SECTION TWO

Transatlantic Digital Connections

CHAPTER 1

Digital Services and Digitally-Enabled Services

The internet is to trade in services what the advent of container shipping was to trade in goods — a transforming capability that enables faster cross-border delivery of a variety of activities that were once considered nontradable.[1]

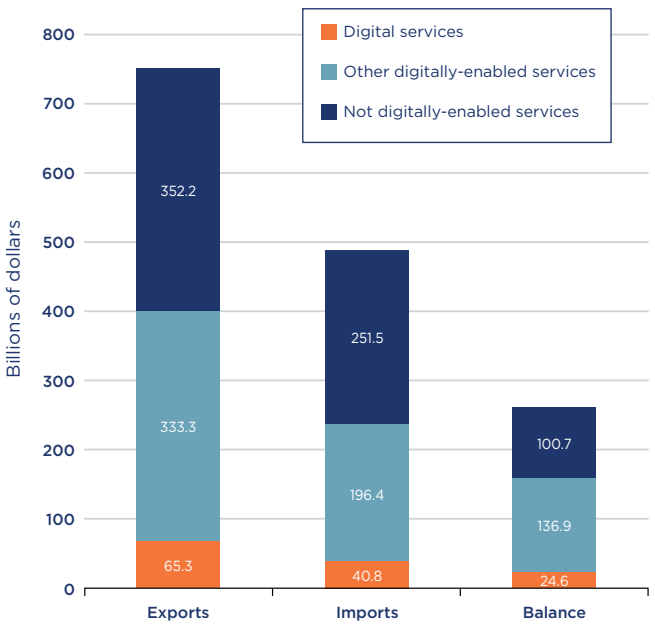
To get a clearer picture of transatlantic connections in digital services, we can use two metrics.

A narrow view can be had by looking at cross-border information and communications technology (ICT)services, or digital services as shorthand, which are services used to facilitate information processing and communication. The U.S. Bureau of Economic Analysis (BEA) defines those services as including three categories of international trade in services: telecommunications services, computer services, and charges for the use of intellectual property associated with computer software.

A broader view can be taken by looking at what the BEA calls *potentially* ICT-enabled services.[2] For many types of services, the actual mode of delivery is unknown. An export of engineering services from Frankfurt, Germany to Hartford, Connecticut, for example, could have been delivered online or in person, or some combination of the two. The statistic does not say exactly whether the specific service was delivered online or in person. The U.S. Bureau of Economic Analysis has sought to take account of this ambiguity by defining "potentially ICT-enabled services" — or digitally enabled services as shorthand — as services that can be, but not necessarily are, delivered remotely over ICT networks. These include digital services as well as "activities that can be specified, performed, delivered, evaluated and consumed electronically."[3] Of course, identifying potentially ICT-enabled services does not tell us with certainty whether the services are *actually* traded digitally.[4] But as the U.S. Commerce Department adds, "these service categories are the ones in which digital technologies present the most opportunity to transform the relationship between buyer and seller from the traditional in-person delivery mode to a digital one,"[5] which means a digital transaction is likely and thus can offer a rough indication of the potential for digital trade.[6]

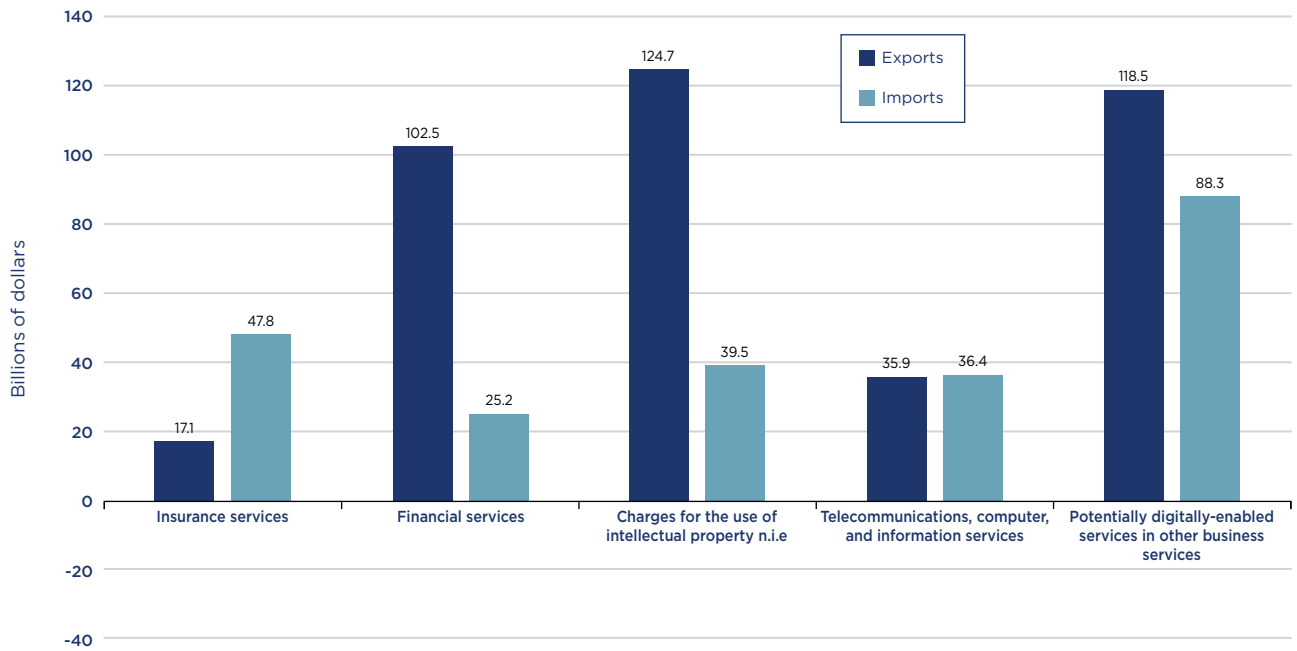
To put the reader's brain at ease, we will use "digital services" to mean ICT services, and "digitally-enabled services" to mean potentially ICT-enabled services.

