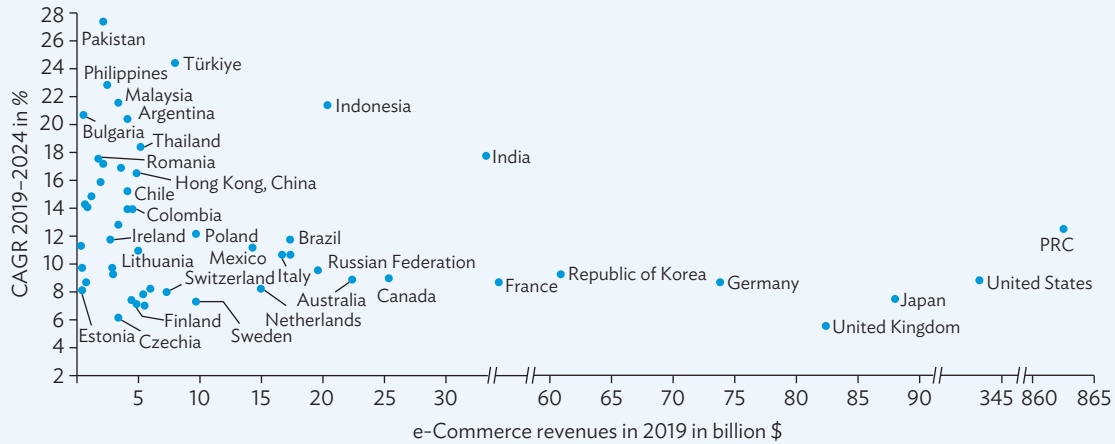
The food market, which became in demand in the wake of the worldwide lockdown, is seen as one of the most profitable sectors in the e-commerce sphere. The food and personal care category reported 26% growth from \$381 billion pre-pandemic to \$482 billion post-pandemic (Figure 1.23b). The segment will expand but not replace traditional bricks-and-mortar shopping. Instead, it provides another option for consumers, through click-and-collect and online-to-offline commerce. Fashion, on the other hand, was hit in the first part of 2020 although it picked up and increased by 14% from the pre-pandemic estimation. However, the segment still produced the largest share of revenue before and after the pandemic—\$752 billion post-pandemic from \$658 billion pre-pandemic.



Market Impacts in Asia and the Pacific

The effects of the pandemic on e-commerce are not limited to its short-term outlook. The PRC had the highest e-commerce revenue in 2019 at \$862.6 billion and this is estimated to balloon by 12.5% CAGR to \$1.556 trillion in 2024. Developing Asian economies, meanwhile, are expected to see the highest growth rates from 2019 to 2024, as seen in Figure 1.24. Markets in Central Asia, South Asia, and Southeast Asia that are estimated to grow at a CAGR above 17% in the 5-year period, include India, Indonesia, Malaysia, Pakistan, the Philippines, and Thailand. Apart from India and Indonesia, these economies garnered e-commerce revenues below most of the selected markets, including high-revenue counterparts in the region, such as the PRC, Japan, and the Republic of Korea (Statista 2020a).

Figure 1.24: E-commerce Revenues of Selected Markets



CAGR = compound annual growth rate, PRC = People's Republic of China.

Source: Statista. 2020. *E-commerce 2020: Trends and Outlook*. <https://www.statista.com/study/42335/ecommerce-report/> (accessed 1 October 2020).

An International Monetary Fund (IMF) report in January 2022 investigated e-commerce during the pandemic using a unique database provided by Mastercard. The report used data from 47 economies across 26 sectors between January 2018 and September 2021. One observation cited in the report is the significant heterogeneity in the share of online spending across economies, specifically deviations during the COVID-19 pandemic. The IMF report finds that although the crisis level was 2 percentage points higher than the pre-pandemic trend, it was 0.6 percentage points (mean) above the average predicted by pre-pandemic trends (Table 1.3).

Meanwhile, e-commerce in Asia and the Pacific performed better than in most other regions during the pandemic. For the 10 economies in Asia and the Pacific included in the IMF sample analysis, the estimated mean share of online spending over total consumption in 2019 is 14.4%—4.1 percentage points higher than the 10.3% estimate for all 47 economies (Table 1.3). The region reached its “crisis peak” share of online spending of 20.1% which is 5.2 percentage points higher than the average for all samples. The latest estimates are also significantly higher at 16.9% while the difference between this and the pre-pandemic trend is also higher at 0.9 percentage points. This shows a higher deviation for each period observed—5.7 percentage points between crisis peak and pre-pandemic level and 3.2 percentage points between the latest level and crisis peak. Such large deviation as well as the higher online spending in Asia and the Pacific signifies a stronger e-commerce engagement of consumers in the region. This is consistent with much of the estimates observed in other statistical databases in e-commerce market size in Asia and the Pacific.

Table 1.3: Online Share of Retail Sales before and during COVID-19—Selected Asian Economies

| Economy | 2019 Average | Crisis Peak (peak year/month) | Latest | Latest Minus Pre-COVID-19 Trend |
|--|--------------|----------------------------------|-------------|------------------------------------|
| Australia | 28.6 | 32.7 (09/2021) | 32.1 | 2.0 |
| Cambodia | 1.0 | 1.4 (07/2021) | 1.2 | 0.0 |
| Hong Kong, China | 26.0 | 34 (12/2020) | 29.8 | -2.1 |
| India | 4.4 | 7.4 (05/2021) | 6.5 | 0.8 |
| Indonesia | 2.3 | 2.6 (07/2021) | 2.5 | -0.4 |
| Malaysia | 11.7 | 19 (08/2021) | 15.8 | 0.9 |
| New Zealand | 28.3 | 39.2 (04/2020) | 29.0 | 5.1 |
| Philippines | 5.1 | 7.6 (2021/09) | 5.9 | -0.5 |
| Singapore | 27.6 | 43.5 (09/2021) | 34.7 | 3.2 |
| Thailand | 9.4 | 13.7 (08/2021) | 11.9 | 0.0 |
| Mean (Asia and the Pacific) | 14.4 | 20.1 | 16.9 | 0.9 |
| Mean (All — 47 economies) | 10.3 | 14.9 | 12.2 | 0.6 |

Note: Mean estimate for Asia calculated by ADB staff based on International Monetary Fund (IMF) data.

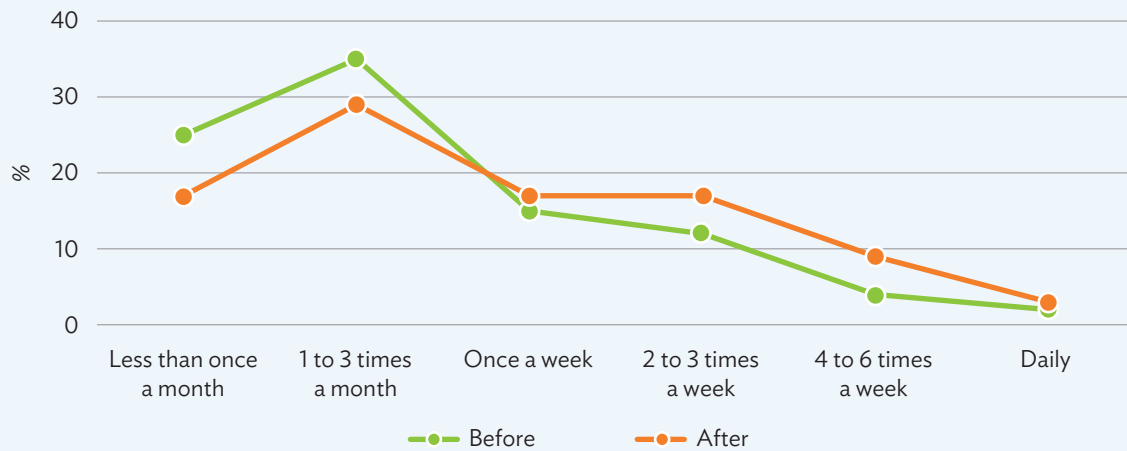
Source: IMF. 2022. *E-Commerce During Covid: Stylized Facts from 47 Economies*. <https://www.imf.org/en/Publications/WP/Issues/2022/01/28/E-commerce-During-Covid-Stylized-Facts-from-47-Economies-512014> (accessed 1 June 2022).

Changes in consumer behavior will sustain growth in digital shopping beyond the pandemic.

The region is set to maintain a high demand in online retail that is expected to last beyond the crisis. The pandemic was the main driver for consumers to switch to digital shopping and as these new digital consumers have become accustomed to online shopping, interest in traditional bricks-and-mortar shopping has declined. A Rakuten Group survey in 2020 looked into the frequency of consumers, purchasing of goods online before and after the pandemic. Before the pandemic, 35% of the survey respondents in the region purchased goods online by up to three times a month while 25% also purchased goods less than once a month. These declined after the pandemic, with 29% of respondents purchasing up to three times a month and 17% shopping less than every month. The same survey now shows that in terms of weekly purchases, the trend has increased from 12% of respondents shopping up to three times a week pre-pandemic to 17% after the pandemic. Further, respondents who stated they purchase goods four to six times a week jumped from 4% pre-pandemic to 9% post-pandemic (Figure 1.25).

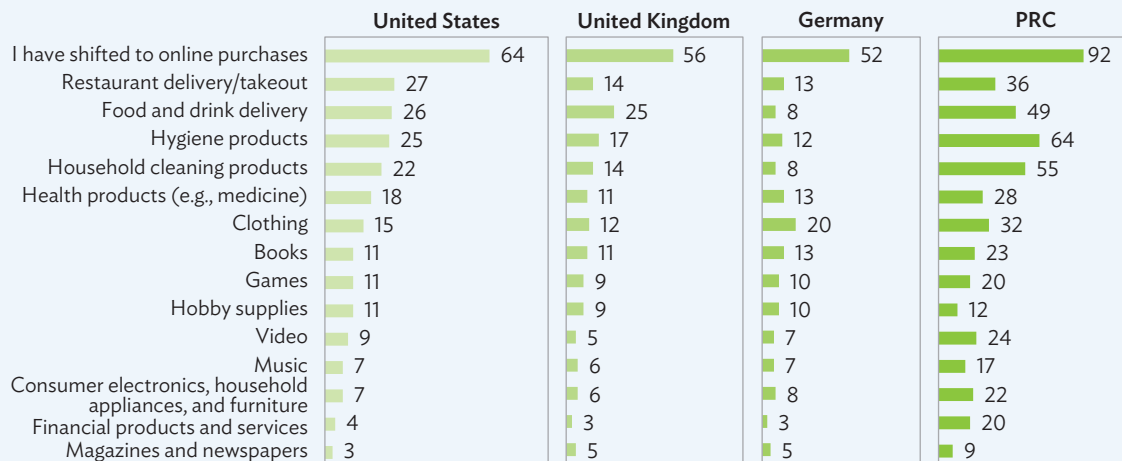
This shopping behavior, though moving toward the same direction, continues to shift in varying degrees in different regions. The majority of consumers in the PRC, along with their other counterparts in Asia and the Pacific, have moved to online shopping. Statista's survey of product consumption and shopping behavior found that 92% of the PRC shoppers surveyed have shifted to online purchases, significantly higher than those in other regions, such as the United States (64%), the United Kingdom (56%), and Germany (52%). The trend is also captured in the differences in online shopping preferences for food and drink delivery, hygiene products, and household cleaning products, where Chinese consumers also recorded higher percentage shifts compared to other respondents. Figure 1.26 displays these differences in online shopping preferences across regions and product categories amid the COVID-19 pandemic.

Figure 1.25: Frequency of Online Shopping before and after COVID-19—Asia and the Pacific
(% of respondents)



Source: Statista. 2021. Frequency of Purchasing Goods Online before and after the Coronavirus (COVID-19) Pandemic in the Asia Pacific Region in 2020. <https://www.statista.com/statistics/1181209/apac-frequency-of-online-shopping-before-and-after-covid-19/> (accessed 1 June 2022).

Figure 1.26: Differences in Online Shopping Preferences across Product Categories, Q2 2020
(% of respondents)



PRC = People's Republic of China, Q = quarter.

Source: Statista. 2020. COVID-19 Barometer 2020 Report. <https://www.statista.com/study/74007/covid-19-barometer-report/> (accessed 1 June 2022).

Boston Consulting Group's research on COVID-19 consumer sentiment found that, in Japan, 20% of consumers intend to increase online purchases of clothing, while 4% intend to increase online purchases of fresh food (Koslow et al. 2020). Most Japanese consumers preferred to purchase at physical retail stores traditionally, but the onset of COVID-19 led many to consider online transactions across various product categories. Food delivery has also seen a rapid growth rate in Japan, where 45% to 49% of consumers in each age group intend to spend more on this category. As shoppers continue to veer away from in-store purchases, everyday food and personal care items are projected to grow at the highest rate among the five major e-commerce product categories at 14.9% CAGR, according to Statista's Digital Market Outlook. The fashion category, which has the highest share in revenue within the e-commerce industry, is projected to grow faster as well—at 12.7% CAGR—as many platforms like Amazon's Prime Wardrobe now allow customers to try on apparel and return them at no cost (Koslow et al. 2020).

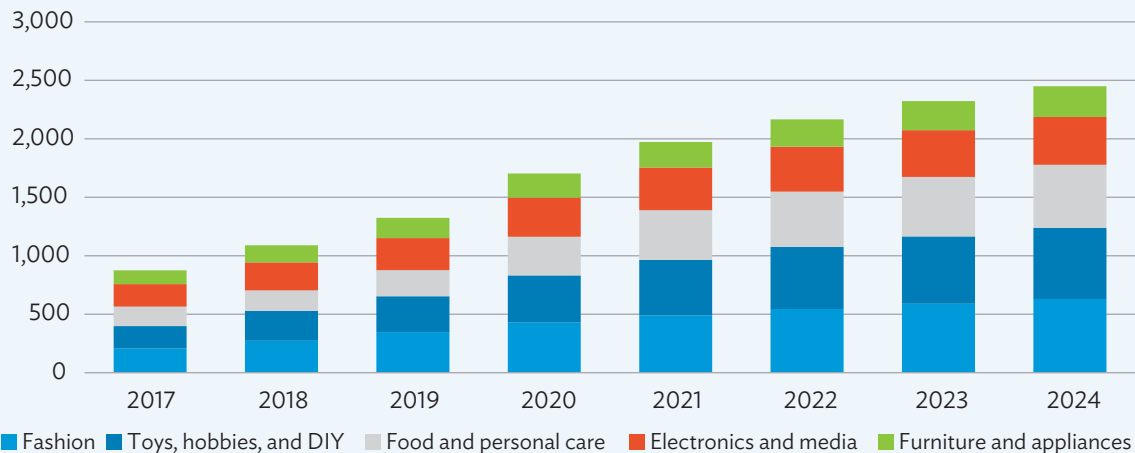
E-commerce revenue in Asia and the Pacific is projected to reach \$2,449 billion in 2024, which is almost twice its market size or an 85% growth from \$1,323 billion in 2019 (before the pandemic). Decomposing these estimates into a segment analysis shows consumers' online preferences in the years to come. Fashion is still the largest B2C e-commerce market segment in Asia and the Pacific. It is the most mature e-commerce segment with its products including apparel, footwear, bags, and accessories. The segment is poised to expand to \$630 billion in 2024 from \$347 billion in 2019 or a growth of 82% from its pre-pandemic level). Globally, the PRC is the leading region in the fashion segment with a market volume equivalent to \$338 billion in 2020. Its online fashion market is driven largely by increasing disposable income, lack of well-established traditional retail particularly in the second/tier cities, and a large appetite for luxury fashion (Ganbold 2021).

Of the five segments in Figure 1.27, the “food and personal care” market expanded quickly from pre-pandemic levels and is the fastest-growing market in Asia and the Pacific. Globally, the experience is largely the opposite as the segment remains smaller than all other segments. In Asia and the Pacific, however, the market overtook “electronics and media” in 2021 to reach the third-largest share of e-commerce revenue in the region compared to its fourth rank in 2019, at pre-pandemic level. In addition, between 2019 and post-pandemic 2022, estimates put growth of the market at 112%—and that rising trajectory is expected to be maintained out to 2024. From \$223 billion in 2019, the market is set to more than double in size to \$538 billion in 2024. Unique and innovative services under the food and beverage category—such as 24/7 opening hours and home delivery for heavy products and bulky beverage crates—helped draw shoppers online.

As technological developments become more widely available and cross-border operations increase, markets in developing Asia—particularly Southeast Asia—now have a better opportunity to accelerate their economies and adapt to globalization and the digital revolution. A study by Facebook and Bain & Company in 2019 estimated that e-commerce platforms in Southeast Asia would triple in size over the next 5 years with consumers spending an average of \$390 in online shopping by 2025 (up from \$125 in 2020). Lazada's online grocery sales through RedMart in Singapore grew four times from early April values, while unique site visitors increased more than 11 times (Choudhury 2020).

The Bain & Company report also found that Southeast Asian shoppers are more inclined than shoppers in the United States and North America to prioritize three key considerations: value for money, health and welfare, and at-home consumption. Consumers in the region experienced a great cultural shift throughout the pandemic. Prior to the height of the pandemic, they were nearly twice as likely as those in the United States to dine “out”; however, they are now 1.5 times less likely to do so than American diners.

Figure 1.27: E-commerce Revenue in Asia and the Pacific from 2017 to 2025, by Segment (\$ billion)



DIY = do it yourself.

Source: Statista. 2021. E-commerce in the Asia-Pacific Region. https://www.statista.com/topics/7121/e-commerce-in-asia-pacific/#topicHeader___wrapper (accessed 1 June 2022).

Barriers to Cross-Border Trade Logistics and Trade Facilitation

International e-commerce transactions consist of goods ordered on an online international platform and delivered through traditional transit routes. The creation of enabling conditions for trade logistics and trade facilitation is fundamental to its smooth functioning. Restrictions and disruptions to supply chains disrupt e-commerce as well. Among the biggest consequences of the pandemic are measures that government and businesses imposed in international and domestic trade to prevent the spread of the virus across borders. These mostly refer to restrictions on movement and transport as well as safety requirements at ports, airports, and land borders (UNCTAD 2021b). These affected international trade, including trade of goods enabled by international e-commerce. In the wake of the crisis, firms experienced supply challenges resulting from suspension of manufacturing activities, while warehousing facilities faced the burden of accumulating inventory of products.

The pandemic exposed the vulnerabilities of cross-border trade.

Further to this, the World Trade Organization also points to other e-commerce related challenges being amplified during the pandemic. These include “price gouging (i.e., increasing prices to unreasonably high levels), product safety concerns, deceptive practices, cybersecurity concerns, the need for increased bandwidth, and development-related concerns” (WTO 2020, p. 1). Due to emergency measures to contain COVID-19, the pandemic exposed the vulnerabilities of logistics systems and tested the flexibility of businesses to adjust swiftly (WTO 2020). These measures led to:

- (i) **Restrictions on transit and border lockdowns.** Restrictions on transit also include enhanced health regulations and requirements to contain the virus and deal with the shortage of staff that became the new normal in the wake of the crisis. The International Air Transport Association (IATA) and the Universal Postal Union (UPU) cite that such restrictions were exacerbated by administrative bottlenecks as well as crew quarantine procedures that prevented cargo flights from being up to speed with demand (WTO 2020). This led to slower trade transactions eventually causing shortage and delays in delivery of goods. Such disruptions and restrictions in cross-border e-commerce meant that vendors, vehicle manufacturers, third-party logistics service providers, and shipping firms had to bear increased logistics costs throughout the supply and distribution chain. In Southeast Asia, restrictions at border crossings also affected road transport workers by increasing waiting times, forced quarantine, mandatory testing, and discrimination (ASEAN 2021b). Another weakness of the subregion is the high transactional costs brought about by unfitting and limited infrastructure connectivity impeding e-commerce development. This barrier worsened in the wake of the pandemic. Further, an already weak supply chain that had slowly developed over the years was disrupted. As demand for products from overseas economies increased, inherent problems in trade logistics were exacerbated. In some economies, the pandemic added to cross-border problems such as long queues in customs clearance, and so increased user inconvenience (Kawa 2021). UNCTAD cites that the worst affected multinational enterprises in global value chain (GVC) intensive industries during the pandemic were the extractive and automotive firms. In Thailand, automotive manufacturers such as Mazda, Mitsubishi, and Nissan (all Japan) have temporarily suspended production following lockdown measures (UNCTAD 2020d). UNESCAP and the Asian Development Bank (ADB) also report how other GVC-intensive manufacturing sectors such as the electronics and apparel industry were disrupted by the lockdowns in the PRC, restricting the flow of parts and components through Indonesia, Thailand, and Viet Nam (for electronics) and Cambodia and Viet Nam (for apparel) (UNESCAP 2021). Another study by the Japan External Trade Organization (JETRO) also mentions that Japanese automobile industries that expanded supply chains to ASEAN, the PRC, the Republic of Korea, and India have experienced difficulties in procuring raw materials (JETRO 2020). As an example, major automobile manufacturers in the Republic of Korea procure wire harnesses and other parts in the PRC (JETRO 2020). In the wake of the COVID-19 pandemic, these manufacturers were unable to procure the parts causing the shutdown of production lines in the country. Subsequently, the suspension of production at Hyundai Motor Company and other producers affected Japanese manufacturers that do business with these major automobile manufacturers (JETRO 2020). As a consequence, they were forced to suspend and adjust production.
- (ii) **Reductions in transport capacity resulting from movement controls.** The impact of the COVID-19 pandemic in international and domestic transport has been multidimensional and cuts across all modes of transportation: air, land, and maritime. Global air freight declined by -22.6% due to pandemic measures aimed at restricting the movement of people (Rivera 2020). However, such measures indirectly affected the capacity to transport cargo loads by air freight too. This made a huge dent in international trade given that, before the pandemic, one-third of the world's trade by value was shipped by air (UNECE 2022). These measures disrupted the supply and distribution chain flow, leading to unnecessary expiry of goods on the part of the manufacturers and depreciation of inventory for distributors and online platform businesses. Both road and railway transportation were also severely affected by the restrictions, causing a sharp decline in e-commerce deliveries by land transportation. Across Europe and particularly in Central Asia and the Caucasus subregion, restrictions on movement and onerous quarantine requirements impact the transport of goods by road (UNECE 2022). In Southeast Asia, restricted entry to neighboring economies led to longer travel times and higher transport costs (ASEAN 2021b). Transport may have been affected for SMEs lacking capacity for contingent planning to manage or quickly adapt their operations. Container shipping was also affected and in the first quarter of 2020, container trade at selected ports worldwide declined by 10% (UNECE 2022).

- (iii) **Reduced demand for passenger flights.** Most e-commerce transactions by SMEs and MSMEs involve small consignments of goods in transit by air, often on passenger flights. Such movements of goods were severely affected when demand for passenger flights declined during the pandemic (UNCTAD 2021b). Global passenger traffic declined 65.5% or equivalent to 2,990 billion revenue passenger-kilometers performed (ICAO 2020). The International Civil Aviation Organization's 2020 preliminary compilation of annual global statistics shows 1.8 billion passengers were carried on scheduled services, a volume 60.1% lower than in 2019. Asia and the Pacific holds the largest share of world passenger traffic at 38% in 2020, although passenger numbers declined 62%. Europe was second, with a share of 23.5%, although posting the greatest decline at 70%. Meanwhile, North America had 22.5% of world traffic, and a decline in volume of 65.2%. The IATA in March 2022 announced that the global air traffic has slowly recovered, with total air passenger traffic up 76% on the previous year and volume closest to the 2019 pre-pandemic levels (IATA 2022). However, Asia and the Pacific's growth rate dropped to -18%, driven by a sharp decline in air travel, including domestic flights in the PRC, which were severely affected by lockdowns and travel restrictions following the spread of Omicron (IATA 2022). While barriers are slowly being lifted in most economies, IATA has stated concern about long delays at many airports with insufficient resources to handle the growing demand in air travel. In Asia and the Pacific, the organization also cites some lingering travel restrictions and border measures that are holding back recovery of the region's travel and tourism industry (Business Standard 2022). These remain a barrier to e-commerce for SMEs and MSMEs that use small consignments.

Widening of the Digital Divide

While pandemic measures such as lockdowns and social distancing ramped up the role of digitalization in economic activities, their enforcement also magnified the glaring digital divides within and across economies. Indeed, digital technology played a critical role in exacerbating the inequality across and within economies that was observed during the pandemic. The digital divide has worsened in least developed economies and among small companies and women-owned businesses. Rapid expansion of e-commerce during the crisis also exposed gaps in equitable returns between highly developed e-commerce markets and least developed ones and gaps between large multinational e-commerce platforms and small online SMEs and MSMEs. According to the WTO, the pandemic reinforced existing barriers and challenges in e-commerce and has continued to hamper inclusion or participation in e-commerce of small producers, sellers, and consumers in developing economies, and especially in least developed countries (LDCs). Some of these traditional obstacles include "access to online payment solutions, reliable internet and electricity connections, the prohibitive costs of trading across borders, visibility in online searches, advertising and sales platforms, and the difficulties in gaining consumer trust" (WTO 2020, p. 5). This section features discussion about some of the vulnerable groups that continue to struggle with the rapid shift to digitalization, including the transition of e-commerce, during the pandemic.

- (i) **Least developed countries.** One of the biggest challenges for LDCs to reap the benefits of e-commerce is that they remain the most vulnerable in digital readiness, with only 27% of individuals in LDCs able to use the internet. When they do, it is typically at a relatively low internet speed with a relatively high cost for access (UNCTAD 2022b). Meanwhile, less than 5% of people in most developing countries are able to buy goods and services online (UNCTAD 2022b). Both rural and urban communities in LDCs continue to have limited access to ICT, due either to lack of ICT infrastructure or low income, or both. This situation worsened during the pandemic, wherein most economies relied heavily on accelerating digitalization and ICT technologies to keep economic activities afloat. A recent UNCTAD report

points to an upward trend in exports of ICT goods only in East Asia and Southeast Asia, while exports declined in all other regions. The sharpest drop was in LDCs, where exports shrank 82% and imports by 49% (Figure 1.28). The findings show how the pandemic may have exacerbated the digital divide in economies already struggling to engage in the ICT goods trade, leaving them falling even further behind (UNCTAD 2022b). Even before the pandemic, available data on the share of the population shopping online in LDCs show how far LDCs are falling behind developed countries in e-commerce in general. Figure 1.29 suggests that while as many as 87% of internet users shop online in developed countries, as represented by the United Kingdom, only 1% to 2% shop online in many LDCs.

Figure 1.28: Change in Global Trade in ICT Goods, 2019–2020 (%)

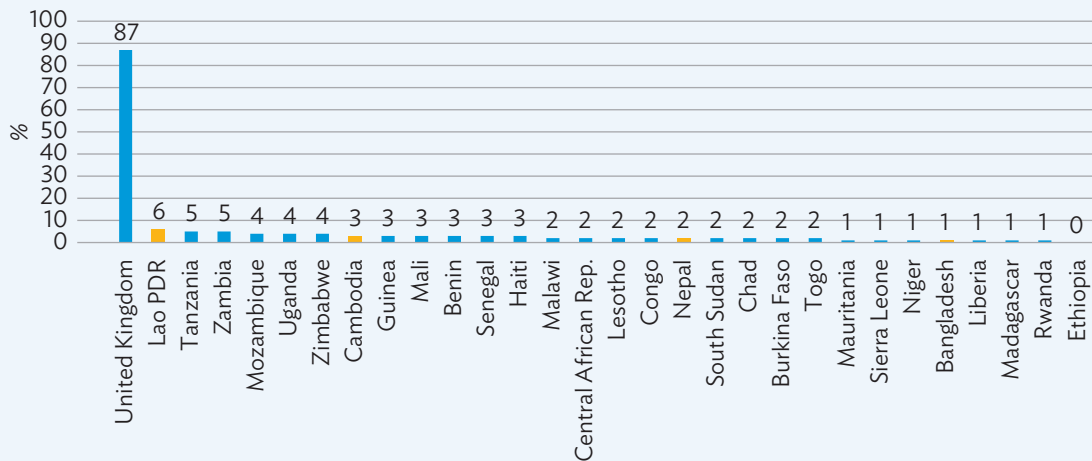


ICT = information and communication technology.

Source: United Nations Conference on Trade and Development. 2022. *E-commerce and the Digital Economy in LDCs: At Breaking Point in COVID-19 Times*. https://unctad.org/system/files/official-document/dtlstict2022d1_en.pdf.

UNCTAD’s Business-to-Consumer (B2C) E-commerce Index also shows that, as a group, LDCs ranked at the bottom from 2015 to 2020. The index consists of four indicators highly correlated with online shopping from a wide range of countries. These indicators are (i) share of individuals using the internet, (ii) secure servers per 1 million people, (iii) UPU postal reliability score, and (iv) share of individuals with a financial account. In individual values, LDCs in Africa are mostly at the bottom of the index and face persistent challenges to advancing e-commerce. Nevertheless, as shown in Figure 1.30, the B2C E-commerce Index of LDCs has improved slowly from only 17 in 2016 to 24 in 2019, driven by an increase in the number of internet users and rising postal reliability. However, this was seen to be mildly interrupted during the pandemic, with the index declining to 23 at one point in 2020. All in all, the index shows stagnated e-commerce preparedness in some LDCs. Direct and swift efforts are crucial in building private and public sector capacities for LDCs to engage in and benefit from e-commerce.

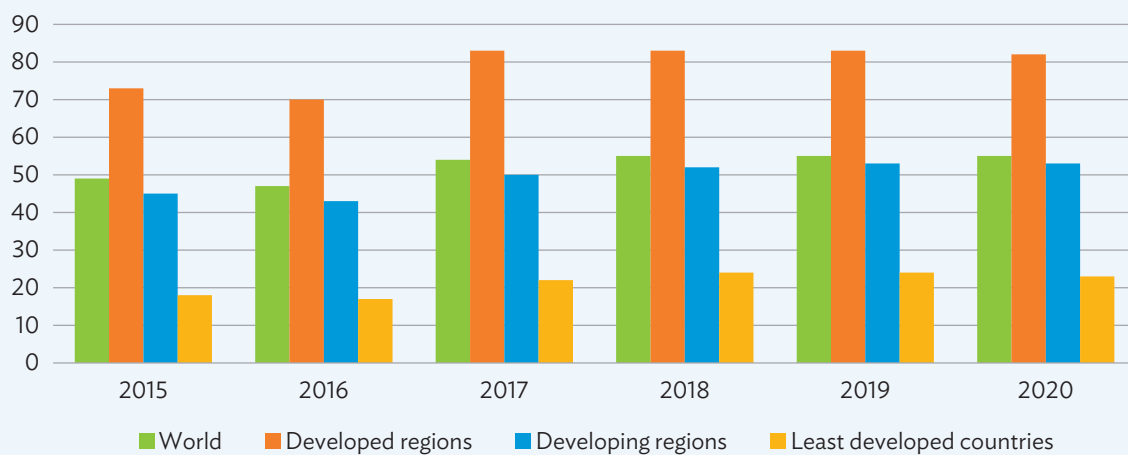
Figure 1.29: Share of Population Shopping Online in Least Developed Economies, 2017
(used the internet to buy online in the past year, % age 15+)



Lao PDR = Lao People's Democratic Republic.

Source: United Nations Conference on Trade and Development. 2022. *E-commerce and the Digital Economy in LDCs: At Breaking Point in COVID-19 Times*. https://unctad.org/system/files/official-document/dtlstict2022d1_en.pdf.

Figure 1.30: Average B2C Index Values of LDCs versus Other Groups of Economies, 2015–2020

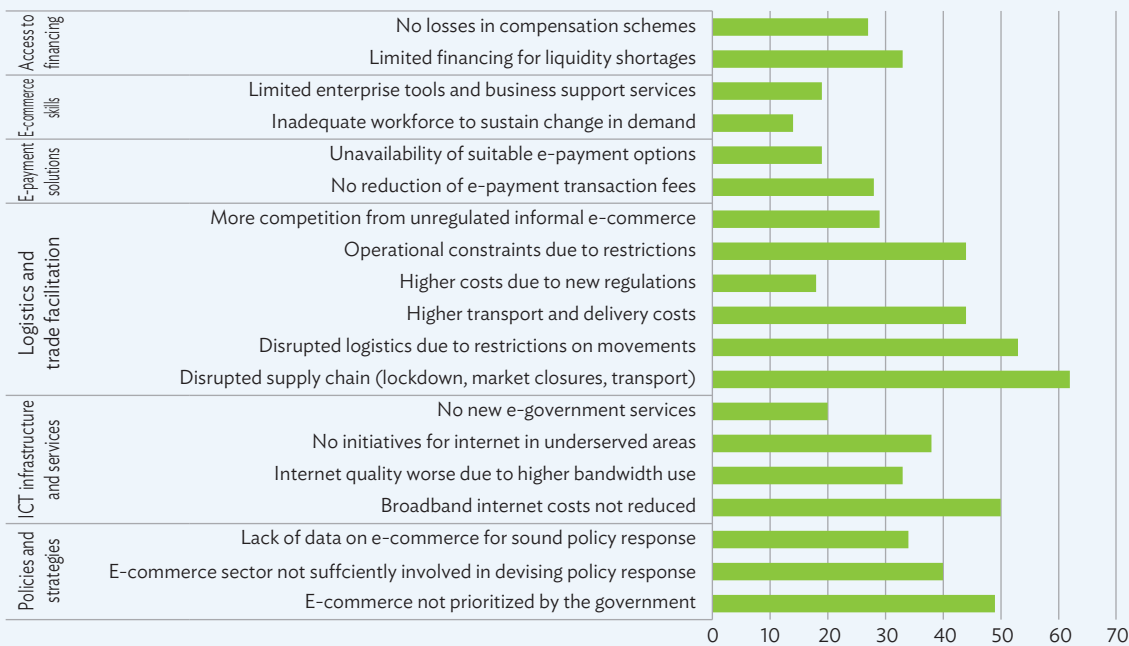


B2C = business to consumer, LDC = least developed country.

Source: United Nations Conference on Trade and Development. 2022. *E-commerce and the Digital Economy in LDCs: At Breaking Point in COVID-19 Times*. https://unctad.org/system/files/official-document/dtlstict2022d1_en.pdf.

(ii) **Micro, small, and medium-sized enterprises.** The surge in demand of online sales of physical goods showed that many businesses and consumers responded initially to the pandemic by stocking up. Nonperishable food, personal care, household essentials, and small medical supplies such as hand sanitizers, disinfectants, and surgical face masks were stockpiled. The increase in consumers flocking to online shopping during lockdowns gave online business platforms good reason to enhance their inventory, distribution, service, and operational capacity to offer better prices and services. However, the ability of businesses to be competitive depends on technical, financial, and staff capacity, which in turn depend on the maturity and size of online businesses. Start-ups and MSMEs are at a disadvantage due to their limited resources in deploying operations requiring expanded technical, financial, and human capacity. In a rapidly changing and expanding market such as e-commerce, these small businesses will struggle to keep up with the bigger e-commerce platform rivals. In developing and least developed countries, small businesses will fall even further behind, with inefficient transport and trade logistics compounding their limited capacities. Even worse is that the pandemic accentuated these inefficiencies. Small consignments characteristic of SME and MSME transactions must pass through the trade logistics restrictions and international trade measure instituted by governments (as mentioned in trade logistics and facilitation) and domestic activities to curb the spread of COVID-19. While major international e-commerce businesses and online platforms have the financial reserves and risk management system to better deal with the interruption in manufacturing activities, along with labor shortages and supply chain disruption, start-ups and small businesses in developing economies and LDCs struggle to absorb these shocks.

Figure 1.31: Challenges since the COVID-19 Outbreak in E-trade for All Policy Areas (%)



COVID-19 = coronavirus disease, ICT = information and communication technology.

Note: Based on 232 responses to the survey question, “Since the outbreak of the COVID-19 crisis, which are the challenges that most impacted on your business?”

Source: United Nations Conference on Trade and Development. 2020. COVID-19 and E-commerce: Impact on Businesses and Policy Responses. https://unctad.org/system/files/official-document/dtlstict2020d12_en.pdf.

UNCTAD released a survey report investigating the impact of COVID-19 on e-commerce businesses between early March and the end of July 2020. The report focused on 23 economies from LDCs in Africa and in Asia and the Pacific, featuring 257 representatives of e-commerce businesses who shared their experience following the outbreak of COVID-19.⁶ The report found that, in sales trends, third-party online marketplaces performed better than e-commerce companies. The latter have predominantly seen declines in sales while sales, for third-party online marketplaces increased nearly 60% as they attracted more customers and new sellers. In terms of bottlenecks, the survey presented the main challenges faced by the respondents. These included disruptions to supply chains, logistics, and trade facilitation, and governments not doing enough to prioritize e-commerce. Figure 1.31 gives a snapshot of the challenges since the start of the pandemic.

- (iii) **Women.** The gender digital divide is estimated at 17% globally, and rises to almost 43% in 2019 in LDCs (UNCTAD 2021b).⁷ Women digital entrepreneurs continue to be underrepresented in ICT and the digital economy. In terms of online retail, e-commerce presents vast opportunities for women-owned businesses to expand access to markets and integrate with a male-dominated sector. The unequal representation of women in the e-commerce sector is brought about by gender inequality and vulnerability in the social, political, and economic systems, making them unable to benefit equally and maximize opportunities offered by the sector (UNCTAD 2021b). But similar to the situation of LDCs, the COVID-19 pandemic has heightened the barriers for women-owned businesses in e-commerce. A survey by the World Bank and Facebook in 2020 found that 22% of women-owned businesses in Asia and the Pacific, including Australia and New Zealand, had closed because of the pandemic, compared to 16% of male-owned businesses. The report further noted that women were less likely to have received financial assistance during the crisis (IFC 2021a).

Due to the preexisting barriers in the digital economy, women are inherently less prepared to withstand economic shocks, according to the report. Barriers such as legal and financial constraints mean that women are not protected from discrimination in accessing credit. In terms of digital connectivity constraints, women are 26% less likely than men to own a smartphone globally (IFC 2021a). Across Southeast Asia, the gender gap in internet usage was 11% (IFC 2021a). Women-owned businesses operate with smaller and less-diverse networks with less access to information than men-owned firms. In Southeast Asia, most women work in the informal sector and tend to be involved in small-scale production and distribution of goods and services. Women-owned businesses tend to be small and concentrated in sectors with lower returns such as agriculture, catering, and beauty. They have experienced financial distress and inability to service bank loans because of a lack of proper bank support on loan restructuring (IFC 2021a). The report also sees these challenges compounded by domestic factors such as the shutdown of schools and child care centers, which shifted responsibilities from business to domestic care. Women entrepreneurs allotted more time than men on unpaid childcare, adult care, and domestic work during the pandemic.

The International Finance Corporation found that closing the earnings gap between male and female e-commerce vendors in Southeast Asia would yield up to \$280 billion by 2030. In Africa, another report said that for every year the e-commerce gender gap is not addressed, the e-commerce market loses just under \$3 billion in value. However, addressing the gender gap in sales could add more than \$14.5 billion to the value of the region's e-commerce market between 2025 and 2030 (IFC 2021b). Combining both Southeast Asia and Africa, addressing the gap would add almost \$300 billion value (Council on Foreign Relations 2021).

⁶ Some of the economies include 13 economies from Africa and 10 from Asia and the Pacific.

⁷ Based on ITU facts and figures, the gender gap is computed as the difference between the internet user penetration rates for males and females relative to the internet user penetration rate for males, expressed as a percentage.

- (iv) **Rural markets.** While the digital divide has improved as economies continue to harness the potential of the internet and digital innovation, rural communities still face a number of challenges in maximizing the potential of e-commerce. These challenges were brought to light during the pandemic as the agricultural markets were directly hit by the shutdown of logistics and supply chains affecting the income of rural communities. In general, the inherent features of rural communities continue to limit their potential to ride along the benefits of innovative activities. These features include geographic remoteness, poor infrastructure, insufficient human capital, and lack of adequate public services and distinct (oftentimes, divergent) culture from its urban counterparts. Such elements often limit rural communities from accessing e-commerce markets. In addition, e-commerce specific challenges faced by rural communities include high delivery costs (or unfeasible delivery), weak ICT access and/or low internet usage, lack of e-commerce payment infrastructure and networks, poor digital literacy, and limited purchasing power (Sicat 2016). Nevertheless, UNCTAD presents two major policy measures so that e-commerce can be fostered for rural development. First is to build the capacity of rural producers to adopt e-commerce for their business and use the online platform to market and sell rural products and/or purchase intermediary products for businesses. In most cases, rural producers are typically agricultural producers, smallholder farms, village factories, and producers of local crafts. The second measure is to build the digital literacy of rural communities to become online suppliers, sellers, and consumers. One critical element that needs to be addressed is the digital financial literacy of rural communities, including skills to access digital financial products and services.
- (v) **Digital discrimination.** Criado and Such (2019) defines digital discrimination as “a form of discrimination in which automated decisions taken by algorithms, increasingly based on AI techniques like Machine Learning, treat users unfairly, unethically or just differently based on their personal data such as income, education, gender, age, ethnicity, religion” (p. 2). Despite the initial public conception of AI systems as unbiased and fair, recent studies have identified cases of user discrimination. Such cases are most dangerous in the event of a health crisis such as the COVID-19 pandemic, where health services discrimination equates to threat to life and health (Levashenko and Magomedova 2020).

As more and more business decisions are delegated to AI techniques such as machine learning, the need to safeguard AI decision systems from algorithmic biases and discriminatory outcomes will rise. The United Kingdom (UK) Research and Innovation (UKRI) has cited some pathways that enable the digital discrimination of AI decision systems, and these occur when (i) an algorithm is specifically designed to create discriminatory outcomes, and (ii) when non-biased algorithms are fed or programmed with biased data. The UKRI portal also reports its current initiative called Discovering and Attesting Digital Discrimination (DADD).⁸ Under the leadership of King’s College London, the DADD research aims to address open research questions on digital discrimination such as (i) how much bias is too much; (ii) what is the legal, ethical, and socially acceptable bias; and (iii) how are legal, ethical, or social expectations translated into automated methods that attest digital discrimination in datasets and algorithms.

⁸ UKRI. DADD: Discovering and Attesting Digital Discrimination. <https://gtr.ukri.org/projects?ref=EP%2FR033188%2F1#/tabOverview>.

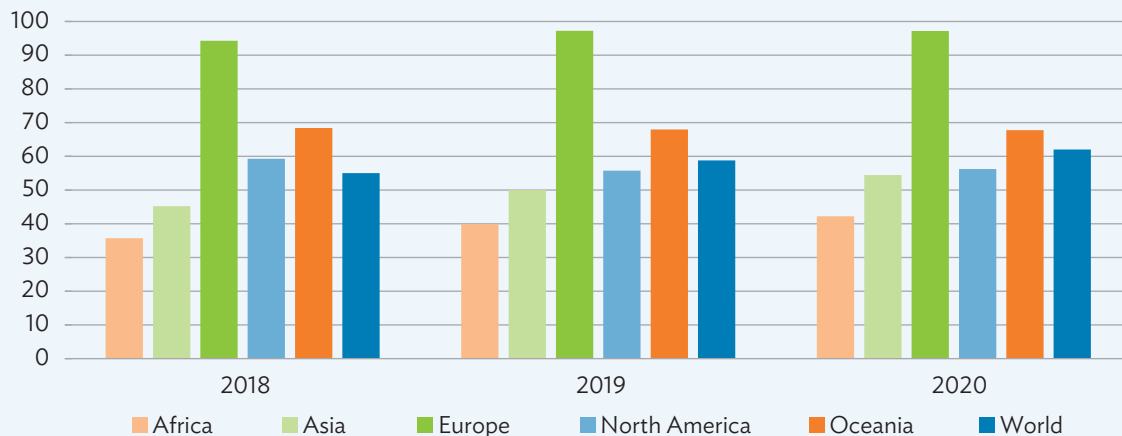
Prerequisites of E-commerce Development

E-commerce technologies and business models are continuously evolving to make businesses of all sizes more accessible, thanks to developments in infrastructure, payment systems, mobile commerce, artificial intelligence, virtual and augmented reality, natural language processing and voice commerce, and machine learning methods. The rapid advancement in technology has connected more consumers across the globe and given them the convenience and other benefits of online shopping and faster delivery.

ICT infrastructure, e-payment, and logistics are connecting consumers, yet regional disparities persist.

However, with all the advancements in technology in developed economies, many parts of the world still find it difficult to stay connected. Many potential buyers and sellers across the globe face several barriers and challenges when attempting to enter the e-commerce market. One main barrier is a lack of internet access. In 2020, almost 4.8 billion people were active internet users—yet only 62% of the global population. Asia and the Pacific leads the world with 2.5 billion active internet users (54.4% of the global count), as shown in Figure 1.32. Lack of internet access can be attributed even further to numerous factors, including affordability, relevance, availability, and readiness.

Figure 1.32: Active Internet Users in Selected Regions
(% of population)



Source: Statista Research Department. Our World in Data. <https://ourworldindata.org/> (accessed 1 October 2020).

A lack of adequate infrastructure and limited technical and economic resources for both vendors and consumers are the most common barriers for economies attempting to increase e-commerce integration. For instance, in 2020, only 60% of Papua New Guinea's population had access to electricity. Consequently, in the same year, only 28% of the country's population used the internet—well below the global internet usage rate of 60%. UNCTAD's

Digital Economy Report 2019 found that, in LDCs, one in five people use the internet. In developed economies, however, the ratio is four out of five.

In South Asia, the rural-urban divide is evident in terms of ownership of computers and access to the internet as measured by internet density or the number of internet subscribers per 100 people.

Disparity is evident across economies in Asian e-payment platforms. At one end, developed economies such as Singapore, the PRC, and the Republic of Korea have pioneered nationwide e-payment services. At the other end, most developing economies and LDCs struggle to adopt advanced and swift e-payment systems to keep up with the rapid pace of e-commerce expansion. Some of the identified barriers include largely unbanked consumers with no access to formal financial services, a lack of trust from both vendors and customers, and the lack of ICT and banking infrastructure. The pandemic, however, has led to an influx of consumers and vendors shifting to digital payment options for safety and convenience.

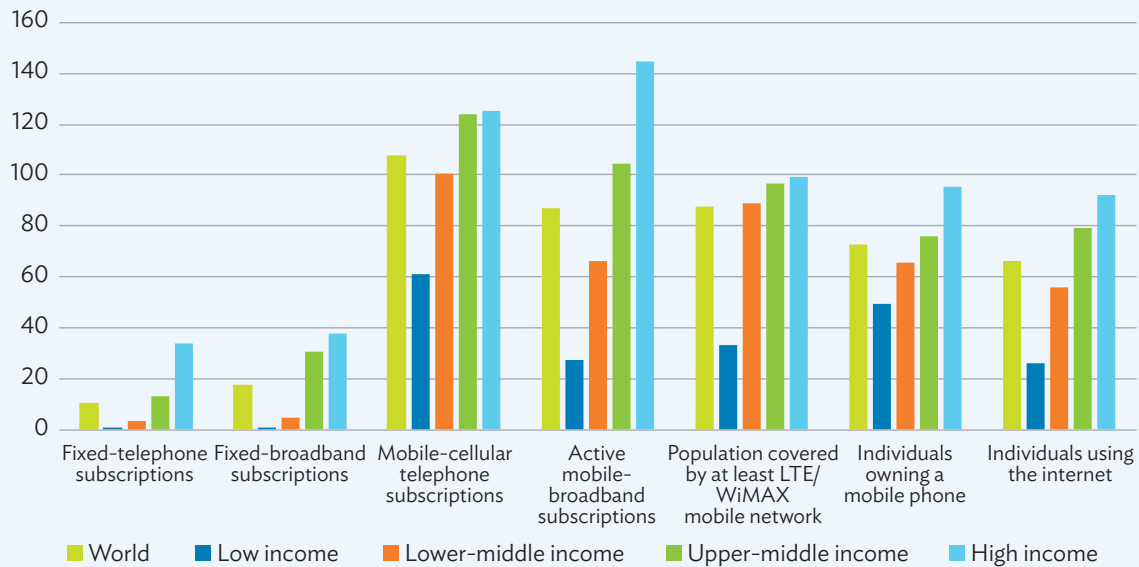
For many economies, especially those participating in cross-border e-commerce, logistics and “last-mile” delivery are key areas of concern. In the Philippines and Viet Nam, “last-mile” shipping to rural areas is a challenge, particularly in regions far from major cities and metropolitan areas. In Indonesia, which has more than 17,500 islands, only 57% (2021) of the population lives in cities. Logistics companies have larger areas to cover. With an increasing amount of rural-based service centers and personnel and developing technology in automation and drone deliveries, among others, companies are finding more and more innovative solutions to bring e-commerce closer to a greater number of consumers.