TABLE 2.1.1: DIGITAL AND DIGITALLY-ENABLED SERVICES SHARE OF TOTAL U.S. TRADE IN SERVICES, 2015



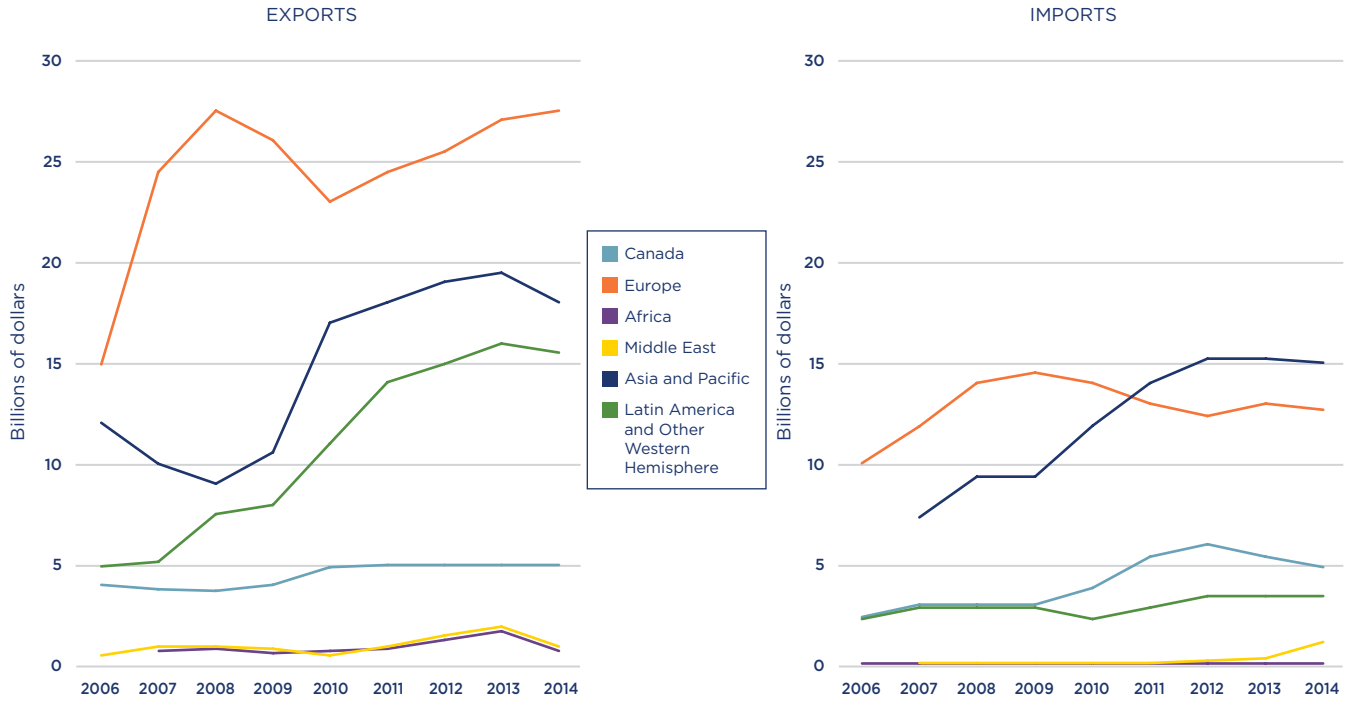
Source: Adapted from U.S Bureau of Economic Analysis, "U.S. International Services Trade in Services in 2015 and Services Supplied Through Affiliates in 2014," December 2016, https://www.bea.gov/scb/pdf/2016/12%20December/1216_international_services.pdf.