ICT Infrastructure

For the e-commerce market to grow, substantial ICT infrastructure is required for consumers to be able to browse, purchase, and interact within the marketplace. Figure 1.33 displays key ICT indicators—such as fixed and mobile telephone, computer, and internet penetration levels—by development. It shows a stark difference in performance between LDCs and the rest of the world across all indicators, a necessary foundation needed to facilitate e-commerce operations. Developing economies are also below global averages and perform poorly against developed economies. Notably, subscriptions for mobile telephone and broadband throughout the world far exceed those of fixed telephone and broadband. On average, every consumer in developed economies owns more than one mobile telephone and a mobile broadband subscription. In LDCs, less than 10 households per 100 own a computer and a little over 1 in every 100 people have a fixed broadband service (International Telecommunication Union 2020).

Figure 1.34 presents similar indicators as Figure 1.33, but shows economies grouped by region. As with the earlier figure, mobile subscriptions (telephone and broadband) far exceed fixed broadband subscriptions. Asia and the Pacific, despite having the largest worldwide e-commerce market, falls in the middle in density in ICT infrastructure, having more subscriptions and individuals per 100 than African markets and Arab states in most categories, but falling behind the Commonwealth of Independent States, Europe, and the Americas. Though markets in Asia and the Pacific perform relatively well in mobile and fixed broadband, as well as for mobile telephone subscriptions, they fall far below in computer ownership and home internet access.

Figure 1.33: Key ICT Indicators by Income Group, 2022
(per 100 people)

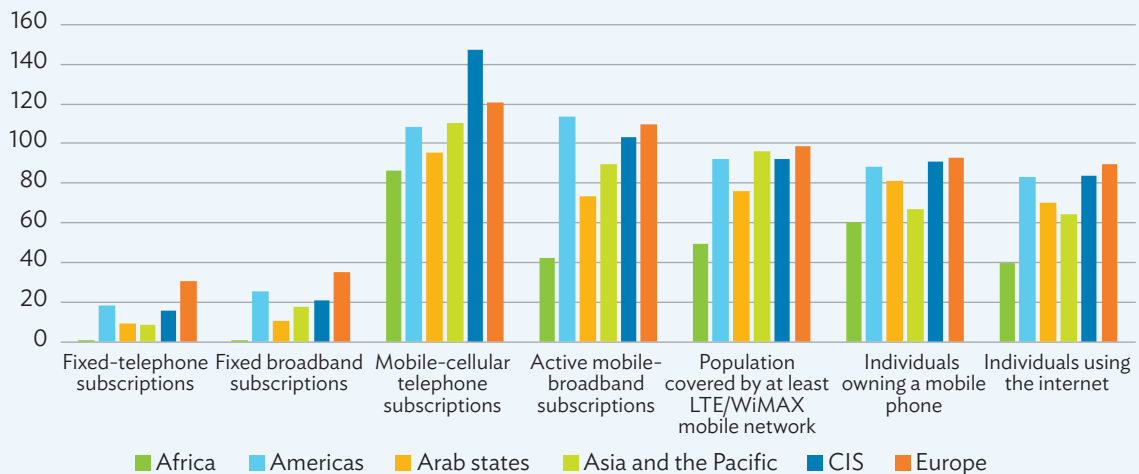


ICT = information and communication technology, LDC = least developed country.

Notes: List of developed and developing economies is based on United Nations M-49 Standard. <https://www.itu.int/en/ITU-D/Statistics/Pages/definitions/regions.aspx>. LDCs listed by UNCTAD. <https://unctad.org/topic/least-developed-countries/list>

Source: International Telecommunication Union. ITU World Telecommunication ICT Indicators database. <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx> (accessed 27 February 2023).

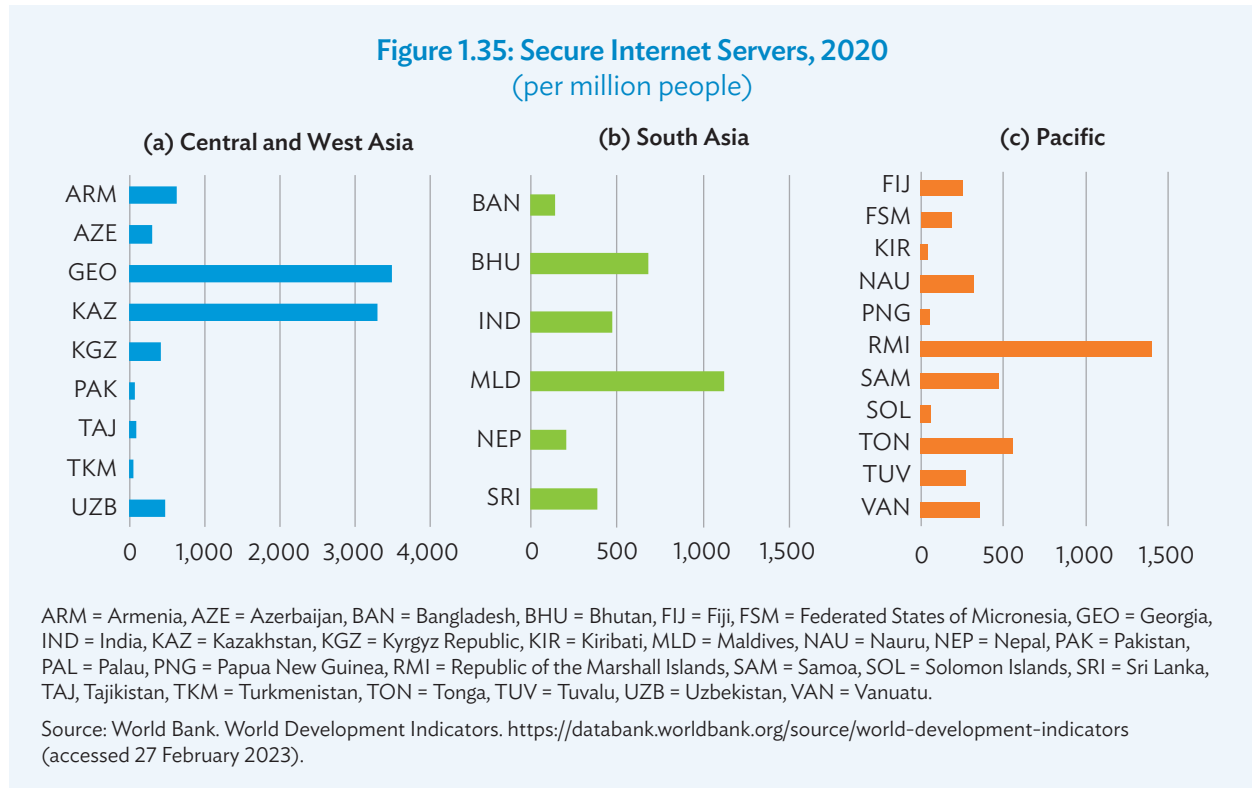
Figure 1.34: Key ICT Indicators by Region, 2022
(per 100 people)



CIS = Commonwealth of Independent States, ICT = information and communication technology.

Source: International Telecommunication Union. ITU World Telecommunication ICT Indicators database. <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx> (accessed 27 February 2023).

However, the presence and accessibility of the internet is just a step toward seamless e-commerce facilitation. To grow and sustain the e-commerce industry and market, the availability of secure internet servers is key. Figure 1.35 shows the current state of secure servers in selected economies in Asia and the Pacific. The number of secure internet servers per million people in the region—particularly in Central and West Asia, South Asia, and the Pacific—is significantly below the world average of 10,050 per million people.

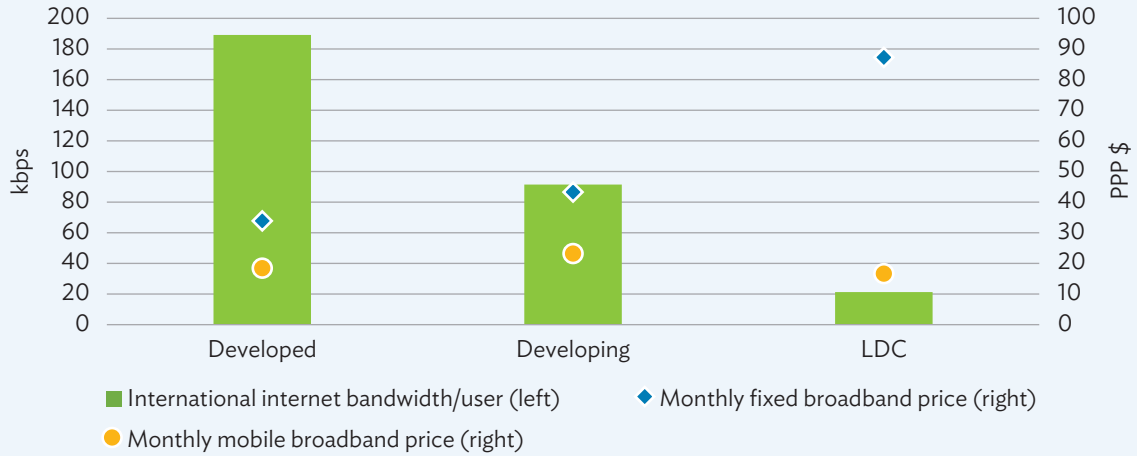


Another key concern for ICT infrastructure and for e-commerce adoption is overall affordability—particularly that of fixed and mobile broadband connections. Figure 1.36 shows the monthly fixed and mobile broadband prices, and bandwidth availability across economies in different development stages. The figure shows wide variations in fixed broadband prices across economies, and that LDCs have much higher prices for lower bandwidth availability for fixed broadband. However, when it comes to mobile broadband, prices are relatively low in LDCs, while consumers in developed economies enjoy a much higher availability in bandwidth.

Bandwidth availability

Figure 1.37 shows broadband speeds—indicating levels of bandwidth availability—in economies in Central and West Asia, East Asia, South Asia, and Southeast Asia. Lower broadband speed and tighter bandwidth extend the time needed to download, upload, or transfer large amounts of data (such as text, videos, images, and other information), reducing the advantage of using the internet and e-commerce. Bandwidth in most LDCs and developing economies in Central and West Asia, South Asia, and Southeast Asia is much lower than in East Asia and falls below global averages whether for mobile or fixed broadband.

Figure 1.36: Monthly Fixed and Mobile Broadband Average Prices and Bandwidth Availability, 2019

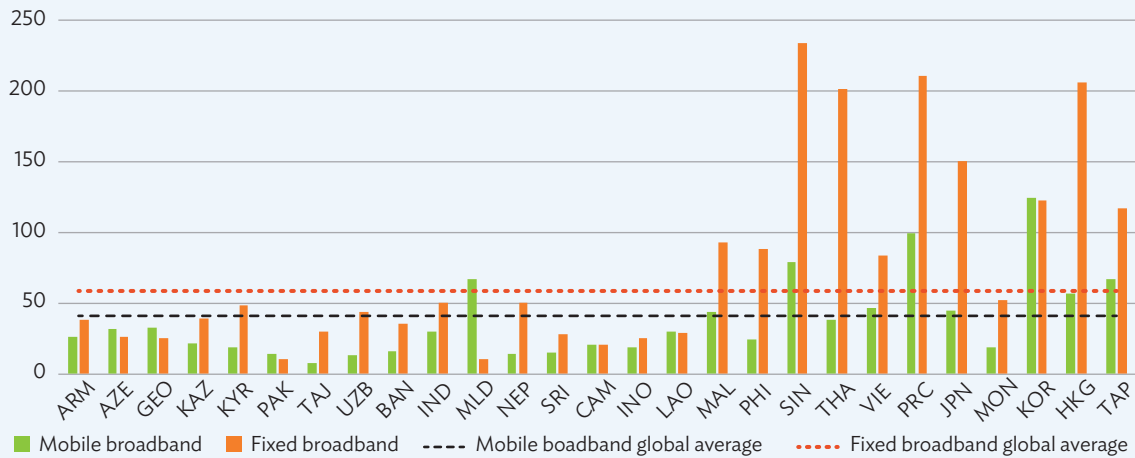


kbps = kilobit per second, PPP = purchasing power parity.

Notes: Figures based on simple averages including data from 162 economies. Prices based on a 1-gigabyte cap.

Source: International Telecommunication Union. Statistics. <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx> (accessed 20 August 2020)

Figure 1.37: Mobile and Fixed Broadband Speed, January 2023
(megabits per second, based on download speed)



ARM = Armenia; AZE = Azerbaijan; BAN = Bangladesh; CAM = Cambodia; GEO = Georgia; HKG = Hong Kong, China; IND = India; INO = Indonesia; JPN = Japan; KAZ = Kazakhstan; KOR = Republic of Korea; KYR = Kyrgyz Republic; LAO = Lao People's Democratic Republic; MAL = Malaysia; MLD = Maldives; MON = Mongolia; NEP = Nepal; PAK = Pakistan; PHI = Philippines; PRC = People's Republic of China; SIN = Singapore; SRI = Sri Lanka; TAJ = Tajikistan; TAP = Taipei, China; THA = Thailand; UZB = Uzbekistan; VIE = Viet Nam.

Source: Speedtest. Speedtest Global Index January 2023. <https://www.speedtest.net/global-index#fixed> (accessed 27 February 2023).

The lack of devices that support e-commerce tasks within certain markets impedes e-commerce, despite increases in bandwidth availability and broadband speeds. While a larger proportion of consumers own basic mobile phones worldwide, there is a stark disproportion with those who use smartphones.

In e-commerce transactions, it is fundamental that ICT is available, accessible, and affordable. It is important that governments promote regulations and initiatives pointed toward the development of ICT infrastructure that offers low-cost and secure broadband. The private sector can also play an important role in investing in ICT infrastructure improvement and technology advancement.

Payment options (e-payment)

Besides a lack of internet access, another barrier to successful e-commerce operations is the insufficiency of payment solutions, with online payment systems and options often failing to provide what online vendors need and consumers can use. Currently used e-commerce payment options can be found in Table 1.4. Many are available in advanced developed and developing economies. At the same time, many of the LDCs and developing economies that lack infrastructure and consumer interest in e-payments are unattractive markets to investors. While a growing number of online payment methods have emerged, cash remains the most popular method of payment for a large share of the population in economies in South Asia and Southeast Asia (Javed 2020; EY Singapore 2019).

One reason for slow growth of e-payment adoption in several markets is that many potential consumers in Asia and the Pacific are still “unbanked.” Estimates put more than 1 billion people in Asia and the Pacific as not having access to formal financial services (Bhardwaj, Hedrick-Wong, and Thomas 2018). In the Pacific islands, many consumers in major islands remain unbanked—75% in the Solomon Islands and 85% in Papua New Guinea, among others (Zibell and Phair 2020).

Lack of trust from both vendors and customers is another barrier to effective e-commerce operations in the region, with some participants capable, but reluctant to join the e-marketplace. In Hong Kong, China, 35% of consumers are hesitant to start using digital payment methods over traditional ones (bank transfers, cash on delivery) due to security concerns (Liu 2020).

Digital and mobile wallets was the payment method with the highest e-commerce transaction volume in 2019, accumulating 41.8% of worldwide e-commerce transactions (WorldPay 2020). This is projected to rise to 68.2% in 2023. The Boston Consulting Group (BCG) found that from 2017 to 2019, the number of e-wallet users globally ballooned from 500 million to 2.1 billion. In Southeast Asia, about 49% of urban consumers in the region with commercial bank accounts already use e-wallets. By 2025, the number is projected to reach 84% or even higher, in the wake of the COVID-19 pandemic. The pandemic has led to an influx of consumers and vendors shifting to digital payments for safety and convenience. However, even before this spike in digital payments, consumers in Asia and the Pacific had already outpaced their counterparts in North America and Europe in using this method to transact on e-commerce platforms. Table 1.5 shows the difference in payment method share in e-commerce transactions across regions. Of the e-commerce transactions in Asia and the Pacific, 58.4% were paid through digital or mobile wallets, more than double those in North America, Europe, and the Middle East and Africa. Total transactions through credit card, debit card, and bank transfer methods were conversely higher in the latter regions than in Asia and the Pacific.

In the Philippines, where fewer than 1 in 10 people have credit cards and 51.2 million people were unbanked in 2019, consumers are instead shifting directly to digital payments and e-money accounts. GCash, the nation’s largest mobile money platform, has increased both users and demand—especially during the initial part of the pandemic. In May 2020, the number of transactions operated through the platform was eight times higher than in May of

the previous year (Devanesan 2020b). In the Pacific, digital payment options are becoming more available and accessible. Consumers in Papua New Guinea will soon be able to get a recently trialed digital access tool that will allow citizens without official identification to take part in the banking sector. In the Solomon Islands, the February 2020 launch of EziPei has given consumers access to a mobile wallet product that allows citizens on any network to send and receive money and pay bills.

Table 1.4: Share of Payment Methods in E-commerce Transactions by Region
(% of transaction volume)

| Payment Method | Worldwide | North America | Latin America | Europe, Middle East, and Africa | Asia and the Pacific |
|--------------------------------|-----------|---------------|---------------|---------------------------------|----------------------|
| Digital/mobile wallet | 41.8 | 23.7 | 13.8 | 24.6 | 58.4 |
| Credit card | 24.2 | 34.4 | 43.8 | 19.7 | 20.1 |
| Debit card | 10.6 | 17.6 | 11.9 | 18.2 | 4.2 |
| Bank transfer | 9 | 5.9 | 10.9 | 16.3 | 7.6 |
| Charge and deferred debit card | 5 | 10.5 | 3.5 | 6.7 | 1.3 |
| Cash on delivery | 4.5 | 3.2 | 5.8 | 4.7 | 5.1 |
| Buy now pay later | 1.6 | 0.9 | 0 | 5.8 | 0.3 |
| PostPay | 1.3 | 1 | 7.9 | 0 | 1.6 |
| Prepaid card | 1 | 0.9 | 1.3 | 1.3 | 1 |
| PrePay | 0.6 | 0.9 | 0.6 | 1.3 | 0.3 |
| Other | 0.6 | 1 | 0.6 | 1.5 | 0.1 |

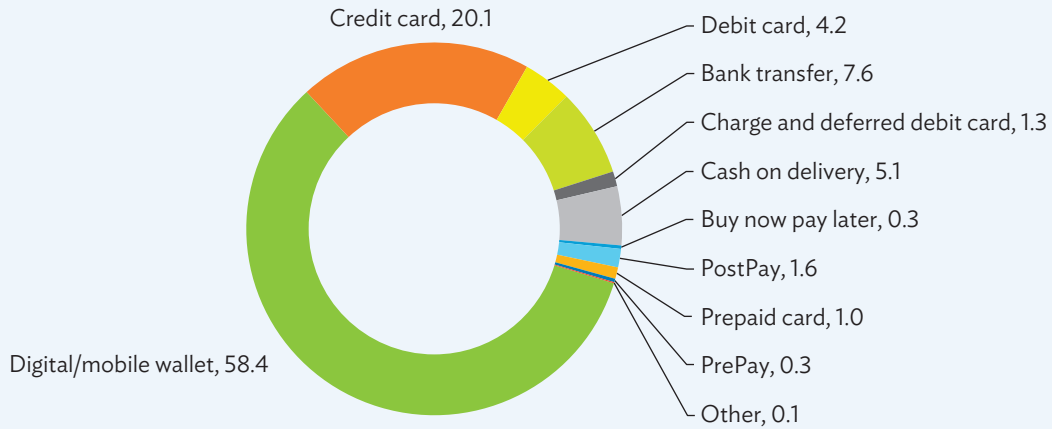
Source: WorldPay Global Payments Report 2020. <https://worldpay.globalpaymentsreport.com/#/en>.

Other e-payment platforms in the region offer contactless and cashless payment systems for physical stores that remained open throughout designated quarantine periods. In India, Mastercard, Axis Bank, and Worldline launched Soft POS to transform smartphones into point-of-sale terminals that provide a safe and simple solution for in-store payments. Major credit card companies have also supported the use of contactless technology. In Australia, Mastercard had doubled tap-and-go payment limits to encourage shoppers to use contactless point-of-sale terminals, while still ensuring cardholder security.

Apart from e-wallets, bank-associated payment methods were some of the most used in Asia and the Pacific, with about 31.9% of e-commerce payments made by credit and debit cards and bank transfers, according to WorldPay. Figure 1.38 shows the share of e-commerce payment methods used in the region in 2019. Online bank transfers are also increasingly used as an alternative to traditional bank-associated methods. Maybank's Maybank2U system was the most popular online payment method in Malaysia, both in terms of usage (65%) and preference (21.4%). However, this method is not forecast to have high growth rates in the next quarter of the decade—only 26% of e-commerce payment share is forecast to come from bank-associated payment methods in 2023.

While use of noncash payment methods is growing at a faster rate than cash on delivery, cash still provides a significant value for many consumers. Over 75% of e-commerce transactions in Asia and the Pacific were paid with cash on delivery in 2018 (G4S 2018). However, on a global scale, cash on delivery is at the bottom of e-commerce payment rankings, taking only 4.5% of total worldwide volume (Cafe24Newsroom 2021).

Figure 1.38: Share of E-commerce Payment Methods—Asia and the Pacific
(% of total transaction volume)



Source: WorldPay. 2020. *The Global Payments Report 2020*. <https://worldpay.globalpaymentsreport.com/#/en>.

The Boston Consulting Group’s Center of Consumer Insight found the main barrier to e-wallet adoption was low acceptance by merchants—which, in turn, was caused by poor understanding of processes, complex merchant payment processing, and high fees (de Sartiges et al. 2020).

Government buy-in has been important for increasing the variety of payment options for e-commerce vendors and customers. The Bank Indonesia has issued chip-based stored-value cards as an alternative to cash and the government also established a national payment gateway, which ensures interconnectivity and interoperability within the retail space. The Philippines’ central bank aims to increase use of e-payments to 50% of total financial transactions by 2023 (BusinessWorld 2020).

The constant development and unforeseen spike in demand in different payment methods, particularly in digital payment systems, may raise some issues. For economies that have recently or are currently entering the space, several concerns may affect the sharp growth of these industries—for government and industry stakeholders alike. Issues with consumer, vendor, and investor protection, participation and compliance costs, money laundering, and tax laws all enter the minds of those planning to invest in digital payment systems in developing nations. These all affect their trust and confidence in the industry.

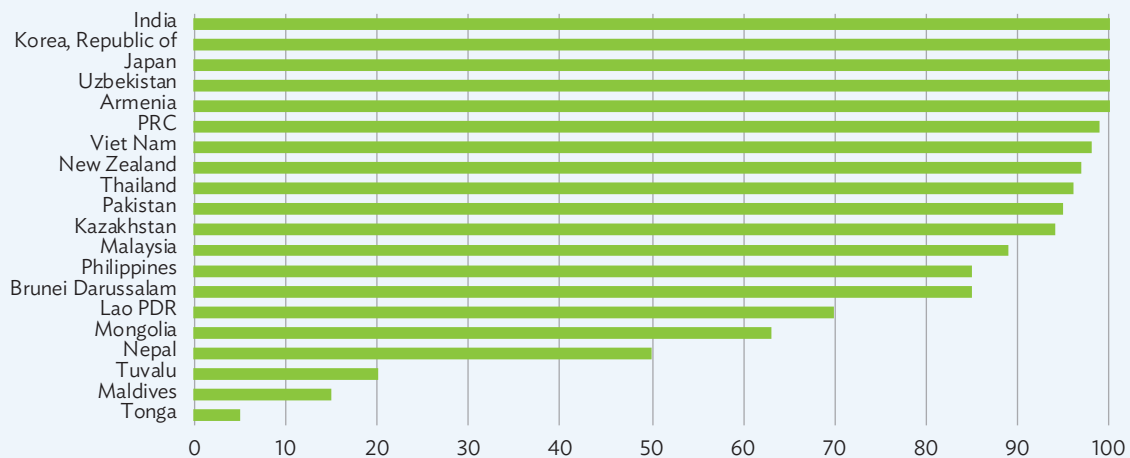
Logistics and Delivery Infrastructure

A well-established logistics operations and delivery infrastructure is fundamental to ensure maximum gains from e-commerce. Convenience, safety, and speed are factors often associated with online purchase preferences. In addition, when consumers can easily return the goods due to the well-developed logistics (and return system), a security and trust is created between the two entities. A study by Dotcom Distribution outlined several insights on logistical preferences. It was found that while speed was an important element of the e-commerce delivery experience, it was still outranked by free delivery and returns. Ninety percent of respondents highly valued free returns, while 91% said that free shipping influenced future purchases—outranking faster delivery times (Dotcom

Distribution 2018). With more efficient systems in place, especially in the United States with Amazon’s same-day and overnight shipping, consumer expectations with logistics are quickly rising. Research in 2020 found that the top reason behind shopping cart abandonment is unexpected fees, taxes, and shipping costs (Baymard Institute 2020). Companies like Amazon, which had 27.9% of its sales allocated for shipping and fulfillment costs, often shoulder costs in exchange for meeting customer expectations for shipping and last-mile delivery. While easy availability and efficiency of delivery systems is commonplace for consumers in developed economies, many developing economies and LDCs have no such access.

Figure 1.39 shows the proportion of people that have mail delivered to their homes in 2019. Several economies, including the Republic of Korea, India, Japan, and Uzbekistan, come out on top with 100% having access to home delivery services. However, archipelagic economies have much lower rates: Maldives (15%), Tonga (5%), and Tuvalu (20%). In other developing economies, fewer than half of the population has mail delivered at home. Many markets in Africa also experience a similar challenge, where just 15.8% of their population can receive mail at home and 71.5% must collect it from post offices (UPU 2019). The challenge is compounded when developing economies struggle to make room for established logistics services such as FedEx or United Parcel Services (UPS) to provide delivery services.

Figure 1.39: Population with Access to Home Mail Delivery—Selected Asian Economies, 2019
(% of population)



Lao PDR = Lao People’s Democratic Republic, PRC = People’s Republic of China.

Source: GovData360, World Bank. https://govdata360.worldbank.org/indicators/hd6f330c9?country=BRA&indicator=24707&viz=line_chart&years=1980,2018 (accessed 1 September 2022).

An underdeveloped delivery and return system is a major challenge for e-commerce development. However, upgrading the delivery systems may be complex when geographic factors are involved. For example, Indonesia has more than 17,500 islands—of which, about 6,000 are inhabited. The Philippines has 7,641. In the case of economies where millions of consumers live in archipelagoes or a significant part of the population lives in rural areas, the delivery of products with cost-efficiency in mind is a challenge.

The Asia and Pacific region has long trailed the United States and Europe in last-mile delivery speed and availability. Amazon, which invests heavily on logistics and delivery, first rolled out its same-day delivery system in 2009. In 2019, the e-commerce giant announced that its offering of same-day and next-day delivery (currently the default option for Amazon Prime members, replacing 2-day shipping) was available to 72% of the US population (Kim 2019). In 2018, nearly a quarter of top 500 European retailers offered next-day delivery, up from 16% the previous year (King 2018).

In Asia and the Pacific, many developing economies and LDCs continue to struggle with satisfactory delivery times. The Parcel Perform and iPrice Group conducted a survey in Southeast Asia and reported about 34% of consumers not being satisfied with their e-commerce delivery experience (The ASEAN Post 2020). The average total transit time within the region was 3.8 days, with Malaysian consumers dealing with the slowest average delivery speed at 5.8 days—despite 46% of local consumers expecting delivery within 3 days (Parcel Perform & iPrice Group 2019; JP Morgan 2019c). The survey also reported that the number of satisfied customers decreased by 10% to 15% for every additional 3 days in transit and that over 90% of customer complaints and negative feedback are related to transit and delivery. In Singapore, customer satisfaction ratings drop off drastically when transit times exceed 6 days. In Thailand, however, the speed of delivery was less of a concern than providing constant updates on delivery.

Despite sizable progress in logistics across the region, customers are still not satisfied with international and domestic parcel deliveries. In 2020, BluJay Solutions, a global provider of supply chain applications, networks, and data solutions, conducted a survey of more than 7,000 consumers across the region—including Australia, Indonesia, Malaysia, New Zealand, the Philippines, Singapore, and Thailand. The study reported that only 22% of consumers have had a delivery experience that met expectations every time, and that delivery service has become a major consideration in the consumer experience. While cost remained the most considered aspect of the delivery process, with 87% of respondents checking cost information before finalizing purchases, time frame (71% of consumers) and the ability to track the parcel (51%) were other key considerations found in the survey. With only 14% of consumers reporting parcel deliveries always being on time, it is important to consider investment in logistics as a key cog in facilitating an effective and efficient e-commerce industry (BluJay Solutions 2020).

Logistics demands in Asia and the Pacific have soared in recent years with rapid growth in e-commerce and cross-border purchases. To increase local and regional availability, investors have funded a significant number of logistics start-ups. McKinsey & Co.'s research has discovered that last-mile start-ups entering the logistics market with traditional modes of transportation (scooters, vans, trucks) were most successful in the region, particularly in India, where start-ups received 8% of global venture capital funding. The height of the pandemic in 2020 led to an even higher demand for logistics in e-commerce. JD.com, a Chinese e-commerce giant, acquired a controlling stake in transport company Kuayue Express Group in August 2020 to bolster its ability to provide same- and next-day delivery (Hu 2020). Best Inc., an integrated smart supply chain and logistics solutions provider based in the PRC, found that domestic demand decreased slightly, shipping 1.9% fewer parcels in the first quarter (Q1) of 2020 year-on-year, compared to the industry-wide 3.2% increase (Alberti 2020). Meanwhile, the same company reported that their international operations have signaled solid surge of growth—shipping 8.8 million parcels in Southeast Asia alone, up from 237,000 the year prior (2019) (Alberti 2020).

Unconventional last-mile delivery methods have driven the transformation of the shopping and e-commerce experience in recent years. The autonomous last-mile delivery market was \$12.88 billion in 2021 and is estimated to grow to \$90.21 billion by 2030 (Allied Market Research 2022).

Smooth and efficient shipping, transportation, and door-to-door (last-mile) delivery of e-commerce goods can only occur when the logistics system is well-developed. With vastly differing economic and geographic characteristics among economies in the region, logistics performance varies widely throughout. Table 1.6 presents the Logistics

Performance Index (LPI) scores of select economies. Of the 160 economies studied by the World Bank in 2018, Japan ranked highest in the region (overall LPI score: 4.03, rank: 5).

Table 1.5: Logistics Performance Index Scores and Ranks—Selected Asian Economies

| | Overall LPI Score | | | Overall LPI Rank | | |
|------------------|-------------------|-------|--------|------------------|------|------|
| | 2016 | 2018 | Diff | 2016 | 2018 | Diff |
| Japan | 3.970 | 4.030 | 0.060 | 12 | 5 | 7 |
| Singapore | 4.144 | 3.996 | -0.148 | 5 | 7 | -2 |
| New Zealand | 3.388 | 3.876 | 0.488 | 37 | 15 | 22 |
| PRC | 3.661 | 3.605 | -0.056 | 27 | 26 | 1 |
| Indonesia | 2.985 | 3.150 | 0.166 | 63 | 46 | 17 |
| Bangladesh | 2.664 | 2.577 | -0.087 | 87 | 100 | -13 |
| Fiji | 2.316 | 2.352 | 0.036 | 136 | 133 | 3 |
| Tajikistan | 2.063 | 2.340 | 0.277 | 153 | 134 | 19 |
| Papua New Guinea | 2.511 | 2.174 | -0.337 | 105 | 148 | -43 |

LPI = Logistics Performance Index, PRC = People's Republic of China.

Note: LPI scores are based on five factors: (i) efficiency of border control and customs process; (ii) transport and trade-related infrastructure; (iii) competitively priced shipments; (iv) ability to track and trace consignments; and (v) timeliness of shipments. The LPI covered 160 economies in 2018 and 2016.

Source: World Bank. Logistics Performance Index. <https://lpi.worldbank.org/international/global/> (accessed 20 July 2020).

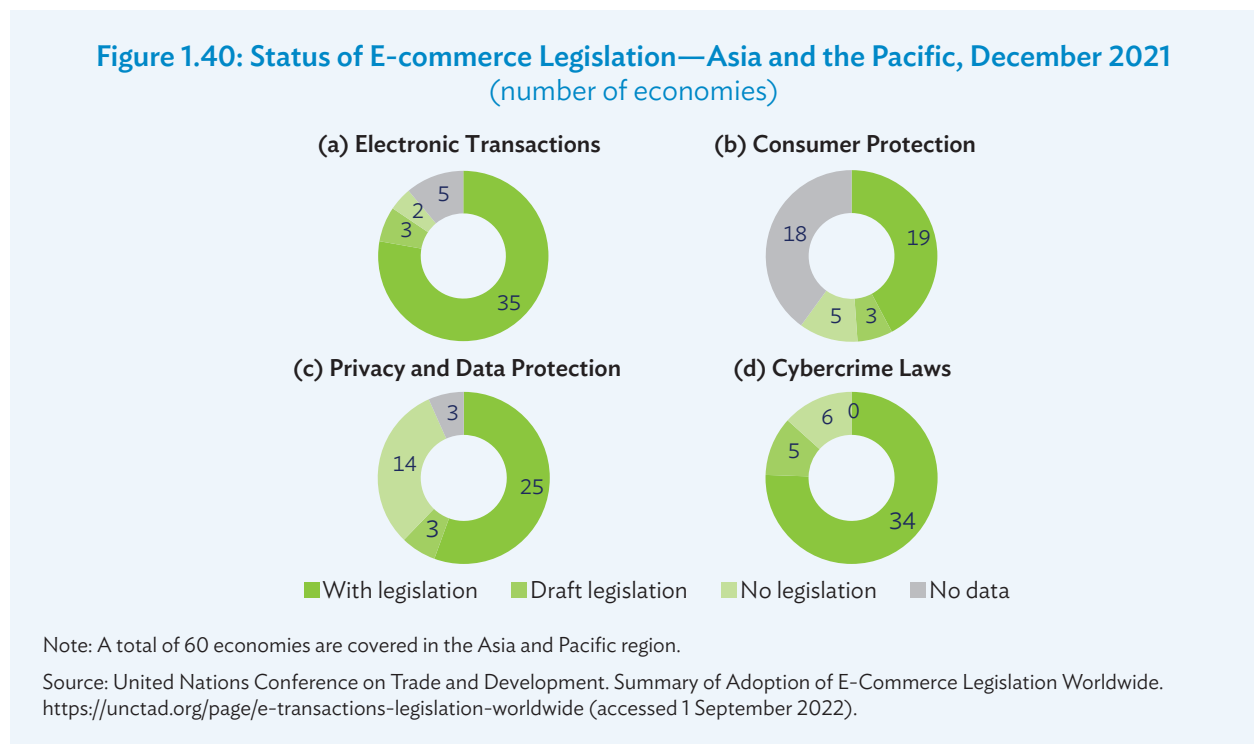
Legal Environment

An increase of legislative challenges from the rapid growth and globalization of e-commerce adds another layer of complexity, affecting e-commerce development worldwide and especially within Asia and the Pacific.

Appropriate legislative and regulatory mechanisms protect all e-commerce market actors and can foster an inclusive and enabling environment for expansion beyond national borders. Legislation related to e-commerce and measures that ensure the affordability and accessibility of e-commerce participation must be promoted. UNCTAD cites four categories of e-commerce legislation worldwide. These are e-transactions laws, consumer protection, data protection and privacy, and cybercrime:

- **E-transaction** facilitates e-commerce, by recognizing the legal equivalence of paper-based and electronic forms of exchange.
- **Consumer protection** aims to protect consumers online by preventing businesses from engaging in unfair, deceptive, or fraudulent practices.
- **Data protection and privacy** regulates the collection, use, and sharing of personal information by entities such as governments, public or private organizations.
- **Cybercrime** refers to criminal activities using computers or computer networks to commit an offense and has caused significant financial and information losses in e-commerce.

Figure 1.40 illustrates the number of economies in Asia and the Pacific, 45 in total, at different stages of legislation affecting e-commerce (i.e., with legislation, draft legislation, and no legislation). As of December 2021, most economies have some form of legislation on electronic transaction and cybercrime, while many have yet to enact legislation related to consumer protection and privacy and data protection. Economies with existing or draft legislation covering the four categories numbered 38 for e-transactions, 22 for consumer protection, 28 for data protection and privacy, and 39 for cybercrime. Compared to the worldwide average, however, the region still has a lower percentage of economies with legislation on the four categories. On the other hand, economies without existing or draft legislation on the four e-commerce laws numbered 2 for e-transactions, 5 for consumer protection, 14 for data protection and privacy, and 6 for cybercrime.

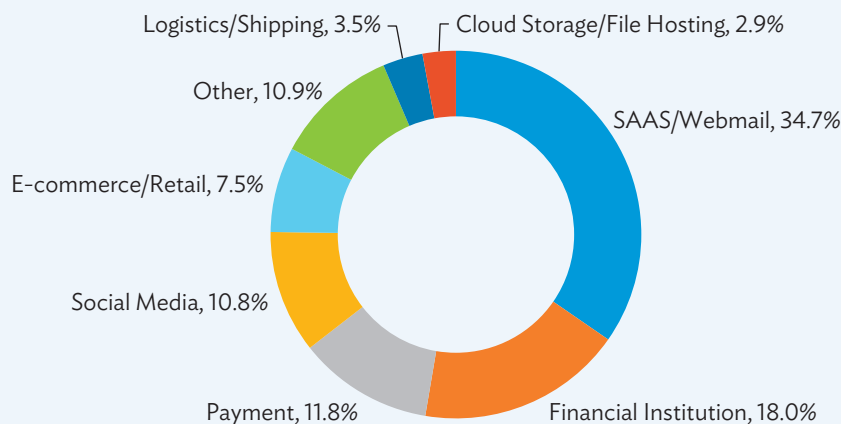


Data protection and cybersecurity are necessary measures in e-commerce since digital interactions with consumers often require use of sensitive personal data and financial information. The rapid growth of e-commerce during the pandemic saw online businesses compete to capture changing customer preferences. As e-commerce expanded at an unprecedented rate, so did concerns about data security. These concerns were amplified by the Asia and Pacific region’s e-commerce growing faster than in any other region of the world. With the varying degree of digital infrastructure and data protection measures, the region is vulnerable to data security risks. Hence, greater awareness of data privacy issues is critical for all stakeholders, from online business platforms and mobile apps to customers and governments. Online business platforms and mobile apps must have adequate cybersecurity system controls in place to avoid risks such as loss of revenue and damage to brand reputation in the event of a cyberattack. Customers, meanwhile, should be educated about how they can protect themselves and their online account information. Most governments in the region have adopted measures and reforms similar to the European Union’s General Data Protection Regulation. The regulation features revenue-based fines, extra-territorial effect, and flexible principles that leave enough room for local interpretation (Hogan Lovells 2021).

Minimizing fraud in the online marketplace is a priority for both consumers and vendors. Fraud rates remain at a record high. PwC's Global Economic Crime and Fraud Survey sought to understand the experiences of more than 5,000 respondents across 99 territories. According to the survey, 47% of companies experienced fraud in the past 24 months, and on average, companies report six counts. The most common types of fraud were customer fraud, cybercrime, and asset misappropriation. Total cost of fraud among respondents was at \$42 billion—directly out of company bottom line—with 13% of those that have experienced fraud losing more than \$50 million each (PricewaterhouseCoopers 2020).

According to the Anti-Phishing Working Group, attacks on the retail and e-commerce industry were significantly lower—with 7.5% of phishing attacks—than industries such as the webmail/software-as-a-service (34.7% of phishing attacks) and financial institution sectors (18.0%). However, in addition to e-commerce, industries related to payment, social media, and logistics or shipping, have also received a significant number of phishing attacks (Anti-Phishing Working Group 2020). Figure 1.41 outlines the most-targeted industry sectors as of Q2 2020. In Asia and the Pacific, the PRC and Taipei, China had the highest percentage of machines exposed to phishing attacks in Q2 2020, while Japan was among the least infected.

Figure 1.41: Most-Targeted Industry Sectors by Phishing Attacks, Q2 2020
(% of industries attacked)



SAAS = software as a service, Q = quarter.

Source: APWG. 2020. *Anti-Phishing Working Group Phishing Activity Trends Report Q2 2020*. https://docs.apwg.org/reports/apwg_trends_report_q2_2020.pdf.

Cyberattacks incur significant financial costs to national economies. According to the 2019 NortonLifeLock Cyber Safety Insights Report, 43% of cybercrime victims in a survey lost money they could not get back. In India, where about 131.2 million consumers were victims of cybercrime, 63% lost money. However, in Japan, where about 24.6 million consumers were exploited, just 18% lost money in some form (Norton Life Lock 2020).

While outdated regulations are barriers to e-commerce market entry, a bigger challenge is enforcing related laws, particularly across borders. Cross-border B2C e-commerce market size is forecasted to reach \$7.9 trillion in 2030, more than 10 times its size in 2021 of roughly \$785 billion (Pasquali 2023). There are a multitude of reasons behind the

rise. Online merchants and retailers can more easily reach global markets when the right conditions for cross-border operations are encouraged. Paired with the vast reach of the internet, well-facilitated cross-border e-commerce allows sellers to market and sell their products to more economies. On the other hand, consumers across the globe are drawn to international sellers based on the availability, costs, and quality of the products they want to buy. Some may not be available in local markets, or the overall purchasing price of a product may be lower than it can be bought domestically—given the possibility that local merchants import these products themselves. Nevertheless, the quality of foreign-made products is another concern of consumers who use e-commerce to buy products from abroad (UNESCAP 2019).

Several economies in Asia and the Pacific have long developed their regulations on e-commerce operations, especially those involving cross-border trade. In the PRC, considered the region's biggest market for e-commerce, work on cross-border policy began in 2012 with a Deployment Meeting on Cross-Border E-commerce Pilot. This began work on cross-border digital trade in cities like Zhengzhou and Shanghai, allowing further study and experimentation on cross-border trade procedures in select areas. The economy's work on developing e-commerce policy culminated in August 2018 with the publication of the E-commerce Law of the People's Republic of China, which came into force on 1 January 2019 (Escudero 2022). The law provided comprehensive regulations on e-commerce development in the PRC, one of the fastest-growing e-commerce markets in the world. In devising the e-commerce law, the central government incrementally adjusted its policies to fit the development stage or situation of the local market. By allowing regulatory bodies and ministries gradually to learn how to effectively manage and control cross-border e-commerce, the PRC was able to better understand and provide a more stable foundation in legislation and infrastructure.

Other economies in the region, such as Cambodia and India, have enacted and issued laws and policies around e-commerce in recent years. However, Cambodia's Law on Electronic Commerce, which came into effect in November 2019, lacks specific regulations and provisions on cross-border e-commerce (Tilleke & Gibbins 2019). In Viet Nam, regulations on e-commerce were added and supplemented through Decree No. 85 effective January 2022 to provide provisions for cross-border e-commerce services (Baker McKenzie 2021).

The WTO plays a major role in facilitating discussions and international cooperation initiatives on e-commerce. In January 2019, 76 of its members confirmed their intention to start e-commerce negotiations centered on agreements and frameworks, as well as the opportunities and challenges they faced in relation to e-commerce (WTO 2019a). The members involved—17 from Asia and the Pacific—account for 90% of global trade. The WTO's Work Programme on Electronic Commerce, established in 1998, examines e-commerce issues around four major areas: trade in services, trade in goods, intellectual property rights, and trade and development.

The United Nations Commission on International Trade Law (UNCITRAL) is the core legal body of the UN system in international trade law. The commission's primary purpose is the modernization and harmonization of international business rules and regulations. In 1996, UNCITRAL adopted its Model Law on Electronic Commerce to provide “national legislators with a set of internationally acceptable rules aimed at removing legal obstacles and increasing legal predictability for electronic commerce” and “overcome obstacles arising from statutory provisions that may not be varied by providing equal treatment to paper-based and electronic information.” This provided a safeguard for merchants and consumers who conduct most of their business online or through electronic devices. The Model Law on Electronic Commerce provided the foundation for modern electronic commerce law, adopting the fundamental principles of nondiscrimination, technological neutrality, and functional equivalence. Nondiscrimination ensures that an electronic document is not denied legal effect, validity, or enforceability based only on its electronic form. Technological neutrality directs the adoption of policies and provisions that are neutral to the technology used in transactions, lessening the need for adjustment based on the rapid innovation in the technology and e-commerce space. Functional equivalence lays out the criteria to consider any functional equivalences between electronic records and communications, with their paper-based counterparts—setting the criteria for electronic-based records to be legally considered as legitimate business records.

For policymakers from developing economies in Asia and the Pacific, it is imperative to consider UNCITRAL's Model Law on Electronic Commerce as a unified and globally consistent framework for developing e-commerce domestically, protecting local consumers and merchants, and enabling seamless cross-border transactions. The rapid expansion of trade networks and the race to fulfill increasing global demand for goods and services requires foundations to be set by economies and regions to easily facilitate e-commerce and grow their online economy exponentially.

A range of factors affect the legal environment surrounding e-commerce—complex border crossing procedures, regulatory burdens, taxation, and other cost-related expenses—and continue to impede the growth of cross-border e-commerce. Because of this, cross-border e-commerce and related issues have been constantly under discussion in regional trade agreements. The 12th chapter of the Regional Comprehensive Economic Partnership (RCEP) agreement focuses solely on e-commerce.⁹ The attention to e-commerce and consumer protection signals a heightened focus on creating ways to protect consumers and merchants from a widely increasing and global network of commerce. In addition to the RCEP, a significant number of enforced regional trade agreements worldwide present guidelines that directly address e-commerce. These agreements tackle issues such as customs duties, nondiscriminatory treatment, national regulatory frameworks, electronic signatures, consumer protection, and data privacy, among others. Some relatively modern regional trade agreements focus on key issues related to digital trade, while others cover customs processes, duties, and other regulatory authority functions. Among the 84 such agreements that contain explicit provisions on e-commerce, 47 were associated with at least one party from Asia and the Pacific.

The flow of cross-border data now affects many industries and economies in the region, particularly due to the rise of international trade through e-commerce. Differences in laws and regulations on digital data and other related issues, such as surveillance and localization, have forced states to set up virtual borders and limit the benefits of a vastly growing digital economy. Aligning data flow laws within the region would benefit economies and companies by lowering costs.

In the Association of Southeast Asian Nations (ASEAN), only four economies—Brunei Darussalam, Indonesia, Malaysia, and Viet Nam—have specific data localization laws. Economies like Singapore, on the other hand, take more focused approaches toward promoting the digital economy and providing sustainable digital ecosystems that allow data-reliant industries to thrive (The ASEAN Post 2018). These approaches aim to strengthen the regional digital economy and allow for more seamless transactions through cross-border e-commerce.

A US-ASEAN Business Council report cites that about 67% of investors hesitate to invest in digital businesses that are required to store user data locally. According to the research by the European Centre for International Political Economy (ECIPE 2014), data localization laws in economies in Asia and the Pacific may have detrimental effects on GDP and investments. From a security and privacy perspective, this is legitimate. At the same time, however, policymakers need to be conscious about the need to explore the least harmful ways in engaging in restrictions in cross-border data flows. To help address harmonization concerns, governments can look to harmonize data policies and other related legislation on a regional level, emulating the Asia-Pacific Economic Cooperation (APEC) Cross Border Privacy Rules. These rules monitor businesses that develop and implement data privacy policies and ensure that they are in line with APEC standards.