TABLE 2.1.2: U.S. TRADE IN DIGITALLY-ENABLED SERVICES BY MAJOR SERVICE CATEGORY, 2015



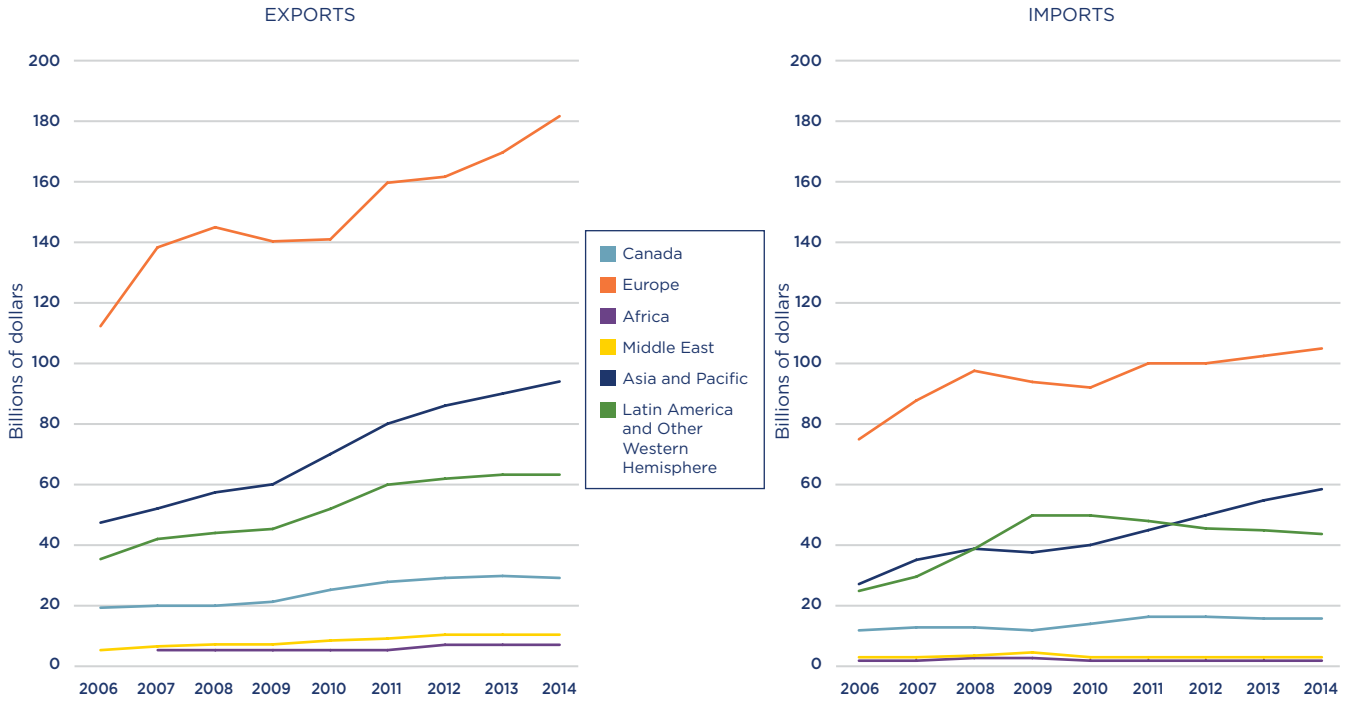
Source: Adapted from U.S Bureau of Economic Analysis, "U.S. International Services Trade in Services in 2015 and Services Supplied Through Affiliates in 2014," December 2016, https://www.bea.gov/scb/pdf/2016/12%20December/1216_international_services.pdf.

TABLE 2.1.3: U.S. TRADE IN DIGITAL SERVICES BY MAJOR AREA, 2006-2014



Source: Adapted from U.S Bureau of Economic Analysis, "U.S. International Services Trade in Services in 2015 and Services Supplied Through Affiliates in 2014," December 2016, https://www.bea.gov/scb/pdf/2016/12%20December/1216_international_services.pdf.

TABLE 2.1.4: U.S. TRADE IN DIGITALLY-ENABLED SERVICES BY MAJOR AREA, 2006-2014



Note. Gaps in the series indicate that data for these years are supressed to avoid the disclosure of the data of individual companies.
Source: Adapted from U.S Bureau of Economic Analysis, "U.S. International Services Trade in Services in 2015 and Services Supplied Through Affiliates in 2014," December 2016, https://www.bea.gov/scb/pdf/2016/12%20December/1216_international_services.pdf.

The transformative impact of each of these types of digital services is not limited to just the services sector but extends to manufacturing and the traditional bricks-and-mortar economy as well. Digitally-enabled services such as consulting, engineering, software, design and finance are used in manufacturing industries such as transport equipment, electrical equipment and food products. In this regard, digitally-enabled services from the United States have become critical to the competitiveness of European manufacturing and retail operations andvice versa. In addition, digitally-enabled services are not just exported directly, they are used in manufacturing and to produce goods and services for export. Over half of digitally-enabled services imported by the United States from the European Union (EU) is used to produce U.S. products for export, and vice versa, thus generating an additional value-added effect on trade that is not easily captured in standard metrics.[7]

A closer look at each of these categories reveals both the deep digital linkages that bind the United States and Europe and the outsized importance of the United States and Europe to the global digital economy.