⁹ The RCEP is a regional free trade agreement signed on 15 November 2020, which aims to broaden and deepen free trade between ASEAN and trade partners, namely the PRC, Japan, the Republic of Korea, Australia, and New Zealand.

E-commerce Skills Development

Venturing into e-commerce corresponds to adopting new business models, which require new skills or digital literacy in marketing, customer service, and digital technicalities, among others. UNESCO defines digital literacy as “the ability to access, manage, understand, integrate, communicate, evaluate and create information safely and appropriately through digital technologies for employment, decent jobs and entrepreneurship” (UNESCO 2023). It includes computer literacy, ICT literacy, information literacy, media literacy, awareness, business and technical knowledge, and the understanding of e-commerce opportunities.

Numerous literature have explored the role of digital literacy and skills in entrepreneurship in Asia and the Pacific. One study analyzed the impact (both direct and indirect) of digital literacy, economic literacy, and entrepreneurial skills on the performance of SMEs in Indonesia’s tourism industry. The study finds that as the knowledge of digital literacy increases, both entrepreneurial skills and business performance of SME entrepreneurs also increases (Sariwulan et al. 2020). Another study analyzed the factors affecting the e-commerce sustainability of MSMEs in Thailand and finds that a solid knowledge of e-commerce increases e-commerce sustainability of MSMEs (Amornkitvikai et al. 2022). The study recommends one-stop service counseling centers to boost knowledge of e-commerce for Thai MSMEs—targeting both the less experienced and new e-commerce entrepreneurs. Meanwhile, a study in the PRC investigated how digital financial exclusion is an important barrier for farmers’ consumption and production activities in the rural sector. The researchers determined that digital financial literacy is a primary factor that impacts farmers’ participation in online purchases and sales in the digital financial market. The study recommends the need for “innovation in rural market-oriented digital financial products and services systematic training for farmers in e-commerce skills as well as digital financial literacy” in the PRC (Su et al. 2021, p. 1).

As digital technologies reshape labor markets in the region, the need to develop workers’ skills and competencies in digital technology and applications becomes vital. A collaborative report by ADB and LinkedIn presents salient insights on the trend of the workforce in the digital economy. Some of the findings of the report are that (i) about 70% of surveyed employers cite that basic digital literacy are now essential in the labor market and more priority is given for workers with higher skills, (ii) about 62% of surveyed employers reported that job applications frequently list at least one digital credential, and (iii) about 64% of surveyed online trainers do not offer digital skills program that target women, disadvantaged youth, or people living in remote locations with little or no access to the internet, and so on (ADB 2022a).

On the government side, policymakers and administrative personnel also need to establish awareness and understanding on how best to support, facilitate, and regulate the private sector and the population to foster an equitable and inclusive e-commerce. However, UNCTAD cites that government officials and MSMEs in many developing economies (especially LDCs) have limited awareness of e-commerce and its potential. Information technology courses in colleges and universities are outdated and are unable to keep pace with the rapid evolution toward digitization. Graduates emerge ill-equipped with entrepreneurial skills relevant to the digital market, which exacerbate the challenges faced by start-ups (UNCTAD 2021b). Meanwhile, digital literacy and confidence among consumers are critical for the development and expansion of domestic e-commerce. While this does not seem a challenge for the younger generation, older and less digitally savvy customers have concerns about risks and miss out on the potential benefits of the platform. In most cases, businesses and consumers mostly adapt and learn through experience rather than formal skills development. Nevertheless, some governments have carried out initiatives to provide tools that address or help overcome skills deficit in the short term.

Nevertheless, some governments have carried out initiatives to provide tools that address or help overcome skills deficit in the short term. The European Union (EU) has launched a range of policies and initiatives to support its citizens to improve their digital skills in the workforce, both as consumers and as entrepreneurs. The region’s

goal is to ensure more of its citizens acquire digital knowledge to strengthen the region's competitiveness and foster equitable economic growth in the digital economy. The EU's Digital Competence Framework for Citizens, initially launched in 2016, provides detailed information on the scope of digital competence of EU citizens. The framework identified 21 competencies under five key areas: (i) information and data literacy, (ii) communication and collaboration, (iii) digital content creation, (iv) safety, and (v) problem solving (European Union 2016). Further, the EU also launched the Digital Competence Framework for Consumers, which targets public education, consumer policy and other authorities, consumer associations, and teachers and training institutions, among others (Brecko and Ferrari 2016). From the business side, the EU also introduced the European Entrepreneurship Competence Framework, which gives better entrepreneurial understanding and emphasizes the value opportunity and innovation that flows from entrepreneurial competence.

In Southeast Asia, the Go Digital ASEAN Initiative was launched in June 2020 spearheaded by The Asia Foundation, endorsed by the ASEAN Coordinating Committee on Micro, Small and Medium-Sized Enterprises, and funded by Google's philanthropic arm, Google.org. The initiative aims to foster a digitally inclusive ASEAN region by expanding digital participation and targeting the rural population and underserved communities—including women-led small and micro businesses, underemployed youth, ethnic minorities, and people with disabilities (The Asia Foundation 2022).

Entrepreneurship

Despite extensive studies and research on e-commerce and its impact to economic growth, very few literature explored its relationship with entrepreneurship (Huang et al. 2018). Yet, the critical role of entrepreneurship in economic growth and development is a compelling theme to understand the causal link between e-commerce and entrepreneurship.

First, entrepreneurs are key movers of digital technology and innovation. In the digital age, entrepreneurs are the driving force of dynamic competition and are central to what economist Joseph Schumpeter refers to as “creative destruction” (ADB 2022b). ADB's Asian Development Outlook 2022 theme chapter cites that creative and transformational entrepreneurs are able to seize unrecognized opportunities; think outside of the box; and take risks to invent and produce new products, services, and industries (ADB 2022b). In the case of e-commerce, online platform applications that emerged in Asia and the Pacific (such as Flipkart, Grab, Zalora, and Rakuten) are some of the successful results of the ability of entrepreneurs at commercializing new technology into products and services that are useful for consumers (ADB 2022b).

Second, e-commerce is seen as the innovative vehicle that drives the maximum potential of entrepreneurs and their business activities. It broadens their access to consumers, giving massive opportunities for businesses to expand their customer base and break into new product markets (Astuti and Nasution 2014). Moreover, because of ICT and digital technology, the e-commerce business model reduces the cost of starting and maintaining a business by eliminating the need for physical infrastructure (i.e. physical stores and offices). Social media, such as Facebook, Instagram, Twitter, Tiktok, and WhatsApp, among others, also help entrepreneurs redefine e-commerce marketing and advertisement (Shemi and Procter 2018). Another important contribution of e-commerce is that through its digital innovation and ICT features, entrepreneurs are able to adapt an internationalization strategy that aims to expand their business to foreign economies. Not only does this contribute to low transaction costs, it also increases the chances of survival of the business firm. One study cites how entrepreneurs who opt for internationalized e-commerce projects increase their probability of survival: the risk of bankruptcy is 2.778 times higher for local entrepreneurs compared to those who choose to carry out cross-border e-commerce activities (Cuellar-Fernandez et al. 2021).

In developing economies in Asia and the Pacific where ICT and digital technology adoption remains sluggish relative to its more developed neighbors, there is a need for a more comprehensive and systemic analysis with regard to the quality of the environment for digital entrepreneurs. To support this need, ADB launched the Global Index of Digital Entrepreneurship Systems, which estimates the enabling environment of an economy for digital entrepreneurs. The index explores the level of digitalization of a business environment in eight areas: culture, institutions, market conditions, infrastructure, human capital, knowledge, finance, and networking. Up to four-fifths of developing Asian economies place at the bottom of the global ranking, demonstrating how digital entrepreneurs face a myriad of challenges both in setting up their business as well as in maintaining them. Of the eight pillars of the index, the region is weakest in culture and informal institutions.

Trust between Businesses and Consumers

A critical barrier to the widespread diffusion of e-commerce is the lack of trust among the fundamental players—distributors, business platforms, consumers, and delivery services. Consumers commonly have a fundamental lack of faith to engage with online business platforms, which involve requiring personal information and money. This is especially true in places where e-commerce is relatively new and online platforms do not have established reputations. In addition, for developing economies and LDCs, consumers may also not trust delivery services in ensuring the safe and secure transport of goods. Conversely, another factor is the sellers' willingness to risk participating in a transaction despite risks and uncertainties. E-commerce platforms have taken steps to overcome these barriers. Some of these include providing unconditional guarantees for financial losses due to credit card fraud, providing detailed information of their privacy policies, and building brand recognition for web-based businesses (McKnight and Kacmar 2000).

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CHAPTER 2

Environmental Impact of E-commerce

Introduction

Over the past few decades, business-to-consumer (B2C) e-commerce has expanded rapidly worldwide. The ease of shopping from home and having packages delivered to the doorstep means that more consumers are unable to resist the idea of online retail. Meanwhile, shop owners are increasingly shifting to e-commerce so they can avoid the costs of setting up and operating a physical store. Some of the most important elements of the success of e-commerce include the expanding range of products available at competitive prices, the high quality of customer experience, the choice of logistics strategy, and the optimum serviceability offered by online retailers (Mangiaracina et al. 2016).

The consensus is that online shopping does less damage to the environment than traditional retail, based on the positive environmental impacts of e-commerce in business models, transportation, paper waste, and digital storage. Indeed, in most e-commerce models, organizations can do businesses on a work-from-home arrangement, and so reduce the environmental impacts of driving and commuting. E-commerce is generally conducted on a paperless business model. Paper waste created by most organizations declines significantly under e-commerce business models given that digital management of data and information reduces the need for physical paper throughout operations (Collins 2021). Distribution centers shipping products to customers mostly use land near major airports, which cuts shipping times and lessens environmental impacts (Wiff 2017). A recent study found that traditional bricks-and-mortar retail generated 1.5 to 2.9 times the greenhouse gas (GHG) emissions of online retail (Oliver Wyman 2021). It also found that across selected European countries, e-commerce saved 4 to 9 times the traffic physical retail generates. That is, deliveries via e-commerce in cities such as Paris, Berlin, and London generated only 0.5% of total traffic, compared to 11% for offline retail. In the United States (US), e-commerce shopping was found to reduce the overall carbon footprint by 30% (Wiff 2017).

Despite the potential benefits to the environment, e-commerce is still expected to emit significant amounts of GHG emissions because the sector continues to expand exponentially across the globe. As will be discussed in this chapter, every step in e-commerce operations creates some environmental harm—from customers logging in to a website to the inefficiencies of last-mile delivery. E-commerce businesses increasingly may try to adapt to growing consumer demand at the cost of environmental impacts. Hence, it is too early to conclude that the potential negative impact has not risen alongside the swift expansion of online shopping or that the negative impact cannot outweigh the positive benefits recorded in the scientific literature. Such negative impact includes the growing number of delivery trucks on the road, the exponential increase in packaging waste from the online shipping boom, and the hazard of the frequent return or orders. Figure 2.1 illustrates the breakdown of GHG emissions in e-commerce by activity (or source). The figure shows the greatest share of GHG generated by e-commerce comes from the packaging of goods, accounting for 45% of estimated emissions. This is contrary to the literature, where most transport activities and particularly last-mile deliveries have the greatest impact on sustainability (Rai, Verlinde, and Macharis 2018; Mangiaracina et al. 2015). The second-largest contributor of emissions is order returns, which accounted for 25% of the total. This is important as the e-commerce boom amplifies the environmental impact of returns in the form of increased carbon emissions from

increased transportation, more packaging and plastic waste, and larger contributions to landfill. Globally, e-commerce returns represent about 20% of all purchases, which is much higher than returns to physical stores (Warehouse News UK 2021).

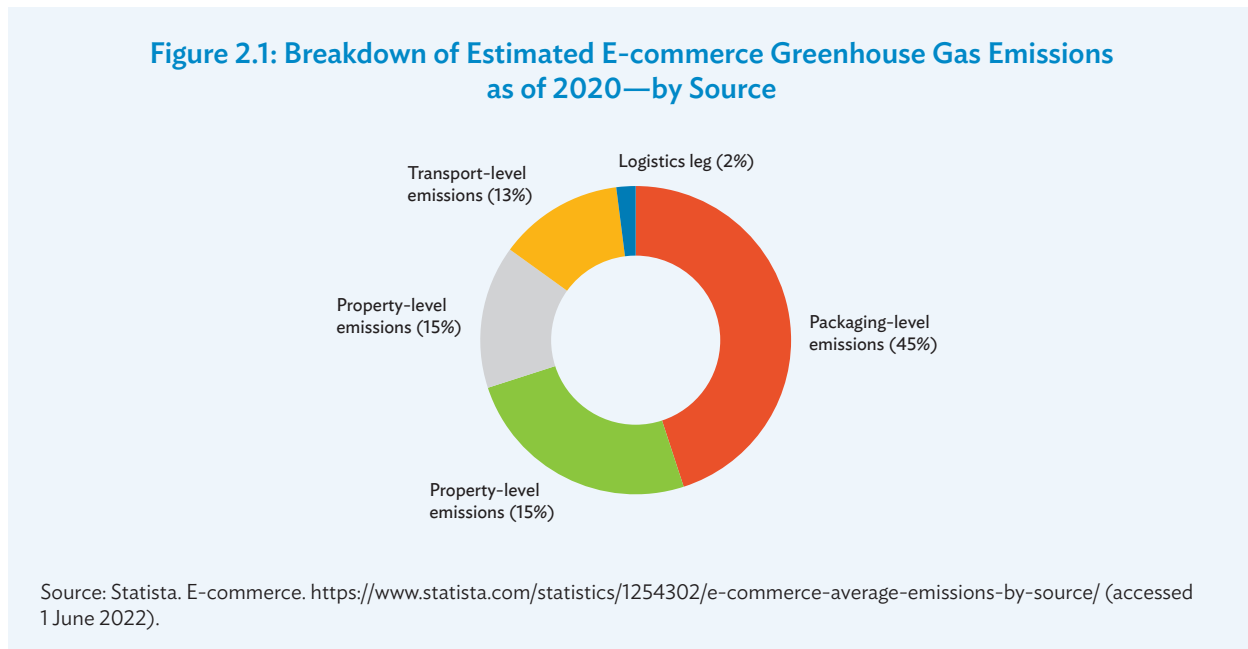
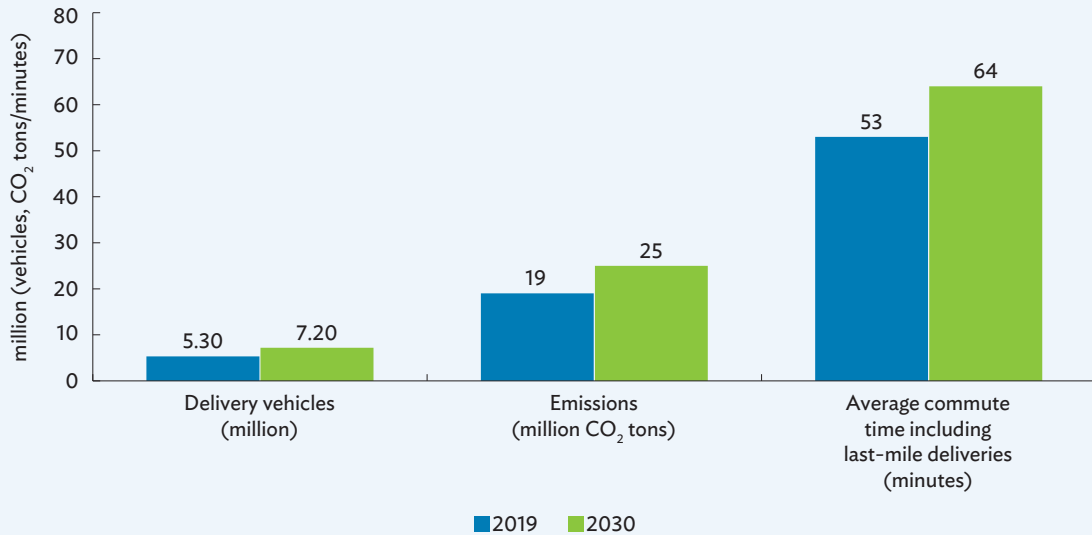


Figure 2.2 presents the environmental impact of e-commerce logistics from 2019 to 2030. Carbon emissions incurred from parcel and freight shipping are projected to increase to 25 million tons of carbon dioxide (CO₂) in 2030 from 19 million tons of CO₂ in 2019. The delivery car fleet could reach 7.2 million vehicles by 2030, from 5.3 million in 2019. And finally, the average commute time, which also covers last-mile delivery, is projected to lengthen from 53 minutes in 2019 to 64 minutes in 2030.

The environmental impact of e-commerce may not have been widely viewed as a challenge before. However, with staggering statistics proving its risk to sustainability, understanding the scale of GHG emissions incurred is crucial. Hence, it is necessary for researchers, policymakers, businesses, and consumers to continue establishing a comprehensive and simple framework to measure the entire carbon footprint of e-commerce operations. The challenge is that all stages of the e-commerce sales process are not necessarily included in most exercises tools and scientific journals where such analysis is featured. Analysis in Asia, the region with the largest share of e-commerce activity in the world, has not been fully explored due to lack of data and information. This section presents most of the available methodologies in use to measure GHG emissions in different stages of e-commerce operations. Its goal is to present a more comprehensive framework to analyze GHG emissions incurred in each stage of the e-commerce process, based on multiple surveys, scientific literature, and articles.

Figure 2.2: Environmental Impact of E-commerce Logistics Worldwide in 2019 with a Forecast for 2030—by Indicator



CO₂ = carbon dioxide.

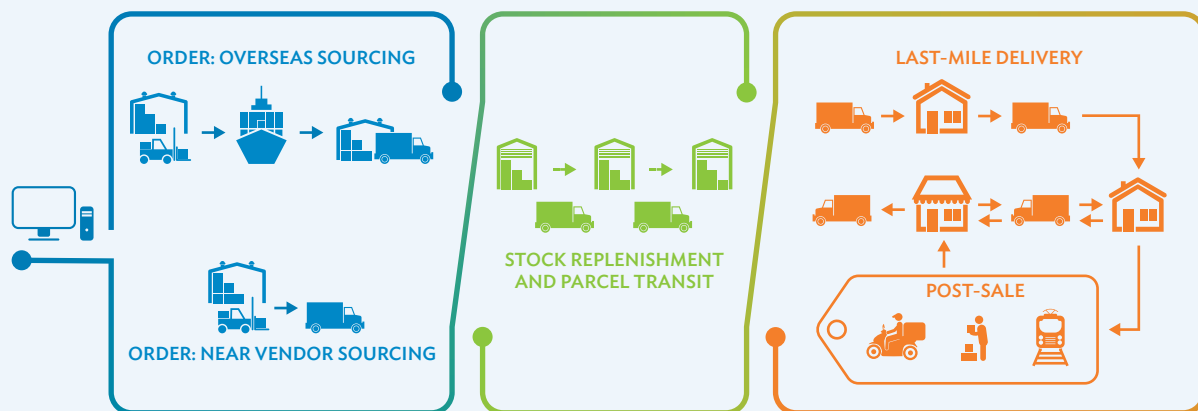
Source: Statista. Key Figures of E-commerce. <https://www.statista.com/statistics/1248537/e-commerce-environmental-impact-worldwide/> (accessed 1 June 2022).

Many institutions have analyzed the impact of B2C e-commerce activity in cities, on traffic, and on the environment. With limitations on data availability, the first study found it difficult to compare the damaging impact of e-commerce on the environment over its advantages (Abukhader and Jönson 2003). Instead, it proposed to view e-commerce as a vehicle toward sustainable development rather than a medium to satisfy market needs. In another study in 2004, Abukhader and Jönson aimed to address varying methodologies and examine conflicting impacts of e-commerce on the environment. The study proposed an assessment model that expands the capacity of the Life Cycle Assessment—a general method used to assess environmental impacts—into both a horizontal and a vertical assessment of e-commerce. Horizontal assessment covers mass production, differentiation, standardization, modularization, focused factories, quick response, outsourcing and leasing, among others. Vertical assessment, on the other hand, depicts an operational assessment. Another study presents a different view, using the “last-mile” stage (i.e., the last link in the supply chain to home) as the benchmark (Edwards, McKinnon, and Cullinane 2010). It compared the GHG emissions from the traditional nonfood shopping trip with home deliveries of nonfood items and found that in nonfood purchases, on average, the home delivery operation is likely to emit less GHG. However, neither e-commerce nor physical retail has an absolute advantage and the relative carbon intensity depends on the particular circumstance of delivery (i.e., failed delivery, returns, combined shopping trips, and so on).

The E-commerce Process

To establish a framework for measuring the environmental impact of e-commerce, it is first essential to determine what encompasses the e-commerce process. Understanding the different operations in the e-commerce market—from online product search to door-to-door delivery—gives a better idea of its carbon footprint. In general, the process consists of five phases: (1) pre-sale and sale, (2) order picking and assembly, (3) stock replenishment, (4) delivery, and (5) post-sale (Beggio 2018). One landmark study of the same scope excludes stock replenishment (Mangiaracina et al. 2016), while a more recent study places stock replenishment before “pre-sale and sale” and “order picking and assembly” (Siragusa and Tumino 2021a). Figure 2.3 illustrates the general operations involved in a single order to an e-commerce platform. Figure 2.4, meanwhile, presents a list of activities that encompass each phase of the e-commerce process. It is essential to treat such a flowchart merely as representing a standard across the e-commerce market. The different stages along with the activities involved in each will vary depending on the industry in focus. The process should adapt to various requirements, including the features of the product and the level of service the customer requires (Beggio 2018). Each activity shown in Figure 2.4 can also be classified in terms of the nature of its GHG emissions—which could be through transport, energy consumption (i.e., power and information technology [IT]), packaging, and waste disposal. Clustering these activities under the main drivers of GHG emissions may also simplify the computation. This and the following section will discuss activities both in e-commerce and in traditional retail and present a model to estimate total GHG emissions. Box 2.1 provides description on the GHG emission accounting methodology presented in this report.

Figure 2.3: E-commerce Supply Chain Coverage



Sources: O. Wyman 2021. *Is E-commerce Good for Europe? Economic and Environmental Impact Study*. Logistics Advisory Experts (LAE), University of St Gallen, Switzerland. <https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2021/apr/is-e-commerce-good-for-europe.pdf>; S. Beggio 2018. *A Model for the Assessment of the Environmental Impact of B2C E-commerce in Italy*. Politecnico Di Milano. https://www.politesi.polimi.it/bitstream/10589/145070/3/2018_12_Beggio.pdf; R. Mangiaracina, A. Perego, S. Perotti, and A. Tumino. 2016. Assessing the Environmental Impact of Logistics in Online and Offline B2C Purchasing Processes in the Apparel Industry. *International Journal of Logistics Systems and Management*. 23. pp. 98–124. <https://re.public.polimi.it/retrieve/e0c31c10-3ac4-4599-e053-1705fe0aef77/2016-IJLSM%20-%20eComm%20Sustainability%20Apparel%20-%20post%20print.pdf>; C. Siragusa and A. Tumino. 2021. E-grocery: Comparing the Environmental Impacts of the Online and Offline Purchasing Processes. *International Journal of Logistics Research and Applications*. 25 (3). pp. 1–27. <https://www.tandfonline.com/doi/full/10.1080/13675567.2021.1892041>.

Box 2.1: Greenhouse Gas Protocol Corporate Accounting and Reporting Standard

The methodologies cited in this report are specifically focused on estimating the greenhouse gas (GHG) emissions incurred from each of the activities that encompass the business-to-consumer (B2C) e-commerce operations. Hence, rather than estimating the GHG emissions incurred from all operations of a single firm specializing on e-commerce (i.e., local or multinational), the report focuses on accounting for the GHG emissions from pre-sale and sales, order picking and assembly, stock replenishment, delivery, or post-sale services of e-commerce. The algorithms presented are taken from research and/or studies that particularly target B2C e-commerce.

Nevertheless, it is important to note that, similar to the requirements for a single firm or corporation, the measuring and reporting of GHG emissions incurred in the full cycle of B2C e-commerce operations should also follow predominant standardized guidelines. To date, there are several accepted reporting schemes for businesses to follow. These include initiatives promulgated by the International Organization for Standardization (ISO), the Carbon Disclosure Project, the North American-focused Climate Registry, and the United States (US)-based Climate Leaders program (Green 2010). These major GHG emissions reporting programs emerged from the guidelines set by the Greenhouse Gas Protocol Initiative, which will be discussed in detail in this box.

The Greenhouse Gas Protocol or GHG Protocol Initiative establishes global standardized frameworks that lay out the requirements and guidelines for governments, cities, companies, and other organizations in preparing a GHG emissions inventory (GHG Protocol 2023). Launched in 1998, the initiative is a result of a multi-stakeholder partnership among businesses, nongovernment organizations (NGOs), governments, and others convened by the World Resources Institute and the World Business Council for Sustainable Development. At the time, its primary mandate was to bring together stakeholders with knowledge on corporate-level GHG accounting in order to develop internationally accepted GHG accounting and standards for businesses (GHG Protocol 2004; Green 2010).

The outcome of the initiative was the first edition of the Greenhouse Gas Protocol Corporate Accounting and Reporting Standard (“Corporate Standard”), which was eventually published in September 2001. This Corporate Standard has become the “gold standard” for corporate level reporting, broadly accepted and applied by businesses, NGOs, and governments worldwide. It provides the standard guidelines to translate firm activities such as day-to-day operations, value chains, and mitigation actions into quantifiable inventories of GHG emissions. By 2016, an estimated 92% of Fortune 500 companies used the guidelines and standards of the Corporate Standard whether directly or indirectly (Green 2010; GHG Protocol 2023). Another global standard is the ISO 14064-1, which emerged from the GHG Protocol Corporate Standard with some distinct differences from the former. These differences include (i) recommended reporting that is formatted like a balance sheet that is similar to financial reporting, (ii) aligns with financial reporting requirements for better flexibility, and (iii) categorizes emissions under Scope 2 and 3 into indirect emissions from the audit and data management perspective (ISO 2022).

The revised edition of the Corporate Standard was published in March 2004 and was the product of a 2-year multi-stakeholder cooperation that incorporates additional technical notes and supplements, case studies, appendixes, and a new chapter on setting a GHG target (Greenhouse Gas Protocol 2004). The additional guidance covers (1) the GHG Protocol Scope 2 Guidance, and (2) Corporate Value Chain (Scope 3) Accounting and Reporting Standard and the Technical Guidance for Calculating Scope 3 Emissions. While the first edition still remains the backbone of the guideline, the revised edition provides clarity in how companies account for and report emissions from electricity and other energy purchases.

One of the key principles in the Corporate Standard is the delineation of direct and indirect emission sources by classifying emissions under Scope 1, Scope 2, and Scope 3. The guidance requires companies to separately account for and report on at least Scope 1 and Scope 2 (at a minimum). The box table provides a brief definition for each scope taken directly from the Corporate Standard guidance.

continued on next page

Box 2.1 *continued***GHG Emissions Classification based on GHG Protocol Corporate Standard**

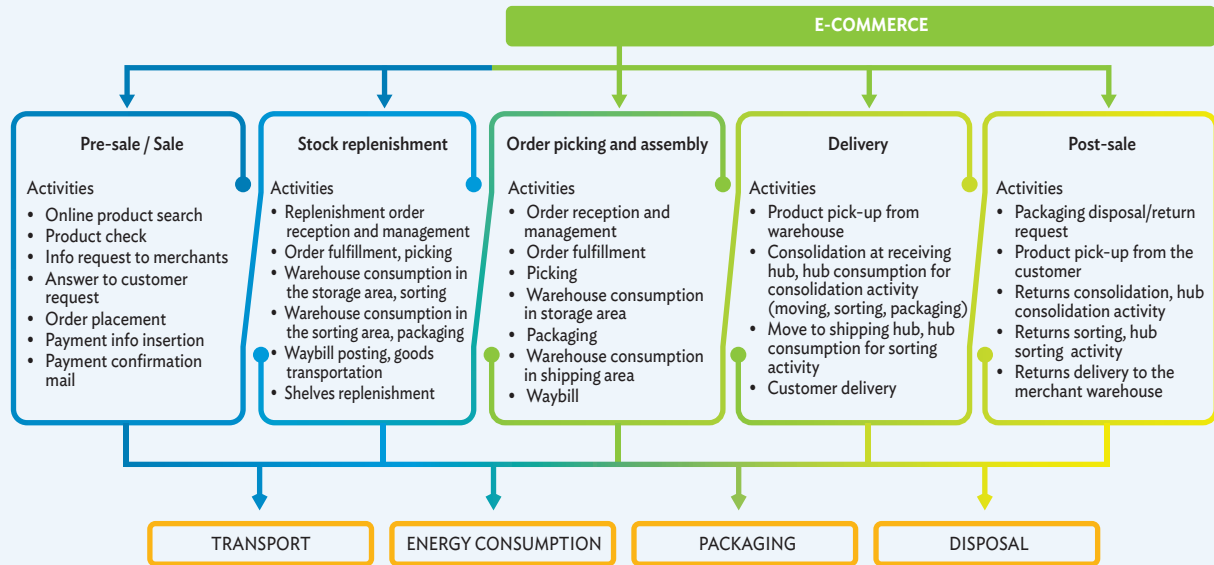
| Category | Definition |
|--|--|
| Scope 1: Direct greenhouse gas (GHG) emissions | <p>Covers GHG emissions from sources directly owned or controlled by the company:</p> <ul style="list-style-type: none"> - emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc. - emissions from chemical production in owned or controlled process equipment <p>Emissions not included are</p> <ul style="list-style-type: none"> - emissions from the combustion of biomass - emissions not covered by the Kyoto Protocol, e.g. chlorofluorocarbon, nitric oxide, nitrogen oxide, etc. |
| Scope 2: Electricity indirect GHG emissions | <p>Accounts for GHG emissions from the generation of electricity, steam, heat, or cooling Purchased from external energy providers</p> |
| Scope 3: Other indirect GHG emissions | <p>Subsumes all other indirect emissions that are a consequence of the activities of the company, but occur from sources not owned or controlled by the company. Examples of activities include</p> <ul style="list-style-type: none"> - extraction and production of purchased materials - transportation of purchased fuels - use of sold products and services |

Source: Greenhouse Gas Protocol. 2004. GHG Protocol Corporate Accounting and Reporting Standard: Revised Edition. <https://ghgprotocol.org/corporate-standard>.

In the case of B2C e-commerce activities, GHG emissions incurred across all stages of operations would heavily involve GHG emissions classified under Scope 3 (although there may be some emissions that would belong under Scope 1 and Scope 2). As an example, a recent GHG Accounting report by Delivery Hero in (2021) provides detailed information with regard to how the activities in B2C e-commerce operations are classified under Scopes 1, 2, and 3 (Delivery Hero 2021). The firm's GHG accounting and reporting procedure was based on the GHG Protocol Corporate Accounting and Reporting Standard: Revised Edition and its complementary document—Corporate Value Chain (Scope 3) Accounting and Reporting Standard. The report differentiates between two type of emissions incurred by Delivery Hero: (i) deliveries emissions, and (ii) corporate emissions. Deliveries emissions cover all emissions incurred during the deliveries of food, groceries, and other goods ordered via Delivery Hero's e-commerce platforms including restaurant packaging and grocery bags. Corporate emissions refer to all emissions related to the company's operations: offices, Dmarts, and Virtual kitchens.

Sources: Delivery Hero. 2021. GHG Accounting. https://www.deliveryhero.com/wp-content/uploads/2022/08/2021-EXTERNAL-DH-GHG-Accounting-Methodology_Final_Branded.docx-1.pdf; Green, J. 2010. Private Standards in the Climate Regime: The Greenhouse Gas Protocol. *Business and Politics*. 12 (3). <https://cssn.org/wp-content/uploads/2020/11/Private-Standards-in-the-Climate-Regime-The-Greenhouse-Gas-Protocol.pdf>; Greenhouse Gas Protocol. 2001. GHG Protocol Corporate Accounting and Reporting Standard. <http://www.co2-sachverstaendiger.de/pdf/GHG%20Protocol%20a%20corporate%20accounting%20and%20reporting%20standard%20First%20Edition.pdf>; Greenhouse Gas Protocol. 2004. GHG Protocol Corporate Accounting and Reporting Standard: Revised Edition. <https://ghgprotocol.org/corporate-standard>; Greenhouse Gas Protocol. 2011. Corporate Value Chain (Scope 3) Accounting and Reporting Standard. <https://ghgprotocol.org/standards/scope-3-standard>; Greenhouse Gas Protocol. 2013. Technical Guidance for Calculating Scope 3 Emissions. <https://ghgprotocol.org/scope-3-technical-calculation-guidance>; Greenhouse Gas Protocol. 2015. GHG Protocol Scope 2 Guidance. https://ghgprotocol.org/scope_2_guidance; Greenhouse Gas Protocol. 2023. About us. <https://ghgprotocol.org/about-us>; International Organization for Standardization. 2022. Submission to Securities and Exchange Commission Response to Proposed Rules to Enhance and Standardize Climate-Related Disclosures for Investors. 17 June. <https://www.sec.gov/comments/s7-10-22/s71022-20131954-302413.pdf>.

Figure 2.4: Key Variables (Activities) in E-commerce Operations for Each Phase



Source: ADB staff based on Beggio, S. 2018. *A Model for the Assessment of the Environmental Impact of B2C E-commerce in Italy*. Politecnico Di Milano. https://www.politesi.polimi.it/bitstream/10589/145070/3/2018_12_Beggio.pdf.

Pre-Sale and Sale

GHG emissions from the initial pre-sale and sale stage of e-commerce result from energy consumption in IT, lights, and air conditioning/space heating (Siragusa et al. 2021). Figure 2.5 shows a flowchart of the general online order process. Pre-sale starts when a customer logs into their account on an e-commerce platform or creates an account for free if they do not yet have one. In most cases, digital technology enhances the personalized e-commerce experience when the website changes its settings to adapt to the customers' previous searches and purchased items. A customer usually carries out a product quality check, and if a customer needs to ask for information they can either send an e-mail or open a live chat on the platform. Once satisfied with the information, the customer chooses "add to shopping cart" and then to check out or add more items. The "check out" option takes the customer to the "final payment information" page before the order is completed. Order information is processed and recorded through the platform's database. In some e-commerce platforms without a warehouse, items are stocked by featured stores. When an ordered item is not available, the store reports this to the platform, which sends an order cancellation notification to the customer. The pre-sale and sale phase of online retail thus have environmental consequences, which include an increase in usage of IT devices, among other aspects.

In contrast, the pre-sale and sale activity of traditional or offline shopping relies on the "transport" activity of retail. It uses minimal IT activity (i.e., mainly for product search online before checking the product in-store). For simplicity, pre-sale phase starts when a customer travels from their home and reaches the shop and performs the purchase. The different phases and activities under both the online and the traditional retail will be discussed in detail in the next section.

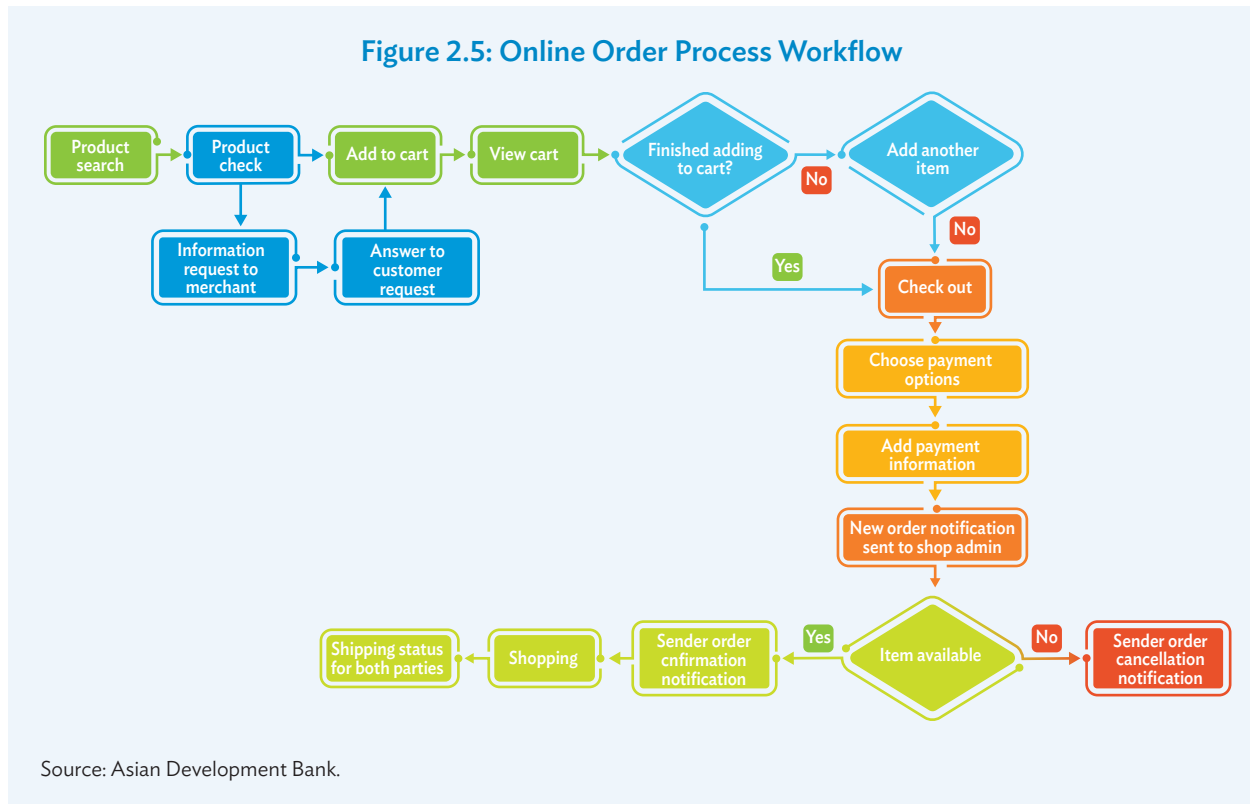


Table 2.1: E-commerce Customer Profile

| Type of Customer | Profile | IT Consumption |
|---------------------|---|----------------|
| Medium customer | The number of interactions with the merchant is at an average both during the purchasing process and in returning products. | medium |
| Systematic customer | More frequent interactions with the merchant and more products purchased with the intent to have more possibility to choose and later return the least desired items. | high |
| Occasional customer | Not much interaction with the merchant with very rare returns of products. | low |

Source: Beggio, S. 2018. *A Model for the Assessment of the Environmental Impact of B2C E-commerce in Italy*. Politecnico Di Milano. https://www.politesi.polimi.it/bitstream/10589/145070/3/2018_12_Beggio.pdf.

Consumer behavior

Determining the total duration of the online order process workflow is an essential variable in estimating the total GHG emissions of e-commerce during its “pre-sale and sale” stage. However, the time it takes one customer to search, check, and purchase an item online depends on several factors. One of the most crucial to consider is the customer profile. Taking account of the different facets of consumers gives a better assumption of their behavior at the pre-sale and sale stage on the e-commerce platform. Some general customer profiles are presented in Table 2.1.

Customer behavior also differs depending on the e-commerce industry and the value of items being purchased. As an example, in the apparel industry, consumers are classified based on three different styles of consumer: fashion-addicted, moderate, and apathetic (Mangiaracina et al. 2016). Fashion-addicted consumers, like systematic consumers, tend to compare many purchasing alternatives, visit different e-commerce websites, and easily returning a product if it fails to fulfill their needs. Moderate consumers display generic purchasing behavior such as limiting visits to websites and stores, trying only garments that really interest them, asking questions only when necessary, and returning the product when the size is not correct or the color does not match that shown on the e-commerce platform. Apathetic consumers behave like those in the occasional customer profile in that the time taken to decide on a purchase is minimal and returns are only done for major problems such as a defective product or an incorrect size (Mangiaracina et al. 2016).

Another important aspect of customer behavior is the propensity to choose eco-friendly products. Growing technological awareness and concerns of global warming and conservation of the natural environment have given rise to green consumerism. A survey reported that globally, the proportion of the population switching their purchasing behavior to more sustainable ways in the past 5 years have reached 85% (Business Wire 2021). The same survey reports that 60% of consumers rate sustainability as an important criterion in their purchases (Business Wire 2021). Such consumer behavior would lead e-commerce to impact the environment in a significant way. However, a recent study cites limited efforts to understand the complexities of green consumerism and its impact on environmental sustainability (Rao et al. 2021). The same study also carried out a survey and analysis to understand the relationships among green consumerism, positive and negative environmental attitudes, and behavioral intention in e-commerce usage. The survey shows that customer concerns for the environment go beyond individual purchasing actions and consumers are concerned about global warming and supportive of green consumerism.

Industry variability

The standard online order flowchart may need to be adapted to the requirements in different industries. That is, industries such as electronics, apparel, publishing, and food and grocery have different product features, order profiles, and service requirements. Online ordering of a USB drive or a book on an e-commerce platform probably requires less time than purchasing a pair of trousers. In terms of order profiles, products in industries such as electronics, apparel, and publishing may have fewer items purchased per order than food and grocery products. The service requirements of these industries, such as delivery lead times, may take longer to fulfill and may depend on the service level requested by the customer instead of being based on limitations of the product features. In contrast, food and grocery orders tend to include many items whose expiry dates may limit the delivery time.

Another aspect related to industry variability is the monetary value of the product. That is, the higher the value, the more attention is dedicated to collecting data about the product and the more interaction there is between customer and merchant (Beggio 2018). In most cases, this is dependent on the nature of the product and what industry it is classified under. As an example, consumers will spend more time checking the product features of a laptop, collecting reviews of the product, and researching brands. The same also can occur for luxury apparel. In contrast, for publishing and food and grocery products, consumers simply tend to rely on the best-known brands or brands to which they are accustomed and will purchase right away.

Information technology usage

Few of the studies on the environmental impact of e-commerce have explored the negative impact of cloud and data centers and general IT usage. Most estimations are targeted toward warehousing, transportation, the distribution network, and packaging. Background literature is generally lacking for energy forecasting model for e-commerce data centers. Yet, data centers are among the most energy-intensive building types globally. The energy consumption of data centers in the European Union (EU) reached 76.8 terawatt-hours (TWh) in 2018 (European Commission 2020a). By 2030, this is expected to increase by 28% to 98.52 TWh (European Commission 2020a). In the US, cloud and data centers account for about 2% of the total US electricity use and is expected to increase (US Office of Energy Efficiency and Renewable Energy).

A landmark 2021 study presents a forecasting model of data center electricity needs based on an understanding of usage growth (Koot and Wijnhoven 2021). Three cases are used in the simulation: the baseline model, scenario 1, and scenario 2. The baseline model aims to estimate electricity demand of data centers as it evolves if current technological and behavioral characteristics do not change. Scenario 1 represents the end of Moore's Law (a doubling of capacity every 2 years). It predicts that a 25% annual energy decline per processing unit is expected to stop having an impact by 2021 and 2023. Scenario 2 simulates the rise of the industrial Internet of Things (IoT) by slowly and linearly increasing its compound annual growth rate up to 31.91% in 2030. This scenario is derived from the observation that a sharp rise can be expected in the number of connected devices to the internet in the upcoming decade due to Industry 4.0 IoT developments. Table 2.2 shows the results from the estimates under each scenario.

Table 2.2: Comparison of Data Center Electricity Forecasts per Scenario

| Electricity Need | Baseline Model | Scenario 1 | Scenario 2 |
|-------------------|----------------|------------|------------|
| Electricity need | | | |
| 2016 | 286.42 TWh | 286.42 TWh | 286.42 TWh |
| 2030 | 320.87 TWh | 658.03TWh | 364.00 TWh |
| Electricity share | | | |
| 2016 | 1.15% | 1.15% | 1.15% |
| 2030 | 0.91% | 1.86% | 1.03% |

TWh = terawatt-hour.

Source: Koot, M. and F. Wijnhoven. 2021. Usage Impact on Data Center Electricity Needs: A System Dynamic Forecasting Model. *Applied Energy*. 291 (1). 1 June.

The study finds that, without deviation from the technological and behavioral trend in the current scenario (baseline model), the server's energy consumption will reach 320.87 TWh or a relative difference of 12% from the 2016 estimate. The impact of ending Moore's law or doubling the server's energy consumption will lead the data center's total energy needs to rise to 658 TWh by 2030. That is a relative difference of about 130% and an incremental increase of the share of the data centers' global energy consumption from 1.15% to 1.86% in 2030. The forecast of a sharp rise of physical objects being connected to the internet in the upcoming decade (scenario 2) will result to an electricity usage of 364 TWh or 27% increase from the 2016 value.

As e-commerce continues to expand globally, estimating electricity usage of data centers will become a major factor in the overall assessment of its environmental impact. It is particularly critical for big e-commerce platforms such as Amazon, Alibaba, and Apple, among others, whose own cloud data centers currently consume significant energy.

In 2017, Amazon's cloud computing operation in Northern Virginia alone approached 1 gigawatt of cloud capacity (Miller 2017). Alibaba, the biggest tech company in the PRC and biggest independent data center operator, had been criticized by nonprofit organizations for not disclosing its electricity consumption, elusive emissions reporting, and its dearth of renewable commitments (Murtaugh 2021).

The main challenge in assessing the information and communication technology (ICT) impacts in e-commerce is lack of prior knowledge of the amount of energy consumption in the production and use of ICT infrastructure attributable to e-commerce compared to other ICT activities (van Loon et al. 2014). Another challenge is measuring the time and corresponding carbon emissions of an e-commerce online shopping experience. Van Loon (2014) cites that the average Google search, consisting of both Google servers and consumer computer, emits 7g of CO₂. Google argued that the IT giant is only directly responsible for 0.2g of CO₂ per search.

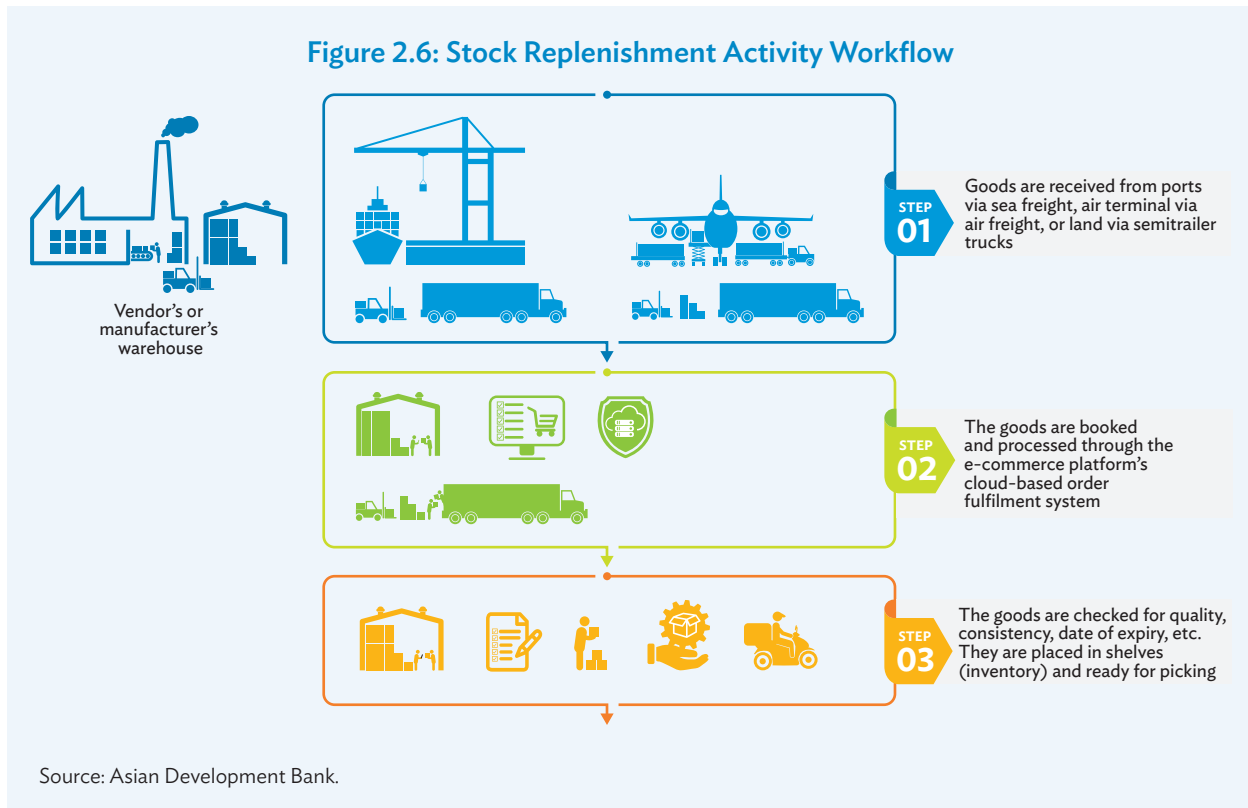
Two recent studies have attempted to incorporate IT energy usage. The most recent was carried out in 2021 by the Oliver Wyman group and covered selected countries in Europe. In the study, IT energy consumption in data centers was assumed to be about 0.32 kilowatt-hours (kWh) for every parcel purchased. It also assigned a value of 150 kWh per square meter for a partially automated warehouse (Oliver Wyman 2021). The study does not include impacts from consumer IT usage, which would cover usage from laptops, desktops, and mobiles. Another study, Beggio (2018), assigned an IT energy usage value of 0.12 kW for consumer operations using a laptop or mobile and a value of energy usage for the online activities of merchants. The study, however, does not emphasize IT data usage for the cloud data centers of e-commerce platforms.