U.S. Trade in Digital Services and Digitally Enabled Services

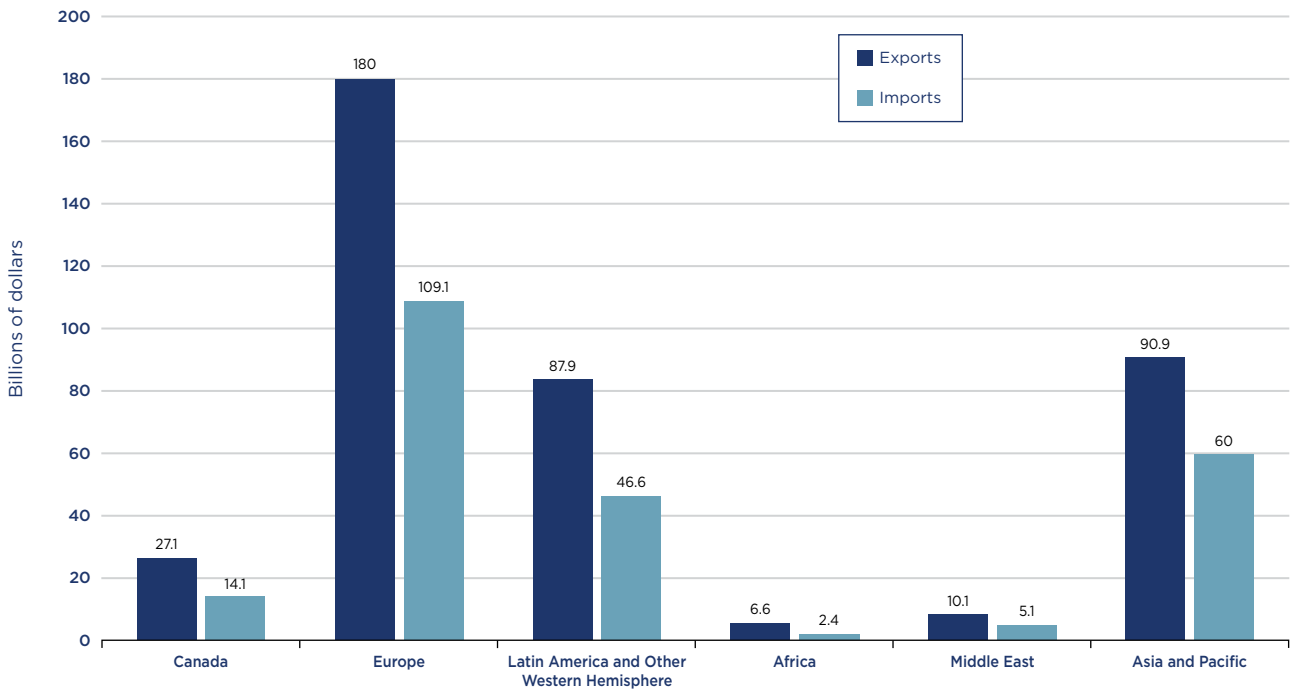
Let us first look through the narrower lens of digital services. U.S. digital services exports of $65.3 billion in 2015 represented 8.7% of overall U.S. services exports of $750.9 billion (Table 1). U.S. exports of digital services decreased 3% after decreasing 4% in 2014. More than half of the exports of digital services were associated with the use of intellectual property in computer software.

U.S. digital services imports of $40.8 billion in 2015 represented 8.4% of overall U.S. services imports of $488.6 billion. Imports of digital services grew less than 1% after growing 3% in 2014. Computer services accounted for more than two-thirds of digital services imports.

The decrease in exports and the increase in imports resulted in a $1.9 billion contraction of America's digital services trade surplus to $24.6 billion in 2015, accounting for 9.4% of the overall U.S. trade surplus in services of $262.2 billion.[8]

Now let's look through the wider lens of digitally-enabled services. U.S. exports of digitally-enabled services totaled $398.7 billion in 2015, accounting for 53% of total U.S.

TABLE 2.1.5: U.S. TRADE IN DIGITALLY-ENABLED SERVICES BY MAJOR AREA, 2015



Source: Adapted from U.S Bureau of Economic Analysis, "U.S. International Services Trade in Services in 2015 and Services Supplied Through Affiliates in 2014," December 2016, https://www.bea.gov/scb/pdf/2016/12%20December/1216_international_services.pdf.

services exports — six times more than the narrower subset of digital services exports alone. Exports decreased 1% in 2015, after growing 6% in 2014.

U.S. imports of digitally-enabled services totaled $237.1 billion in 2015, accounting for 48.5% of total U.S. services exports — almost six times more than the narrower subset of digital services imports. Digitally-enabled imports also contracted 1% in 2015, after growing 5% in 2014.

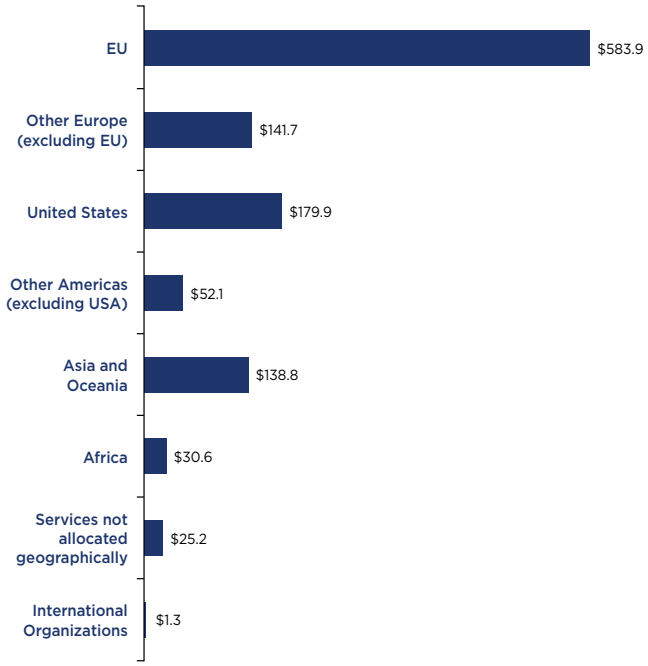
The larger decrease in exports than in imports resulted in a $2.0 billion contraction in America's trade surplus in digitally-enabled services to $161.5 billion. Digitally-enabled services accounted for 61.6% of the overall U.S. trade surplus in services, due in particular to surpluses in charges for the use of intellectual property and for financial services.[9]

Charges for the use of intellectual property comprised the largest category of U.S. exports of digitally-enabled services in 2015, followed closely by exports of other business services and financial services (Table 2.1.2). Other business services comprised the largest category of U.S. imports, followed at some distance by insurance services. The United States registered a $161.6 billion trade surplus in digitally-enabled services in 2015. It registered the largest surpluses in the categories of charges for intellectual property ($85.2 billion surplus) and financial services ($77.3 billion surplus) and a $30.6 billion trade deficit in insurance services.