Warehouse Activities

The next two phases of e-commerce workflow—stock replenishment and order picking and assembly—both occur in the warehouse. Under stock replenishment, the main warehouse activities are “receiving” and “transfer and put away.” This is followed by order picking/selection, accumulation or sortation, cross-docking, and shipping which fall under the category of “order picking and assembly” (Koster, Le-Duc, and Roodbergen 2007). For clarity and simplicity, these two phases will be discussed separately in two subsections.

Stock replenishment. When the stock in the picking warehouse reaches reorder levels, it is necessary to order replenishment (Beggio 2018). Such monitoring process can be automated using a reliable inventory management system. Siragusa and Tumino (2021a) defines stock replenishment as the transferring of goods from the central warehouse (upstream) to the “picking” warehouse to fulfill online orders (downstream). In general, central warehouses consist of a storage area, a sorting area, and a shipping area. Meanwhile, the picking warehouse consists of a storage area optimized for picking; a stock-order area, wherein orders are temporarily stored and assembled; and a packing and shipping area (Siragusa and Tumino 2021a). Goods from the central warehouse are transported in large quantities in 18 to 40 ton semitrailer trucks (Siragusa and Tumino 2021a).

Figure 2.6 provides a detailed workflow of stock replenishment. The scope of most emissions studies is limited to national warehousing and excludes vendor sourcing from overseas. This report incorporates GHG emissions resulting from the transport of goods from both national and overseas vendor source scenarios using assumptions presented in the Oliver Wyman study. Starting from the vendor or manufacturer's warehouse, the purchased goods are shipped (via sea freight, air freight, or semitrailer trucks) to a central station. The “receiving” activity starts here as goods are assessed for quality, accuracy, and consistency. Expiration dates are recorded and monitored, especially for perishable items made in batches. “Transfer and put away” refers to the transfer of incoming products to storage stations. These goods are put away as inventory and stocked on shelves in a manner where the oldest items are put in the front (ready for picking) and the newer/later expiry items are at the back. It could also cover repackaging (e.g., full pallets to cases, or standardized bins), and physical movements (from the receiving docks to different functional/operational areas, within these areas, and from there to the shipping docks) (Koster, Le-Duc, and Roodbergen 2006).



Order picking and assembly. Following stock replenishment is order picking, which refers to retrieving products from storage based on a customer request (Koster, Le-Duc, and Roodbergen 2006). This is the major activity in most warehouses and is considered the most labor-intensive operation in warehouses that require manual operation systems and is highly capital-intensive in warehouses with automated systems. Order picking begins once order confirmation is received at the retailer warehouse and it ends with items packed in cartons ready for the courier to pick up in the shipping area (Mangiaracina et al. 2016). Other steps are order fulfillment and the generation of a picking list, which includes more than one order when a batch picking policy is used. The products are then collected from the picking warehouse, and then packed and prepared for delivery. There are two types of picking systems: low-level and high-level. Low-level picking corresponds to an order picker manually taking requested items from storage racks or bins along the storage aisles. High-level picking involves high storage racks and heavy goods, which require order pickers to drive trucks or cranes to the pick-up locations (Koster, Le-Duc, and Roodbergen 2006).

Figure 2.7 shows the order picking and assembly workflow to better understand the varying sources of emissions under this phase. While staff in most warehouses do the order picking, automated and robotized picking is also used in special cases, such as for valuable, small, and delicate items. This report will focus on manual picking as an added contributor to overall GHG emissions from warehouse activity. This is because there may not be enough data on robotic order-picking systems to recommend the incorporation of such special activity in the estimation.

Main drivers of carbon dioxide equivalent impact: warehouse activities

This report covers two components in calculating GHG emissions for stock replenishment. The first is the shipment of goods from a central warehouse to a picking warehouse via air freight, sea freight, and/or land transportation. There

are not many studies to compare model algorithms in this category. However, the Oliver Wyman report considers cross-border e-commerce in its study. Table 2.3 lists its assumptions about vehicle CO₂e emissions. Government websites can provide greenhouse gas reporting conversion factors for freight goods shipped over land, sea, and air. Table 2.4 lists some of the vehicles used in e-commerce shipments.

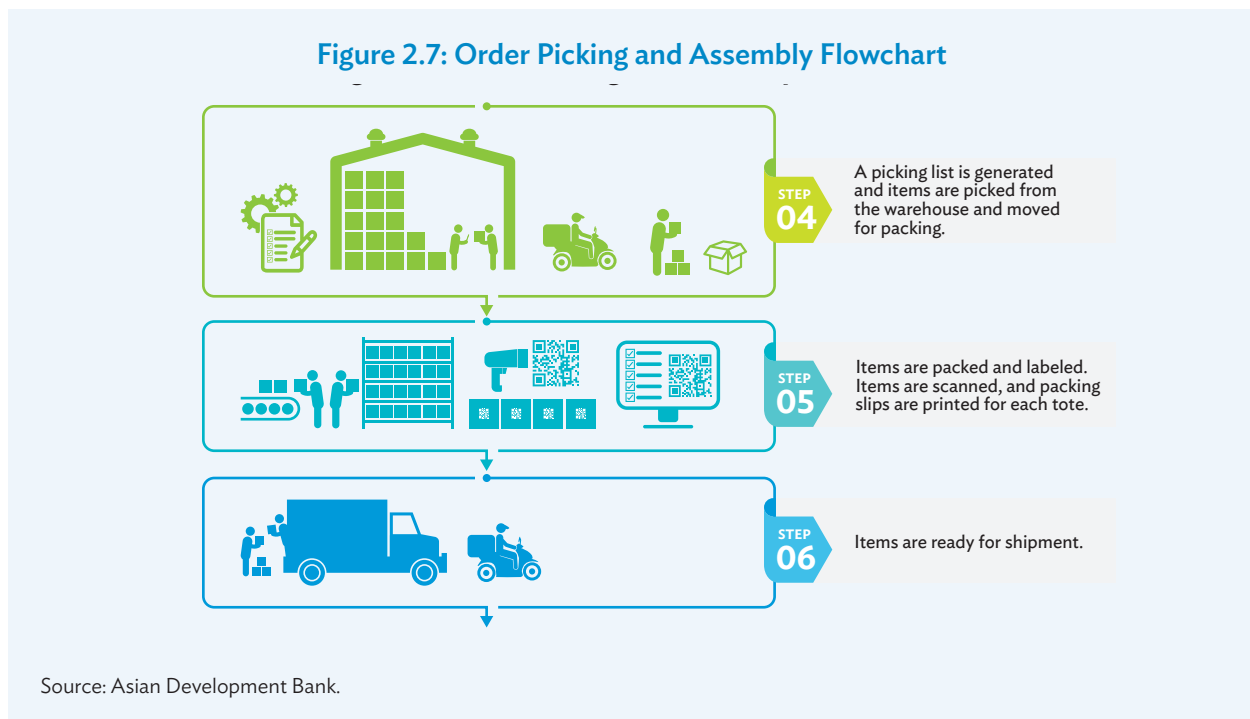


Table 2.3: Assumptions on Vehicle Carbon Dioxide Equivalent Emissions

| Transport Type | Leg Concerned | Load Factor (weight) | Share of Unladen Journey |
|---|--|----------------------|---|
| Sea freight | Sourcing from vendor | 70% | |
| Air freight | Parcel transit (air from Asia) | 70 to 81% | |
| Semitrailer 40 tons (miscellaneous long distance) | Sourcing from vendor (part on road) and store replenishment (physical retail retailer linehaul, between national and regional DC only) | 63% | <ul style="list-style-type: none"> • 0% for sourcing from vendor part • 20% for store replenishment |
| Semitrailer 40 tons (parcel) | Parcel transit (e-commerce retailer linehaul) | 2,500–3,000 parcels | 50% (all return are empty) |
| Straight truck 7.5 tons | Store replenishment (physical retail retailer linehaul, DC, and store only) | 38% | 20% |

CO₂ = carbon dioxide, DC = distribution center.

Source: Oliver Wyman. 2021. *Is E-commerce Good for Europe? Economic and Environmental Impact Study*. Logistics Advisory Experts (LAE) University of St Gallen, Switzerland. <https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2021/apr/is-e-commerce-good-for-europe.pdf>.

Table 2.4: Conversion Factor: Freighting Goods

| Transport Type | Unit | Conversion Factor (kgCO ₂ e) | |
|--|--------|---|--|
| Vans (up to 3.5 tons) | km | 0.24116 (diesel) | 0.05463 (battery electric) |
| Heavy goods vehicle | km | 0.82851 (50% laden) | 1.00128 (100% laden) |
| Freight flights (International, to/from non-UK) | ton.km | 1.0189 (with radiative forcing) | 0.53867 (without radiative forcing) |
| Rail | ton.km | 0.02782 | |
| Sea tanker (products tanker) | ton.km | 0.00903 | |
| Cargo ship (bulk carrier) | ton.km | 0.00354 | |

kgCO₂e = kilogram of carbon dioxide equivalent, km = kilometer, UK = United Kingdom.

Source: UK Department for Business, Energy and Industrial Strategy. 2021. Greenhouse Gas Reporting: Conversion Factors. *Research and Analysis*. 2 June. <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021>.

Last-Mile Delivery

Last-mile delivery refers to the transfer of goods in a delivery vehicle from the shipping or sorting center to the customer's home. The delivery route may be both in urban areas and in extra-urban areas, depending on the customer's delivery point (residence) (Beggio 2018). Last-mile delivery starts when couriers pick up parcels at the retailer warehouse or depots and it ends with delivery at the customer's house. Last-mile delivery has a major influence in calculating the GHG emissions of e-commerce. Like online activities on the e-commerce platform, last-mile delivery is another unique feature of online retail. Most of the other transport activities are the same whether online and traditional retail is involved. However, compared to other phases of e-commerce activities, last-mile delivery is a subject of great concern among researchers. Studies as early as 1999 and 2003 concluded that the steep increase in home deliveries, some of which are relatively inefficient, reduces the net benefit of online retailing (Edwards, McKinnon, and Cullinane 2010). The rapid rise in orders over the internet has increased concerns about the environmental repercussions of the corresponding expansion of the home delivery market (Edwards, McKinnon, and Cullinane 2010).

Besides environmental concerns, last-mile deliveries are also expensive to organize for logistics service and warehouse providers that carry out these deliveries. In general, they account for 13%–75% of total supply chain costs (Rai, Verlinde, and Macharis 2018). The same study also mentions that the high costs are incurred with the express delivery of parcels, which normally takes place over 2 days, the next day, or even the day of purchase) (Rai, Verlinde, and Macharis 2018). Swift delivery terms result in inefficient routing and consolidation of parcels (Rai, Verlinde, and Macharis 2018). Recent studies come to varying conclusions on this point. One study finds that shopping through the hybrid approach (click and fulfillment via physical store delivery) most likely lowers the GHG footprint when replacing traditional shopping, while fast-moving consumer goods (FMCGs) purchased through a pure online platform with product delivery often have a deeper GHG footprint than goods purchased through traditional retail (Shahmohammadi et al. 2020). In contrast, another recent study concluded that compared to customers going to the store in traditional retail approach, last-mile delivery remains more environmentally sustainable. It cited that for an average nonfood product in selected countries in Europe, last-mile delivery accounted for 215 grams of carbon dioxide equivalent (gCO₂e) or 26% of total emissions in an e-commerce operation while “consumers going to store” accounted for 596 gCO₂e or 30% of total emissions in a tradition retail operation (Oliver Wyman 2021).

Distribution centers or collection points to fulfill e-grocery orders are generally set up close to customers to reduce the transport lead time (Siragusa et al. 2021). A large number of products per order means that the consolidation and sorting activities typical of other e-commerce industries are not needed (Siragusa et al. 2021).

Post-Sale

The final phase of online retail is post-sale. On a best case scenario, this covers installation, user support, maintenance, and other services. However, on average, post-sale processes in some industries are targeted mostly toward the return of goods. This adds complexity in logistics as it implies the “reverse flow” of goods (Beggio 2018). In some studies, post-sale is limited to the return of an item. Hence, post-sale activities may or may not take place, depending on specific cases as well as on consumer behavior (Mangiaracina et al. 2016). The same study considers a customer’s intention to return an item as a “trigger” for starting post-sale activities. Interaction can take place between the two actors to exchange information once the customer informs the retailer they intend to return a delivered item. The merchant will check whether it can accept the return request. The customer will also perform all activities necessary for return, such as packaging and labeling the good so it can be picked up by another delivery van or dropped off at a collection point. The items are then brought back to the retailer’s warehouse and the retailer manages the return flows (Beggio 2018).

The Oliver Wyman study cites that across all categories and countries studied, more than 80% of customers return fewer than 10% of the goods they purchase on e-commerce platforms. However, a small share of heavy buyers drive the average online return rate from 10% up to 20%. It is important to note, however, that the study also records that e-commerce return rates are higher than in traditional retail. This corresponds to higher emissions attributed to a higher return rate. Considering an average basket size of three items, the same study calculated the real online return rate per item at between 5.3% and 14.7% and the physical retail return rate at between 2.7% and 7.4%.

These results are consistent with the conclusions by Mangiaracina et al. (2016). The study finds that the environmental impact of post-sale (limited to returns) in the online process is 0.71 kilograms of carbon dioxide equivalent (kgCO_2e), or 24% of the total emissions. That is higher than emissions from traditional retail, which at 0.11 $\text{kg CO}_2\text{e}$ are only 2% of the total emissions. The difference in emissions is driven by a more significant role of returns in the e-commerce platform (mainly from the apparel industry). Higher returns generate more post-sale activities such as labeling and pick-up of returned products, picking, packing, and the delivery of new items. Meanwhile, product returns in traditional stores are very low relative to returns from online purchases. Hence, the post-sale activity in the offline process is often negligible.

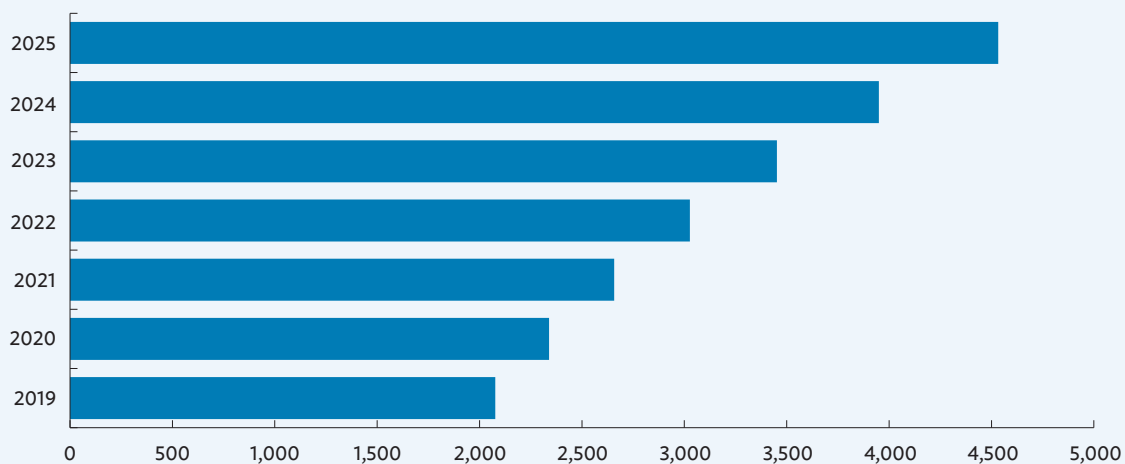
Packaging Waste

Most of the scientific literature assessing the environmental impact of e-commerce excludes the rapidly growing buildup of packaging waste that e-commerce generates. Yet, this issue has become a global concern with environmentalists confronted against excessive padded mailers, corrugated fiberboard, shrink wrap, and air pillows as e-commerce continues to gain traction (Chua 2021). This situation accelerated during the coronavirus disease (COVID-19) pandemic when most of the population shifted to online platforms to meet their shopping needs—a trend that is unlikely to reverse. Statista estimates that, in 2019, the global e-commerce industry used 2.1 billion pounds of plastic packaging (Statista Research Department 2023). They report that plastic usage will reach 4.5 billion pounds over the 5 years to 2025 (Figure 2.8), with Figure 2.9 showing the global breakdown of e-commerce plastic packaging shares in 2019. Protective packaging, which includes bubble wrap and air pillows, account for 35% of packaging use, making it the most used packaging product type. This is followed by pouches and bags at 31%.

Recyclability is quite low. Less than 14% of close to 86 million tons of plastic packaging produced worldwide each year can be recycled (Chua 2021). The rest is landfilled, left to pollute airways, and when incinerated adds exponentially to GHG emissions incurred by e-commerce operations. In the US alone, demand for filled-air products was poised to expand by \$1.16 billion between 2020 and 2024 due to the spike in online sales. Amazon dispatches more than 10 billion packages a year, according to estimates for 2018 (Escursell, Llorach-Massana, and Roncero 2021). A recent study also cites that the e-commerce giant generated about 465 million pounds of plastic packaging waste in 2019 (Chua 2021). In addition, it was also cited that up to 22.4 million pounds of Amazon’s plastic packaging wind up in freshwater and marine systems across the globe (Chua 2021).

Escursell, Llorach-Massana, and Roncero (2021) has proposed packaging alternatives to bring down the buildup of e-commerce waste materials. It cites that cellulose-based materials have a very low environmental impact relative to others. Nanocellulose also appears to have a lot of potential for application due to its exceptional mechanical, physical, thermal, and optical properties. The food packaging industry is also turning toward more efficient ways to produce this material, given its antimicrobial properties, its transparency, and water and oxygen-permeable properties (Escursell, Llorach-Massana, and Roncero 2021). The study also recommended establishing effective guidelines and policies to avoid overpackaging of online items.

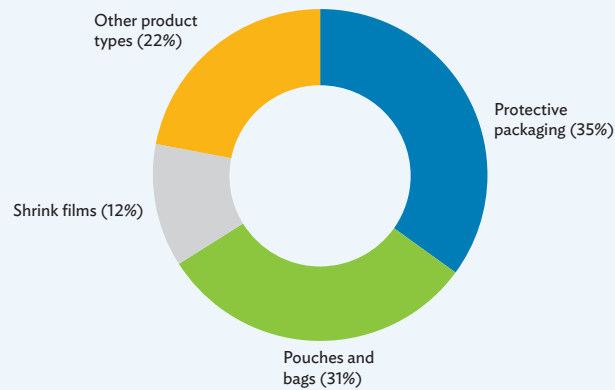
Figure 2.8: Estimated Annual E-commerce Plastic Packaging Use in 2019, with Projections to 2025
(millions of pounds)



Source: Statista. 2023. Estimated Annual E-commerce Plastic Packaging Use in 2019 with Projections to 2025. <https://www.statista.com/statistics/1271093/annual-e-commerce-plastic-packaging-use-globally/#statisticContainer>.

Policy Recommendations

E-commerce comes with considerable negative impacts to the environment as it accumulates GHG emissions at every step—from pre-sale to the last-mile delivery. With this awareness, consumers and corporations increasingly recognize their environmental footprint online. More e-commerce actors are engaging in more sustainable ways of consumption and doing business in ways previously ignored. This has led to a gradual shift toward sustainable

Figure 2.9: Distribution of E-commerce Plastic Packaging Worldwide in 2019, by Product Type

Source: Statista. Plastic and Rubber. Distribution of E-commerce Plastic Packaging Worldwide in 2019, by Product Type. <https://www.statista.com/statistics/1271118/e-commerce-plastic-packaging-product-type-shares-globally/> (accessed 14 February 2022).

e-commerce shopping. From the retailers' side, many companies are finding solutions in addressing GHG emissions in their upstream and downstream supply chains. The latter phase of e-commerce sparked calls for more information about materials used in home deliveries. From the consumer side, more shoppers are becoming sustainability-conscious and are willing to pay a premium for sustainable e-commerce brands and products. The International Post Corporation, in a cross-border e-commerce shopper survey, found that 60% of respondents said they preferred sustainable e-commerce packaging and 48% preferred carbon-neutral parcel delivery (Wouters 2019).¹⁰ The survey also found that 50% of respondents were willing to pay an additional €0.10 fee to switch to environmentally friendly packaging, while 43% were willing to pay €0.10 to cover additional costs for carbon-neutral deliveries. This section discusses alternative solutions that promote sustainability and bring down GHG emissions in e-commerce operations.

Alternative Delivery Systems

E-commerce last-mile delivery offers a wide range of opportunities to go “green.” All actors in its ecosystem—such as post and parcel organizations, retailers, delivery companies, governments, and consumers—can contribute to ensuring deliveries to consumers become more sustainable (Accenture 2021). One of the areas that can be explored is generating the most efficient vehicle route. This pertains to creating a sustainable delivery route, starting from the depot to each delivery location at specific delivery dates while ensuring the least operational cost and GHG emissions. Adjustments to achieve sustainability include merging delivery windows and delivery points to ensure optimal routes and shorter trips. As an example, parcels with the same origin depot and delivery points may be bundled into one delivery route on condition that the delivery windows are identical. This is referred to as “one multi-drop parcels” (Heshmati et al. 2019). For rural regions where few parcels delivered at a time means higher cost for carriers, a study proposes carrier bundling and even regional monopolies to increase the number of parcels carried by a single carrier, which gives leverage for higher profit as opposed to more carriers handling few

¹⁰ The survey covered over 33,500 consumers across 41 different economies in North and South America, Asia and the Pacific, Europe, and the Middle East.

parcels, which generates losses (Heshmati et al. 2019). Bundling parcels into one carrier also decreases emissions per parcel, making this a more sustainable solution for rural deliveries.

Another solution is to establish more sustainable delivery points such as fulfillment centers, collection points, curbside pickup, and parcel drops that can cater to specific locations. Online businesses have adopted this solution in response to the surge in online orders during the pandemic. The e-commerce market and retailers transformed stores into fulfillment centers or collection points that allow customers to collect parcels at their convenience. From the store and carrier's perspective, this mode of delivery is also optimal as they can ship and deliver parcels at lower cost and minimize the risk of multiple failed direct deliveries (Heshmati et al. 2019). More important, the more practical delivery route leads to fewer emissions, with a positive impact to the environment. Economic modeling by Accenture and Frontier Economics in London found that local fulfillment centers or collection points could reduce supply chain emissions by up to 26% by 2025 (Accenture 2021). The positive environmental effects of alternative delivery systems such as collection points and the direct-to-consumer sales channel are elaborated in Appendix A.

Sustainable Delivery Transport

The use of greener shipping options, such as bikes and electric vehicles (EVs), has become the forefront for sustainable last-mile delivery. A survey by Bringg of 500 retailers in the US, Canada, the United Kingdom (UK), France, Germany, and Italy noted that with sustainability and carbon emissions becoming more and more important for retailers and consumers alike, about 56% of e-commerce businesses are using fleets with EV and one in three are using bike fleets (Bringg 2022). About 33% of respondents also said bike fleets help them achieve faster last-mile delivery. E-commerce giants are also shifting to EV vehicle delivery, with Amazon in 2019 famously announcing the order of 100,000 electric delivery trucks from Rivian Automotive, Inc. and plans to complete the rollout by 2030 (Coyle 2022). Meanwhile, other major e-commerce platforms such as eBay, Etsy, IKEA, and Unilever are supporting the adoption of the US regulation on Advanced Clean Truck Rule in line with the objective of achieving 100% zero-emission last-mile deliveries (US Department of Environmental Protection 2021). Major international carriers such as DHL, Fedex, and UPS are also making climate action their priority, including through greener shipping options such as bikes and electric vehicles (Walloch 2021). The PRC has around half of the delivery vehicles worldwide (Dewitna 2022). UPS has been ahead of the game in the PRC in bringing electric vehicles to the country's delivery operations (UPS 2022). In Japan, electric vehicles were expected to account for about 4% of the fleet of Japan Post, the country's mail and parcel delivery services, by the end of March 2021 (Nippon 2019). In 2018, the Korea Post, the Republic of Korea's national postal service, also announced the introduction of 10,000 EVs to replace its gasoline-powered motorcycles by 2020 (International Transport Forum 2019).

Common Warehouse Management

The principle of bundling and monopoly cited for rural regions may also apply in warehouse management, where small businesses without their own warehouses can outsource such a service. This is often provided by third-party logistics (3PL) companies and offered along with logistics management services. Common warehouse management helps promote better supply chain management and smarter, less carbon-intensive transportation solutions (Couto 2020). As an example, it can (i) provide a cost-efficient and sustainable method for delivering parcels in similar origin depot, delivery points, and delivery times; (ii) consolidate shipments or use of intermodal services to reduce environmental impacts; and (iii) ensure shipment deliveries are in compliance with regulatory standards before they leave the warehouse. Within warehouse operations, integrating or bundling shipments in a common warehouse also reduces energy usage in lighting, IT infrastructure, and office equipment, among other

uses.¹¹ Otherwise, such warehouse operations add to the warehouse operational costs and are a major source of GHG emissions. Hence, the reduction of energy consumption through bundling of shipments into one major warehouse also translates to a lighter carbon footprint.

Recycling and Sustainable Packaging

Körber Supply Chain cites that one important contribution of 3PLs to reducing environmental impact of e-commerce is establishing sustainable infrastructure to support recycling and disposal (Couto 2020). This includes going paperless and digitalizing logistics and warehouse operations, reducing wasteful practices in shipping, and recycling and reusing of packaging. In general, e-commerce businesses can aim to reduce waste by using recycled paper and cardboard boxes for packaging and shipping. In the PRC, the government released the nonbinding guidelines called National Standard for Parcel Packaging Products in 2018 to address overpackaging, the rapid increase of parcel delivery, and plastic package recycling (1421 Consulting Group 2021). In April 2021, the China State Post Bureau announced that a program for excessive packaging would be launched and that a long-term mechanism to deal with excessive packaging issues would be established within 1 year (Smithers 2021). By September 2022, the PRC government released the Notice on Further Strengthening the Control of Excessive Packaging of Commodities, which is in line with the government's green development strategy (Bestao Consulting 2022). The notice calls for enhanced enforcement of laws and regulations against excessive packaging, particularly those of moon cakes, *zongzi* (rice dumplings for the dragon-boat festival), tea, health food, and cosmetics (Bestao Consulting 2022).

Major e-commerce giants have taken initiatives to promote sustainable packaging following the release of the guidelines in promoting green packaging in the delivery industry (Wan 2019). Additionally, the increase in the price of carton boxes (i.e., corrugated paper) are also influencing e-commerce platforms to take initiatives in reducing packaging waste (Wan 2019). In the US, innovations to reduce plastics usage to a minimum have made sustainable packaging easier to implement. This includes biodegradable cartons made from cornstarch, peanuts, and mushrooms (Oates 2021). The Republic of Korea has also introduced recycling guidelines for postal and delivery packaging (Government of [the Republic of] Korea, Ministry of Environment). In 2021, the chemical company LG Chem and the Republic of Korea's e-commerce giant Coupang made a tie-up to recycle 3,000 tons/year of stretch wrap at Coupang fulfillment centers and to offer a door-to-door plastic-waste retrieval system (Plastics and Rubber Asia 2021). The EU has ongoing consultation on the revision of the EU Waste Framework Directive, which aims to create a real single market for waste intended for reuse, repair, and recycling (E-commerce Europe 2022).

Incentives for Environment-Friendly Packaging

Sustainability in packaging has gained traction in the shift toward environment-friendly e-commerce and amid global consumer sentiment brought about by packaging leakage into the marine ecosystem (McKinsey & Company 2022). Governments worldwide are passing stricter regulations in support of sustainable packaging beyond the traditional shopping bags and food-service items (McKinsey & Company 2022). The UK introduced the Plastic Packaging Tax starting April 2022. The regulation applies to plastic packaging manufactured in, or imported into the UK (Government of the United Kingdom 2021) and aims to provide an "economic incentive for businesses to use recycled plastic in the manufacture of plastic packaging" (Government of the United Kingdom 2021). The EU also passed a tax of €0.80 (about \$1.00) per kilogram on nonrecycled plastic packaging waste. This aims to provide the incentive for member states to enable recycling or reduce single-use plastic packaging (Pont Green 2020).

¹¹ BCR. 4 Ways to Build a Sustainable Supply Chain with a 3PL Sydney. <https://bcr.com.au/build-sustainable-supply-chain-3pl-sydney/>.

France also established schemes for recyclability of packaging materials such as a “bonus/malus” system wherein paper companies pay 10% less when using packaging with more recyclable material but pay 5% more when using or introducing unsustainable materials into the recycling system (Pont Green 2020).

Volume-Rate Garbage Disposal and Separate Collection of Packaging Waste

Proper collection and segregation of waste are crucial for improving the quality of recyclables and to ensure all types of waste go through the appropriate form of decomposition and/or reuse. Some economies have introduced programs for disposal systems and the proper collection of packaging waste. The first economy to introduce Volume-Based Waste Fee was the Republic of Korea in 1995. Under this policy, households and small businesses were required to purchase standardized plastic bags in disposing household waste (World Bank 2019). According to the Republic of Korea’s environment ministry, the Volume-Based Waste Fee policy was highly effective in increasing recycling rates and, as a result, also decreased the amount of recycled and composted waste sent to landfills and incinerators, which helped relieve the burden for municipal governments in creating new waste infrastructures (World Bank 2019). The EU also introduced the Waste Framework Directive in 2008, which provides guidelines in the separate collection of municipal waste and establishes a waste disposal hierarchy of prevention, reuse, recycling, recovery, and disposal (European Union 2009).

In order to increase the demand and value of recyclables, packaging materials cardboards, boxes, and so on, improvement to sorting and collection is essential. The EU’s Directive on Packaging and Packaging Waste of 1994 was the first regulation on packaging and packaging waste prevention and management (European Commission 2020b). The *Waste Framework Directive* of 2008 built on this regulation by providing updated guidelines on the separate collection of paper and cardboards (Dubois et al. 2020). The UK released its guidance on the separate collection of waste paper, plastic, metal, or glass in 2014. This introduced the requirement to separately collect waste, including paper and packaging materials (Government of the United Kingdom 2014). Japan’s *Container and Packaging Recycling Act* was enforced in 1997, initially targeting glass bottles, aluminum cans, steel cans, and PET bottles (Tasaki 2008). The act was revised several times, including in April 2000 when plastic packaging, paper packaging, and cardboard were added to the items for recycling. In 2008, the act incorporated a mechanism providing incentives to municipalities for the high-quality separation of waste. Singapore, meanwhile, introduced the *Resource Sustainability Act* in July 2020 to provide a legislative framework for the regulation of e-waste, food waste, and packaging waste, including plastics. Under the law, packaging waste in e-commerce delivery such as paperboard and cartons are classified under secondary and tertiary packaging and are required to be reported by brand owners, manufacturers, and importers, as well as retailers such as supermarkets (Government of Singapore, Ministry of Sustainability and the Environment 2020).

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CHAPTER 3

Competition Policy for E-commerce

Introduction

The greatest benefit of e-commerce for consumers is in driving down prices by expanding access to a wider range of products through online searches, while for manufacturers and retailers it is the efficiency gains added for promotions and transactions, and supply chain management. However, e-commerce increasingly risks fueling anticompetitive behavior because of the advantages it offers for e-commerce business players, including dominant online platform operators, through economies of scale and exclusive access to suppliers and market information. This chapter explores in detail the challenges that competition policy faces in the digital economy in Asia and the Pacific. It presents cases from other regions and outlines opportunities for the development of e-commerce in such challenging conditions.

In 2018, the previous report in this series noted that e-commerce not only has changed the modality of consumer shopping but also greatly widened information available and the range of choices for products and services (ADB 2018). Online retail platforms have many different opportunities to gain access to a wider market, including consumers in various markets. Freed from the conventional vertical value chain model of the physical retail platform, their options for making money include direct retail sales, providing intermediate services or platforms to other online retailers, monetization of consumers' "eyeballs" for advertisers, and the buildup of consumers' personal data. The Organisation for Economic Co-operation and Development (OECD) cites two fundamental questions in anticompetitive behavior that are relevant to e-commerce. The first question is to what extent business activities in the ever-changing digital economy should be subject to competition law. The second is whether established competition rules and enforcement tools are effective and can be appropriately applied to e-commerce. OECD concludes with the consensus that established competition rules and analytical framework are sufficient to assess and sanction anticompetitive behavior in the e-commerce sector (OECD 2018a). However, defining the e-commerce market is particularly complex given the extent to which online sales overlap with retail activities offline.

The Association of Southeast Asian Nations (ASEAN) discusses this challenge, both in terms of the relevant product and/or services and the area of jurisdiction covered (ASEAN 2018). Its competition report noted that 80% of respondents in a survey point to a lack of market definition as among the biggest issues in dealing with e-commerce competition challenges. In a typical single-sided online market, the traditional method of defining a relevant market takes account of factors such as supply-side substitution and potential competition from new entrants. For such a market, competition authorities usually perform the SSNIP test (measuring the effect of a small but significant and non-transitory increase in price) as standard procedure. This hypothetical monopoly test determines whether a company in a market can profitably raise prices by 5% to 10% for a sustained period of time.

In the case of e-commerce with a multisided characteristic of markets, this becomes challenging. Multisided online platforms generally involve one intermediary serving multiple customer groups with indirect network effects between these sides. This arrangement consequently impacts the prices that both sides can set (ASEAN 2018).

Determining the market dimension, in itself, is also challenging and may involve cross-elasticity analysis to show how prices respond to changes in supply on one side of the market against demand on another side. In the multisided case, applying the SSNIP test is challenging as this often requires considering multitudes of possible companies that can take a monopolistic role in the test (ASEAN 2018). The distinction becomes analogous with consumers easily switching between either online or offline channels should prices rise by 5% to 10% (ASEAN 2018).

Competition enforcement is highly context-specific. According to OECD (2018a), the practice depends on factors such as product specifications, customer preferences, market trends, and the business models of existing vendors. It was suggested that such rise of multisided business modalities has led to existing approaches being irrelevant “due to interrelationships and externalities between distinct sides of the market which affect the way firms set prices.” They regard the standard tests used by competition authorities in a traditional market as generally not applicable in an e-commerce setting. Given the complex and context-specific enforcement of competition policy, new forms of information gathering and analytical models are needed in e-commerce to capture innovative approaches, multisided markets, and the implications of big data.

Implications of Competition in the E-commerce Marketplace

Understanding how players in the digital market adapt to competition strategy may be one of the primary steps in conforming competition policy and enforcement in the age of e-commerce. What then are the implications for competition in e-commerce (Van Gorp and Batura 2015)? The European Parliament’s Committee on Economic and Monetary Affairs raised three fundamental questions on the implications of competition in e-commerce. These are (i) what are the challenges for traditional competition policy and what sectors are they relevant, (ii) whether the existing instruments are sufficient to enforce and reach the proper target, and finally, (iii) what are the necessary steps to address such challenges (Van Gorp and Batura 2015). A European Union (EU) report cites some ways businesses are operating to compete in the digital market:

- (i) **Innovate to compete.** One of the ways digital business players operate in the e-commerce sector is to compete through constant innovation. They innovate to compete, enter new markets, and/or defend current market positions. All players benefit from network effects and scale economies and can reach a situation that resembles winner-takes-all. These big players are put under pressure by new business models that offer innovative services and new products that, oftentimes, favor small businesses able to bypass gatekeepers and reach end users faster. Such situations force large platforms to keep on innovating to gain a larger share or even a monopoly of the specific market.
- (ii) **Customer lock-in.** Vendor lock-in is a strategy that puts a customer into a position wherein the transfer costs required to switch to a different vendor exceeds the amount that the customer is willing to pay or is so high that customers choose to be “locked-in” with the original vendor. The switching cost generally occurs when shifting from the original to a new service provider incurs inconvenience or extra costs. In e-commerce, this “switching cost” may not necessarily be financial. It could relate to the consumer’s time and effort to transfer (soft lock-in) and the good reasons to stay with the original vendor, such as positive customer experiences and incentives. A successful lock-in strategy occurs when businesses are able to link their brand to a customer’s idea of their own personal brand. This establishes a solid partnership and builds a direct relationship, while making it more difficult for competitors to encroach on that space. E-commerce platforms lock in customers through verification of payment information, quick sales, and discounts on favorite items that other platforms may not offer. Some online platforms often

offer loyalty incentives such as cash-on-delivery or transfer payments once the customer's reputation has been verified through numerous transactions.

- (iii) **Control large customer data to improve platform service.** A higher form of customer lock-in occurs through the integration of multiple platforms using customer data, which creates synergies benefiting both consumers and businesses. This means that while players compete in the digital market by control of personal data to improve service quality, customers end up getting locked in. This happens because certain services can become integral to an individual's day-to-day activities, and they are less willing to switch to other services. This is the leverage businesses can use if they collect personal data from consumers. Indeed, limits on the sharing of personal data with competitors create another layer of switching costs for consumers.

Digital platform operators can set themselves up as gatekeepers by using personal data to create a unified digital environment. The power of receiving data from consumers gives rise to interoperability—the ability of different digital services to align their systems with each other (OECD 2021). Small service providers and potential market entrants find interoperability appealing as this gives them access to a large customer base they might otherwise not have the resources to reach. Consumers benefit from interoperability as they can easily switch between different platforms or even use multiple platforms simultaneously. However, dominant digital platforms have an incentive to minimize multi-homing and raise switching cost.

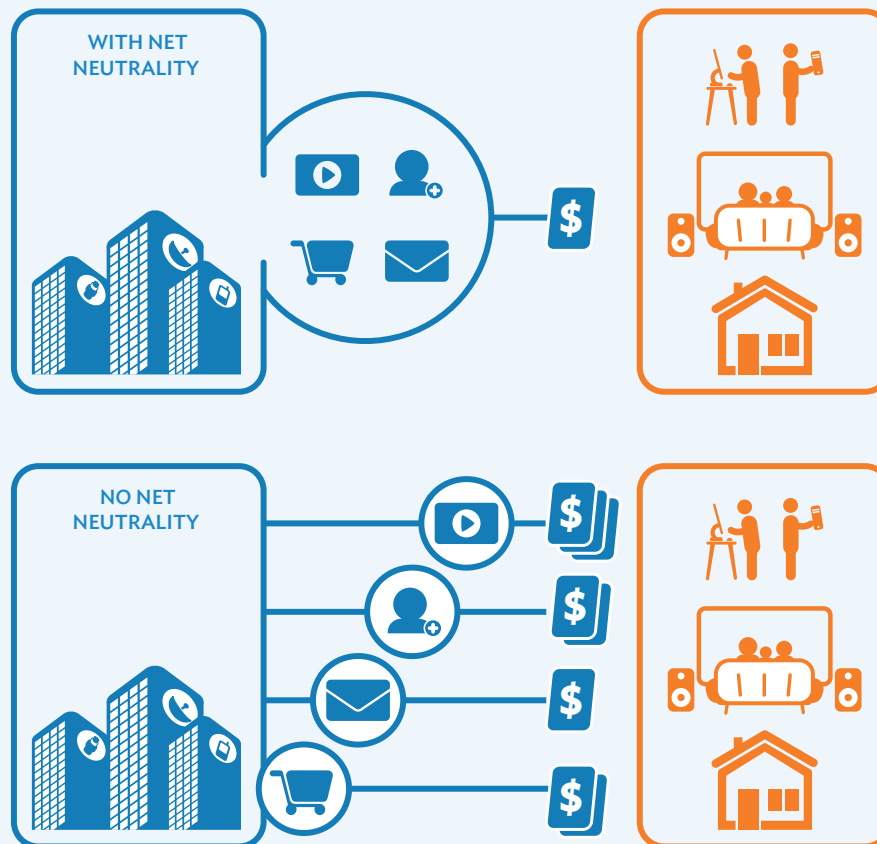
An OECD report notes that “competition enforcement is the optimal mechanism for imposing interoperability and portability measures” (OECD 2021, p. 28). This is because it can promote competitive markets and consumer welfare, and limit dominant companies, reducing burdens on small companies and new entrants. However, another EU-focused report cites that data protection regulation, as in the case of the EU's General Data Protection Regulation (GDPR), can inadvertently limit the ability of start-ups and small and medium-sized enterprises (SMEs) venturing into the online marketplace if such protections “(i) prohibit or restrict certain data collection methods used by entrants to catch up to incumbents, (ii) create disincentives to share data, and to acquire data from external sources due to difficulties in obtaining consent, thus increasing first-mover advantages for companies that already possess data, and (iii) provide incumbents with a justification for limiting data access to rivals” (Gal and Aviv 2020, p. 4-5, 20, 22; OECD 2021, p. 39).

- (iv) **Control access to technology.** The OECD (2021) report cites control over access to technology as another potentially powerful gatekeeper position in the e-commerce sector. Hence, patents have a critical role in the competition for leadership in the operating systems (OS) market as they can grant control over access to digital technology. There is intense battle between operating systems, with the role of patents being among the critical areas large platforms consider. That is, devices are only as good as their technological capacity to support OS applications and other services provided through them. It is important that all devices are interoperable, based on technological standards (such as GSM, UMTS, LTE). Such standards have a combination of patented technologies and are referred to as Standard Essential Patents (SEPs). In general, OS developers own a wide range of portfolio of SEPs and they collectively commit to license in/out SEPs from/to each other on the basis of fair and reasonable and nondiscriminatory terms.

Net Neutrality and E-commerce

In the event that economies lift regulations on net neutrality, internet service providers (ISPs) will have free control in setting prices for specific internet content (Figure 3.1). This would give smaller content and service providers a huge disadvantage, limiting both their businesses and the conditions open to end-users. In the case of e-commerce, net neutrality is particularly crucial as sales rely heavily on speedy internet access and page loading times, as discussed in Box 3.1. If a company's web page platform is controlled by an ISP, its customers would experience one of two scenarios: a faster access and page loading if they are able to pay the ISPs set premium, or a much slower access if they do not pay such premiums to ISPs. Easy access and fast web page loading is crucial in online selling because impatient consumers tend to leave if a page is taking too long to load (Doyle n.d.). Worse is when an ISP blocks a site altogether, as customers are no longer able to browse (Doupnik 2017). Under a no net neutrality scenario, where ISPs can control internet speeds on e-commerce platforms, large multinational e-commerce businesses, with more financial resources to pay for premium speed and access, are able to compete. In contrast, start-ups and small companies lack the financial resources to pay ISPs for a targeted speedy connection, and despite needing equal access to consumers, will be unable to compete on the same terms. And while small sellers will lose revenue, they also may be moved further down the search results. One particular case is when lifting measures on net neutrality will hurt e-commerce platforms for specialty products, women-owned businesses, and local goods and services.

Figure 3.1: Negative Impact of No Net Neutrality



Source: Asian Development Bank.

Box 3.1: Role of Internet Service Providers and Net Neutrality

Competition occurs when several ISPs provide services and end-users are able to switch to alternative access routes. This limits ISPs from charging high retail prices. However, by charging digital service providers fees to get premium access to customers, ISPs can create new revenue streams and use part of that income to improve network quality. In the absence of any agreement with digital service providers, ISPs can degrade or block access to content. Although large digital platforms may have countervailing bargaining power, small platforms and less popular ones will be worse off as they pay premium access or may have limited access to potential customers. On the other hand, ISPs have limited power in their data prioritization charges if competition between ISPs allows customers to switch freely from one ISP to another.

Such a regulatory concept has been coined as “net neutrality.” This is the principle that presupposes that ISPs and governments treat all content and users on the internet equally and fairly. It denotes a neutral transmission such that “every packet of data, regardless of its content, origin and the application that created it, is treated the same way and the best effort should always be made to forward it” (CESifo 2011, p. 44). This principle remains the most relevant internet regulation policy and has been heavily debated around the world for nearly 2 decades (Garrett et al. 2022). One study notes that global debate targets whether net neutrality should be enforced through regulations or not and questions its potential (or lack of) impact on the telecommunications market (Garrett et al. 2022).

The power of ISPs to block or slow down traffic on local broadband networks—based on discrimination of users, content, services or applications—became known in the study by Wu (2003) entitled *Network Neutrality, Broadband Discrimination*. The fundamental argument is that establishing network neutrality is no different from upholding fair evolutionary competition in any privately owned environment, whether in a digital sphere (i.e., cellular networks, operating systems) or in a physical setting (i.e., retail stores). It sees a communications network like the internet as a platform on which different applications—e-mails, the web, streaming applications, and other internet services—all compete for interest from end-users. Given this, the study takes the view that an internet platform should be neutral to ensure unbiased competition. Even as this position has been alive for about 2 decades, the pros and cons on net neutrality are still being debated in academia and in policy circles.

Sources: CESifo. 2011. Dice Report: Net Neutrality. *Journal for Institutional Comparisons*. 9 (1); T. Garrett, L. Setenareski, L. Peres, L. Bona, and E. Duarte. 2022. A Survey Of Network Neutrality Regulations Worldwide. *Computer Law and Security Review*. 44. April. <https://www.sciencedirect.com/science/article/pii/S0267364922000024>; T. Wu 2003. *Network Neutrality, Broadband Discrimination*. *Journal of Telecommunications and High Technology Law*. 2. 5 June. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=388863.

Small businesses suffering reduced revenue streams will have to cut back on discounts and other buyer incentives and ultimately may be phased out of the market. Furthermore, they will also have less money to pay for legal action in the event that ISPs discriminate against them or unfairly control access to their webpages (Doupnik 2017).

To understand the fundamental role of ISPs, it is helpful to view the online markets as two-sided, with ISPs at the center. On the one side, ISPs such as Orange, AT&T, Rakuten, and Spintel grant access to the network for content providers such as Google, YouTube, Netflix, Amazon, Facebook (and smaller apps) by sending their content to end-users. On the other side, ISPs sells broadband internet access to end users (Figure 3.2).

ISP companies such as Orange, Vodafone, AT&T, and other net neutrality detractors are on the other side of the debate. They argue that regulations on net neutrality discourages them from innovating, investing on maintenance, and extending network capacity. They also contend that regulation allows free-riding behavior from content providers. This concern continues to take the global spotlight, largely due to the Big Tech companies such as the so-called GAFAM (Google, Amazon, Facebook, Apple, and Microsoft) being big winners from net neutrality. These companies dominate the current digital content market and have also experienced massive expansion in innovative capacity, giving them a similarly dominant position in dealings with ISPs (Comeig, Klaser, and Pinar 2022). Big Tech companies having been protected

by net neutrality regulations initially, now have the power and resources to exclude minor companies from gaining and maximizing rewards from net neutrality in the digital market. The United States (US) and the EU are constantly finding legal and administrative measure to regulate Big Tech and prevent them from abusing their dominant positions (Comeig, Klaser, and Pinar 2022). Table 3.1 shows the progression of regulation in large e-commerce markets.