The largest major categories of both U.S. exports and imports of potentially digitally-enabled services to and from Europe were "other" business services and charges for the use of intellectual property. For Asia and the Pacific, the largest categories of U.S. exports of digitally-enabled services were charges for the use of intellectual property and "other" business services, whereas the largest import categories were "other" business services and telecommunications services. More than half of U.S. exports of digitally-enabled services to Latin America/Other Western Hemisphere consisted of financial services, and insurance services accounted for more than half of U.S. imports.[10]

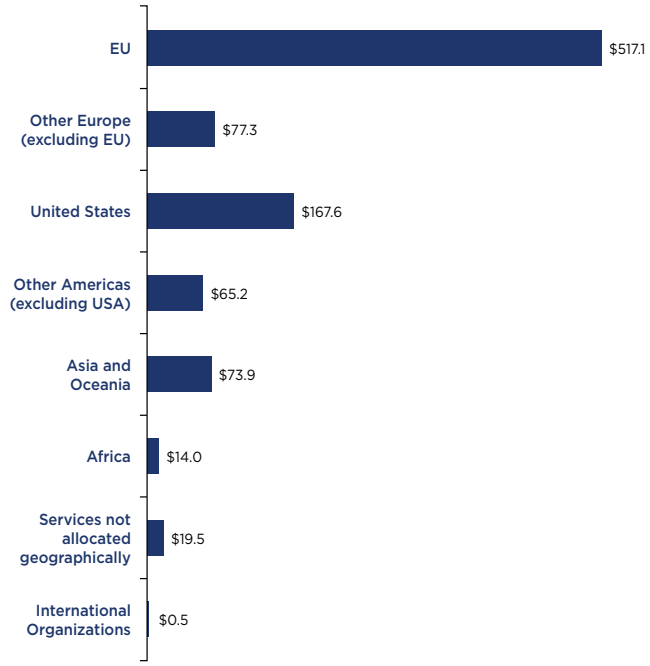
In terms of major markets, Tables 2.1.3 and 2.1.4 compare U.S. trade in the narrower category of digital services and the wider category of U.S. trade in digitally-enabled services, with major markets between 2006 and 2014. In both categories Europe is the major export market, and remains the main source of U.S. imports of digitally-enabled services, although it has been overtaken by Asia as a source of specific digital services. Nearly 90% of digital

TABLE 2.1.6: DESTINATION OF EU EXPORTS OF DIGITALLY-ENABLED SERVICES, 2014 (BILLIONS OF DOLLARS)



Source: U.S. Department of Commerce, Office of the Chief Economist using data from the Organization for Economic Cooperation and Development.

TABLE 2.1.7: ORIGIN OF EU IMPORTS OF DIGITALLY-ENABLED SERVICES, 2014, U.S. - EU (BILLIONS OF DOLLARS)



Source: U.S. Department of Commerce, Office of the Chief Economist using data from the Organization for Economic Cooperation and Development.

services imports from Asia and Pacific were imports of computer services, most of which were from India.

Looking through our narrow lens, Europe was again the largest market for overall U.S. services exports as well as U.S. exports of digital services in 2015, followed in both cases by the Asia-Pacific and Latin America/Other Western Hemisphere markets. More than half of U.S. digital services exports to Europe and to the Asia-Pacific were exports associated with the use of intellectual property in computer software. For exports to Latin America/Other Western Hemisphere, the largest component of digital services was communications services. The largest sources of U.S. digital services imports were Asia and Pacific, Europe, and Canada. Nearly 90% of digital services imports from Asia and the Pacific were imports of computer services, most of which were from India. Computer services was also the largest component of ICT services imports from Europe and Canada.

Taking the wider view, in 2015 the United States registered a $166.2 billion trade surplus in digitally-enabled services with the world. Its main commercial partner again was Europe, to which it exported $180 billion in digitally-enabled services and from which it imported $109.1 billion, generating a trade surplus with Europe in this area of $71 billion. U.S. exports of digitally-enabled services to Europe were more than double U.S. trade with Latin America and almost double U.S. trade with the entire Asia-Pacific region (See Table 2.1.5).