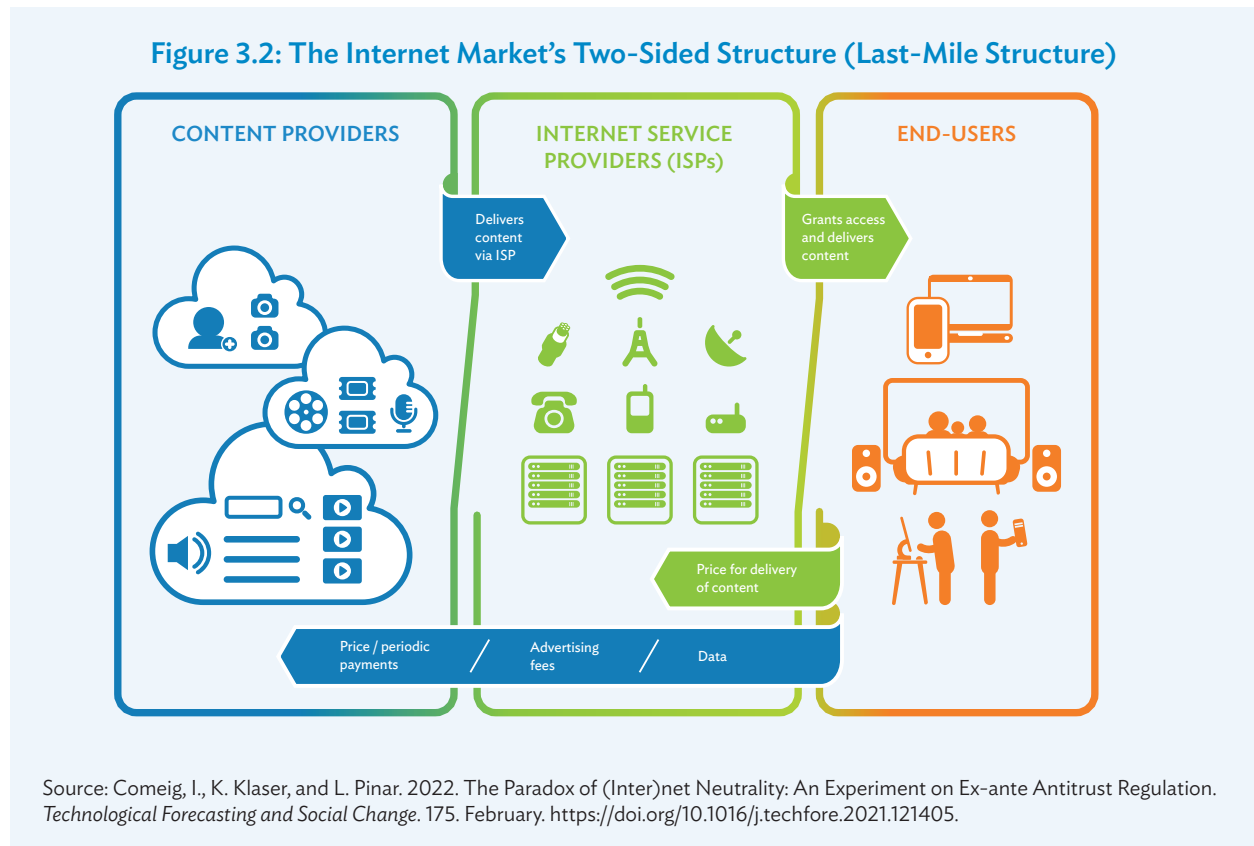


Table 3.1: Net Neutrality Regulations in the US, the EU, and Selected Asian Economies

| Economy | Year | Net Neutrality Legislation |
|---------------|------|---|
| United States | 2005 | The Federal Communications Commission (FCC) release of the Appropriate Framework for Broadband Access to the Internet over Wireline Facilities which upholds the principles of, among others: (i) Competition—to ensure access to facilities and interconnection so that SMEs continue to enjoy the lower prices and increased choices. (ii) Internet Openness—preserve and promote openness. |
| | 2005 | Start of the net neutrality debate worldwide when the FCC reclassified wireline broadband (i.e., high speed) internet access services as “information services.” |
| | 2010 | The FCC released its Ruling on Preserving the Open Internet, Broadband Industry Practices, which upholds free and open internet and adopts four core principles: no blocking, transparency, no unreasonable discrimination, and reasonable network management. |

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Table 3.1 *continued*

| Economy | Year | Net Neutrality Legislation |
|---------------|-----------|---|
| United States | 2015 | <p>The FCC released the Open Internet Report and Order on Remand, Declaratory Ruling, and Order, which established FCC new rules, including, among others:</p> <ul style="list-style-type: none"> (i) Clear rules on no blocking, no throttling, and no paid prioritization. (ii) No unreasonable interference or unreasonable disadvantage to consumers or edge providers. (iii) Enhanced transparency. |
| | 2017 | <p>The FCC reversed its 2015 regulation of broadband internet access service, which established substantial costs on the entire internet ecosystem. In particular, the Commission overturned earlier requirements on net neutrality on internet service providers (ISPs).</p> <p>In place of the heavy-handed utility-style framework, the FCC returns to the traditional light-touch regulation originally in place before the 2015 regulation.</p> <p>Declaratory Ruling:</p> <ul style="list-style-type: none"> (i) Reinstate the classification of broadband internet access service as an “information service.” (ii) 2015 regulations reduced ISP investment in networks and hampered innovation. (iii) Reinstate broadband consumer protection authority to the Federal Trade Commission (FTC), enabling it to impose uniform online protection against unfair, deceptive, and anticompetitive practices. <p>Report and Order:</p> <ul style="list-style-type: none"> (i) ISPs to disclose information on business practices to stakeholders such as consumers, entrepreneurs, and the Commission. (ii) Finds that transparency, antitrust, and consumer protection laws achieve benefits comparable to those of the 2015 “bright line” rules at lower cost. (iii) Eliminates the Internet Conduct Standard, under which the FCC could micromanage innovative business models. |
| | 2018 | <p>The FCC releases the Restoring Internet Freedom Order stipulating the principles in the earlier statement in December 2017.</p> |
| | 2019 | <p>Following the FCC’s reversal of the 2015 regulation, the Save the Internet Act of 2019 was proposed to restore the 2015 regulation. The House of Representatives approved the bill in April 2019 and is subject to Senate approval.</p> <p>Attorneys general filed suit against the FCC’s Restoring Internet Freedom Order. In October 2019, the Court of Appeals of the District of Columbia issued its ruling, which upheld the 2018 order with some exceptions.</p> |
| | 2019–2022 | <p>In addition, state legislators responded by introducing net neutrality legislation:</p> <ul style="list-style-type: none"> (i) Seven states—California, Colorado, Maine, New Jersey, Oregon, Vermont, and Washington—plus Puerto Rico enacted said legislation and/or adopted resolutions in previous legislative sessions. (ii) Some legislators also introduced measures that would restrict the ISPs’ use of customers’ personal information and adopt privacy protections. (iii) Eleven states have introduced net neutrality legislation in the 2022 legislative session. |

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Table 3.1 *continued*

| Economy | Year | Net Neutrality Legislation |
|---------------------|------|---|
| European Union (EU) | 2009 | <p>EU Telecoms 12 reforms that established “net neutrality” as a policy objective and regulatory guideline to be promoted by national regulatory authorities:</p> <ul style="list-style-type: none"> (i) National telecoms authorities were given authority to regulate network transmission services so as to promote “net neutrality” and “net freedoms.” (ii) Requirement on transparency for consumers such as information on traffic management techniques and their impact on service quality, bandwidth caps, or available connection speed, among others. (iii) Net neutrality under close scrutiny with the European Union (EU) Commission being the region’s first line of defense. |
| | 2011 | The European Parliament released its 2011 Communication on “The Open Internet and Net Neutrality in Europe,” citing the EU’s commitment to an open internet objective. It also allowed time for member states to incorporate the EU electronic communications framework into national law and see how it would operate in practice. |
| | 2015 | <p>The EU adopted Regulation (EU) 2015/2120, known as the Telecommunications Single Market Regulation to provide harmonizing rules for net neutrality and enshrine the principle of net neutrality:</p> <p>A. Safeguarding of open internet access</p> <ul style="list-style-type: none"> (i) Rights of end-users to access and distribute information, content, applications, and services regardless of end-user or ISP location and the origin/destination of information. (ii) ISPs to treat all traffic equally, when providing internet access services, without discrimination, restriction, or interference. (iii) Traffic management measures shall be transparent, nondiscriminatory, and proportionate, and shall not be based on commercial considerations. <p>B. Transparency measures for ensuring open internet access</p> <ul style="list-style-type: none"> (i) ISPs to ensure all contracts include information such as traffic management measures, volume limitation, speed, and other service quality parameters. (ii) Provision of transparent, simple, and efficient procedures to address the complaints of end-users. |
| | 2020 | The Body of European Regulators for Electronic Communications (BEREC) released the <i>Guidelines on the Implementation of the Open Internet Regulation</i> for the implementation of the obligations of national regulatory authorities. It stipulates the obligations of the authorities to closely monitor and ensure compliance with rules on equal and nondiscriminatory treatment of traffic in the provision of internet access services and related end-users rights. |
| | 2022 | BEREC released an updated version of the Open Internet Regulation. Changes were incorporated in light of the European Court of Justice rulings on the interpretation of the Articles of Regulation. In particular, “zero-rating” was abolished, replaced with “differentiated pricing” practices. The court concluded that a zero tariff option violates the obligation to treat all traffic equally. Guidance on the assessment of differentiated pricing practices was introduced. |

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Table 3.1 *continued*

| Economy | Year | Net Neutrality Legislation |
|-------------------|------|---|
| Japan | 2007 | <p>The Working Group on Network Neutrality issued a final report citing the principles of fairness in network cost sharing and fairness in network use, which featured:</p> <ul style="list-style-type: none"> (i) “Light-touch approach” and allow the markets to determine the best solution. (ii) Surcharge imposed on content providers but not a standard treatment; voluntary negotiations among stakeholders. |
| | 2019 | Creation of an interim report, which called for the drafting of three new rules on bandwidth control, priority control, and zero-rating and sponsored data. |
| | 2022 | No strict net neutrality regulations in place yet. No laws forcing ISPs to comply with net neutrality. Investigation of violations are on a case-by-case basis. |
| Republic of Korea | 2011 | <p>The Korea Communications Commission with exemptions where reasonable management is needed:^a</p> <ul style="list-style-type: none"> (i) Internet users are entitled to information concerning internet traffic. (ii) Transparent administration of internet traffic by internet access service providers. (iii) Any legitimate content, application, or appliance or device should not be blocked except if it causes hazard to services or networks. (iv) ISPs should not unreasonably discriminate legitimate content by the type of content, application, service, or its provider. |
| | 2013 | <p>New rules to prevent ISPs from employing abusive practices covering:</p> <ul style="list-style-type: none"> (i) Transparency—whether traffic management policy is correctly disclosed. (ii) Proportionality—whether traffic management is equitable with its aim and motive. (iii) Nondiscrimination—whether there is unlawful discrimination between similar type of contents. (iv) The technical characteristics of a network. |
| | 2021 | <p>The National Assembly amended the Telecommunications Business Act (TBA) to restrict app market operators.</p> <p>Proposed amendment of the TBA, which allows Korean ISPs to impose financial barriers on the network access of content providers.</p> <p>According to the proposals, ISPs are allowed to restrict access to content relative to the cost paid by the sender or to block traffic from content providers that are unable to pay network usage fees.</p> |
| Australia | 2022 | <p>No laws that regulate or enforce net neutrality. However, despite the lack of regulation, several factors contribute to the prevalence of net neutrality:</p> <ul style="list-style-type: none"> (i) End-users pay a certain amount of internet usage per billing period. ISPs are less affected by rapid growth in online traffic since data usage is capped and those who use more pay higher fees. |

continued on next page

Table 3.1 continued

| Economy | Year | Net Neutrality Legislation |
|-------------|--------------------|--|
| | | <ul style="list-style-type: none"> (ii) The ISP market is much more competitive with low barriers to entry. Consumers can switch providers if an ISP were to implement non-net neutral practice. (iii) ISPs are prohibited from taking deceptive conduct and are required to disclose any practices that restricted consumer use of the internet. (iv) ISPs are prohibited from abusing their market power in a way that substantially lessens competition. |
| India | 2016 | Prohibition of Discriminatory Tariffs for Data Services Regulations: <ul style="list-style-type: none"> (i) ISPs are prohibited from charging discriminatory tariffs for content services. (ii) ISPs are prohibited from entering into any arrangement, agreement, or contract that has the effect of discriminatory tariffs for data services. |
| | 2018 | Principles on nondiscriminatory access to content, which prohibits ISPs from carrying out any form of discriminatory treatment of content, including blocking specific websites or impeding speed of access to content. |
| Singapore | 2011 | Guidelines that generally provide a broad policy approach and prohibition on blocking of legitimate internet content, applications, and services: <ul style="list-style-type: none"> (i) Net neutrality policy applies to fixed-line, wireless, and mobile internet services. (ii) However, end-users cannot expect access to content restricted by its owners for various purposes, or for commercial purposes, unless access is granted. (iii) Allows flexibility for network management and service differentiation. ISPs or network operators can still offer specialized or customized internet content, applications, and services based on commercially negotiated arrangements or specialized terms and conditions. |
| Malaysia | -- | No laws that specifically promote or guarantee the principles of net neutrality. No recent proposals on that principle are being codified as a regulation. |
| Indonesia | -- | No laws that specifically promote or guarantee the principle of net neutrality. No recent proposals on the principle being codified as a regulation. |
| Philippines | 2021 for enactment | Current Senate bill filed entitled Internet Consumer Protection and Net Neutrality Act of 2021. The bill imposes net neutrality standards and measures to protect internet end-users, by imposing obligations of transparency and reliability on ISPs, telecommunications providers, and industry players. |

SMEs = small and medium-sized enterprises.

Sources: Azis (2021); BEREC (2020, 2022); Carr (2018); Comeig, Klaser, and Pinar (2022); Connolly (2005); European Commission (2009); European Union (2011, 2015); Federal Communications Commission (2005, 2010, 2015, 2017, 2018, 2022); Garrett (2022); IFEX (2021); Infocomm Development Authority of Singapore (2011); Jitsuzumi (2020); Kim and Oh (2014); Korea Communications Commission (2012); Morton (2022); Open Net Korea (2011); Parsheera (2020); Rajah & Tan Asia (2018); Telecom Regulatory Authority of India (2016); Varcas (2021).

Theories of Harm Related to Competition in the Digital Space

The competition problems in a digitalized economy need deeper exploration. While the previous section discusses e-commerce players' primary and direct reaction to competition, this section will consider their further intentions and actions. Theories of harm are listed below. Except for the third point, these are problems created to hamper competition in the e-commerce sector. They are best addressed through competition policy.

- (i) **Digital monopoly hampering competition and innovation.** Digital business players, in their fight to compete in a winner-takes-all game, may enact measures to prevent others from being the first or prevent entry into future markets. Some large e-commerce market players acquire a company with an innovative technology or service that may complement services offered by the larger company. The risk is that the purpose of acquisition is to eliminate the most threatening potential competitors or to block alternative routes to end-users. Actions that have a sole purpose of preventing future competition by blocking innovations from being marketed or discouraging innovation are referred to as preemptive mergers and considered a main theory of harm to competition in e-commerce. This is because the act of foreclosing potential markets (i) provide an enabling environment for large and powerful digital companies to compete on other things than merit, and/or (ii) prevent small digital players from competing on merit. This behavior slows down the development of new products, services, or business models. Competition authorities, in distinguishing between anticompetitive motives and normal business mergers and acquisitions, need to stick to the prudent enforcement of competition law. It requires lengthier deliberation to determine whether such actions will lessen or likely lessen competition—or make end-users worse off.
- (ii) **Digital monopolies to lock in customers.** The previous section cites how big e-commerce players discourage multi-homing in order to lock in end-users. However, the principle of interoperability itself, which leads to multi-homing, can both be beneficial to consumers and business users. An EU analytical paper presents several conditions wherein buyers and end-users switch across different platforms and the main obstacles and opportunities for multi-homing (Barcevičius et al. 2021). In either case, the ideal policy direction should be that business users and customers can conveniently switch platforms or use several platforms simultaneously without substantial costs and disadvantages. Starting with one side of the online platform, e-commerce business users (i.e., sellers, producers, and hoteliers) may choose to multi-home as part of its business strategy to increase sales through (i) expanding their reach in selling goods and services, and (ii) gaining access to international markets (Barcevičius et al. 2021). However, two factors can impact the extent of multi-homing for businesses: the nature of the goods and services and the market for such products. As an example, businesses selling clothing may choose to sell in fashion-dedicated platforms (e.g., Zalora, ASOS, Zalando) while businesses selling electronic gadgets will use platforms such as eBay, Amazon, among others. In this case, multi-homing for businesses may still be influenced by the clear domination of large e-commerce platforms for specific markets such as Amazon in e-commerce, Airbnb in short-term rental accommodation, Booking.com in hotel accommodation, and so on (Barcevičius et al. 2021). Some businesses may also maintain single-home as a business strategy or due to its limitations to multi-home. One example would be app developers opting to single-home in either Google Play or Apple App Store due to the complexities of the operating systems (Android vs iOS). Single-homing may be a good strategy for businesses that have assessed the benefits of the services offered by an e-commerce platform such as cost, user access and experience, data access, or other terms and conditions.

On the other side of the online platform are end-users (i.e., buyers, renters, consumers) who generally prefer multi-homing for purchasing goods and services, booking hotels, using social media, messaging

apps, among others. But similar to business users, the likelihood of eventually sticking to a single platform for specific tasks (e.g., ordering food, ordering a car ride) may dominate (Barcevičius et al. 2021). In behavioral terms, consumers get used to services they like and become less willing to switch if such services become integral in their daily activities. They are even less eager to switch when the experience of an individual depends on using other services of a large platform. Use of personal data profiles causes this effect and any change that requires transferring data to a competitor will impose switching costs to end-users. Hence, consumers lock themselves in a certain platform by providing their personal data. In the e-commerce market, this generally happens once consumers are used to purchasing items requiring only a few clicks, given that their personal information (i.e., payment details, delivery address, and so on) are already stored. Additionally, OECD (2017) also cites a situation wherein customers on one side only join one platform but, as a consequence, limit the customers on the other side to join the same platform in order to access the preceding customers (Collyer, Mullan, and Timan 2017). Some e-commerce platforms may use their potential to enable single-homing and wield their dominant position in the market to nudge businesses and consumers to make specific choices that are anticompetitive. This becomes a competitive issue from the public policy and market perspective.

The EU analytical paper proposes several actions to facilitate multi-homing for business users and end-users: (i) enable data portability and interoperability to create a system that fosters business users and end-users to use and switch across multiple platforms easily, (ii) impose measures for dominant, gatekeeper platforms to open data access and prevent the possibility of user lock-in, and (iii) continuously adapt competition policies to the fast-changing digital markets and utilize innovative tools to enforce regulatory measures against monopolistic practices (Barcevičius et al. 2021).

- (iii) **Risks to privacy and data.** In their quest to monopolize multiple platforms, digital service providers collect, analyze, and market the private data of consumers who are not always aware of how such data is used. Nor do consumers always know about the security risks involved when information falls into the wrong hands. Companies disclose customer information not to benefit consumers but for their own interests in expanding their reach. An example would be multiplatform entities that are developing watches, glasses, and bracelets to support their end-users, lifestyle. End-users may not know how their personal information is used or whether it is safely stored. Another issue is the ownership of the data gathered by these apps and services.

Effect of Landmark EU Data Privacy Rules

Data privacy laws were created to counter risks to privacy and data. The EU's General Data Privacy Regulation (GDPR) provides EU customers with protection and control over how their personal information is collected, used, and sold. It is considered the world's toughest privacy and security law by far. As a landmark privacy law, it has inspired a wave of privacy regulations in such countries as Brazil, Japan, and the Republic of Korea (Goldberg, Johnson, and Shriver 2019). The regulation features an "extra-territorial effect," which imposes obligations onto multinational and national organizations anywhere in the world so long as the consumers or the company's consumers live in the EU (Usercentrics 2021). The GDPR establishes an "opt-in" model of regulation, which requires companies to obtain consent from consumers in processing their personal information before it can be collected. The data can only then be processed within what is "reasonably necessary" as per the guidelines. Other laws feature an "opt-out" model (i.e., California Consumer Protection Act which does not require consent to collect personal information unless such data is sold or shared (Usercentrics 2021). Violation of privacy and security regulations is subject to two tiers of strict and harsh penalties—one that may reach €20 million or 4% of a company's global revenue (whichever is higher) and the other one compensating for damages to data subjects (Wolford n.d.).

In the e-commerce market, GDPR for digital companies will prove challenging at the start. As cited in the previous section, e-commerce platforms regard consumer data with a sense of proprietorship. This will largely go against the principles of GDPR which require all online retailers to review their existing data management and cybersecurity systems and processes. With such strict regulation in place, personal data are no longer seen as an asset that can be mined or exploited (DP Organizer 2018).

Empirical evidence shows that digital privacy laws have some negative impact and in the case of GDPR, protecting individual privacy comes at a cost. One study cites that the law particularly hurt online companies that rely on customers' personal data analytics to make business decisions and for personalized marketing and those that use data analytics to draw more users to their sites and improve site content and usability (Goldberg, Johnson, and Shriver 2019). Using data from 1,500 online companies constituting over 1 billion weekly visits by EU residents, the study found that "recorded online outcomes fall about 10% across the board: page views, visits, orders, and revenue" (Goldberg, Johnson, and Shriver 2019, p. 2). Since the regulation came into force, e-commerce websites in Europe have seen page views fall by 9.7%, while website visits declined by 9.9% (E-commerce News 2019). For e-commerce websites in Europe, revenue also declined by 8.3% (E-commerce News 2019).

GDPR's Impact on Data Regulation in Asia and the Pacific

The massive impact of GDPR worldwide also highlighted the fragmented state of data regulation in Asia and the Pacific. In some economies in the region, local privacy and cybersecurity rules often conflict with international compliance requirements on anti-money laundering, anti-bribery, and anticorruption. Meanwhile, other economies, such as the Republic of Korea, take a tough stance on data privacy, with penalties including "paying punitive damages, forfeiting profits, and holding senior executives of a company personally accountable" (Artz 2018). The GDPR set a precedent for Asian economies to revisit and evaluate their own policies on data regulation (Artz 2018). Some of the economies that are taking significant steps to GDPR alignment include the following:

- (i) New Zealand achieved adequacy decision from the EU Commission, meaning that its regulations are aligned and adequate with those of the EU, and with sufficient data protection through domestic legislation and international commitments.
- (ii) Japan adopted the Act on the Protection of Personal Information (APPI) and has followed a path of convergence with the EU's data privacy regime (Marcén 2022). The latest revision in 2020 covered data breach reporting and the use of facial recognition data gathered from devices such as security cameras. Japan's APPI took effect on 1 April 2022 imposing tighter controls on the international transfer of data bringing the country's data protection regulation further in line with the GDPR (Woollacott 2020; Hogan Lovells 2022). The country is also a convenor of the WTO e-commerce negotiations and a strong proponent of easing data flow with necessary safeguards for cybersecurity, personal data, or intellectual property (Marcén 2022).
- (iii) Meanwhile, the EU adopted an adequacy decision for the Republic of Korea in December 2021, which permitted free transfers of personal data from the European Economic Area to private and public entities in the Republic of Korea from December 2021 (including remote access from the country) (O'Donoghue and Ibraimova 2021). It also began reforms to its data protection legislation in 2020 which include (1) setup of an independent supervisory authority to enforce data protection rules, (2) additional requirements from the EU Commission with regard to transparency and onward transfer obligations of data recipients, and (3) potential access of public authorities to personal data and redress mechanisms available in case of unlawful requests, among others (O'Donoghue and Ibraimova 2021).

- (iv) Finally, the Personal Information Protection Law (PIPL) of the People's Republic of China (PRC) came into effect in November 2021. The design of the PIPL was based on extensive data privacy laws enacted worldwide and is currently a match for the GDPR. However, it is important to note that in extraterritorial scope, the PIPL is broader and leaves some discretion for public authorities to further extend the applicability of the PIPL extraterritorially (Privacy Research Team 2021).

One of the issues with the regulations (and their alignment with the GDPR) is the protectionist trend gaining ground worldwide, such as through data localization laws. While more often than not implemented from legitimate policy concerns, including on privacy, data localization could reduce the competitive advantage of multinational companies from their global uniformity of operating models, IT systems, and data collection. With new regulations promoting data localization, such companies are forced to develop and enforce overlapping and complex regulations on data privacy, protection, and localization (Parekh et al. 2022). Some economies in Asia and the Pacific have established extraterritorial scope on their privacy laws, either requiring “data to be stored and processed within a given country or region” or allowing data to be accessed and copied outside the country of origin but replicated in the local digital infrastructure (Parekh et al. 2022).

In order to establish better data governance and support e-commerce platforms in navigating stringent data protection regulation in the EU, the EU Commission passed a legislative proposal on data act regulation on February 2022. The proposal aimed to “ensure a better distribution of the value derived from the use of personal and non-personal data between the actors of the data economy.” *The Data Governance Act* was adopted in May 2022 and was applicable by September 2023. The act covers measures to (1) facilitate the sharing of e-commerce data between companies (B2B) and with consumers (B2C); (2) allow the use of data held by online companies subject to justification of an exceptional need; (3) facilitate the swapping of data processing services (cloud and edge computing) by regulating the business arrangement of service providers and consumers; (4) help develop interoperability standards for data and its reapplication across other sectors; and (5) establish safeguards against unlawful access by governments to nonpersonal data in third economies (CNIL 2022).

Anticompetitive Practices

Some of the main theories of harm listed above may be addressed by competition policy measures among e-commerce players. However, some of these competition policy measures are in themselves anticompetitive in nature. It is the fundamental responsibility of competition authorities to assess a competition problem on the basis of consumer welfare.

Some of the anticompetitive measures that has arisen in the e-commerce space include

- (i) vertical restraints which limits competition online,
- (ii) horizontal practices (i.e., algorithmic collusion and hub-and-spoke cartels), and
- (iii) unilateral conduct.

In the OECD, most of the anticompetitive practices being regulated are on vertical restraints frequently practiced by suppliers and online marketplaces. Horizontal collusion in the form of algorithmic collusion and hub-and-spoke cartels are also evident wherein online retailers engage in anticompetitive horizontal agreement through vertical contracts between an online e-commerce platform and its users.

Vertical Restraints

Solving market failures

Competition authorities face the challenge of determining the impact of vertical restraints in e-commerce on the welfare of consumers. In general, vertical restraints can have procompetitive effects if they address market failures and align incentives resulting to improved coordination through the distribution chain. However, these challenges competition authorities to accurately assess whether such wide restrictions should be allowed, given their potential to address market failures or produce overall economic benefits that outweigh their anticompetitive nature.

Market failures, which are mostly free-riding behavior, may take different forms in the e-commerce sector. A special report by the International Competition Network (ICN) has grouped these market failures into four main types.

Free-riding on retail service provision. The first type is free-riding on retail service provision in offline retailers or traditional bricks-and-mortar stores. The provision of retail services through in-store demonstrations and the choice to try out products before buying can benefit both consumers and suppliers. On the one hand, consumers benefit by being better able to assess the product's fine features, while on the other hand, manufacturers benefit from being able to better explain product features. Traditional bricks-and-mortar stores incur costs in providing retail services including advertising, product promotion, and staff training to provide sound marketing advice to consumers (ICN 2015). Free-riding occurs when consumers piggyback on pre-sales services of a specific product in traditional bricks-and-mortar stores before purchasing the same product online at a cheaper price. Another case would be if other retailers benefit from the service provision of another retailer carrying the brand. The free-rider problem arises if the latter cannot fully appropriate the returns from the cost of providing the retail services. If this is expounded, offline retailers will lose the incentive to provide such retail services. Consumers will be worse off if they do not receive retail services that give them the maximum advantage in making purchasing decisions. As a consequence, they will likely purchase a product that does not best fit their needs. Suppliers also will lose the platform to inform consumers about product features. At the manufacturer or distributor level, free-riding may also arise when these entities are required to invest in technical support, promotion, and provision of necessary equipment and financing to retailers. In this case, other manufacturers can free-ride on the investment, especially if it increases the market appeal of the retailer and not just the original manufacturer/distributor brand. Customers may then purchase products from a rival manufacturer/distributor also carried by the online retailer.

Conversely, consumers also make use of the online pre-sales service, such as price comparisons and customer reviews provided by online sellers, before ultimately purchasing a product in store (ASEAN 2018). This is the second form of free-riding, where offline retailers or traditional bricks-and-mortar stores benefit from online retailers. This arises because online retailers increasingly focus on non-price aspects of competition and invest in services such as product reviews and information that help consumers to navigate the vast choices available in online markets. Overcoming these free-riding issues has been broadly accepted by competition authorities as a procompetitive benefit of vertical restraints. However, the legitimacy of this issue may be difficult to justify in the companies' use of certain vertical restraints.

Free-riding on retailer brand investments. Similar to free-riding on retail services, market failure may arise if retailers that lack an established reputation have access to free ride on the brand or product reputation and quality certification of other retailers. In this manner, the free-riders can stock comparable products without needing to invest in quality certification and may choose to bring down product prices through discounts and the like. If high-quality retailers have inadequate incentives to conduct certification, then the manufacturers whose products they are carrying—or consumers who value such quality certifications—will be worse off in the long term. Vertical

restraints in the form of resale price maintenance (RPM) or online sale restrictions are therefore critical. On the other hand, brand image is high priority for luxury or prestigious brands. This includes the price of the product and the overall retail environment, through pre-sale and after sale service, memberships, and the like. Brand image conveys information not just about quality but about status and prestige, which is important to some consumers. Price cuts can reduce the value of the brand to such consumers because they often convey a message of lower brand value. RPM and online restrictions are also applicable in these circumstances in order to protect the brand's prestige.

Information asymmetry. E-commerce creates additional information asymmetry between buyers and sellers, in particular about the quality of the products and services offered. Information is skewed against buyers who lack adequate information about the quality and features of the products and services because they are not able to inspect a product or service physically prior to purchase. In addition, the surge of new online retailers that do not have established offline presence may work against consumers as they lack information about the quality and credence of such nascent entities. There is a high probability of matching with low-quality retailers and products than is optimal. The EU report, however, cites this type of market failure as less of a concern as the online platform is constantly improving and increasingly competing against non-price aspects that help reduce information asymmetry. These include favorable delivery and return policies, customer feedback, and reviews. Over time, such policies by e-commerce players will reduce the prevalence of information asymmetries (ICN 2015).

Demand uncertainty. This fourth type of market failure occurs when a retailer/distributor launches new products. Suppliers will often find it difficult to get an online retailer or distributor to bring in a new product in its online platform, especially if the seller has to bear sunk promotional costs while demand for product is still uncertain. The propensity for other online sellers to free-ride on such promotional costs may result in a product failing to enter the market. In this case, entrants may choose to use vertical restraints such as RPM, minimum advertised price, or selective distribution. The restraints in this case function to provide better incentives for retailers to stock, launch, and promote a new product adequately. Similar to the information asymmetry, this type of free-riding behavior may be corrected within online markets. That is, over time, new developments in e-commerce (1) give manufacturers the option to ship the product direct to the consumer, minimizing the need for sellers to hold inventories; and (2) give suppliers the opportunity through social media to raise awareness of a product launch to encourage consumers to find information about the product, thereby reducing the need for marketing/promotional activities.

The ASEAN (2018) report also cites a “signaling benefit” of vertical restraints whereby specific “quality” retailers are known to stock only “quality” products, with selling through these channels vital to the introduction of a new product. Absent a vertical limitation if a manufacturer will not initially limit sales of the product to such premium stores, the product launch may fail and consumers will have no knowledge of the product. Another benefit to vertical restraint is in overcoming double marginalization. This refers to “the distortion caused by successive markups of independent firms in a distribution channel” (Gabrielsen, Johansen, and Shaffer 2018, p. 3). Double marginalization problem happens as these distortions lead to reduced company profits causing adverse effects on consumers (Gabrielsen, Johansen, and Shaffer 2018). Through a vertical agreement, a manufacturer and a retailer may coordinate pricing or quantity sold so as to maximize profits and ensure that the retail price for consumers only has a single markup, hence, increasing total welfare.

Dealing with resale price maintenance

RPM is a form of vertical restraint whereby an upstream company, such as a manufacturer or distributor, restricts the retail price or other terms of sale set by a downstream company or a seller (OECD 2018a). It consists of agreements or concerted practices by the supplier with the goal of setting (1) a maximum RPM (upper ceiling for the retail price),

(2) a minimum RPM (lower bound for the retail price), and (3) a fixed RPM (exact value that a retailer must charge for the product). The first case of setting a maximum RPM usually does not constitute a violation of competition policy. This is because this type of measure does not prevent sellers setting discounts or engaging in inter-brand price competition. In addition, and as mentioned, RPM can be procompetitive if it is used to address market failures. However, an RPM raises competition concerns once it sets a fixed and minimum price, which curtails price competition among competing sellers of the same product or limit intra-brand competition. The ASEAN report cites that RPMs may be explicitly stipulated in a contract or implicitly enforced when manufacturers impose threats to punish retailers (ASEAN 2018). An RPM is considered a hardcore restriction as it reduces intra-brand competition, hike-up prices, and reduce inter-brand competition if imposed by multiple manufacturers. An RPM can also facilitate collusion. This arises when retailers have sufficient power to compel a manufacture to enter into minimum-price RPM agreements. This results to a similar outcome as a horizontal collusive arrangement between retailers. Hence, RPM is subject to assessment and competition enforcement globally in e-commerce in the same manner applied to cases of RPM in bricks-and-mortar markets, wherein RPM is deemed likely to harm consumers.

A manufacturer or distributor may sometimes suggest a recommended retail price (RRP). This is usually not considered an RPM since sellers retain the authority to set retail prices and are not penalized for noncompliance with the recommended price (ICN 2015). However, any attempt to enforce the RRP, such as by threatening to punish errant retailers (by removing discounts or limiting/ending supply) becomes a hardcore restriction (ASEAN 2018). Nevertheless, in most cases, retailers are often adaptable to RRP for reasons such as profitability, preservation of long-standing business relations, or avoidance of explicit threats to retaliation for noncompliance. One way to strengthen the *de facto* fixed or minimum quality of price recommendations may be the use of price monitoring software—a technology that enables manufacturers to detect fluctuations from recommended prices by online retailers.

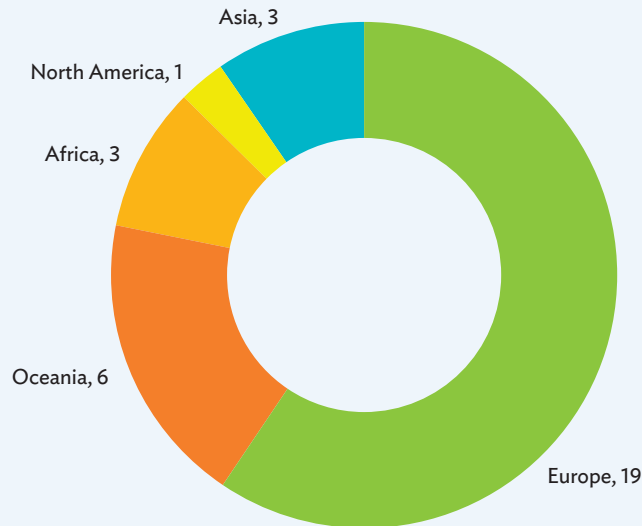
The ICN (2015) report cites how RPM conduct in e-commerce is of great concern to survey respondents¹² than any of the other vertical restraints included in their survey. That is, almost half of all respondents assessed that online RPM conduct is of great concern (ICN 2015). The report also mentions that online RPM was the most common online vertical restraint issue investigated by the ICN member agencies in 2013. Approximately 60% of the investigations into RPM were carried out in European jurisdictions: there were 19 online RPM investigations by ICN members in Europe, and only 3 in Asia and the Pacific. However, this does not mean that online RPM conduct is not of concern among Asian economies: nearly three quarters of the Asian respondents said it was. The data in Figure 3.3 are taken directly from the report.

The RPM legal framework

The appropriate legal enforcement of RPM conduct has been debated. In an earlier period, competition law in most jurisdictions regarded RPM as seriously detrimental to competition and never justified. However, current jurisdictions—notably the US and Canada—have pulled back from prohibition. The rule of reason approach applies at the federal level, although several states maintain that RPM is illegal.

¹² International Competition Network member countries' business entities.

Figure 3.3: Number of Online Resale Price Maintenance Investigations in 2013—by Region



Source: International Competition Network. 2015. Online Vertical Restraints Special Project Report. 2015 *International Competition Network Annual Meeting*. https://www.internationalcompetitionnetwork.org/wp-content/uploads/2019/11/SP_OnlineVR2015.pdf (accessed July 2022).

The same ICN report broke down the types of provisions that deal with RPM conduct. Existing provisions dealing with online RPM include, among others,

- (i) Provision based on Article 101 of the Treaty on the Functioning of the European Union, which prevents any form of agreements that may affect trade between Member States and may lead to preventing, restricting or distorting competition;
- (ii) Laws based on rule of reason;
- (iii) Breaches of competition law;
- (iv) RPM is considered unlawful but exemptions may apply, such as block exemption for non-horizontal agreements that do not include minimum RPM, naked restraints or restraints that may substantially harm competition, and block exemption for franchise agreements; and
- (v) Other tests.

Enforcing RPM countermeasures

The ICN report cites that most of its members (respondents) have competition laws that cover online RPM conduct. About 60% of respondents verified that online RPM is covered by general provisions, 38% say online RPM is covered by a specific provision, and only 2% note that existing laws do not cover online RPM. Table 3.2 lists the general provisions covering online RPM in selected economies outside of Asia and the Pacific.

Table 3.2: General Online Resale Price Maintenance Provisions Outside of Asia and the Pacific

| Type of General Provisions | Economies |
|---|--------------------------------------|
| Online RPM is considered unlawful if no analysis/assessment of competitive effects (per se breach or strict liability breach) | Ireland |
| Online RPM is considered unlawful if no analysis/assessment of competitive effects | Israel |
| Exemptions can apply | |
| Rule of reason applies to online RPM | Chile, Ecuador, Egypt, United States |
| Rules apply to online RPM that are based on Article 101 of TFEU | Countries in the European Union |

RPM = resale price maintenance, TFEU = Treaty on the Functioning of the European Union.

Source: International Competition Network. 2015. Online Vertical Restraints Special Project Report. *2015 International Competition Network Annual Meeting*. https://www.internationalcompetitionnetwork.org/wp-content/uploads/2019/11/SP_OnlineVR2015.pdf (accessed July 2022).

Online RPM in Asia and the Pacific is covered by other tests or types of provision:

For **Hong Kong, China**, minimum/fixed price RPM can be regarded as restriction *by object* but open to efficiency justifications. Meanwhile, maximum RPM will be considered as restriction *by effect* (ICN 2015). For **Singapore**, vertical agreements that prevent, restrict, or distort competition are considered a violation under abuse of dominance provision. The Competition Commission of Singapore also considers whether, in the conduct of vertical restriction, the e-commerce platform also abuses its dominant market position and whether there is an objective justification for such conduct. This means whether the potential procompetitive effects of the conduct outweighs its anticompetitive effects.

In the **PRC**, based on the prevailing practice, online distributors are not subject to restrictions on their ability to determine the sales price, which can deviate from the list price or recommended price provided by suppliers. Article 14 of the Antimonopoly Law explicitly prohibits fixing the resale price of distributors or their minimum resale price—collectively, RPM. The Auto Guidelines of August 2020, which has been generally accepted for use as a reference for the same vertical restraints in other industries, provided detailed guidance on RPM and various other vertical restraints not prescribed in the Antimonopoly Law, such as territorial and customer restrictions (Hui, Bai, and Li 2018).

In **Japan**, RPM constitutes a violation of the competition law (Antimonopoly Act) and is considered a classic type of competition and antitrust law infringement (Shiozaki 2021). The Japan Fair Trade Commission revised its *Guidelines Concerning Distribution Systems and Business Practices Under the Antimonopoly Act*, intending to encourage companies and trade associations to do business without infringing laws (OECD 2018b). For e-commerce, the guidelines emphasize the procompetitive aspects of online transactions and advise that e-commerce should still be reviewed under the same fundamental principles as real site transactions. In terms of analysis of vertical restraints in e-commerce (including RPM), the amended guideline points out that the changing competition status and network effects unique to an online platform should be considered in addition to standard factors reviewed in traditional businesses (Takamiya 2020). It may have “justifiable grounds” where a manufacturer’s RPM generates actual procompetitive effects such as avoiding “free-riding” and promoting inter-brand competition, and increasing demand for the product.

In **Taipei, China**, Article 19 of the Fair Trade Act prohibits RPM without justification. This means that when an enterprise forces its trading counterpart to sell goods at a certain price or imposes indirect price restrictions that limit the freedom of the third party to set prices, this reduces price competition. However, in certain exceptional circumstances where RPM may be more procompetitive than prices set by distributors, enterprises are able to submit reasonable evidence to justify their RPM practices under a proviso of Article 19 (Global Competition Review 2019).

In **Australia**, across all platforms, RPM is prohibited “regardless of its purpose or its effect, or likely effect, on competition” (Witt and Coorey 2019). Entities may seek immunity from the Australian Competition and Consumer Commission if they are able to prove that the public benefits arising from the RPM outweighs any public detriment. The ICN report, however, mentions that there is a current debate in the country about whether RPM conduct should remain a per se prohibition under the Competition and Consumer Act (CCA) of 2010. The Commission’s stand is that there are circumstances where RPM may improve efficiencies. However, it also needs to consider that an efficiency-enhancing RPM is more of an exemption than a general trend; hence, all RPMs need to be assessed for their competition effects. A final report from the Competition Policy Review Committee accepts the view that RPM should itself remain illegal but that the “notification process under the CCA should be extended to include RPM.” It goes on to say that “[t]he notification process is quicker and less expensive than the authorization provisions through which business may currently seek exemption from the CCA for RPM conduct” (ICN 2015).

Across platform parity agreements/Online retail most favored nation clauses

Across platform parity agreement (APPA) is a new form of vertical restraint between suppliers and online platforms that developed in the e-commerce sphere. The APPA refers to a vertical agreement between a seller and an online platform in which the seller agrees to charge on the same platform a retail price no higher than what it charges on other platforms. An APPA prohibits the supplier/service provider from offering goods/services at better terms and prices in other online platforms. The agreement provides protection and security to the online retailer ensuring that products sold on its platform will be lowest in the market. This prevents an online retailer from losing business to a competing retailer. The APPA therefore reduces the price competition among retailers (Goyal 2020).

APPAs discussed in this section are akin to a “most favored nation” (MFN) trade arrangement. There are two types of MFN—the “narrow” and the “broad” retail MFN. The distinction between these two types of MFN is important to ensure that the scope of any vertical price restraint is no greater than what is necessary to realize efficiencies. A broad retail MFN constitutes restrictions in contracts that ensure no other platform will receive more favorable terms—for instance, the power to sell at a lower price. Hence, it restricts a supplier from offering lower retail prices to other platforms, including on its own website. In contrast, a narrow MFN prevents a company from setting a lower price on its own website, but it is free to agree to lower prices with other platforms. In general, by only restricting intra-brand competition between the supplier and the particular platform, narrow MFNs have less effect on competition than broad MFNs.

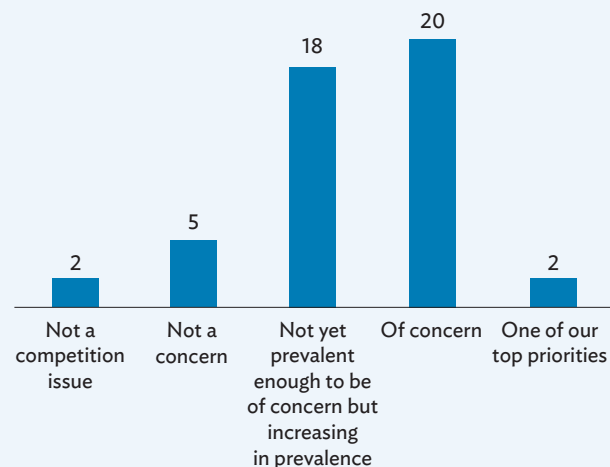
APPAs raise competition concerns when they impede the entry of rival platforms by making it difficult for entrants to attract suppliers by offering lower commissions or platform fees. It also softens competition between platforms and may inflate the fees that suppliers pay to platforms. This ultimately makes consumers worse off. It also limits incentives to innovate and reduce prices among competing platforms because these actions would not be reflected in the final retail price. Due to a uniform price, customers will also become dependent on few platforms even when their services are unsatisfactory.

APPAs may also facilitate collusion between platforms by preventing changes or deviation from a consensus rate of commission—a situation that promotes the cartelization of the market. Further, APPAs may also encourage collusion between sellers because narrow price deviations across online platforms might be conducive for sellers to form a price agreement and to detect deviations from it. In this regard, APPAs may facilitate outcomes that are similar to traditional horizontal agreements. The risk of harm appears to be particularly clear when MFN clauses are of the broad type and imposed by dominant players. The antitrust considerations also vary based on whether the theory of harm is dependent upon horizontal or vertical restrictive efforts.

Additionally, while MFNs may be useful and effective to protect an online platform from a supplier free-riding on investments promoting the suppliers' product, the platform can achieve efficiency through less restrictive means. An EU report suggests that free-riding can be circumvented through alternative financing models on the basis of charging suppliers a fixed fee for using the platform or by charging consumers a service fee for using the platform to seek information (OECD 2018a). Online MFN clauses are subject to scrutiny by competition authorities and repeated antitrust interventions across multiple jurisdictions.

The ICN report featured APPAs and online MFN clauses as part of its survey. Nearly half of the ICN member survey respondents tagged APPAs/MFNs as a concern in their jurisdiction, of which 4% identified these measures as among their top priorities. About more than a third of the respondents indicated that such measures were not prevalent in their jurisdictions but said they should be monitored, as use of such agreements and clauses is on the rise. Geographically, the survey results showed that APPAs/MFNs have the highest prevalence and are cause of major concern in Europe, North America, and Asia and the Pacific (Figure 3.4). Respondents in Asia and the Pacific were evenly split with 33% citing these measures as a major concern and noting its increasing prevalence, while another 33% indicated these are not yet a concern.

Figure 3.4: Are ICN Members Concerned about APPAs/Online MFN Clauses?



APPA = across platform parity agreement, ICN = International Competition Network, MFN = most favored nation.

Source: International Competition Network. 2015. Online Vertical Restraints Special Project Report. *2015 International Competition Network Annual Meeting*. https://www.internationalcompetitionnetwork.org/wp-content/uploads/2019/11/SP_OnlineVR2015.pdf (accessed December 2021).

Some ICN recommendations on further work relating to APPAs/MFNs included the following:

- (i) Monitoring market outcomes of concluded negotiations and agreements to assess possible competition issues with APPAs;
- (ii) Determining whether a standard method of assessment is possible and/or effective;
- (iii) An ICN (or OECD) ex-post review of cases;
- (iv) Undertaking further research and studies on the possible efficiencies and competitive harm of APPAs in various scenarios;
- (v) In some jurisdictions with exemptions based on market shares, identifying the proper definition of the relevant market may be crucial.