EU Trade in Digitally-Enabled Services

In 2014, the last year of available data, the 28 EU member states collectively exported $1.2 trillion and imported $935.1 billion in digitally-enabled services, to countries both inside and outside the EU (See Table 2.1.6 and Table 2.1.7). Excluding intra-EU trade, EU member states exported $569.6 billion and imported $418.0 billion in digitally-enabled services, resulting in a surplus of $151.6 billion for these services. Digitally-enabled services trade represented 56% of all services exports to non-EU countries and 52% of all services imports from non-EU countries.[11]

The largest shares of all EU digitally-enabled services exports and imports, and in trade of these services with non-EU countries, were in "selected other business services," which includes: research and development services (R&D); professional, management, and consulting

services; architectural, engineering, scientific and other technical services; and other business services not included elsewhere.[12] EU trade in this category with non-EU countries exceeded $400 billion in 2014, more than twice as much as the second largest category of telecommunications, computer and information services. The United States accounted for 32% of the EU's digitally-enabled business services exports to non-EU countries, and 47% of EU research and development services exports.[13]

The EU member states with the largest estimated value of digitally-enabled services exports were the United Kingdom ($159.0 billion), Germany ($149.2 billion), France ($128.0 billion), and the Netherlands ($115.3 billion). Some member states, like the UK, the Netherlands, and Sweden, transmitted more than half of their digitally-enabled services exports to destinations outside the EU. Overall, however, more than half of EU member state exports stayed within the EU. Member states like Poland, Austria, and Belgium were more likely to export to other EU member states than to non-EU states. The United States purchased 15%, or $179.9 billion, making it the largest non-EU consumer of EU digitally-enabled services exports,[14] accounting for more EU exports than the rest of non-EU Europe ($141.7 billion), and more than all digitally-enabled services exports from the EU to Asia and Oceania ($138.8 billion).

In 2014, the EU imported $935.1 billion in digitally-enabled services, 49% of all EU services imports that year. 55% of the digitally-enabled services imports originated from other EU member states (See Table 2.1.7). Another 18% ($167.6 billion) came from the United States, making it the largest supplier of these services. The EU imported more of these services from the United States than from EU member states Germany ($74.8 billion) and the UK ($56.6 billion) combined. Of the $90.7 billion of charges for the use of intellectual property from non-EU countries, the United States supplied 41% ($37.0 billion). The United States also supplied almost one-third ($71.3 billion) of the $223.0 billion in selected other business services originating from outside the EU.[15]

U.S.-EU Trade in Digitally-Enabled Services

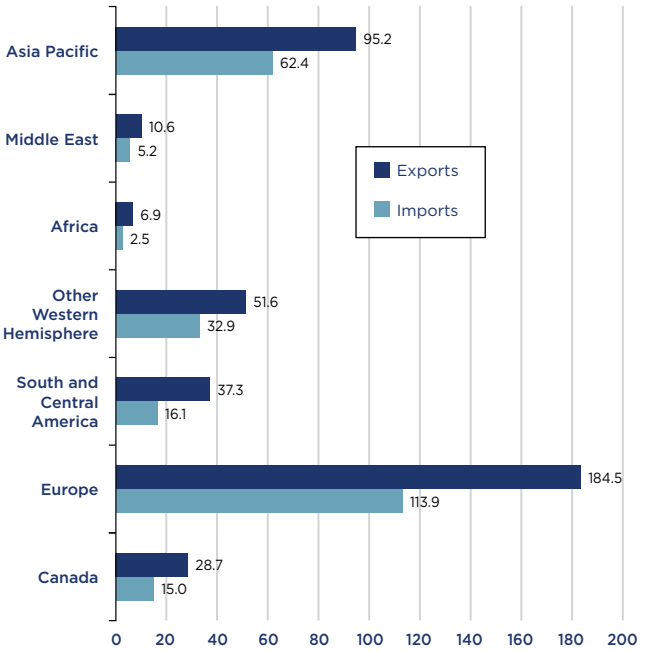
Table 2.1.8 categorizes U.S.-EU digitally-enabled services trade into five sectors. For both economies, the most important exports are represented by business, professional and technical services, which accounted for 53% of digitally enabled services exports from the EU to the United States and 42% of digitally-enabled services from the United States to the EU in 2015. The second most important category consists of royalties and license fees, most of which are paid on industrial processes and software, underscoring how integral such transatlantic inputs are to production processes in each economy. For the United States, the larger share of royalties and license fees (33%) reflects strong European demand for U.S.-produced television and film.[16] The third largest digitally-enabled services export category for each side is financial services.

Digitally-Enabled Services Supplied Through Foreign Affiliates

The digital economy has transformed the way trade in both goods and services is conducted across the Atlantic and around the world. Even more important, however, is the delivery of digital services by U.S. and European foreign affiliates. In fact, affiliate sales of digitally-enabled services has exploded on both sides of the Atlantic in recent years — another indicator reinforcing the importance of foreign direct investment, rather than trade, as the major driver of transatlantic commerce.

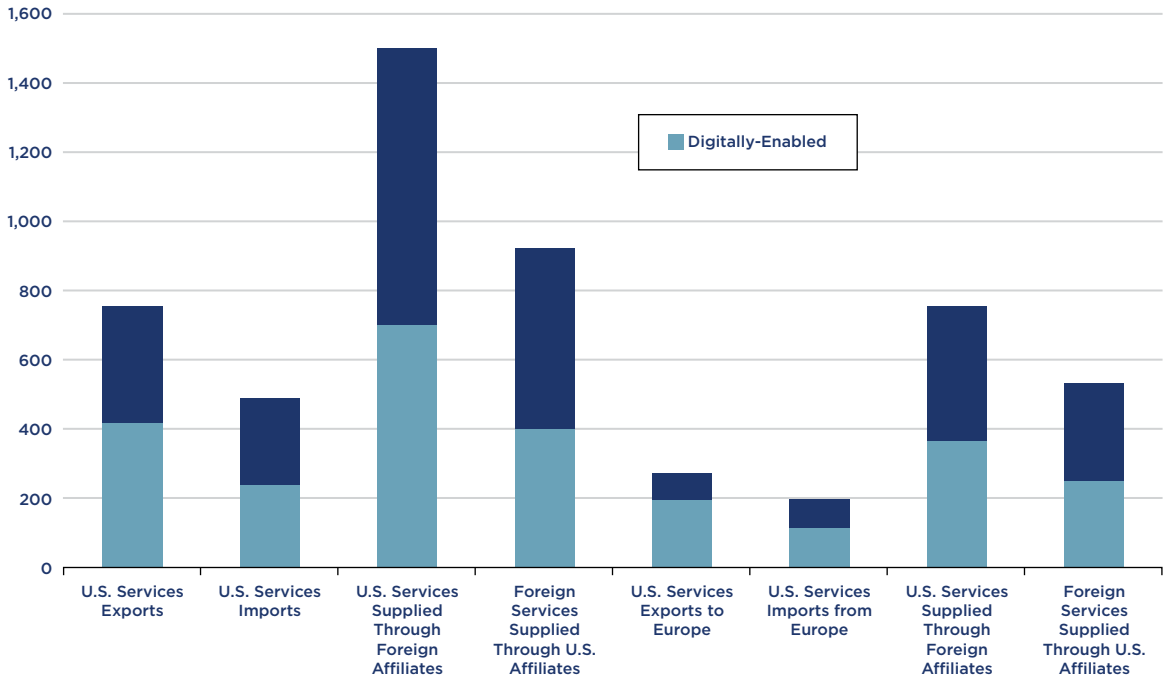
Table 2.1.9 underscores the relative importance of digitally-enabled services supplied by affiliates of U.S. companies located in Europe and affiliates of European companies in the U.S., versus U.S. and European exports of digitally-

TABLE 2.1.8: U.S. TRADE IN DIGITALLY-ENABLED SERVICES, 2015 (BILLIONS OF DOLLARS)



In 2015 the BEA redefined some sector categories so earlier data sets do not correspond exactly to later data sets.
Source: Bureau of Economic Analysis.
Data as of September 15, 2016.

TABLE 2.1.9: U.S. DIGITALLY-ENABLED SERVICES TRADE AND SERVICES SUPPLIED THROUGH FOREIGN AFFILIATES, 2015 ($ BILLIONS)



**Affiliate data are for 2014, the latest available year.*
Sources: U.S. Bureau of Economic Analysis.

enabled services. In 2014 U.S. affiliates in Europe supplied $428 billion in digitally-enabled services, whereas European affiliates in the United States supplied $270 billion in digitally-enabled services. Digitally-enabled services supplied by U.S. affiliates in Europe were 2.3 times greater than U.S. digitally-enabled exports to Europe, and digitally-enabled services supplied by European affiliates in the United States were 2.4 times greater than European digitally-enabled exports to the United States.

The significant presence of leading U.S. service and technology leaders in Europe underscores Europe's position as the major market for U.S. digital goods and services. Table 2.1.10 underscores this dynamic. In 2014, Europe accounted for almost two-thirds of the $228.4 billion in total global information services supplied abroad by U.S. multinational corporations through their majority-owned foreign affiliates. This is not surprising given the massive in-country presence of U.S. firms throughout Europe, with outward U.S. FDI stock in information overwhelmingly positioned in Europe. Roughly 65% of U.S. overseas investment in the "information" industry was in Europe in 2014.

Inter-firm Trade in the Transatlantic Digital Economy

While affiliate sales are a more important means of delivery for digital services and digitally-enabled services than cross-border trade, the two modes of delivery are more complements than substitutes, since foreign investment and affiliate sales increasingly drive transatlantic trade flows. The fact that digital services and digitally-enabled services are following this same broad pattern of transatlantic commercial flows reinforces our point that intra-firm trade is critical to the transatlantic economy. Nearly 40% of data flows between the United States and Europe are over business and research networks.[17] Companies rely on cross-border, intra-firm data flows to manage their communications, finances, data centers, human resources and supply chains, access software, and build synergies in research, development and other tasks among affiliates across the transatlantic space. These activities spur innovation and create economic value and are important attributes of the transatlantic digital economy, but are not captured adequately by national statistics.

TABLE 2.1.10: INFORMATION SERVICES SUPPLIED ABROAD BY U.S. MULTINATIONAL CORPORATIONS THROUGH THEIR MAJORITY-OWNED FOREIGN AFFILIATES [MOFAS] ($ MILLIONS)

	2006	2007	2008	2009	2010	2011	2012	2013	2014
Canada	3,595	4,140	3,971	5,996	6,316	7,135	7,595	7,401	8,725
Europe	67,270	76,156	85,450	84,117	96,310	110,525	119,123	120,796	147,123
France	4,045	3,794	4,475	4,713	4,582	5,013	4,768	5,258	5,715
Germany	5,260	6,031	6,104	6,456	7,143	7,798	7,970	10,599	12,086
Netherlands	5,925	8,152	9,980	8,674	8,719	9,313	10,196	9,117	10,900
Switzerland	2,871	2,527	3,197	3,747	4,034	4,419	5,243	4,778	6,051
United Kingdom	28,073	30,500	31,479	29,906	24,941	26,446	25,996	23,876	29,326
Latin America and Other Western Hemisphere	7,255	10,845	13,165	13,798	17,578	20,943	21,887	21,751	21,083
Australia	5,722	6,365	6,369	5,961	6,852	6,960	5,531	7,735	8,380
Japan	3,447	(D)	6,224	7,856	4,575	4,828	5,204	5,807	7,505
Other Asia-Pacific and MENA Countries	5,217	(D)	(D)	8,875	10,215	11,947	13,244	15,882	17,500
TOTAL	**92,507**	**(D)**	**(D)**	**126,603**	**141,846**	**162,338**	**172,583**	**179,372**	**228,396**

(D) indicates that the data in the cell have been suppressed to avoid disclosure of data of individual companies.
Source: Bureau of Economic Analysis.