The ICN report cited that most survey respondents cover APPAs/MFNs in their existing competition policies. In particular, 77% indicated that APPA conduct is primarily covered under their jurisdiction's general competition law provision. Meanwhile, 23% lacked a legal framework that addresses APPAs. The distinction between broad and narrow MFNs becomes particularly important given the differences between their anticompetitive effects or justification for allowing them on procompetitive grounds.

Online sales bans or distribution limitations, exclusive purchase restrictions

Outright bans on internet sales, selective distribution, or exclusive purchase restrictions constitute the most pronounced vertical restriction to e-commerce. These clauses enforce a direct contractual prohibition on the resale of a product in the online environment. This means that purchasing competing products from anyone other than the manufacturer with whom it has entered into an agreement is prevented. Such measures are a common feature of the markets for luxury, experience, and credence goods.¹³ Typically, it is a solution for suppliers or manufacturers to (i) build and secure its branding, (ii) restrict free-riding on pre-sales service, and (iii) provide information that might help to limit information asymmetries in online markets. This is particularly relevant for highly technical products, where a manufacturer has to channel resources in training for a retailer or in providing new or specialized equipment to support the sales process. Information asymmetries are particularly challenging in highly technical, specialized experience, and credence goods. Nevertheless, restrictions still limit inter-brand competition on the website of the retailer that agrees to the clause. Most important, as the 2018 ASEAN report cites, the positions of both the retailer and the manufacturer are critical. If both dominate the market, their restrictive practice will likely lead to anticompetitive effects. However, if neither are in a position of market dominance, then anticompetitive effects are less likely.

Next to RPM, online sales bans and other derivatives are other types of online vertical restraint issues.

The legal framework of online sales bans/limitations. Online sales bans and other restrictive forms are generally covered by most competition laws across jurisdictions given their direct impact to retailers. The ICN survey indicated that 83% of respondents have existing competition laws that cover such measures, with general provisions dealing with vertical restraint. Existing provisions dealing with online sales bans/limitations include (1) rules based on Article 101 of the Treaty on the Functioning of the European Union, (2) rule of reason approach, (3) direct violation without analysis of competition effects although some exemptions may apply, and (4) other applicable tests.

¹³ Experience goods or services refer to purchases that can be extensively known only after the purchase and after its use or consumption (i.e., a car or a restaurant meal). Credence goods or services refer to purchases that are not perfectly or completely identified even after purchase or use (i.e., the accuracy of a medical diagnosis or effectiveness of therapy, the quality of legal counsel, or the effectiveness of a university course) (Dranove 2011).

Horizontal Constraints

Horizontal agreements long existed among traditional bricks-and-mortar stores and were widely recognized as a fundamental concern for competition law enforcement. In the digital market, horizontal collusion implies the formation of a cartel between competing manufacturers/suppliers or retailers, and any act that contributes to outright cartel behavior should be discouraged. With the rapid growth of e-commerce yet slow development of competition regulation and enforcement, horizontal collusion remains a major concern (Box 3.2). There are also claims that, given its structure or nature, e-commerce may gain some form of exceptionality.

Hub-and-spoke cartels, which involve horizontal coordination between retailers and vertical contact between platform operator and users, are also apparent in the e-commerce market. Two anticompetitive situations are relevant to this scenario. The first is the extent to which competition authorities treat the behavior as either a form of horizontal collusion or a series of restrictive vertical agreements (e.g., the Apple e-books case). The second is the extent to which passive modes of retail participation are enough to establish involvement in a horizontal conspiracy.

OECD (2018a) notes that monitoring or uncovering acts of collusion in e-commerce is complicated by the use of algorithms to set retail prices that are also being exploited by retail cartels. In the age of digitization, price-tracking and price-setting software replaces the traditional way of running a retail cartel. Enforcement, therefore, needs to be more advanced in its monitoring of such activities. Accordingly, competition authorities may need new and innovative investigative tools and other resources to collect proper and sufficient evidence of collusive behavior in e-commerce markets.

Box 3.2: Mergers and Acquisitions

Consideration should be given to merger control and acquisition cases in e-commerce markets. There are a few proposed or completed large mergers that have raised important competition concerns in e-commerce—ancillary services such as online payment systems and online advertising have been part of concluded transactions. However, as the sector develops it is to be expected that the number of merger and acquisition cases will rise. One case is Ayala Group's acquisition of online fashion retailer Zalora in the Philippines. In 2016, the Ayala Group bought stakes in Zalora, riding the momentum of e-commerce growth in the country. The most pressing issue was that the Ayala Group has wide-ranging interests and holds substantial market power in banking (Bank of the Philippine Islands), e-payments (Gcash), the retail space (through Ayala Malls), and telecommunications (Globe). Concerns include whether the group can leverage its market power in situations such as (i) Zalora only listing BPI credit cards or Gcash as payment options, and (ii) a requirement for fashion retailers in Ayala Malls to sell exclusively on Zalora. By September 2017, the Ayala Group obtained the approval of the Philippine Competition Commission and acquired a 49% controlling stake in Zalora Philippines. Consequently, the online fashion retailer is in a position to gain access to Ayala's advanced technology and market penetration for digital payments through Globe and Gcash.

Another case is in Singapore, where the online recruitment portal Seek Asia Investments Pte Ltd (Seek Asia Investments) bought Southeast Asia's largest online employment company Jobstreet in 2014. Singapore's competition commission was concerned that the acquisition would shrink competition in the digital market for the supply of online recruitment advertising services. It also took the view that since alternative job portals did not have the same reach and depth of jobseeker data, this would further reinforce the merged entity's market power. However, the commission was unable to determine that such features will end up constraining the merged entity completely. The review was cleared upon the offer of commitment by Seek Asia to address these concerns.

Sources: Lee, C. and E. Lee, eds. 2020. *E-commerce, Competition & ASEAN Economic Integration*. Singapore: ISEAS Publishing; OECD. 2020. *Annual Report on Competition Policy Developments*. Directorate for Financial and Enterprise Affairs Competition Committee. Paris; Serafica, R., M. A. Rosete, P. J. Camaro, and A. P. Salvanera. 2020. *Issues Paper on the Philippine Digital Commerce Market*. Manila: Philippine Competition Commission; Shiau, D. and E. Chen. 2018. E-commerce Competition Enforcement Guide: Singapore. *Global Competition Review*. 7 December.

Unilateral Conduct or Abuse of Dominance

E-commerce businesses may be able to engage in unilateral anticompetitive conduct by abusing their dominant market positions. The ASEAN (2018) report defines dominance in the market as “a position of economic strength enjoyed by an undertaking which enables it to prevent effective competition being maintained on the relevant market by affording it the power to behave to an appreciable extent independently of its competitors, customers and ultimately its consumers” (p. 54). In ASEAN, dominance refers to “a situation where the business operator has enough economic strength to act in the market without regard to what its competitors (actual or potential) do” (p. 92).

In theory, any economic actor—including manufacturers or retail service providers—can hold a dominant position or monopoly power. But with the rise of the digital economy and e-commerce, the debate is now focused on whether or not online retail platforms can have such power. This sector involves some of the world’s biggest and most influential companies, such as Google, Amazon, Facebook, Apple, and Microsoft, which have secured long-term dominance based on a business model that rides on the features of the digital market, as much as they have propelled its development.

So how is market power defined in the e-commerce sector? The primary purpose of a market definition is “to enable the calculation of market shares, which function as an initial proxy for market power” (OECD 2018a, p. 37). Such a proxy definition is applicable both for online and traditional bricks-and-mortar markets. Other factors should also be considered, including (1) the ability of smaller companies to expand, and new competitors to join the market; (2) leveraging barriers to entry (e.g., network effects and switching costs for consumers); and (3) access to big data. Another important feature of prominent digital platforms is the accumulation and expansion of its digital functions. This means that most e-commerce platforms now operate across multiple product segments, incorporating “direct e-commerce activity (e.g., direct retail sales), more oblique e-commerce services (e.g., online advertising), and ostensibly zero-price digital service (e.g., social networking),” among others (OECD 2018a, p. 38). Aggregation of these business properties might amplify existing market power structures such that these platforms become crucial gateways to the digital economy and e-commerce market. An EU background report cites that such entities cause bottlenecks in accessing a broader universe beyond the platform’s own products and services. For the purpose of unilateral conduct rules, this raises an important question: To what extent does dominance within a single product or market give entities a “special responsibility” to refrain from anticompetitive behavior in adjacent or even unrelated markets?

Competition law does not forbid market dominance in itself, but rather prohibits its misuse. According to OECD (2018a), few cases of enforcement against abuse of dominance have been recorded in the e-commerce subsector, although this is expected to become a major issue as e-commerce grows along with large and powerful online retail platforms. For such cases, the report recommends assessment of common barriers to entry in online markets, such as network effects that reinforce the perceived value of an e-commerce platform to its users. Another barrier is obstacles to multi-homing, which prevents users from accessing the services of other multiple platforms at the same time. Another major dominance is the ability of large companies to collect and capitalize on consumer data, which gives them substantial advantage over potential or new entrants in terms of product improvement, targeted marketing and advertising, and the personalized product offerings to consumer preferences.

In addition, the OECD report identifies new theories of harm:

- **Refusal to supply**—restricted access (via outright refusal or conditional access on unreasonably disadvantageous terms) to a platform (or consumer data) that could be essential for operation in an adjacent market.

- **Tying**—when a dominant platform enacts online deals that forces its customers to purchase two or more products together.
- **Predatory pricing**—when online retailers get ahead of their bricks-and-mortar competitors by cutting prices by a significant margin.
- **Forced free-riding, for consistency**—when an e-commerce platform devotes the most popular product designs sold by third-party retailers through its platform.
- **Discriminatory leveraging**—involves a more favorable treatment of a dominant platform’s own products in order to extend market power and capture the market for other segments. As an example, discriminatory results of search engines compared to a general search of a specific product can be a target for enforcement.
- **Personalized pricing**—this leverages personal data of certain customers and assesses their willingness to pay and extract higher prices.

In the e-commerce sphere, competition law should play a key role in keeping markets open and competitive so as to permit new entry and facilitate innovation. While this is critical for correcting market failures, it is far from the only available regulatory solution. Consumer harm can arise in cases that are beyond the recognized scope and application of competition law. Consumer protection laws can help prevent unfair and discriminatory online business-to-consumer practices while data protection laws regulate and/or restrict the extent to which e-commerce businesses can collect and use consumers’ personal data.

Operational Challenges: Data Collection, Storage, Utilization, and Sharing

The explosion of digital technology and e-commerce has given online businesses massive quantities of data about consumer behavior and activities to market their products and services online. In particular, customer data are critical when it comes to personalized services, experience, and offerings of new products. The availability of big data and use by means of data sharing generates economic and social benefits. These include transparency and accountability, empowerment of users, an enabling environment to prosper for online start-ups and SMEs, “cooperation and competition across sectors and countries, crowdsourcing, new insights, user-driven innovation, and increased efficiency across society through data linkage and integration” (Leistner and Antoine 2022, p. 31).

However, while transparency on data collection, processing, and storage are continuously monitored and regulated under the GDPR and similar regulations worldwide, companies remain autonomous in their data sharing. E-commerce platforms can easily acquire and use large amounts of data to their advantage (Box 3.3). Suppliers and retailers operating under such platforms might also use the data collected to (i) better understand customer needs through diverse product selection and enhanced quality, (ii) improve their organizational structure and business models, and (iii) increase sales through optimized or targeted marketing. One study cites Amazon Marketplace as an example. Independent retailers offering goods on the platform may have only limited information available to them, such as customer reviews. The platform, on the other hand, can access all transaction data of all its retailers including casually recorded data, giving Amazon an advantage over the individual retailers (Klimek and Funta 2021). Independent retailers, meanwhile, are at a disadvantage since switching to direct sales or establishing a separate platform is generally not financially viable.

Data sharing offers many advantages that are also applicable for e-commerce platforms. However, the general situation in the online marketplace is that most companies and business entities either do not have any incentive to share customer data with external partners or they face barriers to doing so. This has given rise to a great

disconnect in data sharing among (1) retailers and brands, (2) large cross-border e-commerce platforms and start-ups or SMEs, and (3) e-commerce platforms, third-party logistics providers, and delivery operators, among others.

Between retailers and brands, barriers in sharing of data start with competition in owning data on customer insights. Since most retailers and brands will not share data for free, they forego the economic gains and massive opportunities that collaboration opens up. Another challenge is the lack of a proper and common platform to implement data sharing effectively. The most common barrier for e-commerce actors—the manufacturer, the brand, and the online retail platform—is finding the technology to transfer data safely and securely among parties and import into dashboards that allow all parties to see the same information and perform data analytics to gain insights that are beneficial to all stakeholders involved (Marfice 2020). Another challenge is that while consumer goods suppliers and retailers see the value of data sharing, manual processes and siloed management are limiting the benefits (RSI Retail Solutions 2010). Some SMEs and start-ups may still be using Excel sheets, PDFs, and flat files to share data because they lack the financial resources to establish the right software to import and process big data. This is a time-consuming, taxing, and often error-prone practice that puts a huge burden on all stakeholders (Marfice 2020). Even when new e-commerce companies may have more advanced software technologies to import big data, most start-ups do not know how to maximize the use of data technology or even use the big data effectively (Zhydik n.d.).

Certain retailers also hesitate to share customer data with brands and suppliers due to security concerns. This is particularly a challenge for omnichannel e-commerce platforms that have relationships with several different suppliers and manufacturers. Another challenge is that large e-commerce platforms lack incentive to share sales data with either their upstream counterparts (suppliers) or minor competitors such as start-ups and SMEs. Sales data sharing comes at a cost of helping retail rivals. Hence, some brand and retailers view data sharing as a profitable opportunity rather than something to share freely with different members of the supply chain.

In some sectors, data sharing is considered critical to the welfare of the public at large. As an example, companies in the health sector are better off sharing data than maintaining data secrecy. One study cites that institutions such as the Global Alliance for Genomics and Health are promoting data sharing among research participants (Jin 2018). The most current display of data sharing in the health sector was conducted during the pandemic. Data sharing within the pharmaceutical industry led to a rapid progress in both drug testing and approvals. Boehringer Ingelheim and GSK have opened their drug compound libraries to external researchers while Pfizer and Novartis were redirecting their resources to revisit their data from previous trials and determine its application in developing suitable treatments for COVID-19 (Davies 2020).

Another area wherein data sharing plays a critical role is in fighting off counterfeit goods among e-commerce platforms and brands selling electronic goods and luxury items. In 2017, following Alibaba's first court case against counterfeiters, the e-commerce giant pledged to increase its focus on fake goods with its announcement of a partnership with 20 global consumer brands including Louis Vuitton, Swarovski, Samsung, and Mars (Russell 2017).

The push for open data and data sharing, however, needs to be balanced with other equally significant interest and policy concerns such as privacy and security. Another important policy consideration with regard to open data access is its implication in obtaining software patents. Capital investment in machine learning innovation that will process and analyze big data has become a necessity. However, the willingness to invest to promote innovation may be at risk if policies do not strike a balance between protecting machine learning innovation while permitting data sharing. On the one hand, data sharing practices may void trade secret protection and nullifies the interest to promote further innovation. On the other hand, the benefits data sharing create may accelerate innovation.

The repurposing of big data to further promote innovation in big data analytics has encouraged more industries to collaborate and forge alliances enabling endless possibilities. As one study has cited, rather than focusing on trade secret concerns, more companies are looking into capitalizing on the commercial possibilities that data sharing may provide that were previously not possible (Jin 2018).

Box 3.3: Breaking the Big Tech E-commerce Monopoly

The European Union (EU) is aiming to change business practices of Big Tech companies through the Digital Markets Act, which targets companies that are able to dictate the rules of the market. Under this EU regulation, companies that are considered gatekeepers of the digital economy are (1) forced to share the data they collect with competitors and regulators, (2) prohibited from giving their own companies preferential access to adjacent markets, and (3) banned from mergers. The goal of EU regulators is to prevent Big Tech companies from abusing their dominant position by giving smaller companies an opportunity to grow without the risk of being driven out of the market by the power of the oligopolistic digital market. Violations under the regulation entail massive penalties that amount to between 6% and 10% of annual turnover.

Source: Comeig, I., K. Klaser, and L. Pinar. 2022. The Paradox of (Inter)net Neutrality: An Experiment on Ex-ante Antitrust Regulation. *Technological Forecasting and Social Change*. 175. <https://www.sciencedirect.com/science/article/pii/S0040162521008362> (accessed December 2021).

Other Issues

Barriers to Expansion across Borders: Differences in National Laws

Across countries, commercial laws governing e-commerce transactions have not always adapted to realities on the ground. Moreover, countries that have amended their corresponding laws have taken similar and opposite stances over different provisions. In a period where e-commerce has grown into a prominent activity, these differences can create inefficiencies or barriers to expansion for companies looking to operate through different countries and regions (ADB 2021).

Competition authorities' varying opinion on MFN clauses across the world have raised concerns. Although a company's practices may be legal in one jurisdiction, these may not be treated similarly in another jurisdiction. This limits their ability to expand internationally using one platform and accompanying business model.

An EU survey found that about 66% of businesses view different contractual/legal practices as significant or extremely significant (Van Gorp and Batura 2015). These barriers to expansion are particularly relevant to the application of vertical restraints in an online platform. International differences in competition policies and regulations come with added transaction costs and longer assimilation periods as companies adapt their own company policies and conduct depending on the approaches imposed in different territories. The ASEAN (2018) report cites the recent Booking.com case as a good example, wherein different competition authorities reached different decisions on the use of wide and narrow MFN clauses.

Geo-Blocking and Copyright Restrictions

One particular barrier related to competition policy is geo-blocking. This refers to the practice of preventing users from accessing content based on location. The ability to access content is often limited by geographic (and jurisdictional) restrictions imposed because of ownership of intellectual property rights in licensing agreements (Van Gorp and Batura 2015). Rights owners argue that geo-blocking allows them to protect their art and be paid correctly for it. While ultimately this issue is about preventing piracy, an EU report cites that geo-blocking can actually encourage piracy—if consumers cannot access a service legally, they will consume it illegally.

In the digital era, the logic of treating regions differently for the marketing and logistics of intellectual property or content may no longer be relevant from a logistics or costs perspective (Van Gorp and Batura 2015). Digital platforms such as YouTube, Spotify, Netflix, and iTunes allow individuals to market their services globally without the need for large production and distribution companies or national collecting agencies. These platforms are in a position to replace nationally oriented supply chains. However, as some regional price differences remain profitable to maintain, this requires measures to prevent parallel imports. Geo-blocking becomes relevant in this case. However, geo-blocking may be incompatible in some countries in which the legal provisions on e-commerce competition treats this measure as a violation and considered to reduce competition in the e-commerce market. In the EU, geo-blocking or any form of territorial restriction is strongly opposed and viewed as a significant barrier to the digital single market that is envisaged by the trading bloc. The EU classifies geo-blocking practices into four main categories (Dahlberg et al. 2020):

- (i) Denial of access and/or involuntary or automatic rerouting to a website in a different country or jurisdiction with differing prices, terms, and conditions;
- (ii) “Refusal to sell based on the member state or residence or establishment of the prospective customer”;
- (iii) “Refusal to deliver a product or service to the member state of the prospective customer’s residence or establishment”; and
- (iv) “Refusal to accept payment using payment mechanisms that are common in the member state of the prospective customer’s residence or establishment.”

Each of these practices may take different forms in the EU and may happen at distinct stages of the shopping process. They may be relevant immediately upon clicking a specific e-commerce portal. In most cases, however, the customer spends considerable time browsing a website and attempts to carry out a cross-border online purchase before finding out that the online platform refuses to sell or will allow purchase under differing prices, terms, and conditions that deviate from what was desired or expected (Dahlberg et al. 2020).

According to an EU parliamentary report, copyright and other vertical geographic restrictions are ranked as 16th and 17th among 17 impediments to cross-border sales by EU businesses (Dahlberg et al. 2020). Business respondents cite several issues as chief concerns. One of these is how copyright impedes selling abroad or results to added value, which makes products or services too expensive. Another major problem is when suppliers prevent businesses from selling abroad on the grounds of copyright issues and other vertical geographic restrictions (Dahlberg et al. 2020). This is not surprising given that copyright is a legal tool used as a leverage to enforce geographic vertical restrictions (Dahlberg et al. 2020). In the EU, copyright regulations are governed by the Directive on Copyright in the Digital Single Market (Directive 2019/790) (Dahlberg et al. 2020). Within this regional directive, copyright is also governed by the laws of each member state. The directive also cites differences in the implementation of copyright and related provisions between the single market rule and national regulations. This becomes an issue in pushing toward a single e-commerce market in the region. However, an EU report cites that while this is a hurdle, the vertical geographic restrictions imposed by rightsholders act as greater barriers to expansion of the cross-

border sale of copyrighted content than any differences in the interpretation, implementation, and enforcement of member state laws (Van Gorp and Batura 2015).

In 2018, EU institutions enacted the Geo-Blocking Regulation, requiring websites to sell their goods throughout the EU regardless of where the buyer lives. This, however, still excludes cultural properties such as music streaming websites, electronic books, online games, and audiovisual content. Such exclusion should be considered in the context of the complexities of copyright law. Nevertheless, following such regulations, the EU has envisioned expanding the measures to online services such as video games, music, and e-books (Barbière 2018). As of 2022, the EU has set regulations to enable its residents to use their online subscriptions for films, sports events, e-books, video games, or music when traveling the region (European Commission 2022).

In the case of Asia and the Pacific, geo-blocking and other associated measures may not be relevant as the region has not been geared toward a single market. However, this could become a significant concern as ASEAN moves closer toward a regionally integrated market under the ASEAN Economic Community Blueprint 2025, the ASEAN Competition Action Plan (2016–2025), and the ICT Masterplan 2020 (ASEAN 2018).

As the ASEAN action plan argues, greater harmonization of competition policy and law will lead to (1) a seamless policy environment for goods, services, and capital to move without hindrance, while businesses operate and allocate resources to find the most efficient and cost-effective ways possible; (2) greater transparency and predictability of the investment climate; and (3) a smoother path for regional cooperation on competition law enforcement (ASEAN 2016).

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CHAPTER 4

Taxation of Digital Transactions

Introduction

Online retailing took off in the 1990s when the first secure online purchases were made. Book Stacks Unlimited, which opened in 1992 and changed name to Books.com in 1994, was among the first e-commerce sites (Guevarra 2018). The very first e-commerce purchase was a CD by the musician Sting, sold in early August 1994 by a United States (US) retailer on the NetMarket website in a transaction protected by encryption technology. The second e-commerce transaction was a pizza sold later that month by Pizza Hut (Grothaus 2015). By 1996, an estimated 250,000 commercial websites and companies had established an online presence (US Department of Treasury 1996). This novel mode of transaction rapidly gained momentum, with the computer hardware supplier Dell becoming the first company to record \$1 million worth of sales in a single day sale in 1997 (Adamson 2016).

As the internet grew from a tool for military and academic purposes to one ripe for commercial exploitation, concerns began to surface in developed countries. By 1996, finance ministries began to consider this new form of retail transaction and international trading as an excessive risk to tax revenues (Holmes 2008). In light of an alarming 1997 headline citing potential loss of “billions” of tax dollars, the OECD formed working groups to determine and assess possible threats and possible ways to address challenges (Holmes 2008).

Early Responses to the Digital Tax Challenge

United States

The United States Treasury Department answered to these early developments in e-commerce with a discussion paper entitled *Selected Tax Policy Implication of Global Electronic Commerce*. It served as a first step in reexamining the Internal Revenue Code and establishing principles for international tax policy on e-commerce. The US Treasury’s goal was to invite and encourage not only taxpayers and their tax advisors, but also tax law specialists, computer technology specialists, academics, and foreign tax policymakers to identify potential taxation issues arising from e-commerce (US Department of Treasury 1996). It aimed to spark debate, discussion, and public consultation on developing measures fit for the evolving landscape of commerce. The end result was to establish a framework that did not impede the development of electronic commerce and was sufficiently stable and flexible enough to adapt to new ways of doing business (US Department of Treasury 1996).

Among the issues discussed in the paper were tax policy, tax administration, substantive principles of taxation, and tax compliance. These are explored in Box 4.1.

Box 4.1: Implications of E-commerce on Taxation (the United States Case)

Tax policy and implementation issues. The highly technical structure of the internet has direct implications for tax policy and administration. One of these is lack of central control given that the internet has no physical location. This poses challenges that include the difficulty in regulating and monitoring transfers of information or electronic cash both domestically and internationally as the internet has no regard for national boundaries. Registration requirement will become impertinent as tax authorities lack the tools to monitor new sites and their owners. Hence, there is little incentive to comply. Another aspect is the weak correspondence between computer domain name and reality, which pertains to identification and ownership of activities. This presents a challenge as well since it is difficult to determine a person's location and identity, which are key elements in taxation. Further to this, the remote control potential of the internet runs the risk of preventing audit. A person living in a different region can remotely run an e-commerce site for United States (US) customers using a computer located in one other region.

Substantive tax law issues. Electronic commerce challenges policymakers in staying true to one of the tax law principles of neutrality. The existing principles of taxation were defined within the context of trade and business having a permanent and physical establishment. With the advent of technology forcing governments to account for the borderless world of cyberspace, maintaining and pursuing neutrality in taxation becomes a challenge. Like most countries, the US asserts its jurisdiction on tax based on both source and residence. With the growth of new ways of communication and technology and the development of e-commerce, two issues became critical—the critical function of residence-based taxation and the irrelevance of source-based taxation. The paper argues on using a taxpayer's residence as a means “to identify the jurisdiction where the economic activities that created the income took place” (US Department of Treasury 1996, p. 27). Hence, such jurisdiction should have the authority to tax such income. In contrast, the paper also argues that source-based taxation becomes difficult, if not obsolete, to apply in e-commerce. That is, transactions are conducted without regard to national boundaries and instead are taking place in the nebulous world of “cyberspace.” This impacts the US cross-border tax treaties as well.

Tax administration and compliance issues. Broad categories of issues that belong under tax administration and compliance will need to adapt to technological innovations. These include electronic money; identity verification; record keeping and transaction verification; and disintermediation and information reporting. The tax evasion potential of electronic money, especially the unaccounted form, is substantial. In a similar manner, tax evasion issues are also raised in recordkeeping and transaction verification in e-commerce. Taxpayers engaged in electronic goods and services activities are likely to transact electronically without any paper trails. This disincentivizes proper reporting and encourages tax evasion and fraud as computer records can be altered. In terms of identity verification, not being able to correctly identify a counterparty raises concerns given that verifying a taxpayer's identity is a major element in numerous tax provisions. Finally, e-commerce tends to eliminate traditional intermediaries and centralized institutions that are important pillars in tax reporting and compliance. Information reporting is also critical in tax administration as this provides data and building blocks for an e-commerce friendly taxation system.

Source: US Department of Treasury. 1996. *Selected Tax Policy Implications of Global Electronic Commerce*. Office of Tax Policy. <https://home.treasury.gov/system/files/131/Report-Global-Electronic-Commerce-1996.pdf>.

The European Union and Others

In a wide-ranging response as early as June 1996, the Organisation for Economic Co-operation and Development (OECD) deliberated the tax implications of the development of communications technology (OECD 2015). Its Committee on Fiscal Affairs (CFA) made it a long-term goal to establish global agreements and action plan as a blueprint for the roles of government, international organizations, and the private sector (Holmes 2008). Guidelines were to cover, among other areas, income taxes and consumption taxes—particularly value-added tax (VAT), given its direct vulnerability to a nascent global internet that made cross-border trading easier (Holmes 2008).

Because international trading has a significant function in e-commerce, OECD and stakeholders understood the need for solidarity among countries in tackling the issue. Cooperation needed to be global in scale and involve the public and private sectors.

In light of developed countries' concerns, the OECD held a conference in Turku, Finland in 1996, and a European Ministerial Conference followed in Bonn, Germany in 1997. Both conferences were aimed at addressing issues sparked by the advent of e-commerce and its rapid development. They put forward proposals to promote e-commerce globally and maximize its economic and social potential. These were aimed at industry self-regulation, standards, codes, voluntary compliance, and the application of technology to securing the domestic and international use of digital signatures, cross-certifications, and transaction authentication (Cordis EU 1998). The same parties reconvened in a major OECD ministerial conference on e-commerce in Ottawa, Canada in October 1998. The conference, *A Borderless World—Realizing the Potential of Electronic Commerce*, brought together government ministers, private sector representatives, and industry leaders, along with heads of international organizations selected by each OECD member country (OECD 1998a). Organizations such as the Inter-American Center of Tax Administrations, Centre de Rencontres et d'Études des Dirigeants des Administrations Fiscales, Intra-European Organisation of Tax Administrations, and Commonwealth Association of Tax Administrators were also in attendance. The conference culminated with a set of measures and principles known as the Ottawa Taxation Framework Conditions. The framework, published by the OECD's CFA, became the basis for the OECD's work on taxation and e-commerce.

Governments and businesses across the world generally accepted the Ottawa Taxation Framework Conditions as foundational for further policy work on the taxation of e-commerce (OECD 1998b). The goal of the framework was to find the right balance between the state's role in providing a climate for e-commerce to flourish and in setting regulations for operating a "fair and predictable taxation system" that would meet the needs of citizens for funding public services (OECD 1998b). The CFA retained taxation principles that also laid the groundwork for the taxation of conventional commerce. Given that at the time e-commerce was at a nascent technological and commercial stage, the CFA believed existing taxation principles were relevant. However, major additions, adaptations, and revisions were made to administrative or legislative measures to adapt to the new environment. Such changes remained true to existing taxation principles.

The taxation principles at the foundation of the Ottawa framework remain relevant to this day. They are:

- (i) **Neutrality.** Tax neutrality is a widely accepted guiding principle in the taxation system which strives to make decisions that are "neutral" or of economic merit, and not for tax reasons. In practice, however, this can be skewed by tradeoffs between different concepts of neutrality and the goals of policymakers for taxation. As an example, neutrality is impossible on "sin taxes," where a government's intent on promoting health and disincentivizing alcohol and cigarettes accepts a certain level of distortion from the neutrality principle (Furman 2008).
- (ii) **Efficiency.** The OECD defines tax efficiency as ensuring that "compliance costs to business and administration costs for governments should be minimized as far as possible" (OECD 2015, p. 20).
- (iii) **Certainty and simplicity.** Tax rules should be specific as to how varying taxes are determined and the required amount of payment that taxpayers are expected to pay. It should also be clear as to when and how payment of the tax should be made. With regard to simplicity, taxpayers across all levels of income should be able to understand their tax obligations and easily comply in a cost-efficient manner (AICPA 2017). Tax rules are expected to have both certainty and simplicity so that taxpayers (individuals and businesses) can anticipate their tax consequences in advance of a transaction and understand their obligations and entitlements. This helps ensure that businesses can make sound decisions and respond

to tax policies cost-effectively. Complexity in taxation only leads to aggressive tax planning, triggering deadweight losses for an economy (OECD 2015).

- (iv) **Effectiveness and fairness.** The OECD defines effectiveness and fairness as ensuring that “taxation produces the right amount of tax at the right time” (OECD 1998b, p. 4). This principle stresses the importance of making sure that taxpayers are not subject to double taxation and unintentional non-taxation. It also takes care that similarly situated taxpayers are taxed uniformly (horizontal equity) and that the tax system accounts for individuals’ different capacities to bear their tax burden (vertical equity). Another important consideration is the importance of preventing evasion and avoidance and providing the right environment and tools to enforce tax violations.
- (v) **Flexibility.** Finally, the tax system should be well-structured and stable enough to withstand drastic shifts, able to remain unwavering in its execution. However, it also should be flexible and dynamic such that it can adapt at the right time to the needs of an economy amid technological and commercial developments. Hence, tax authorities should be able to implement the right measures at the right time and/or adapt to changing circumstances (Stein 1946).

Asian Responses

Historical context

Asia and the Pacific’s adaptation and response in e-commerce has been quite different from that of economies such as the US and the European Union. The region was unable to reach the same level of action on e-commerce as early as developed economies. Nevertheless, individual economies in Asia and the Pacific have enacted specific laws to legitimize e-commerce in their jurisdictions. Some national laws have been based on the *UNCITRAL Model Law on Electronic Commerce* of 1996. They have covered areas such as electronic signature, data protection and privacy, consumer protection, intellectual property, and electronic banking and finance (ESCAP 2004). In most economies, offline laws were simply extended to the online environment. However, a 2004 ESCAP report noted that no economy in Asia and the Pacific had adopted legislation or other forms of regulation that specifically addresses the issues of tax or custom duties for online transactions. Any taxation on e-commerce at the time resulted from the application of traditional levies such as sales tax. None of the economies in the region enacted custom duties on online services and transactions at the point of consumption (ESCAP 2004). E-commerce taxation developments across several markets can be traced from the initial stages of the digital economy.

Australia, in contrast, responded to the challenges of the digital tax system almost as early as the US and the OECD. In 1996, the Australian Tax Office began examining the tax implications of e-commerce and established the Electronic Commerce Project to assess and report such issues. This culminated with the August 1997 publication of its first report *Tax and the Internet*, followed by a second report in December 1999 (Australia National Audit Office 2000). The second report acknowledged that the application of the general principles governing the taxation of e-commerce is often unclear (Li 2000). In particular, it presented the opportunities and challenges of e-commerce for tax administration, laid out in a comprehensive action plan, which the tax office was to adopt. The plan included a commitment by the tax authority to consult with the Australian Transaction Reports and Analysis Centre and other government agencies to ensure that equivalent legislative and regulatory requirements of traditional commerce would also apply to e-commerce transactions.

In **Singapore**, the Ministry of Finance issued a ministerial order in February 2001 (amended that May) and referred to as Income Tax (Exemption of Royalties and Other Payments for Economic and Technological Development). The tax authority also published the *Income Tax Guide on E-commerce* in the same year, highlighting the income tax measures imposed on cross-border tangible and intangible goods. Similar to the views of Hong Kong, China, the tax authority explained in the guideline that a “server alone will not constitute a permanent establishment

under Singapore’s domestic tax law” (Cockfield 2006, p. 158). For the ministerial order, the directive was to exempt royalty payments to nonresidents for various forms of software from tax. The software included (1) shrink-wrap software, which refers to a software distributed in wrapped boxes accompanied by what is generally referred to as a shrink-wrap license; (2) downloadable software by an end-user from the internet or a network for a fee; (3) site license; and (4) software bundled with computer hardware (Tan n.d.).

Tax authorities in **Hong Kong, China** responded by 2001, issuing a Departmental Interpretation and Practice Note to apply neutral tax rules to e-commerce with the intention that no business would have a tax advantage over others (Cockfield 2006). However, the note rejected the OECD’s view that internet servers alone can constitute permanent establishment in certain circumstances. The existing tax law in 2001 implied the need for a physical place and the presence of personnel for an establishment to be defined as “permanent.” The government was more focused on the specifications of the underlying physical operations and transactions were conducted for the taxpayer to earn the taxable profits. In terms of cross-border income characterization concerns, tax authorities followed the OECD model tax treaty, which emphasized scrutiny of the substance of the electronic transfer to see if payment is taxable (Cockfield 2006).

Elements of the Taxation Framework

Two principal taxes apply to e-commerce in general: consumption tax and income tax.

Consumption Taxes (Value Added, and Goods and Services)

The 1998 Ottawa framework laid out the OECD’s agreed views on incorporating basic principles in e-commerce taxation. The CFA conclusions are summarized in Box 4.2.

Box 4.2: Consumption Taxation Framework for E-commerce: Ottawa Conditions

1. For consumption taxes, the supply of products in the digital market should not be treated as a supply of goods.
2. Consumption taxation for cross-border goods and services should be in the jurisdiction where the consumption takes place (place of consumption). For goods that are held to be consumed in a jurisdiction, international consensus must be sought.
3. Where businesses and other entities within a country avail the services and intangible property from suppliers abroad, countries may explore mechanisms such as reverse charge, self-assessment, or other equivalent measures that can give immediate security of their revenue base as well as the competitiveness of domestic suppliers.
4. Countries or jurisdictions should align the development of systems in coordination with the World Customs Organization and in consultation with stakeholders (i.e., carriers and other interested parties) to collect tax on the importation of physical goods. In addition, they should ensure that such systems do not constrain revenue collection and impede the efficient delivery of products to consumers.

Source: Organisation for Economic Co-operation and Development. 1998. *Electronic Commerce: Taxation Framework Conditions*. Committee on Fiscal Affairs. Paris. <https://www.oecd.org/ctp/consumption/1923256.pdf> (accessed February 2022).

Following the 1998 publication of the Ottawa framework, the OECD in 2001 developed guidelines for consumption taxes as they relate to international cross-border electronic commerce.

Place of consumption

One of the consumption taxation issues arising from e-commerce is defining the place of consumption. As per the OECD guidelines, the definition of the place of consumption for business-to-consumer (B2C) transactions should be the jurisdiction in which the recipient has their usual residence, with further work required on measures for verifying this (OECD 2001a). The CFA's conclusion is that "taxation at the place of consumption promotes certainty and prevents double taxation" (OECD 2001c, p. 10). It also solves the risk of unintentional non-taxation, wherein two jurisdictions impose conflicting rules in terms of place of taxation such as at source or at destination (OECD 2001c). Simply put, in the case of cross-border supply of traditional goods, the place of consumption can be based on the recipient's delivery address (OECD 2001c). However, for digitally downloaded or electronically delivered cross-border products, this definition creates difficulties for revenue authorities. Meanwhile, the report categorizes services as either tangible, where the place of consumption can be easily identified, or intangible, where the place of consumption may not be certain. Examples of transactions involving tangible services include those to estate agents, hotels, architects, restaurants, concert halls, and sporting venues, among others. The place of consumption for these services are readily identifiable and the place of consumption commonly refers to the jurisdiction where the service is consumed (OECD 2001c).

OECD (2001) cites some examples of intangible services such as consulting, accountancy, legal advisory and other intellectual services, banking and financial deal and transactions, advertising, telecommunications services, broadcasting, among others (OECD 2001c). The place of consumption for these services, in contrast to tangible services, cannot be readily seen to be physically consumed or performed at one particular location. Back in 2001, this and services capable of being consumed through electronic delivery, posed challenges to the OECD working group's practical consumption test (OECD 2001a).

OECD (2015) noted that VAT systems are based on two approaches. The first mechanism applies to the jurisdiction where the customer is located (or resident). For this type of approach, when the customer has a different residence from the supplier, the supply of a service/product is treated free of VAT ("zero-rated") in the jurisdiction of the supplier. Instead, VAT is charged on the product in the jurisdiction where the customer is a resident. The second mechanism, on the other hand, applies to the jurisdiction where the supplier is located (or resident). In this case, the supply of a service is subject to VAT in the jurisdiction where the supplier is a resident, even when the supplies of services are performed abroad or given to foreign customers/foreign private consumers. Customers with taxable businesses can typically apply for a VAT refund from the tax authorities of the supplier's jurisdiction for intangible services or business inputs provided by the supplier (OECD 2015). The report also emphasized that services acquired from abroad are not subject to VAT in the resident final consumers' jurisdiction. However, this may carry distortion risks by creating an incentive for suppliers to (i) shift its operations and activities to jurisdictions where no or a low VAT is charged, and (ii) provide remote services abroad VAT-free or at the low VAT rate (OECD 2015). As such, more jurisdictions are exploring measures to keep a destination-based approach for B2C cross-border supplies of services.

The OECD in 2017 released the International VAT/GST Guidelines, citing the general rule that for services in international trade, VAT neutrality is generally achieved through implementation of the "destination principle" (OECD 2017). Under this principle, tax is only levied in the jurisdiction of consumption for cross-border supplies. Guideline 3.1 cites that internationally traded services and intangibles should be taxed according to the tax rules of the jurisdiction where the final consumption occurs (OECD 2017). Thus, the primary objective for VAT taxation is

to determine the place where the cross-border services or intangibles are likely to be consumed, with reasonable accuracy. The guideline emphasizes that such a place of taxation should have a simple and practical system for taxpayers to apply, for customers to understand, and for tax administrations to administer. In most VAT systems, the place in which customers have their usual residence is the most accurate for predicting the place of consumption and is used as its proxy for many types of services and intangibles supplied to final customers (OECD 2017).

The VAT taxation system in the European Union

VAT taxation in the EU saw a major change on 1 July 2021 with the application of new rules. One of the highlights of the modification is the streamlining of registration into just one EU member state. This means that, to secure validity of VAT declaration and payments, online businesses need only register in one EU member state for all cross-border sales of goods and services to customers across the EU (European Commission 2021a). In addition, international sales to end-customers residing in the EU will be taxed in the destination country of final consumption and local distance-selling thresholds will be removed—which is another amendment to the 1993 VAT law. In addition, the abolishment of the distance threshold is replaced by a new EU-wide threshold of €10,000. However, the supply of telecommunications, broadcasting, and electronic services and distance sales may still be subject to VAT in the member state where the taxable person is established. The new VAT taxation also removed the exemption at importation of small consignments of a value up to €22 but a simplification of measures for distance sales of imported goods in consignments not exceeding €150 is introduced. Supporting these new measures in importation is the creation of the Import One Stop Shop. The Import One Stop Shop is an electronic portal that caters to businesses for their compliance with the VAT e-commerce obligations on distance sales of imported goods. It allows suppliers selling imported goods to buyers via electronic interfaces in the EU to collect, declare, and pay VAT to tax authorities, instead of requiring end-consumers to settle the VAT at the moment the goods are imported into the EU as they previously had to (European Commission 2021b).

Another major change to the taxation system as aforementioned is the establishment of the One Stop Shop (OSS) (previously Mini One Stop Shop) which covers two schemes, the Union scheme and the non-Union scheme. The OSS simplifies VAT compliance in the country of residence or registration into a single point of contact. It is expected to reduce red tape by up to 95% (European Commission 2021a). In the e-commerce market, the OSS aims to simplify VAT since tax liabilities in other EU countries can now be managed in the country of residence through the OSS, thus bypassing tedious processes such as reporting of VAT locally in each member state. The limitation, however, is that the OSS reporting is only possible for certain types of transactions. According to the European Commission (2021a), transactions that are covered under the OSS are

- (i) “Distance sales of goods within the EU by suppliers or deemed suppliers (electronic interfaces)”;
- (ii) “Domestic sales of goods by deemed suppliers (electronic interfaces)”;
- (iii) “Supplies of services by EU and non-EU sellers to consumers in the EU”; and
- (iv) “Distance sales of goods imported from third territories or third countries carried out by suppliers and deemed suppliers, except for goods subject to excise duties.”

The VAT taxation system in the United States

The US is undergoing widespread change in policy for taxing digital products and online businesses. As a rule, the US does not have a unified “national” law on sales tax. Each state imposes its own view on whether or not it charges sales tax and its rate. Any seller in the US needs to look at the tax regulations for each state relevant to the seller.

This extends to digital goods and services as well when the sales tax laws were updated to include digital goods and services in diverse ways across different states. Digital products are not taxed in 23 states, while 4—Delaware, Montana, New Hampshire, and Oregon—do not tax retail sales at all. In the 28 states that tax digital products, rates vary from 1% to 7% depending on the state and the type of digital goods (Quaderno 2022a). On top of these state sales tax, most states also allow local areas such as cities, counties, and other “special taxing districts” to collect additional sales tax (i.e., New York).

Another feature of the US taxation system is the “sales tax nexus” or economic nexus. In general, this refers to a significant connection between a seller and a state and occurs when sellers have some kind of “physical presence” in a state. Richard (2021) lists some of the ways a sales tax nexus is created in different states:

- (i) Location—refers to an office, warehouse, store, or other physical infrastructure of a firm.
- (ii) Personnel—refers to an employee, contractor, salesperson, installer, consultant, among others.
- (iii) Inventory—refers to most states that store inventory in a state to cause a nexus.
- (iv) Affiliates—refers to an individual who markets products in exchange for a percentage of the profits.
- (v) A drop shipping relationship—refers to a third-party presence that ships to consumers.
- (vi) Selling products at a trade show or other event.
- (vii) Economic nexus—referring to when a buyer exceeds a state-mandated dollar amount of sales or does more than the state-imposed number of transactions in a state.

Several attempts have been made to streamline sales taxes on digital goods and services. In March 2000, *The Streamlined Sales and Use Tax Project* was established to develop a tax system based on sales and use to make it easier for retailers to pay their taxes. The project worked to simplify and improve administrative procedures, streamline uniform definitions within tax laws, and provide applicable and relevant technology for tax collections.¹⁴ Since the project aims to improve tax administration both for local and remote businesses for all types of commerce, it remains of significant use in e-commerce to this day. The Streamline Sales Tax includes the SST Central Registration System and other harmonization of filings. Currently, 24 US member states make use of the system.

In 2011, the US Congress enacted the *Digital Goods and Services Tax Fairness Act*, which serves as a federal framework for digital taxation. The act “prohibits a state or local jurisdiction from imposing multiple or discriminatory taxes on or with respect to the sale or use of digital goods or services delivered or transferred electronically to a customer” (US Congress 2011).

The US Supreme Court on 21 June 2018 made a ruling based on the decision on *South Dakota vs. Wayfair, Inc.*, which is now widely known as the “Wayfair decision.” The 5–4 decision introduced a new “economic nexus” test to determine if out-of-state online retailers are responsible for charging a sales tax. The decision changes the basis of tax to the location of the consumer even if the vendor is not resident in the state, which reflects the rules of most economies’ VAT and GST rules, including the EU. Prior to this, most states and local governments have raised concerns of losing up to \$33 billion in annual revenue because there were no policies enabling states to tax remote sellers (Quaderno 2021). However, the decision brings nonresident retailers a further burden since they have to consider the varying local sales tax jurisdictions.¹⁵

¹⁴ Sales Tax Institute. What Is the Streamlined Sales Tax Project (SSTP)? https://www.salestaxinstitute.com/sales_tax_faqs/streamlined_sales_tax_project_sstp.

¹⁵ Avalara. US Sales Tax Wayfair Ruling and Foreign Sellers. <https://www.avalara.com/vatlive/en/country-guides/north-america/us-sales-tax/us-sales-tax-wayfair-ruling-and-foreign-sellers.html>.

Origin vs. destination-based sales tax sourcing. Unlike most economies in Asia and the Pacific and even the EU as a region, the US currently allows each state to choose whether or not to use “origin-based” or “destination-based” sales tax sourcing. The majority of the states (i.e., 35 in total) follow a destination-based approach and, hence, require online sellers to collect sales tax at the customer’s residence. There are 11 states who follow the origin-based approach, which requires e-commerce platform sellers to charge sales tax based on the tax rate of their business jurisdiction.

Having a destination-based taxation system in the US can be more complicated than the origin-based system. The reason is that the applicable sales tax rate is based on the location of the buyer. Given the varying tax rates for different jurisdictions, buyers are required to charge different rates for different buyers. On the other hand, an origin-based taxation system also has its complication. As mentioned, digital sellers are required to determine their sales tax nexus and it is often the case that the sellers may have acquired such nexus in multiple states.

VAT taxation system examples in Asia and the Pacific

Australia imposed a 10% GST on the sale of electronic or digital services by nonresident providers to its consumers from 1 July 2017 under the *Tax and Superannuation Laws Amendment Bill 2016*. This applies to electronic distribution platform operators or nonresident importers of services or digital products for Australian consumers. The scope of the imported services and digital products referred to as “inbound intangible consumer supplies” includes streaming or downloading music, films, mobile applications and video games, e-books, online professional services, and online cloud and storage services. For nonresident providers of electronic services, registration is only required if annual sales exceed A\$75,000. Market platforms (e.g., Google Play, Apple App Store, and Amazon Kindle) providing services to the consumer on behalf of content creators will be liable to declaring any GST due.

Similar to other economies, GST taxes of online purchases are an extension of existing tax rules applied to any other import. The *Treasury Laws Amendment (GST Low Value Goods) Act 2017* (the amending Act) extended the provisions of the previous act to international supplies of “low value goods brought to the indirect tax zone, with some modifications, from 1 July 2018” (Australian Taxation Office 2018). Under the amended act, the previous A\$1,000 low-value consignment stock exemption from GST was abolished so that all goods sold by foreign online retailers to Australian consumers are now subject to 10% GST. These goods are charged at the point of sale, not at the border. The value of such goods and how they arrive in Australia will determine how they are cleared for delivery and the applicable duties, taxes, and charges. In the **People’s Republic of China** (PRC), foreign sellers of goods purchased online may refer to the April 2016 government circular defining import tax policies for imported goods under the cross-border e-commerce model. Under the guideline, consumers purchasing goods imported through either direct shipping or a bonded warehouse are required to pay import taxes such as tariffs, import VAT, and consumption tax. The government also released the *Cross Border e-Commerce Imported Goods List*, which specifies the type of goods that could be imported under a cross-border e-commerce model (Mazars 2019). Import tax rates vary depending on the type of goods and the shipping method adopted. The three different types of shipping are as follows:

- (i) **Direct shipping via parcel or postal tax.** The parcel or postal tax applies exclusively to goods that PRC residents bring in to the country for personal use. Tax brackets have been set at 15%, 25%, or 50% effective 1 November 2018 (Mazars 2019). If the tax value is less than CNY50, the parcel or postal tax will be exempted (Mazars 2019).
- (ii) **Direct shipping** (business commercial model). Many shipping companies use the business commercial model, which the PRC government introduced in 2016 (Shen 2019). The benefit of this model is that overseas shipment is more efficient with faster clearance and lower import taxes, similar to the bonded

warehouse model. The tax rates for direct shipping are similar to the bonded warehouse model and may vary from 11.2% to an additional 15% consumption tax for high-end products. And like the bonded warehouse model, a 30% discount applies (Export2Asia 2018).

- (iii) **Bonded warehouse model.** The basic requirement under this model is that the warehouse is in a free trade zone. This means that e-commerce businesses can store and clear goods without having to register or file with PRC authorities, which is a clear advantage. In free trade zones, products can move freely and shipped back overseas without paying taxes, and duties are only paid before customs clearance (Export2Asia 2018). Tax rates for the bonded model are about 30% lower than for traditional import rates. As of 2019, under this model, tax rates are normally set at 9.1%. Every so often, exporters may need to pay an additional consumption tax of 10% to 20% for luxury cosmetics for lips, eyes, and foundation makeup, perfume, and skin care (Export2Asia 2018).

In **Japan**, an e-commerce consumption tax (JCT) was applied to B2C e-commerce and digital goods under the e-commerce JCT, which passed into law in March 2015 (Adam 2015). The JCT is analogous to the EU electronic services VAT. Foreign businesses selling electronic goods and services from outside the country to customers inside Japan were required to collect and remit an 8% tax, which was increased to 10% in October 2019 (Vertex 2019). The new JCT applies to a diverse and wider range of digital and electronic goods and services such as the direct purchase of mobile applications (including added in-app purchases) and/or indirect purchase of such applications from various available platforms (GooglePlay, iTunes, Amazon, Microsoft Store, and the like), music and game downloads, and digital books (Adam 2015). Affected services also include advertising through the internet or telecommunications to consumers in Japan. Similar to the process in the PRC, taxes in Japan may differ depending on the mode of delivery, although the same JCT rate is used. The modes include the following:

- (i) **Direct shipping.** If a customer purchases products directly from overseas sellers shipping internationally, an import tax may be charged when the item arrives in Japan, depending on the order value. For parcel posts, total customs value covered in one package does not exceed ¥10,000.¹⁶ Additionally, personal imports, or those items shipped directly to customers from an overseas warehouse each time they are sold, have a de minimis threshold of up to ¥16,666 (Fuoti 2018; Rakuten 2021). If the value exceeds that, the item is subject to personal import tax upon crossing the border into Japan. The tax is paid cash on delivery by consumers residing in Japan (Rakuten 2021).
- (ii) **Warehouse model.** If a company chooses to warehouse products in Japan, the company is responsible for hiring an importer to obtain the necessary legal paperwork to have the products commercially imported and tax must be paid when inventory arrives in Japan. These products are also subject to import duty upon arrival at customs, similar to those delivered directly. This is separate from the JCT and can run up to 20% of the value of goods although the average rate may be about 5% or lower. The customer is still responsible for such fees (Rakuten 2021).
- (iii) **Japanese platforms.** For companies choosing to establish a Japanese entity to sell their products, the JCT and import duty costs would become the organization's responsibility. Most of these sellers incorporate such costs into the price of their products. This is a common practice and is almost to be expected by international shoppers (Rakuten 2021).

In the **Republic of Korea**, digital service legislation was incorporated in the *Value-Added Tax Act of Korea* (VAT Act) on 15 December 2015. The act mandates foreign suppliers selling digital services to Korean customers to register and collect 10% VAT on them. Digital services cover software services, cloud or hosting, customized software delivered electronically, online marketplaces, e-books, videos, music, online video gaming, subscriptions to digital content, and mobile phone applications, among others. The term “foreign suppliers” refers to any person that operates a commercial enterprise but is neither a resident nor has a permanent establishment in the country. They

¹⁶ Japan Customs. 1006 Duty Exemption for Goods at a Total Customs Value of 10,000 yen or less (FAQ). https://www.customs.go.jp/english/c-answer_e/imtsukan/1006_e.htm.

may choose to use a fiscal representative to facilitate the VAT requirements on the company's behalf. The VAT Act excludes live broadcasts of webcasts, access to recorded webcasts, e-mail services, and discussion forums. No exemptions are applied to B2C transactions, which would also include activities conducted by organizations such as nonprofit entities, charitable organizations, health education, and government bodies. Currently, there is no specificity on the verification of the location of the consumer. It is, however, a generally accepted method that the service provider considers the residential address given by the customer through the internet in addition to country of issuance information provided in the payment information. In December 2018, the National Assembly passed a bill to amend the VAT Act to broaden the type of digital services subject to taxes on direct-to-customer sales. The amendment (commonly referred to as "Google tax") became effective on 1 July 2019 and imposes 10% VAT on profits from cloud services by companies such as Google, Amazon, Facebook, online revenues collected by Youtube, and platform commissions earned by Airbnb. This move was a step to hold foreign information and communication technology (ICT) giants running major digital businesses to the same tax policies imposed on local companies in the same business (Sohn 2018).

A service tax in **Malaysia** came into effect on 1 January 2020. The *Service Tax Policy No. 10/2020 (STP 10/2020)* is imposed by the Royal Malaysian Customs Department. Under the regulation, digital services purchased by any consumer in Malaysia and provided by a foreign-registered person are subject to tax at 6%—one of the lowest worldwide. The STP 10/2020 was passed to ensure equal treatment in the digital industry, so that taxable services businesses acquired by firms in Malaysia from a foreign service provider belong under "imported taxable services," effective 1 January 2019. Businesses are required to account for and pay the service tax on these "imported taxable services." The new service tax legislation requires that a foreign provider of digital services to consumers is registered as a foreign-registered person. The digital services include software, mobile applications, video games, music, e-books and film, advertisements, search engines and social networks, online database, internet-based telecommunications, and online training (Royal Malaysian Customs Department 2021).

Singapore imposed the *Overseas Vendor Registration* regime on 1 January 2020 on electronic or digital services. Under the regime, any e-commerce supplier based outside Singapore that has a global annual turnover exceeding S\$1 million and whose B2C supplies of digital services to consumers in the country are more than S\$100,000 a year is required to register, charge, and account for GST. The GST is charged not only on the supply of both goods and services in Singapore, but also on any goods imported into Singapore. Since the GST is paid by the end consumer, it is not a cost to the company. However, it is important to note that overseas vendors should only apply GST to their supplies of digital services for non-GST-registered customers in Singapore. Similarly, overseas vendors should not apply GST on supplies of digital services to GST-registered customers with subsequent GST registration numbers. In addition, the GST-registered customers are authorized to reverse charge on overseas purchases if they fall within the scope of reverse charges (IRAS 2022).

Thailand enforced an e-commerce tax on 1 September 2021 through the *Revenue Code Amendment Act BE 2564*. Thailand's e-services tax policy has shifted from customers residing in Thailand to the foreign service providers (Sarachai and Ashburn 2021). The act stipulates that nonresident electronic service providers and electronic platforms earning an income of more than B1.8 million a year from non-VAT registered customers in Thailand shall register for VAT, file VAT returns, and pay the corresponding VAT (Thailand: The Revenue Department 2022). Thailand's goal in broadening the VAT base, similar to its Asian neighbors, was to create the same conditions for domestic and foreign operators providing services online to Thai customers. The previous VAT rate of 10% was lowered to 7% in September 2020 due to the impact of the pandemic in Thailand, and that rate will remain until 30 September 2023 (Vertex 2021). The Revenue Department released the guidance entitled *A Guide on VAT on Electronic Service Provided to Non-VAT Registrants in Thailand by Nonresident Business Person*, which clarifies issues of concern to potentially affected nonresident electronic service providers and electronic platforms (Thailand: The Revenue Department 2022).

- (i) **Electronic platform operator.** Such entities are liable to pay VAT on behalf of nonresident electronic service providers if the latter provide for electronic services through a platform covering end-to-end transactions starting from offering the service, receiving payment for the service, and delivering the service. In this case, if the electronic platform operator carries all three processes and meets the income threshold for VAT registration, then it must register, file, and pay VAT on behalf of all service providers it carries through the platform.
- (ii) **Electronic service provider.** This refers to a service provider in Thailand that supplies electronic services through an electronic platform registered in Thailand; the service provider will be responsible for paying VAT.

VAT collection

Traditionally, suppliers are responsible for implementing the correct charging, collection, and remittance of VAT and its related reporting obligations. For suppliers in the jurisdiction of taxation, that role is routine and straightforward. However, for suppliers of goods and services that are taxable in a jurisdiction where the business is not located, such responsibility is much more complex. The additional feature of digital technology in e-commerce magnifies this challenge.

In 2015, the OECD published *Addressing the Tax Challenges of the Digital Economy*, a report covering issues related to consumption tax for business-to-consumer e-commerce transactions. The VAT system for goods, which generally means “tangible property,” is merely an extension of the traditional commerce taxation system. This means that the treatment of supplies of goods normally depends on the location of the goods at the time of the transaction and/or their location as a result of the transaction. When goods are shipped from one jurisdiction to another, the goods exported are generally treated free of VAT in the seller’s jurisdiction, while goods imported are subject to the same VAT as equivalent domestic goods in the purchaser’s jurisdiction. The VAT of imported goods are collected from the importer together with customs duties, and before the goods are released from customs control. In most jurisdictions, VAT systems typically apply an exemption for imports of relatively low-value shipment. An exemption is adopted to minimize transaction and administrative costs of including items of low-value into the customs system, which generally outweigh the revenue gained from such a volume of goods imported. If these costs are passed on to customers, the charges could become disproportionately high compared to the value of the goods.

Most economies have initially applied VAT relief arrangements with value thresholds varying across jurisdictions. However, such exemptions have become a growing concern as online retail sales have continued to rapidly expand. At the time of threshold introduction, e-commerce was at a nascent stage and the scope of imports benefiting from such relief was negligible. The OECD cites that “many VAT countries have seen a significant and rapid growth in the volume of low value imports of physical goods on which VAT is not collected resulting in decreased VAT revenues and growing unfair competitive pressures on domestic retailers who are required to charge VAT on their sales to domestic consumers” (OECD 2015, p. 120). The EU is the most recent region applying a new rule to resolve such concern. The rule, enforced on 1 July 2021, abolished VAT exemption at importation of small consignments. All goods imported in the EU are now subject to VAT. Previously, goods valued at up to €22 were VAT exempt (European Commission 2021a). Some economies retained thresholds, mostly at an annual basis. These are discussed in Table 4.1.

Table 4.1: VAT/GST Threshold and Collection Mechanisms in Selected Economies for Digital Goods

| Economy | VAT Threshold | Rule | Administrative |
|----------------------------------|---|---|--|
| European Union (EU) | €10,000 (per year) for the following EU member states: Belgium, Bulgaria, Czechia, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland and Sweden | All goods imported are subject to VAT | <ul style="list-style-type: none"> • Online sellers can register in one EU member state. • Registration is valid for the declaration and payment of VAT across all distance sales of goods and cross-border supplies of services within the EU. • Online sellers can make VAT payments via the One Stop Shop. • Simplification measures will be introduced for distance sales of imported goods in consignments not exceeding €150 in value. |
| United States | \$100,000 (common annual threshold per year) | 10% VAT/sales rate | <ul style="list-style-type: none"> • Based on “economic nexus”—a sales tax nexus determined by economic activity in a particular state/location—where the common threshold is \$100,000 or 200 separate sales transactions, whichever is reached first. • Charge sales tax to customers in that state (destination-based tax) although some states have origin-based taxes. • File sales tax returns in that state. |
| Canada (British Columbia) | Can\$30,000 (GST/HST per year) | 7% provincial sales tax on digital sales made by foreign suppliers | <ul style="list-style-type: none"> • Distribution platform operators (including nonresident vendors) are required to register under the normal taxes on goods and services and harmonized sales, and to collect and remit such taxes in respect of sales of goods shipped from a warehouse or another place in Canada. • Businesses can claim input tax credits (ITC) to recover the GST/HST • To simplify tax compliance for businesses, the ITC threshold increased from Can\$30–\$150 to Can\$100–\$500. |
| People’s Republic of China (PRC) | CNY5,000 (single purchase) CNY26,000 (per year) | 15%, 25%, or 50% postal tax 9.1%, 10%–20% for bonded warehouse model | <ul style="list-style-type: none"> • Cross-border e-commerce platform operators in the PRC are registered with customs and have customs declaration, payment, and logistics information. • For goods delivered directly to customers (in the absence of platform operators connected with customs authorities), the logistic companies delivering the good will provide the payment, logistics, and order information to the customs authority. The latter is authorized to collect the relevant VAT and customs duties from the customer. |

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Table 4.1 *continued*

| Economy | VAT Threshold | Rule | Administrative |
|-------------------|---|---|---|
| Japan | ¥10 million (per year) | 10% consumption tax on all business-to-consumer (B2C) e-commerce transactions | <ul style="list-style-type: none"> • Every company incorporated, including a foreign company with a permanent establishment, shall submit a notification of incorporation to the competent district director of the tax office. • Every company is obliged to submit a tax return certificate to the tax office. |
| Republic of Korea | None | 10% VAT with no registration threshold | <ul style="list-style-type: none"> • Online businesses must register with the Korean National Tax Service. • If the electronic service provider uses a marketplace or intermediary to provide and charge for a service, then they are not obliged to VAT register. • VAT returns are filed via Hometax. • Returns are paid on a quarterly basis and deposited into a VAT bank account operated by Woori Bank. |
| New Zealand | NZ\$60,000 (per year) | 15% GST rate for digital sellers | <ul style="list-style-type: none"> • Businesses that exceed the threshold must register for GST. • Digital sellers who provide their services to New Zealand-based consumers must also collect two nonconflicting pieces of evidence proving the customer location. |
| Taipei,China | NT\$480,000 (per year) | 5% VAT on digital services provided to consumers by foreign business | <ul style="list-style-type: none"> • Foreign businesses supplying digital services must register for VAT in Taipei,China; file VAT returns; and pay VAT to the Taxation Administration. |
| Indonesia | Rp600,000,000 (per year) | 11% VAT on all online transactions | <ul style="list-style-type: none"> • If a foreign merchant sells products online through an Indonesian operator, the Indonesian operator of the online marketplace is responsible for collecting VAT. • If the same foreign merchant also sells directly, they should collect VAT on their direct sales, provided that they are appointed as VAT collector by the Director-General of Taxation. |
| Cambodia | KR250,000,000 (per year, 12-month rolling period) | 10% VAT to nonresident sellers | <ul style="list-style-type: none"> • Nonresident entities providing digital goods/services or e-commerce activities must register for VAT with the General Department of Taxation. • VAT registered nonresidents are required to file monthly VAT declarations and pay the 10% VAT on B2C sales to the General Department of Taxation. |

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Table 4.1 *continued*

| Economy | VAT Threshold | Rule | Administrative |
|------------------|---|---|---|
| Malaysia | RM500,000 (per year) | 5%, 6%, 10% sales and service tax (SST) on digital services for foreign providers whose services rendered | <ul style="list-style-type: none"> Resident businesses will be required to register for SST only at the Royal Malaysian Customs Department (RMCD) My-SST portal. Service tax on hotels are suspended temporarily amid the COVID-19 crisis. |
| Hong Kong, China | None | No sales tax or GST | |
| Singapore | S\$1,000,000 (per year) S\$100,000 (per wholesale) | 8% GST to foreign suppliers of digital services | <ul style="list-style-type: none"> GST registration is compulsory for all companies whose annual turnover exceeds the threshold. GST is payable directly to Singapore Customs at the point of importation. |
| Thailand | B1,800,000 (per year) | 7% VAT to nonresident sellers | <ul style="list-style-type: none"> E-service providers including foreign e-service providers and other electronic platform owners must register for VAT and remit VAT every month Registration, return filing, and payment can be done online through the Revenue Department's Simplified VAT System for e-Service (SVE) online platform. |
| Uzbekistan | None | 12% VAT on all online transactions | <ul style="list-style-type: none"> Nonresident e-service suppliers to register for tax purposes in the Republic of Uzbekistan and start paying VAT on electronic services rendered to citizens of Uzbekistan. |

GST = goods and services tax, HST = harmonized sales tax, VAT = value-added tax.

Sources: Avalara. Malaysian Sales and Service Tax. <https://www.avalara.com>; Avalara. US Sales Tax Wayfair Ruling and Foreign Sellers. <https://www.avalara.com>; Government of Canada. Annex 6: Tax Measures—Supplementary Information. <https://www.budget.gc.ca/2021/report-rapport/anx6-en.html#application-of-the-gst-hst-to-e-commerce>; European Commission (2021a); Export2Asia (2018); Mazars (2019); O'Connell (2021); Quaderno (2022b); Taxation Customs EU (2021).

Customs duties

The World Trade Organization (WTO) has had a critical impact on policies that have spurred e-commerce development. On 15 May 1998, the General Council of the WTO declared a moratorium on customs duties on electronic transmissions recognizing the growth of global electronic commerce and its role in creating new opportunities for trade (WTO 1998). The 20-year moratorium was set to expire in December 2018. Amid interest from some member economies to lift the moratorium, WTO members agreed to renew the regulation until the 12th Ministerial Conference set to take place in 2020 but postponed to 2022 due to the COVID-19 pandemic. In June 2022, when the conference convened, a ministerial decision was taken to maintain the moratorium until the 13th Ministerial Conference in December 2023 (WTO 2022). Such practice of not imposing customs duties on electronic transmissions has raised concerns as economies witness the rapid development of their digital economies. On the one hand, as more trade becomes digital, economies should seek to recuperate lost customs revenue (Farge 2019). On the other hand, the growth momentum of the e-commerce market could be at risk if economies decide to lift the moratorium and instead customs duties on e-commerce alongside consumption and digital taxation measures.

Forgone customs revenue from electronic transmissions and international trade alone were estimated to range from \$280 million to \$8.2 billion. In particular, while the revenue impacts are much bigger for developing economies than for developed economies, the welfare gains from customs duties liberalization are expected to be higher for developing economies. Further, despite higher potential forgone revenues, developing economies rely least on customs revenue as a source of overall government revenue (Andrenelli and López González 2019).

The de minimis threshold for customs duties is another form of tax exemption, which is often higher than the threshold for VAT exemption. Most economies apply a de minimis threshold for customs duties. Contracting parties to the convention are encouraged to agree on de minimis values that are below the values for duties and taxes collected. The International Chamber of Commerce (ICC) defines de minimis as a “valuation ceiling for goods, including documents and trade samples, below which no duty or tax is charged and clearance procedures, including data requirements, are minimal.” In its 2015 policy statement, the ICC recommends that establishing a global baseline de minimis value of \$1,000 and no less than \$200 will generate economic benefits by shifting public revenue collection toward more reliable and efficient revenue sources (ICC 2015).

Table 4.2 presents the de minimis thresholds for select economies in Asia and the Pacific. Economic advisory bodies like the Productivity Commission have reviewed the state of de minimis thresholds in Australia, which has the highest de minimis threshold in APEC at A\$1,000 and a substantial GST rate at 10% and found that any reduction below the threshold would result to a substantial net cost on the economy.

Table 4.2: De Minimis Thresholds—Select Economies in Asia and the Pacific, as of November 2021

| Economy | April 2016 | | November 2019 | |
|----------------------------|----------------|-------|--|------------|
| | Local Currency | in \$ | Local Currency | in \$ |
| Australia | A\$1,000 | 781 | <A\$1,000 | 750 |
| Brunei Darussalam | B\$400 | 301 | B\$400 | 296 |
| People’s Republic of China | | | CNY50 | 8 |
| Japan | ¥10,000 | 93 | ¥10,000 | 88 |
| Republic of Korea | ₩162,420 | 150 | <US\$150 (non-US imports) <US\$200 (US imports) | 150 200 |
| Malaysia | RM500 | 127 | RM500 | 120 |
| Philippines | ₱10,000 | 192 | ₱10,000 | 206 |
| Singapore | S\$400 | 301 | <S\$400 | 298 |
| Taipei,China | NT\$3,000 | 103 | NT\$2,000 | 65 |
| Thailand | B 1,500 | 48 | B 1,500 | 47 |

GST = goods and services tax, VAT = value-added tax.

Notes: “Cross-border e-commerce retail goods” should not be more than CNY2,000 per person each time and not more than CNY20,000 per person each year. Foreign exchange rates as of 2022.

Source: Global Express Association. 2021. Overview of De Minimis Value Regimes Open to Express Shipments Worldwide. https://global-express.org/assets/files/GEA%20De%20Minimis%20Country%20information_4%20November%202021.pdf.

De minimis thresholds affect economies in many ways, both positive and negative. The pros and cons for governments setting high de minimis thresholds bring benefits around border management, logistics, and low-value goods businesses. A higher threshold helps border management become more efficient, simplifying inspection

procedures, and improving the efficiency of cross-border operations. It also allows governments to avoid spreading their revenue collection efforts too thin and focus on indirect tax segments that yield higher net revenue. On the side of merchants—particularly SMEs—a higher threshold is crucial for minimizing the costs to businesses whose main source of revenue are low-value goods obtained through cross-border e-commerce.

On the other hand, higher de minimis thresholds could also hurt an economy on both the regulatory agency and local business sides. Domestic retailers would face distorted competition from overseas counterparts. Without the added cost of de minimis fees, overseas retailers would have an advantage over local businesses because they would not have to pay certain taxes. The same effects are relevant for local manufacturers of low-value products. With a higher threshold, these products could be more easily imported and render local manufacturers incapable of strongly competing with prices. Several international organizations such as the ICC have recommended the adoption of de minimis and setting certain limits to the thresholds set by each economy. The ICC's 2015 *Policy Statement on Global Baseline De Minimis Value Thresholds* states that raising de minimis thresholds for economies would bring significant benefits to businesses, particularly SMEs and others that operate through e-commerce. The organization recommended establishing “a preferred de minimis value of \$1,000 and no less than \$200 to be applied to the value of the goods and not to the dutiable amount” (ICC 2015). It also recommends that governments regularly review and update de minimis thresholds to account for inflation and fluctuations in exchange rates.

Several economies are debating removing de minimis thresholds, but it must be paired with equally or more efficient methods of collection.

Income Taxes

Some challenges in the digital economy related to direct income taxes, both personal and corporate, remain relevant. These include the following:

Permanent establishment

One of the first challenges is the interpretation of the “permanent establishment” definition and its application in e-commerce. The basic question to answer is whether the mere use of a computer equipment in e-commerce operations in a country could constitute a permanent establishment. In an article published to clarify the application of the permanent establishment definition, the OECD's Committee on Fiscal Affairs noted that there should be a distinction between a computer equipment that is set up at a location in order to constitute what is interpreted as a “permanent establishment” and the data and software which is used by, or stored on said equipment (OECD 2000). As an example, a website which is both a software and an electronic data, does not fully represent a tangible property. Having no other infrastructure (i.e., machinery or equipment) or simply no facility involved, a website cannot constitute a place of business. Meanwhile, the server on which the website is stored and through which it is accessible is a tangible element with a physical location. Such a physical location may constitute a “fixed place of business” of the enterprise that operates the server, accordingly. Computer equipment at a given location may constitute a permanent establishment only if it meets the requirement of being fixed. For a server, what needs to be determined is not the possibility of the server being moved, but whether it is in fact moved. In order to represent a fixed place of business, a server needs to be stationed in place for a sufficient period of time to be considered a “fixed place of business” (OECD 2000).

Another ambiguity that needs clarity is on whether an enterprise operates wholly or partly at a certain location where such enterprise has equipment (i.e., server, computer equipment). The issue of whether the location of the equipment determines “permanent establishment” of the business of an enterprise needs to be examined on

a case to case basis (OECD 2000). However, the committee was of the view that where an enterprise operates computer equipment at a particular location, a permanent establishment is created even though the presence of personnel is not needed for the operation of the equipment to take place. The committee said the presence of personnel is not necessary to determine if an enterprise wholly or partly conducts its business at a specific location if the enterprise's personnel is not required to conduct business at that location. Finally, the committee discussed whether it may be appropriate to use the location of an ISP to determine a permanent establishment, given that it is common for ISPs to host the websites of other enterprises on their own servers. ISPs may constitute permanent establishment of the enterprises that conduct electronic commerce by websites operated through the servers owned and operated by these ISP. However, the committee found that this is generally not applicable because "ISPs will not constitute an agent of the enterprises to which the websites belong, because they will not have authority to conclude contracts in the name of these enterprises and will not regularly conclude such contracts or because they will constitute independent agents acting in the ordinary course of their business, as evidenced by the fact that they host the websites of many different enterprises (OECD 2020, p. 7)."

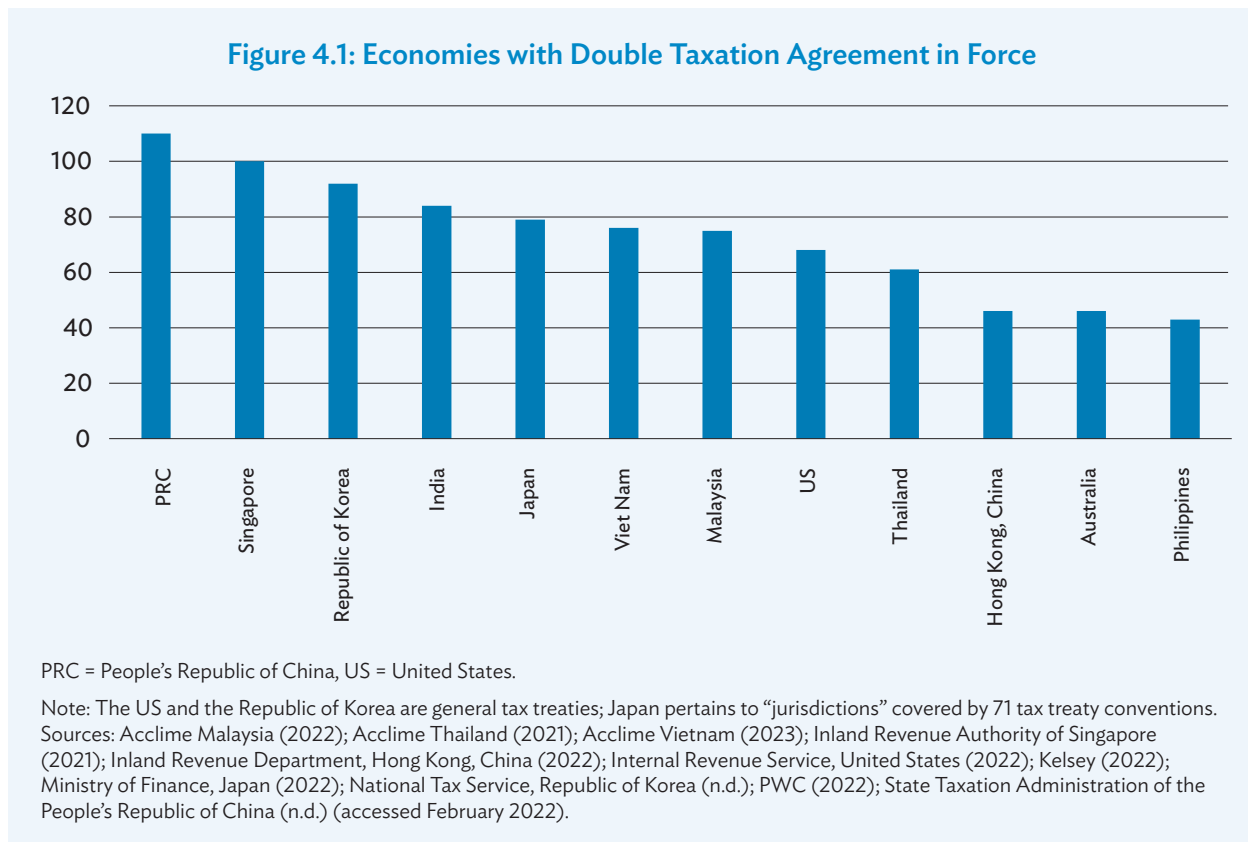
Place of effective management

Another issue raised on the OECD Model Tax Treaty was the application of the concept of "place of effective management" tie-breaker rule in the e-commerce and technology environment and to identify solutions. This concept is critical in deliberating between the two ways economies may impose income tax—source jurisdiction or residence jurisdiction. Income gained by a person is subject to tax by a country on the basis of how the income was generated in the country, such as a business conducted in the country, real property located in the country, or an employee working in that country (OECD 2001b). This pertains to income tax in the source jurisdiction. Economies uphold the rule for source jurisdiction in order to tax income on the basis that such income is generated from economic activity that takes place within the country. On the other hand, economies may also tax income when a person earning the income is a resident of that country, which pertains to residence jurisdiction taxation. A country's justification for residence tax is based on the need to finance its public goods and social infrastructure, and the link between the consumption of such public goods and social infrastructure by persons residing in the country and have an overall capacity to pay. The committee, in its 2001 draft discussion, cites that most economies tax income on the grounds of both source and residence base. This means that a resident person is taxed on income from both domestic and foreign sources, while nonresidents are taxed only on domestic source income (OECD 2001b).

In most cases, double taxation occurs from (1) residence-source jurisdictional conflicts, and (2) residence-residence conflicts where both jurisdictions ("contracting states") consider a person as resident who is subject to tax under their domestic law (OECD 2001b). In the case of a person, the OECD Model Tax Convention resolves the residence-residence conflicts through tie-breaker rules by assigning the residence of the "dual resident" person to one of the "contracting state(s)" to serve the purpose of the Convention (OECD 2001b). The tie-breaker rules check personal attachments to the "contracting state" to assess which state should impose the tax. In the case of companies and other bodies of persons, the OECD Model Tax Convention rules that such non-individuals are considered a resident only of the state where its place of effective management is established. The updated version of the OECD tax model summarizes key factors in determining the "place of effective management" and these include (1) where the center of top level management is located; (2) where actual business operations take place; (3) where legal aspects are established such as the place of incorporation; the location of the registered office, public officer, and the like; (4) where controlling shareholders carry out significant business decisions (management and commercial) for the company; and (5) where the directors reside (OECD 2001b).

Double taxation has negative effects on the international trade and exchange of cross-border goods and services as well as cross-border movements of capital, technology, and persons. These are resolved through the drafting of

bilateral tax treaties, which allocates taxing rights to the contracting states. Most existing bilateral tax treaties are concluded on the basis of a model, such as the OECD Model Tax Convention or the United Nations Model (OECD 2015). While substantial variations are apparent across economies, existing double tax treaties typically follow a standard structure, which can be viewed as a series of provisions with separate and distinct functions: (1) articles focusing on the scope and application of the tax treaty, (2) articles clarifying and resolving the conflict of taxing jurisdiction, (3) articles providing for double taxation relief, (4) articles targeting the prevention of tax avoidance and fiscal evasion, and (5) articles addressing miscellaneous matters (such as administrative assistance) (OECD 2015). Figure 4.1 shows some of the double tax treaties being enforced in 2022.



Unilateral Digital Service Taxes

The challenges in achieving a global consensus on digital taxation led individual economies to make unilateral attempts to tax multinational companies active in digital business. The OECD and Group of 20 are spearheading the OECD/G20 *Inclusive Framework on Base Erosion and Profit Shifting*, which aims to tackle the tax challenges arising from digitalization of the economy.

Absent a full-fledged multilateral solution and prior to the Inclusive Framework initiative, several EU states and some Asian economies established unilateral measures—on digital service taxes (DSTs) in particular—to secure their tax base and tax income from certain digital activities operating or sourced within their jurisdiction (Bloomberg Tax 2022). Such measures include “sunset clauses” and are meant to lapse once international or regional consensus is reached. Table 4.3 lists some of these taxes on digital services.

Table 4.3: Digital Service Taxes in Selected Economies

| Economy | Year Enforced | Digital Service Tax |
|---------------------|---------------|---|
| Italy | 2020 | <ul style="list-style-type: none"> • Digital service tax (DST) applied at a 3% rate for advertising services, intermediation, and marketplace and data transmission. • Payment is based on a “cash principle” approach. • Taxable basis is computed using a specific ratio that applies to the different type of services. • A nonresident entity located in a noncooperative country should have an appointed representative in Italy. |
| France | 2019 | <ul style="list-style-type: none"> • DST applied at a 3% tax on the revenues derived from the digital services cited below: <p>Scope of business activities subject to DSTs:</p> <ul style="list-style-type: none"> • The supply of a digital platform should be provided in France during the calendar year with one of the users of the digital platform located in the country. • DSTs are not applicable to the supply of digital platforms that mainly operates to collect user data. • The supply of services that place advertisements on a digital platform and target advertising content generated from customers’ personal data collected from digital platforms. • For the DST to be applicable, digital platforms must reach key thresholds: (i) €750 million yearly turnover on digital services supplied worldwide, and (ii) €25 million turnover on digital services in the country. |
| United Kingdom (UK) | 2020 | <ul style="list-style-type: none"> • DST applied at a 2% tax on revenue derived from the following digital services: <ul style="list-style-type: none"> » Search engines searching more than a single website. » Social media services with “user-generated content sharing” as a major feature of the service. » Online marketplaces with the exemption of financial and payment services. • Online transactions subject to DST must involve UK users if at least one of the parties in the transaction is based in the UK. • Tax is cut in half if the other user is located in a country with a similar tax to the DST. • In-scope companies that operate at low profit margins or incur losses can take advantage of the “safe harbor” principle. • DST is deductible as a business expense presuming it is incurred wholly and exclusively for the purposes of a trade. |
| Spain | 2021 | <ul style="list-style-type: none"> • DST applied at a 3% tax on the revenues derived from the following digital services: <ul style="list-style-type: none"> » Online advertising services » Data transmission services » Intermediation services • Businesses must meet key thresholds for the DST to apply: (i) net revenue during the prior calendar year exceeds €750 million, and (ii) total revenue from the operations and transactions of digital activities during the prior calendar year exceeds €3 million. • DSTs apply to digital services that are deemed to be carried out within Spanish territory whenever the user is located in Spain. |
| Malaysia | 2020 | <ul style="list-style-type: none"> • DST levied at a rate of 6% from 1 January 2020. • Key threshold: value of the services rendered exceeds the threshold of RM500,000 for a period of 12 months. |

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Table 4.3 *continued*

| Economy | Year Enforced | Digital Service Tax |
|-----------|---------------|--|
| Singapore | 2020 | <ul style="list-style-type: none"> • Singapore GST will be extended to cross-border B2C and B2B digital service supplies at a rate of 7%. • Implementation of tax rules adopt the changes in tax measures introduced across the globe as the taxation of the digital economy gains momentum. • Key threshold: applies to foreign suppliers of digital services with an annual global sales exceeding S\$1,000,000 and whose sale of digital services to Singapore consumers exceeds S\$100,000. |
| Indonesia | 2020 | <ul style="list-style-type: none"> • Under Law No. 2/2020, an Electronic Transaction Tax is imposed on direct sales or sales through marketplace in the event that an existing tax treaty prevents charging a corporate income tax. • Ministry of Finance Decree No. 48 (PMK-48) cites that a 10% VAT is applied on the provision of foreign intangible goods and services via electronic devices or systems in the local market. |

B2B = business-to-business, B2C = business-to-consumer, VAT = value-added tax.

Note: Verdex covers Indonesia, Malaysia, Singapore, and other economies in Southeast Asia.

Sources: Polacco et al. (2021); Surkadi and Jiaqian (2020); Verdex (n.d.).

Following the OECD's leadership in harmonizing digital taxation, an OECD/G20 Inclusive Framework statement on 1 July 2021 had been reached on a two-pillar approach under the framework (Table 4.4). The objective of Pillar One is to ensure that the distribution of profits and taxing rights among economies are equitable with respect to the largest multinational enterprises. The fundamental rule under this pillar is tax certainty. As such, it includes a mandatory and binding dispute resolution process that will also allow developing economies to benefit from an elective mechanism in certain cases, ensuring that the rules are not too burdensome for such economies. Under the pillar, a Multilateral Convention will supersede existing tax treaties (such as DSTs) and allow market jurisdictions to tax allocated profits (OECD 2021a).

Pillar Two, on the other hand, aims to minimize tax competition by multilaterally setting limitations on the corporate tax rate. It puts a floor on corporate income tax (and therefore tax competition) through the introduction of a 15% global minimum corporate tax rate, which economies can use to protect their tax bases. The pillar targets around 2,000 multinational corporations and aims to generate about \$150 billion a year in additional global tax revenues (Bloomberg Tax 2023). In terms of implementation, the OECD has published a commentary to the model Global Anti-Base Erosion Rules, which guides tax administrations and taxpayers on interpreting and applying the rules. The EU Commission also published a draft directive on December 2021 to implement Pillar Two, with EU member states required to translate and integrate the final version of the directive into domestic law by 2023 (Bloomberg Tax 2022).

With the implementation of Pillar One, the Multilateral Convention will take responsibility for requiring the termination of DSTs and other relevant similar measures.

The Multilateral Convention released a statement citing that no newly enacted DSTs or other relevant equivalent measures were to be imposed from 8 October 2021 until 31 December 2023, when the Multilateral Convention was expected to come into force, giving effect to Pillar One (OECD 2021b). Several economies have reached an agreement with the US—known as the Unilateral Measures Compromise—to keep existing DSTs in place until Pillar One is actually implemented. Under the compromise, corporations subject to DSTs may receive or avail a tax credit against future tax liabilities (US Department of Treasury 2021).

Table 4.4: Key Elements of the Two-Pillar Solution

| Pillar One | Pillar Two |
|--|--|
| <p>Scope In-scope multinational enterprises with a global income higher than €20 billion and profitability above 10%.</p> <p>Nexus A new special purpose nexus rule is introduced which allows the allocation of Amount A to a market jurisdiction when the in-scope multinational derives at least €1 million in revenue from that jurisdiction.</p> <p>The nexus will be set at €250,000 for smaller jurisdictions with gross domestic product lower than €40 billion.</p> <p>Quantum 25% of residual profit—which is the profit in excess of 10% of revenue—will be allocated to market jurisdictions with nexus using revenue-based allocation key.</p> <p>Revenue Revenues are generated and collected from the end market jurisdictions where final consumption occurs (i.e., goods or services are used or consumed).</p> <p>Elimination of double taxation Double taxation of profits earmarked for market jurisdictions will be resolved using either the exemption or credit method.</p> <p>Administration The tax compliance will be unified (including filing obligations) and authorize a single entity to manage tax compliance of in-scope multinational enterprises.</p> <p>Implementation The Multilateral Convention—through which Amount A is implemented—will be developed and opened for signature in 2022, with Amount A set to come into effect in 2023.</p> | <p>Pillar design Two interconnected domestic rules (including the Global Anti-Base Erosion Rules (GloBE) rules): (i) Income Inclusion Rule (IIR) (ii) Undertaxed Payment Rule (UTPR)</p> <p>Scope Multinational enterprises that meet the €750 million threshold as determined under Base Erosion and Profit Shifting (BEPS) Action 13.</p> <p>Rule design The IIR allocates top-up tax using a top-down approach and subject to a split-ownership rule for shareholdings below 80%.</p> <p>Minimum rate For the purposes of the IIR and UTPR, the minimum tax rate used will be 15%.</p> <p>Carve-outs Exclude a percent of income that is equivalent to 5% of the carrying value of tangible assets and payroll.</p> <p>Provision for a de minimis exclusion for jurisdictions where a multinational enterprise has revenue of less than €10 million and profit of less than €1 million.</p> <p>Administration The implementation framework will include safe harbors and/or other mechanisms to ensure targeted administration.</p> <p>Implementation Pillar Two was intended to be brought into law in 2022 and effective in 2023, with the UTPR set to come into effect in 2024.</p> |

Source: OECD. 2021. Two-Pillar Solution to Address the Tax Challenges Arising from the Digitalisation of the Economy. OECD/G20 Base Erosion and Profit Shifting Project. <https://www.oecd.org/tax/beps/brochure-two-pillar-solution-to-address-the-tax-challenges-arising-from-the-digitalisation-of-the-economy-october-2021.pdf>.

How Is E-commerce Taxation in Asia and the Pacific Different?

Keeping up to speed with the taxation policies of developed economies with regard to the digital economy is challenging. Some developing economies are still at the nascent stage of enforcing VAT, GST, customs duties, and income taxation on digital goods and services. For now, these economies are mainly extending their existing tax rules to the e-commerce sector. This likely proves inefficient and ineffective given the unique landscape of digitalized businesses that online sellers and e-commerce businesses and platforms work around. However, the rapid rise of

e-commerce means that governments in Asia and the Pacific, most especially in developing economies, are losing a lot of potential revenue by not taxing e-commerce effectively.

Developing Asian economies, require additional efforts in taxation to meet their revenue mobilization needs. This is a challenge given the current taxation regimes of most developing economies in Asia and the Pacific where e-commerce is expanding rapidly. The hurdle begins with how international transactions under the digital economy are taxed under the current international tax framework. As a consequence, this requires the interaction and alignment of domestic tax laws and international tax treaty obligations, while ensuring taxing rights between economies and avoiding double (or no) taxation.

An ADB study (Mullins 2022) cites three features of digital business models that are creating opportunities for tax planning in accordance with OECD recommendations:

- (i) “Scale without mass,” which refers to significant economic activities transpiring in one jurisdiction, and/or operations and stages of production occurring across multiple economies, but with little significant physical presence.
- (ii) Reliance on intangible assets such as intellectual property, brand recognition, among others.
- (iii) Heavy use of data and user participation, including network effects, to generate value (e.g., a social media site may use the data it collects about users to sell targeted advertisements).

Such features of digital business models present challenges in taxing the digital economy throughout much of developing Asia, such as the following:

- (i) Lack of comprehensive domestic laws to tax multinational enterprises—including digital platforms—that establish significant operations in a jurisdiction. Such domestic laws should cover clear permanent establishment definition, transfer pricing rules, and withholding taxes on payments to nonresidents.
- (ii) Persistent bureaucratic challenge in collecting VAT and similar taxes on international goods and services shipped to overseas suppliers.
- (iii) Uncertainty in charging taxes on the peer-to-peer economy on digital platforms (e.g., ride-sharing apps such as Uber, Grab, Didi, and peer-to-peer accommodation platforms such as Airbnb and Tujia).

On top of these challenges, digital service taxes do not raise much revenue and other drawbacks must be dealt with in developing economies in Asia and the Pacific (Dabla-Norris et al. 2021). For example, a digital services tax yields only minimal revenue for many developing Asian economies. In addition, the article cites that DSTs can also distort business decisions and complicate trade relations because they are usually applied only to large companies headquartered abroad (Dabla-Norris et al. 2021). With regard to the OECD/G20 Inclusive Framework, Mullins (2022) reports that reforms under Pillar One will likely have minimal impact on tax revenue in developing Asia, with minimal gains and losses. Meanwhile, investment hubs such as Singapore and Hong Kong, China, risk losing revenue because of the reallocation of profits. Pillar Two, on the other hand, will also have minimal impact as most economies have corporate and income tax rates above the 15% minimum (Mullins 2022). Nevertheless, some developing economies could be exposed to the risks of tax revenue decline due to the potential attrition of tax incentives offered to multinationals.

As the e-commerce sector in Asia and the Pacific continues to expand at breakneck pace, tech giants are expected to move deeper into developing Asia. This makes taxation in a digitalizing economy an urgent policy issue for governments in the region.

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APPENDIX A

New Frontiers of E-commerce Facilitation

The Direct-to-Consumer Model

In the competitive e-commerce landscape, direct-to-consumer (D2C) selling reduces the reliance of brand manufacturers on e-commerce giants and creates an opportunity for them to capture a larger share of the e-commerce market (Atsmon et al. 2021). D2C in Asia and the Pacific has become a fast-growing alternative sales channel even as brands increasingly depend on marketplaces such as Alibaba and Lazada. These platforms and other digital intermediaries have a growing hold on brands and dominate the region's e-commerce. However, their strong grip has fostered business processes that are not favorable to manufacturers, especially small brands. Registration fees to sell on platforms can be as high as \$8,000 a year, while commissions can take up to 6% of sales revenue made through such a channel (SQLI Digital Experience 2020). Data privacy of third-party platforms—in which brands have only limited or no direct access—is another issue. More concerning is that the e-commerce giants are already beginning to commercialize such data.

Brand manufacturers have not been active players in online direct sales, even in the nascent stage of digital commerce. Depending on the industry, manufacturers have largely remained reliant on traditional distribution partners to continue the business-as-usual setup and they are not as receptive to selling directly to consumers. One of the main reasons for this is that traditional trading partners engage in associated roles such as general agents, importers, wholesalers, and retailers. Typical trading partners carry out transactions with providers of such services, which reduces transaction costs on a larger scale. If brand manufacturers build their own direct distribution channels, that would mean they would have to create similar structures to existing providers, incurring additional costs and sometimes creating indirect conflict among these services.

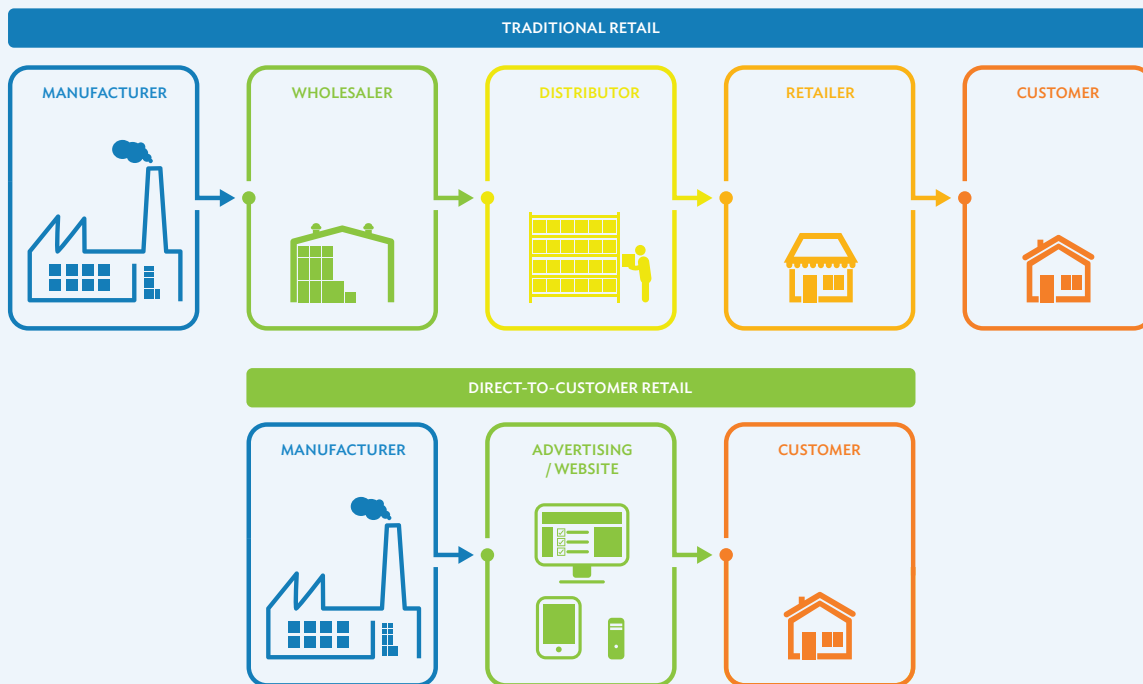
The continued rise of e-commerce and increasing role of digital distribution platforms have caused structural changes in the retail value chain (Leimstroll and Wolfle 2020). Brand manufacturers now have more reasons to invest in direct sales channels and are primed to take advantage of the increasing trend of shopping online. This is particularly relevant for specific industries (i.e., luxury goods, electronic gadgets) with large and well-known brands that continue to sell mostly through traditional distribution channels and bricks-and-mortar stores. The rise of internet shopping makes it necessary to present brands in an informative and brand-specific manner on the internet. More and more consumers also expect the brand to offer opportunities to purchase articles directly from the brand's website. In some industries, this is preferred by consumers who strive to reduce the risk of product piracy by purchasing directly from the brand's flagship online store. Another reason would be that specific types of consumers prefer shopping directly from the manufacturer as part of brand identification and an enhanced purchasing experience.

Meanwhile, brand manufacturers are increasingly motivated toward complete control over distribution and prices. Among the factors behind this are the reduction of distribution costs from bypassing intermediaries, increased market coverage, and the opportunity it gives to strengthen the direct relationship between supplier and customer

(Leimstroll and Wolfle 2020). Another advantage is that structural changes brought about by technological advances and social media engagement in e-commerce have enabled manufacturers to sell their products directly to customers from their own online shop (Schacker and Stanoevska-Slabeva 2021). Start-ups in particular encounter fewer barriers to entry in a D2C business model than when selling through a retailer (Schacker and Stanoevska-Slabeva 2021). It is also becoming more important for manufacturers to brand products as environmentally friendly and socially responsible. The D2C business model offers an interesting channel to adopt a more sustainable practice, given that it cuts out intermediation (Schacker and Stanoevska-Slabeva 2021).

D2C online shops are different from corporate websites that feature products but do not sell directly. Figure A.1 shows the general difference between the standard process in traditional retail and the direct-to-consumer route. A typical D2C strategy consists of a hyper-focused product range and a subscription-based distribution model. In general, a D2C process consists of a brand shipping directly to consumers, partnering with retail locations or specific stores, or setting up pop-up shops and stalls to distribute products. Today, the D2C business model presents the best opportunity for brands to build direct relationships with their customers (Atsmon et al. 2021).

Figure A.1: Traditional Retail vs. Direct-to-Consumer Retail



Source: Harris, R. 2021. Direct-to-Consumer: E-commerce Marketing Techniques for D2C Brands. *Smart Insights*. 4 November. <https://www.smartinsights.com/digital-marketing-strategy/direct-to-consumer-e-commerce-marketing-techniques-for-d2c-brands/> (accessed 7 February 2022).

While more D2C brands are embracing sustainability, studies analyzing the environmental impact of the sales model are sparse. Nevertheless, the retail process that encompasses a D2C business model is far simpler than the standard e-commerce business model. Hence, the probability is higher that such a new model will help reduce GHG emissions from e-commerce.

One recent study sought to determine the effect of sustainability and corporate social responsibility (S/CSR) on consumer behavior and the core practical and theoretical implications in the D2C context (Schacker and Stanoevska-Slabeva 2021). The study cited possible measures for S/CSR information to have a positive influence on brand perception and purchase intentions in D2C online shops. In particular, companies need to (1) know their target market precisely and ascertain what environmental issues resonate with them, (2) evaluate egoistic and altruistic dispositions and adapt their branding and communication accordingly, and (3) determine how company characteristics can possibly moderate the effect of S/CSR information (Schacker and Stanoevska-Slabeva 2021).

Last-Mile Delivery: Alternative Final Destination Locations

Alternative delivery points have become important to ensuring the success of the final stage of the e-commerce process, which is last-mile delivery. Unsuccessful deliveries to home addresses have become widespread and are increasing. A recent report cites that 99% of surveyed e-commerce organizations admitted to some deliveries going wrong and 24% say more than one in every 10 orders are not delivered at the first attempt (Loqate GBG 2021). Failed deliveries are costly and time-consuming for both retailers and consumers (Edwards et al. 2009). Research done in 2018 estimates that delivery failure cost over €1.85 billion (Hoeijmans 2019). Another survey conducted in December 2020 cites that in the United States (US), 8% of first-time deliveries fail, at an estimated average cost of \$17.20, while in Germany, 7% of delivery attempts fail, costing on average €14.69 per piece (Loqate GBG 2021). In the UK, failed delivery is at 6%, with an average cost of £11.60 each (Loqate GBG 2021). In general, many people are not at home to receive deliveries during working hours, which is when most home delivery companies operate, and parcel carriers must cope with this failed delivery problem.

In optimizing the last-mile delivery of parcels, efficiency is key for carriers. The total mileage of a delivery round should be minimized, not only to reduce impact on cost but also to improve the environmental impact of the delivery rounds. The shorter distance needed to complete a delivery round, the lower the impact on the environment. As discussed in Chapter 2, transport activities and last-mile deliveries are distinct features of e-commerce and have the greatest emissions footprint. From the perspective of tracking greenhouse gas (GHG) emissions, deliveries of online purchases to homes are the least sustainable.

Research literature backs up the conclusion that alternative delivery locations (such as collection points) offer the most efficient, sustainable, and flexible alternative to home deliveries (Rai et al. 2020). They offer a solution by regrouping the drop of several packages in a single destination, which is called consolidation. This reduces the number of stops the driver needs to make on a round. A study cites that such an operation is crucial for efficient last-mile deliveries because it is the opposite of fragmentation, one of the main barriers to last-mile sustainability and efficiency (Ducame 2019). Alternative delivery essentially means that the deliveries will not take place at the customer's home but at other locations, with the aim to increase the chance of successful deliveries. Another important advantage of these locations is that they may have more environmental gains than in standard home deliveries. This is because they are strategically located to be on routes of routine travel: next to a customer's workplace, on their way home from work, or at a nearby grocery and shopping area (Ducame 2019). Further, in

urban areas, it is increasingly common for customers to pick up their package on bike or foot. Some alternative delivery arrangements explored in scientific literature are collection/delivery points and automated parcel lockers.

Collection/delivery points are partner establishments of most carriers. Typically, they have a primary activity other than handling parcels. These include libraries, 24/7 stores, supermarkets, flower shops, night shops, gas stations, and local post offices. Collection points are the most widespread alternative to home deliveries and the most used alternative when deliveries fail. As standard protocol for most carriers, drivers leave a note in the recipients mailbox (or e-mail) indicating at which collection point they will be able to retrieve their package, provided no previous instruction had been given for the delivery. One of the main advantages of collection points as an alternative is their proximity to customers, given that the points are numerous and widespread, allowing customers to retrieve failed deliveries from a location that is closer than a depot. This, however, depends on how consumer collection trips are organized—and itself is a function of customer profiles and behavior. In one study, most consumers visit collection points or fulfillment centers within the postal code zones where they live, have shorter travel time to collect parcels, and incorporate other activities in their journey to collect parcels. The study cites that consumers using collection points are generally in the younger age cohort (typically single students), have no children, and are more frequent online shoppers (Rai et al. 2020).

Another form of alternative delivery collection is the use of automated parcel lockers. These are compartments located in strategic areas of a city or a neighborhood that are locked with a code that can be used to retrieve the item. The code is usually sent to the customer by e-mail. This form of delivery offers some advantage: lockers are generally located in public areas and close to parking spaces that make collection convenient.

As noted, alternative deliveries also ensure a positive environmental impact through consolidation and the certainty of a successful delivery (Ducame 2019). One study found that at 20% take-up level, the collection point model would reduce carbon monoxide emissions associated with home deliveries by about 20% (McLeod and Cherrett 2009). Further, the method also lessens other emissions such as (nitrogen oxide, carbon dioxide, hydrocarbons, particulate matter) by between 13% and 15% (McLeod and Cherrett 2009). Another study calculated the percentage of CO₂ per collection point drop compared with traditional delivery to range from 13% to 47% of a traditional delivery, with the local post office being the most environmentally favorable location incurring only 13% of the emissions generated by traditional deliveries (Edwards et al. 2009).

With collection points already gaining popularity around the world, several e-commerce platforms in Asia and the Pacific have also jumped on the wagon. The Infocomm Media Development Authority (IMDA), Singapore's statutory board, announced its plan to set up 200 parcel locker points across the economy by early 2021. Such locker points are accessible within a 5 minute walk from the place of initial delivery (Parcel Monitor 2021). Since April 2021, Pick Network, a wholly owned subsidiary of the IMDA, has rolled out 1,000 locker stations and intends to deploy another 150 in the next three years (Choo 2022). Meanwhile, in other Southeast Asian economies, sites such as Ninja Van are rapidly increasing their collection points throughout Southeast Asia since launching its first collection point/parcel locker in 2015 (Huang 2021). As of 2020, Ninja Van has over 5,384 collection points across Southeast Asia: 1,015 in Singapore, 3,472 in Malaysia, 710 in Indonesia, 155 in the Philippines, and 32 in Viet Nam (Parcel Monitor 2021).

In Japan, carrier companies Yamato and Neopost Shipping are working together on a venture called Packcity Japan, a nondiscriminatory parcel locker that in 2019 had a network of about 5,000 locker installations (Kerr 2019). Japan Post has also set up a locker service called Hako Post, which is carrier-specific and operates about 400 lockers in large cities. Pickup, drop off points are also widespread, with over tens of thousands of locations and are most exclusively used for failed deliveries. They are scattered around the country, particularly at convenience stores such as Lawson, Family Mart, CircleK, and 7/11 (Kerr 2019). These stores have widescale tie-ups with major carriers (Kerr 2019). Meanwhile, in the Republic of Korea, DHL Express signed a memorandum of understanding (MOU) with

the Seoul City Metropolitan government to utilize Seoul's Safe Locker for express delivery from abroad. Through the MOU, DHL Express Korea was to add 187 safe lockers across Seoul as collection points for its "On Demand Delivery" (ODD) service, allowing customers to select a preferred delivery date and location to receive the parcel (DHL 2017). The People's Republic of China (PRC) in the meantime has the largest scale of parcel lockers globally. E-commerce is integrated well in Chinese culture especially among the urban population. The scale of online shopping in the country makes parcel lockers indispensable and always available. As of 2018, e-commerce parcel volumes were growing at an annual rate of 40% to 50%—a scale requiring last-mile, out-of-home solutions to be developed quickly (Sotolongo, Kerr, and Rozycki 2019). Hence, the PRC developed an out-of-home delivery network out of necessity and currently treats parcel lockers as a crucial element in e-commerce delivery. In 2019, the country had 310,000 locker installations and that grew to 400,000 lockers by 2020 (Sotolongo, Kerr, and Rozycki 2019; Morgan 2021).

Warehouses for Small E-commerce Players

As Asia and the Pacific's rapid growth in the e-commerce sector continues, newer business models continue to emerge to better serve consumers while achieving cost-effectiveness. One of these is the search for better storage and inventory of manufactured products, leading to insatiable demand for modern warehousing facilities. E-commerce drastically shifted modern retail from operating a physical storefront to a large-scale modern logistics facilities including distribution centers and backup inventory warehouses. In this race toward faster delivery and lower costs, many companies are engaging third-parties to distribute products directly, along with other forms of storage and inventory management services (Yap 2020). Asia and the Pacific is at the forefront of such services with a record \$358.8 billion in third-party logistics (3PL) revenue in 2018 and is forecast to reach \$538.2 billion by 2023 (Yap 2020). The increasing trend of engaging logistics services has also led to an increasing demand in modern warehousing facilities. Such services generally require up to three times more space than traditional warehouse users to accommodate a wider range of products suitable for e-commerce (Yap 2020). Among the classes of logistics and warehousing services are the following:

- (i) **Third-party logistics.**¹ Third-party logistics (3PL) providers are often engaged for logistics and supply-chain management to outsource a segment of a business's distribution, storage and inventory, and fulfillment services. It supports small e-commerce businesses that do not have their own logistics and warehousing facilities. Companies providing 3PL services cover transportation, warehousing, picking and packing, inventory forecasting, order fulfillment, packaging, and freight forwarding. Some of the advantages of using a 3PL provider include lower cost; being able to scale up or down as needed; better customer experience; the ease of testing new markets without committing to major investments for own warehousing; mitigating risk; gaining instant expertise and knowledge in the field; and support on international documentation, customs, duties, and other issues at the border.
- (ii) **Warehouse management systems.**² The warehouse management system (WMS) is a software program that provides a platform for better visibility into a business entire inventory. It can also automate the monitoring and management of supply chain fulfillment operations from depot to distribution center to the store shelf. These software solutions are designed to support the entire global supply chain needs of international businesses, including their needs for distribution, manufacturing, and service businesses. This allows organizations to control, monitor, and manage warehouse operations from the time goods or materials enter a warehouse to when they are shipped out. Another important feature is that a WMS

¹ Intuit Inc. 3PL: Third-Party Logistics. <https://www.tradegecko.com/supply-chain-management/what-is-3pl>.

² Oracle. What Is a Warehouse Management System (WMS)? <https://www.oracle.com/scm/logistics/warehouse-management/what-is-warehouse-management>.

helps a company to maximize its labor and space usage and equipment investments by coordinating, delegating, and optimizing resource usage and material flows. The latest innovation in the software is the application of a cloud-based WMS that is designed to connect to consumers using the Internet of Things and digital technology for a fulfillment solution that provides real time visibility, scalability, and market reactivity.

- (iii) **Multi-warehouse/Multi-channel management systems.**³ Multi-warehouse management involves a unified management of operations in multiple warehouses, which are essential if an e-commerce platform aims to ship to a wider area at lower cost. As with 3PL, multi-warehouse management covers all operations: inventory, staff, shipping, storage, and movement of goods. The inventory management software system becomes crucial for multi-warehouse operations to manage distribution effectively and ensure order fulfillment is accurate, efficient, and transparent. It may feature barcoding capabilities, intuitive stock, transfer, and inventory forecasting (Finale Inventory 2021). An effective multi-warehouse management system ensures that every single data point under each warehouse is indexed and easily accessible. This removes the complexity or cross-referencing different information from warehouses across mismatched systems. Another benefit is accessibility to a unified, real-time, accurate data in which all warehouses are connected to the same inventory and distribution system. This ensures precise monitoring of stock quantities and stock in transit. Additionally, the full visibility of every order and every piece of inventory ensures that businesses can locate and track inventory around the globe.
- (iv) **Shipping and fulfillment apps.**⁴ The fundamental elements of an order fulfillment service is picking, packing, and shipping orders to customers. The order fulfillment process starts with a purchase online. E-commerce shipping meanwhile refers to the delivery method offered to online shoppers and how much they are charged for it. Fulfillment companies provide packaged services at discounted rates to ensure e-commerce businesses can offer their customers the fastest, most affordable shipping. Fulfillment companies also include shipping carriers that do daily pickup of packages and parcels from their fulfillment centers. Some countries offer mobile apps for shipping and fulfillment orders, as is shown in the example in Table A.1.

In Japan, moving a manufacturer's inventory into a domestic warehouse for the domestic market is crucial in setting up an online store. This ensures lower shipping costs per unit, faster and more reliable delivery, and the elimination of possible issues between cross-border fulfillment and partial shipping from a foreign country to the final delivery point. Table A.1 provides an overview of the logistics and warehousing ecosystem in Japan as well as the main app and services used by online stores.

Meanwhile, a vast range of logistics and warehouse facilities providers are doing business in the PRC. These include 3PL companies like Easy China Warehouse in Shenzhen, FF Logistics, Kerry Logistics, Sinotrans, and E-commerce Express, to name a few. For small and medium-sized enterprises (SMEs) looking to enter into the PRC's trillion-dollar e-commerce market, finding the appropriate 3PL partner saves time, money, and the complexity. The right 3PL partner will have the network to navigate logistics and operations such as proper registration at the border, facilitation of duties, and determining which ports are best for a shipment (WPIC Marketing + Technologies 2019).

The Republic of Korea's 3PL market is among the top five logistics services in Asia and the Pacific. The country's logistics industry has expanded following the entry of multinationals, major manufacturing, and wholesale companies. The 3PL market there is segmented according to type, which includes domestic and international transportation management and value-added warehousing and distribution. The country's 3PL market is set to grow at a rate of over 8% (compound annual growth rate) during 2020–2025.⁵

³ Big Commerce Essentials. What Is Multi-Warehouse Management? <https://www.bigcommerce.com/ecommerce-answers/what-is-multi-warehouse-management/>.

⁴ ShipBob. Ecommerce Fulfillment Guide. <https://www.shipbob.com/ecommerce-fulfillment>.

⁵ Mordor Intelligence. South Korea Third-Party Logistics (3PL) Market—Growth Trends, Covid-19 Impact, and Forecasts (2022–2027). <https://www.mordorintelligence.com/vi/industry-reports/south-korea-3pl-market>.

Table A.1: Logistics and Warehousing Facilities in Japan: Main Applications and Digital Services

| Logistics and Warehousing Facilities | Apps and Services | How It Operates |
|--|---|--|
| Third-party logistics | OpenLogi | <ul style="list-style-type: none"> • Entirely manageable online • Zero-fixed cost • Easy to manage service • Wide application programming interface (API) documentation |
| | Connect Logistics | <ul style="list-style-type: none"> • Covers domestic and global fulfillment • Easily integrated with Shopify |
| Warehouse management systems | Logiless | <ul style="list-style-type: none"> • Cloud-based all-in-one software • Possible to manage orders and stock in one place |
| | Anchanto | <ul style="list-style-type: none"> • Provide services in Southeast Asia, Japan, and Australia • Covers logistics network, software for inventory, orders fulfillment, and multi-channel stores |
| | Next Engine | <ul style="list-style-type: none"> • Covers order management, inventory management, and products registration and management for e-commerce |
| | Logikura | <ul style="list-style-type: none"> • Cloud e-commerce logistics software • Shopify integrated • With smartphone and desktop version |
| Multi-warehouse/Multi-channel management systems | Stitch Labs | <ul style="list-style-type: none"> • Highly responsive support center • Wide API documentation • Personalized plans |
| | Tradegecko | <ul style="list-style-type: none"> • More affordable, English-based interface • Highly integrated, centrally managed inventory • Multi-channel management system |
| Shipping and fulfillment apps | Ship&Co | <ul style="list-style-type: none"> • Compatible with Japan Post, Yupack, Yamato, FedEx, DHL, UPS • Creates shipping labels quickly and easily |
| | Shipstation | <ul style="list-style-type: none"> • Creates hundreds of labels at a time for many shipping options • Allows merchants to calculate shipping rates |
| | Easy Label Japan Post / Easy Rates Japan Post | <ul style="list-style-type: none"> • App to calculate rates for Japan Post • Creates and prints shipping labels in the correct format |

Source: L. Siardi. 2018. A Guide to Local Warehouses and 3PLs in Japan. *Flagshipblog*. 19 May. <https://medium.com/flagshipblog/a-guide-to-local-warehouses-and-3pls-in-japan-9946a0de8486>.

APPENDIX B

Model Algorithm to Measure GHG Impact of Online Activities

Model Algorithm: Online Activity

To estimate the total computer energy consumption from online activities, two factors need to be considered: (i) the duration of each activity laid out in Chapter 2, Figure 2.3, and (ii) the approximate total time it takes from logging into the platform up to the order confirmation for both customer and merchant. The different energy consumption of the customer and the merchant also needs to be considered. For example, in the case of the customer, the Wi-Fi router and laptop/mobile/desktop power consumption can be estimated. Laptop and/or mobile values taken from Beggio (2018) are used for the analysis in this appendix. Wi-Fi consumption usage is not included in Beggio (2018) and is added in the estimation in Table B.1. For merchants, IT energy consumption is more complex. E-commerce platforms such as Amazon have their own software, digital cloud, and data and infrastructure to support the digital platform. To better represent the energy consumption of e-commerce platform businesses, assumptions from the Oliver Wyman report were used. For IT energy consumption, the Oliver Wyman report covers data centers and computer networks. Lighting, meanwhile, is not included in the energy consumption computation both for consumers and online merchants.

Table B.1: Online Activities Consumption Data

| Actor | Device | Energy Conversion Factor |
|------------------------|---------------------------|--------------------------|
| Consumer | Laptop/mobile | 0.12 kW |
| | Wi-Fi router ^a | 0.0060 kW |
| | Lighting | - |
| | Total | 0.126 kW |
| Online merchant | Data centers | 0.32 kW |
| | Computer network | 0.11 kW |
| | Lighting | - |
| | Total | 0.43 kW |

kW = kilowatt.

^a Wi-Fi router computation is done online.

Source: Beggio, S. 2018. A Model for the Assessment of the Environmental Impact of B2C E-Commerce in Italy. Politecnico Di Milano School of Industrial and Information Engineering. https://www.politesi.polimi.it/bitstream/10589/145070/3/2018_12_Beggio.pdf; Oliver Wyman. 2021. *Is E-commerce Good for Europe? Economic and Environmental Impact Study*. Logistics Advisory Experts (LAE). University of St Gallen, Switzerland. <https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2021/apr/is-e-commerce-good-for-europe.pdf>; and Wifi Router Power Consumption, Calculation, Power Saving Tips. <https://www.electrical4u.net/energy-calculation/wifi-router-power-consumption-calculation-power-saving-tips/> (accessed 14 February 2022).

Table B.2: Electricity Coefficient

| Activity | Energy Conversion Factor |
|-------------------|---------------------------------|
| Energy production | 0.49 kg CO ₂ e / kWh |

kgCO₂e = kilogram of carbon dioxide equivalent, kWh = kilowatt-hour.

Source: Siragusa, C. and A. Tumino. 2021. E-Grocery: Comparing the Environmental Impacts of the Online and Offline Purchasing Processes. *International Journal of Logistics Research and Applications*. 25 (3). pp. 1–27.

For online consumption, we have

$$AF = D * CD * ECF * IMF \quad (B.1)$$

Where,

AF is the activity footprint in kilogram of carbon dioxide equivalent (kgCO_2e), *D* is the activity duration in hours, *CD* is the average consumption of the consumer's or the merchant's online activities in kilowatt-hour (kWh) presented in Table B.1. The *ECF* is the electricity conversion factor in $\text{kgCO}_2\text{e/kWh}$ presented in Table B.2. The activity footprint may only include these factors as estimated by Siragusa and Tumino (2021a). It should also be noted that the Beggio (2018) study added another factor variable: the *IMF* or the industry-dependent multiplying factor. This adds precision to the estimate by accounting for only one single product shipped to the customer. A few of the industry-dependent multiplying factors included in the study are listed in Tables B.3, B.4, and B.5.

Table B.3: Selected Industry-Dependent Multiplying Factors of Customers' Activities

| Customer's Activities | Industry-Dependent Multiplying Factors |
|--|---|
| Online product search on search engines | 1/Items per order |
| Customer redirection to the merchant website | No. of visited websites/Lines per order |
| Product, availability, size, color check | No. of visited websites/Lines per order |
| Info request to merchant | No. of interactions with merchant/Items per order |
| Info insertion and interaction with the merchant | 1/Items per order |
| Payment info insertion | 1/Items per order |
| Info insertion about return | Return rate |
| Info request about return | No. of interactions with merchant *Return rate |

Note: Return rate is calculated as the number of returned items as a percentage of the total number of products sold within a specified time frame.

Source: Beggio, S. 2018. *A Model for the Assessment of the Environmental Impact of B2C E-commerce in Italy*. Politecnico Di Milano. https://www.politesi.polimi.it/bitstream/10589/145070/3/2018_12_Beggio.pdf.

Table B.4: Selected Industry-Dependent Multiplying Factors of Merchants' Activities

| Merchant's Activities | Industry-Dependent Multiplying Factors |
|--|---|
| Answer to the consumer | No. of interactions with merchant/Items per order |
| Interaction with the customer | 1/Items per order |
| Order reception and management | 1/Items per order |
| Order fulfillment | 1/Items per order |
| Tracking service activation | 1/Items per order |
| Return reception and management | 1/Items per order |
| Waybill emission | 1/Items per order |
| Replenishment order emission | 1/Items per replenishment order |
| Replenishment order reception and management | 1/Items per replenishment order |

Source: Beggio, S. 2018. *A Model for the Assessment of the Environmental Impact of B2C E-commerce in Italy*. Politecnico Di Milano. https://www.politesi.polimi.it/bitstream/10589/145070/3/2018_12_Beggio.pdf.

Table B.5: Selected Industry-Dependent Multiplying Factors of Point-of-Sale Activities

| Point-of-Sale Activities | Industry-Dependent Multiplying Factors |
|--|---|
| Replenishment order emission | 1/Items per replenishment order |
| Replenishment order reception and management | 1/Items per replenishment order |
| Order fulfillment | 1/Items per replenishment order |
| Info request about delivery | 1/No. of picks in a tour |
| Interaction with the PoS about delivery | 1/Items per replenishment order |
| Tracking service activation | No. of interactions with merchant/Items per replenishment order |
| Waybill emission | 1/Items per replenishment order |

PoS = point of sale.

Source: Beggio, S. 2018. *A Model for the Assessment of the Environmental Impact of B2C E-commerce in Italy*. Politecnico Di Milano. https://www.politesi.polimi.it/bitstream/10589/145070/3/2018_12_Beggio.pdf.

Model Algorithm: Stock Replenishment

In constructing the algorithm for GHG emissions of cross-border freight shipment, two route distances may be considered. The first is freight shipment—the distance from the place of origin of goods purchased to the arrival/port of destination. The second is the line haul (or upstream transport), which is the distance from the arrival/port of destination to the picking warehouse. Most studies do not cover the freight shipment distance under the stock replenishment phase. Line haul route distances, however, have been cited by some reports. Table B.6 provides record algorithms constructed by some studies in estimating the GHG emissions associated with line haul or upstream transport.

Table B.6: Algorithms to Measure GHG Impact for Upstream Transport

| Study | Reference Equation |
|-----------------------------|--|
| Mangiaracina et al. (2016) | $AF = (\text{impact in kgCO}_2\text{e/km}) \times (\text{average distance per parcel pick up route in km})$ |
| Siragusa and Tumino (2021a) | $AF = (\text{average route distance in km}) \times (\text{percentage space occupied by a piece in } \%) \times (\text{vehicle GHG conversion factor in kgCO}_2\text{e/km}) \times (\text{number of items per order})$ |
| Shahmohammadi et al. (2020) | $GHG_{UT} = \sum_{v=0}^n (C_v \times DT_v \times GI_v \times W_{prod})$ <p>Where, GHG_{UT} is the GHG emissions associated with upstream transport in kg CO₂e/item V is the mode of transport C_v is the probability of the type of transport mode V DT_v is the distance traveled by transport mode V (km) GI_v is the GHG emission intensity of transport mode V and W_{prod} is the weight of the product</p> |

GHG = greenhouse gas, kgCO₂e = kilogram of carbon dioxide equivalent, km = kilometer.

Sources: Mangiaracina, R., A. Perego, S. Perotti, and A. Tumino. 2016. Assessing the Environmental Impact of Logistics in Online and Offline B2C Purchasing Processes in the Apparel Industry. *International Journal of Logistics Systems and Management*. 23. pp. 98–124; Siragusa, C. and A. Tumino. 2021. E-grocery: Comparing the Environmental Impacts of the Online and Offline Purchasing Processes. *International Journal of Logistics Research and Applications*. 25 (3). pp. 1–27. <https://www.tandfonline.com/doi/full/10.1080/13675567.2021.1892041>; Shahmohammadi, S., J. Zoran, N. Steinmann, L. Tambjerg, P. van Loon, J. M. Henry King, and M. Huijbregts. 2020. Comparative Greenhouse Gas Footprinting of Online versus Traditional Shopping for Fast-Moving Consumer Goods: A Stochastic Approach. *Environmental Science and Technology*. 54. pp. 3499–509.

Model Algorithm: Building Energy and IT Energy Consumption

In considering the consumption of resources through e-commerce activities, it is also important to think about the indirect environmental impact of the energy use of warehouses and IT energy consumption itself (Box B.1). Lighting and other utilities in warehouses, stores, and other related building structures and the energy used in ordering online and managing inventory (servers and computers) are in this category. And in this section, the activities considered are those done within the confines of the warehouse. Researchers are expanding ways to compare model equations that estimate the environmental impact of e-commerce. The Oliver Wyman study reports the building energy consumption associated with online emissions across France, Germany, Italy, Spain, and the United Kingdom (UK). Across these selected countries in Europe, building and IT energy consumption is estimated at 170 grams of carbon dioxide equivalent (gCO₂e), or 19% of total emissions with online shopping for an average nonfood product. In contrast, traditional retail recorded a high of 1,184 gCO₂e, or 29% of total emissions, mainly because both warehouse and physical stores are needed. As expected, IT energy consumption for online shopping is relatively higher at 178 gCO₂e, or 20% of total emissions in online shopping compared to 116 gCO₂e or 3% of total emission in traditional retail.

The Oliver Wyman study also provided a model equation on how these values were computed. In calculating the GHG impact of a 350 grams book purchased through national e-commerce in Germany, the reference equations are:

1. IT energy consumption = [Energy from data centers (0.32 kWh)] + [Energy from computer network (0.11 kWh)] x [Residual mix factor (0.61 kgCO₂e/kWh)]
2. Building energy consumption = [Energy from warehouses (150 kWh/sqm)] ÷ [number of item/sqm in warehouse (500 item/sqm)] x [Residual mix factor (0.61 kgCO₂e/kWh)] + [Emissions for delivery buildings energy (e.g., sorting centers) (~46 gCO₂e)]

Beggio (2018), meanwhile, provides a detailed formula for the overall consumption of the building that can be attributed to the single activity and the single item that passes through the warehouse. The reference equation used is

$$\text{BFA} = \text{DBC} / \text{DNP} * \text{AP} \quad (\text{B.2})$$

$$\text{DBC} = \text{YC} * \text{BV} / \text{WD} \quad (\text{B.3})$$

Where, BFA is the building footprint for a certain activity; DBC is the daily building consumption; DNP is the daily flow of products, and AP is the percentage of space allocated to the activity under analysis. YC is the yearly consumption, BV is the building volume, and WD is the number of working days a year. The study further provides comprehensive consumption data associated with industrial buildings, as shown in Table B.7.

The equation presented by Beggio (2018) provides a standard algorithm in estimating building footprint. However, differences across industries will correspond to amendments of the reference equation. As an example, for the food and grocery industry—both in the central and local warehouse—one more consumption factor should be considered: consumption related to conserving goods by refrigeration (Beggio 2018).

Table B.7: Industrial Buildings Consumption Data

| Climatic Zone | Warehouse Consumption (kWh/m ³ year) | | | | | Hub Consumption (kWh/m ³ year) | | |
|----------------|---|---|---|----|-------|---|----|-------|
| | H | C | S | L | Total | S | L | Total |
| A | 16 | 3 | 4 | 15 | 38 | 2 | 12 | 33 |
| B | 22 | 4 | 4 | 15 | 44 | 2 | 12 | 39 |
| C | 33 | 5 | 4 | 15 | 57 | 2 | 12 | 52 |
| D | 50 | 6 | 4 | 15 | 75 | 2 | 12 | 70 |
| E | 73 | 7 | 4 | 15 | 100 | 2 | 12 | 95 |
| F | 97 | 0 | 4 | 15 | 116 | 2 | 12 | 111 |
| Average | | | | | 82 | | | 77 |

C = climatization, H = heating, kWh = kilowatt-hour, L = lighting, m³ = cubic meter, S = sanitary water production.

Source: Beggio, S. 2018. *A Model for the Assessment of the Environmental Impact of B2C E-commerce in Italy*. Politecnico Di Milano. https://www.politesi.polimi.it/bitstream/10589/145070/3/2018_12_Beggio.pdf.

Box B.1: Accounting for Greenhouse Gas Emissions Incurred in Storage Activities

Siragusa and Tumino (2021a) provide a model algorithm for warehouse consumption in storage, sorting, and shipping activities. However, the study did not elaborate on the results of the building and IT energy consumption. Instead, it reported on the total consumption of warehouse activities. The reference equations for warehouse consumption activities used in the study have similar algorithms but are differentiated based on the specific warehouse activity (i.e., storage, sorting, shipping). These are as follows:

1. Warehouse consumption in the storage area = (warehouse daily energy consumption for storage [kWh] / items per day [#] * electricity conversion factor [kgCO₂e/kWh]) * number of items per order [#]
2. Warehouse consumption in sorting area for sorting activity = (warehouse daily energy consumption for sorting [kWh] / items per day [#] * electricity conversion factor [kgCO₂e/kWh]) * number of items per order [#]
3. Warehouse consumption in shipping area (sorting, packaging, goods moving) = (warehouse daily energy consumption for shipping [kWh] / items per day [#] * electricity conversion factor [kgCO₂e/kWh]) * number of items per order [#]

Shahmohammadi et al. (2020) also featured a model algorithm to calculate the greenhouse gas (GHG) emissions associated with the storage of fast-moving consumer goods in the retail channels in the United Kingdom. In the study, GHG_S was calculated for the manufacturers’ warehouses, distribution centers, parcel distribution centers, and retail shops. The sum of the GHG emissions from the relevant phases (f) to each retail channel (i) was then calculated to get the total GHG footprint for product storage. The reference equation is:

$$GHG_{S_i} = (E_w \times GI_E + G_w \times GI_G) \times [(T_w \times AF_w \times V_{prod}) / H_w]$$

Where, E_w is the annual electricity use (MJ/(m²·year)). GI_E is the GHG emission intensity of electricity consumption (kg CO₂eq/MJ). G_w is the annual natural gas use (MJ/(m²·year)). GI_G is the GHG emission intensity of gas consumption (kg CO₂eq/MJ). T_w is the storage time (year). AF_w is the storage volume factor (fraction of the volume of the warehouse/store, which is dedicated to store the products) (dimensionless). H_w is the height of the warehouse/shelf stack (m). V_{prod} is the volume of the product (m³/item).

kgCO₂e = kilogram of carbon dioxide equivalent, kWh = kilowatt-hour.

Sources: Shahmohammadi, S., J. Zoran, N. Steinmann, L. Tambjerg, P. van Loon, J. M. Henry King, and M. Huijbregts. 2020. Comparative Greenhouse Gas Footprinting of Online versus Traditional Shopping for Fast-Moving Consumer Goods: A Stochastic Approach. *Environmental Science & Technology*. 54. pp. 3499–509; Siragusa, C. and A. Tumino. 2021. E-grocery: Comparing the Environmental Impacts of the Online and Offline Purchasing Processes. *International Journal of Logistics Research and Applications*. 25 (8). pp. 1164–190.

Model Algorithm: Picking

A limited range of studies cover both the picking and sorting processes of warehouse activities as part of their GHG estimations. Further, only two studies illustrated a reference equation for the picking activity. Within the warehouse operations, picking is carried out both in stock replenishment and order picking and assembly. Picking is done once purchased goods are received before they are placed in shelves. In another instance, picking is also done once a customer places an order; as mentioned, this is the most laborious part of warehouse activity.

Siragusa and Tumino (2021a) illustrates a model algorithm to estimate the GHG emissions caused by the picking activity both in stock replenishment and order picking and assembly. Below are reference equations used in the study:

1. Picking list emission = (activity duration [h]) * (power supply of retailer device [kW]) * (electricity conversion factor [kgCO₂e/kWh])
2. Picking = (picking consumption per piece [kWh]) * (electricity conversion factor [kgCO₂e/kWh]) * (number of items per order [#])

While the model equation above provides a clear reference in estimating GHG emissions brought about by the picking activity, the laborious nature of the picking activity within the warehouse requires a more detailed reference equation. The standard equation constructed by Beggio (2018) is illustrated below:

$$AF = PCP * ECC \quad (B.4)$$

$$PCP = TT * PST / (N * NPL) \quad (B.5)$$

Where PCP is the consumption due to the picking of a piece and ECC is the electricity conversion factor; TT is the travel time; PST is the power supply of the order picker truck; N is the number of picks in a tour; and NPL is the number of pieces per line in a tour. The PCP, meanwhile, depends on the travel time on board the order picker truck.⁶

⁶ To estimate the travel time (TT), the following reference equation is used:

$$TT = (L_i + L_e) / S$$

Where, L_i is the travel within the aisles, L_e the travel across the aisles, and S is the average speed of the motor driven order picker truck. The equation for the L_i variable, on the other hand, is given by:

$$L_i = (W_e + l) * V$$

$$V = \sum_A [1 - (1/A)^N]$$

The travel within the aisles (L_i) is given by the expected travel within one aisle, which is the sum of the length of the aisle (l) and the cross aisles width (W_e), multiplied by the expected number of aisles to visit (V). V is a function of A, the number of aisles in the warehouse, and N, the number of picks in a tour. Meanwhile,

$$L_e = 2 * (F - 1) + 2 * D_{I/O}$$

$$F = \sum_{j=1}^{A/2} f_j * [(2j/A)^N - ((2j-2)/A)^N]$$

The travel across the aisles depends on F, the farthest couple of aisles to visit from the I/O point and on D_{I/O}, the distance of the first aisle between the I/O point.

Model Algorithm: Sorting

Sorting takes place in the central warehouse for the informatics and electronics, apparel, and publishing industries. For the grocery industry, it takes place both in the central and in the local warehouse. It is performed after the picking activity where purchased goods from the central warehouse are then taken away and placed in shelves. Traditional commerce flows are managed using an automatic sorter, which is powered by electricity.

Three background studies constructed a reference equation for sorting. All three can easily be adopted in calculating GHG emissions attributed to sorting. Mangiaracina et al. (2016) presented a simple equation to estimate sorting as shown below:

$$\text{GHG}_{\text{sorting}} = (\text{impact in [kgCO}_2\text{e / kWh]}) * (\text{total energy consumption per item in sorting hub [kWh / item]}) \quad (\text{B.6})$$

Another study shows a related but slightly different approach (Siragusa et al. 2021) from the equation above:

$$\text{GHG}_{\text{sorting}} = (\text{sorting consumption per piece [kWh]}) * (\text{electricity conversion factor [kgCO}_2\text{e/kWh]}) * (\text{number of items per order [#]}) \quad (\text{B.7})$$

Finally, Beggio (2018) also constructed a reference model for e-commerce sorting activity:

$$\text{AF} = \text{SCP} * \text{ECC} \quad (\text{B.8})$$

$$\text{SCP} = \text{PSS} / \text{SC} \quad (\text{B.9})$$

Where SCP is the sorting consumption per piece, ECC is the electricity conversion factor, PSS is the power supply of the automatic sorter, and SC is the sorter capacity.

Model Algorithm: Packaging

While packaging is one part of warehouse activity under “order picking and assembly,” this subsection will focus on the material used during the said activity. E-commerce is among the major economic sectors that heavily consume packaging materials. Packaging is considered a main driver of CO₂e impact and refers to the quantity, volume, and material of packaging for goods sent in parcels (Oliver Wyman 2021). In addition, compared to traditional retail, e-commerce relatively uses more packaging for various products, producing additional energy consumption for the production of packaging (Williams and Tagami 2003). In one study, it was found that packaging in e-commerce contributes more to GHG emissions with a recorded value of 0.32 kgCO₂e or 11% of total emissions compared to that in traditional retail, which was estimated at 0.18 kgCO₂e or just 3% of the total emissions (Mangiaracina et al. 2016). The distinction between the primary packaging of e-commerce and traditional retail lies in the delivery to consumer. As an example, Wyman and Tagami (2003) cites that e-commerce vendors pack books in small, corrugated cardboard boxes for shipping to courier while traditional bookstores only use light paper bag or paper cover. However, for bulk orders, boxes are typically the same in e-commerce and bookstores—usually medium-sized cardboard boxes holding around 40 books. The energy used to produce packaging materials vary immensely between e-commerce and traditional retail (i.e., bookstores)—3.9 megajoules (MJ) for a wraparound cardboard package per book and 0.36 MJ for a small paper bag (Williams and Tagami 2003). The total packaging

energy requirement was calculated at 3.9 MJ for e-commerce (which corresponds to a large box with wraparound package) and 0.8 MJ for traditional retail (which corresponds to a paper bag) or paper bag (Williams and Tagami 2003).

Another study, meanwhile, argues that online retail can use less of some forms of packaging than in the traditional retail channel. Van Loon (2014) notes that deliveries that typically use cardboard boxes can be reduced if electronic products are shipped straight to consumers. However, this would also mean that individual items that traditional stores normally provide in bulk, within secondary packaging, are now being individually wrapped for home delivery (van Loon 2014). This increases the total amount of packaging needed (van Loon 2014).

The preferred packaging across different industries varies—cardboard for apparel, electronics, and publishing; and plastic for food and grocery. Packaging features that are useful as input data for CO₂e emissions are packaging type, size, capacity, weight, and amount of raw material. Data in Table B.8 are taken from various sources and provide details about the types of packaging and their corresponding GHG emissions conversion factors.

Table B.8: Packaging Assumptions

| Packaging Pollution per Packaging Type | Value | Unit |
|--|-------|------------------------|
| Corrugated cardboard | 1.45 | gCO ₂ e |
| Expanded polystyrene (EPS) | 4 | gCO ₂ e |
| Paper | 0.123 | gCO ₂ e |
| Cardboard boxes | 1.127 | kgCO ₂ e/kg |
| Plastic bags | 1.578 | kgCO ₂ e/kg |

gCO₂e = grams of carbon dioxide equivalent; kgCO₂e/kg = kilograms of carbon dioxide equivalent per kilogram.

Source: Oliver Wyman. 2021. *Is E-commerce Good for Europe? Economic and Environmental Impact Study*. Logistics Advisory Experts (LAE). University of St Gallen, Switzerland. <https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2021/apr/is-ecommerce-good-for-europe.pdf>; Siragusa, C. and A. Tumino. 2021. E-grocery: comparing the environmental impacts of the online and offline purchasing processes. *International Journal of Logistics Research and Applications*. <https://www.tandfonline.com/doi/full/10.1080/13675567.2021.1892041>.

Several studies demonstrate a simple equation to illustrate how to calculate the energy consumed in packaging. One way is by multiplying the packaging footprint expressed in kgCO₂e/cardboard with the number of cardboards (Siragusa and Tumino 2021a). Another way is by multiplying the GHG emissions linked to production of the packaging (expressed in gCO₂e) with the weight of packaging (estimated at 10% of the parcel weight) (Oliver Wyman 2021).

Another equation is presented by Beggio (2018):

$$AF = \frac{PW * PCC}{NP} \quad (B.10)$$

Where, *AF* is the activity footprint in kgCO₂e, *PW* is the packaging weight, *PCC* is the packaging conversion factor shown in Table B.8, and *NP* is the number of pieces per parcel or packaging unit.

Model Algorithm: Last-Mile Delivery

The vast research on the GHG impact of last-mile delivery will give researchers more choices and comparisons of possible model equations. This report cites several studies that constructed a model algorithm of last-mile delivery in their total estimation of e-commerce environmental impact. The study carried out by Shahmohammadi et al. (2020) refers to online consumers as “pure players” and gives the following reference equation:

$$GHG_{LM} = \left[\left(\frac{2 \times SM}{N_D} \times GI_{ves} + \frac{DM}{N_D} \times GI_{veD} \right) \times (1 + F \times R) + F \times (1 - R) \times D_{CDP} \times GI_{TC} \right] / BS_{pp} \quad (B.11)$$

Where, “SM is the one-way stem mileage (km) (multiplied by 2 to account for a return trip); DM is the drop mileage (km); N_D is the number of parcels delivered (dimensionless). GI_{ves} and GI_{veD} is the GHG intensity of the delivery vehicle ($kgCO_2eq/km$) for either stem mileage (s) or drop mileage (D). D_{CDP} is the roundtrip distance to the nearest collection and delivery point in kilometers. GI_{TC} is the GHG emission intensity of the travel to the nearest CDP ($kg CO_2eq/km$). F is a binary variable that equals 1 when delivery to the consumer fails and equals 0 when the parcel is delivered. R is a binary variable that equals 1 when the parcel is re-delivered after a failed delivery and equals 0 when the parcel is taken to a collection and delivery point after a failed delivery. BS_{pp} is the number of items per delivery for pure players (dimensionless)” (Shahmohammadi et al. 2020).

Some studies constructed a simpler reference equation to Beggio (2018), where the equation for the computation of its impact is:

$$AF = RDP / NP * VCC \quad (B.12)$$

$$VCC = (VCC_U * \%_U + VCC_E * \%_E) \quad (B.13)$$

Where RDP is the average route distance per parcel; NP is the number of products per parcel; VCC is the vehicle conversion factor. This factor is relative to the electric van and corresponds to a lower saturation for the pickup route (the average saturation is 37%). VCC depends on three factors: (1) the vehicle conversion factor in urban routes (VCC_U); (2) extra-urban routes (VCC_E); and (3) on the distribution between urban and extra-urban areas, which is an input data provided by the user. The percentage of urban areas in the country is represented by $\%_U$, while $\%_E$ is the percentage of extra-urban areas.

The Oliver Wyman study also provided a model equation on how emissions attributed to last-mile delivery are computed. In calculating the GHG impact of a 350 g book purchased through national e-commerce in Germany, the reference equations are:

$$\text{Last-mile delivery emissions} = [\text{Van } CO_2e \text{ (367 } gCO_2e/km)] \times [\text{Delivery loop distance (80 km)}] \div [\text{number of parcel delivered (100)}] \times [\text{Average number of delivery attempts (1.06)}] \quad (B.14)$$

Siragusa and Tumino (2021a) illustrated a model algorithm to estimate the GHG emissions caused by last-mile delivery. Below are the reference equations used in the study:

- Product pickup from the retailer warehouse = [average route distance (km)] * [percentage space occupied by a piece (%)] * [vehicle GHG conversion factor ($kgCO_2e/km$)] * [number of items per order (#)] (B.15)

- Customer delivery = [average distance per parcel (km)] * [vehicle GHG conversion factor (kgCO₂e/km)] (B.16)

Finally, Mangiaracina et al. (2016) constructs a simple equation of the last-mile delivery:

$$\text{Last-mile delivery emissions} = [\text{impact (kgCO}_2\text{e / km)}] \times [\text{average distance per parcel (km)}] \quad (\text{B.17})$$

Model Algorithm: Post-Sale

Siragusa and Tumino (2021a) presented a comprehensive step-by-step equation to estimate emissions generated during post-sale activities, which include:

1. Info insertion about return = (activity duration [h]) * (power supply of customer device [kW]) * (electricity conversion factor [kgCO₂e/kWh]) * (probability of return rate offline [%]) (B.18)

2. Confirmation mail sending = (activity duration [h]) * (power supply of retailer device [kW]) * (electricity conversion factor [kgCO₂e/kWh]) * (probability of return rate offline [%]) (B.19)

3. Product pickup from the customer = (average distance per parcel [km]) * (vehicle GHG conversion factor [kgCO₂e/km]) * (probability of return rate offline [%]) (B.20)

E-commerce Evolution in Asia and the Pacific

Opportunities and Challenges

This report analyzes e-commerce in Asia and the Pacific, assesses its environmental impact, and explains why providing adequate internet, online payments, and last-mile logistics is key to creating a sustainable and inclusive digital marketplace. Noting the region makes up the largest share of the world's online retail market, it tracks the impact of the pandemic and emphasizes the need to level the playing field for small businesses. It outlines ways for companies to measure their carbon footprint, highlights the potential risk of anti-competitive behavior, and explains the need to improve digital taxation policies in line with e-commerce's rapid growth.

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