Endnotes

1. See Daniel S. Hamilton, *Europe 2020. Competitive or Complacent?* (Washington, DC: Center for Transatlantic Relations, 2011, Chapter 2); Bradford Jensen and Lori Kletzer, *Tradable Services: Understanding the Scope and Impact of Services Outsourcing.* (Washington, DC: Institute for International Economics, 2005).
2. UNCTAD, which has been working to improve measurement of digital economy concepts for over a decade, is promoting an official definition of ICT-enabled services that includes "services that can be delivered remotely," such as: ICT-services (telecommunications services, computer services, and licenses to reproduce and/or distribute computer software); sales and marketing, management, administration, and back office services; insurance and financial services; engineering; R&D; education; and "any other service that can be delivered remotely." ICT-enabled services are "services with outputs delivered remotely over ICT networks" and "include activities that can be specified, performed, delivered, evaluated and consumed electronically." Alexis N. Grimm, "Trends in U.S. Trade in Information and Communications Technology (ICT) Services and in ICT-Enabled Services," Survey of Current Business, May 2016, https://www.bea.gov/scb/pdf/2016/05%20May/0516_trends_%20in_us_trade_in_ict_serivces2.pdf; Timothy J. Sturgeon, Torbjörn Fredriksson, Scarlett Fondeur, and Diana Korka, *International Trade in ICT Services and ICT-Enabled Services: Proposed Indicators from the Partnership on Measuring ICT for Development* (Geneva, Switzerland: United Nations Conference on Trade and Development (UNCTAD) Division on Technology and Logistics, Science, Technology and ICT Branch, ICT Analysis Section, October 2015).
3. The BEA approach draws on work by UNCTAD and the OECD. See BEA International Data, https://www.bea.gov/iTable/index_ita.cfm; Jessica R. Nicholson, "New BEA Estimates of International Trade in Digitally Enabled Services," May 24, 2016, Bureau of Economic Analysis, http://www.esa.doc.gov/economic-briefings/new-bea-estimates-international-trade-digitally-enabled-services.
4. https://www.ntia.doc.gov/files/ntia/publications/measuring_cross_border_data_flows.pdf; United States International Trade Commission, "Digital Trade in the U.S. and Global Economies, Part 2", Pub.4485, Investigation No.332-540, August 2014, p.47.
5. Jessica R. Nicholson and Ryan Noonan, "Digital Economy and Cross-Border Trade: The Value of Digitally-Deliverable Services." Washington, DC. U.S. Department of Commerce, Economics and Statistics Administration, ESA Issue Brief # 01-14, January 27, 2014, available at http://www.esa.doc.gov/sites/default/files/digitaleconomyandcross-bordertrade.pdf.
6. For more, see Joshua P. Meltzer, "The Importance of the Internet and Transatlantic Data Flows for U.S. and EU Trade and Investment," Brookings Institution, Global Economy and Development Working Paper 79, October 2014; Ryan Noonan, "Digitally Deliverable Services Remain an Important Component of U.S. Trade," Washington, DC. U.S. Department of Commerce, Economics and Statistics Administration, May 28, 2015, available at http://www.esa.gov/economic-briefings/digitally-deliverable-services-remain-important-component-us-trade
7. Ibid; Meltzer, op. cit.
8. Given the difficulty of measuring "digital services", statistics are likely to underestimate their extent. https://www.bea.gov/scb/pdf/2016/12%20December/1216_international_services.pdf; Grimm, op. cit.; Nicholson, op. cit.
9. Ibid.; Grimm, op. cit.; Nicholson, op. cit.
11. Jessica R. Nicholson, "ICT-Enabled Services Trade in the European Union," ESA Issue Brief #03-16, U.S. Department of Commerce, Economics and Statistics Administration, August 31, 2016, http://www.esa.doc.gov/sites/default/files/ICT-Enabled%20Services%20Trade%20in%20the%20EU_0.pdf.
12. Ibid.
13. Nicholson, op. cit.
14. Ibid.
15. intellectual property not included elsewhere, or n.i.e. Ibid.
16. Ibid.
17. Growing the Trans-Atlantic Digital Economy," Remarks by Catherine A. Novelli, Under Secretary for Economic Growth, Energy, and the Environment, Lisbon Council, Brussels, Belgium, June 2, 2015, http://www.state.gov/e/rls/rmk/243086.htm.

CHAPTER 2

E-Commerce

Another way to measure transatlantic digital connections is to look at electronic commerce. This complements our lens of digitally-enabled services, because most digital sales and purchases are delivered physically or in person — not digitally.[1]

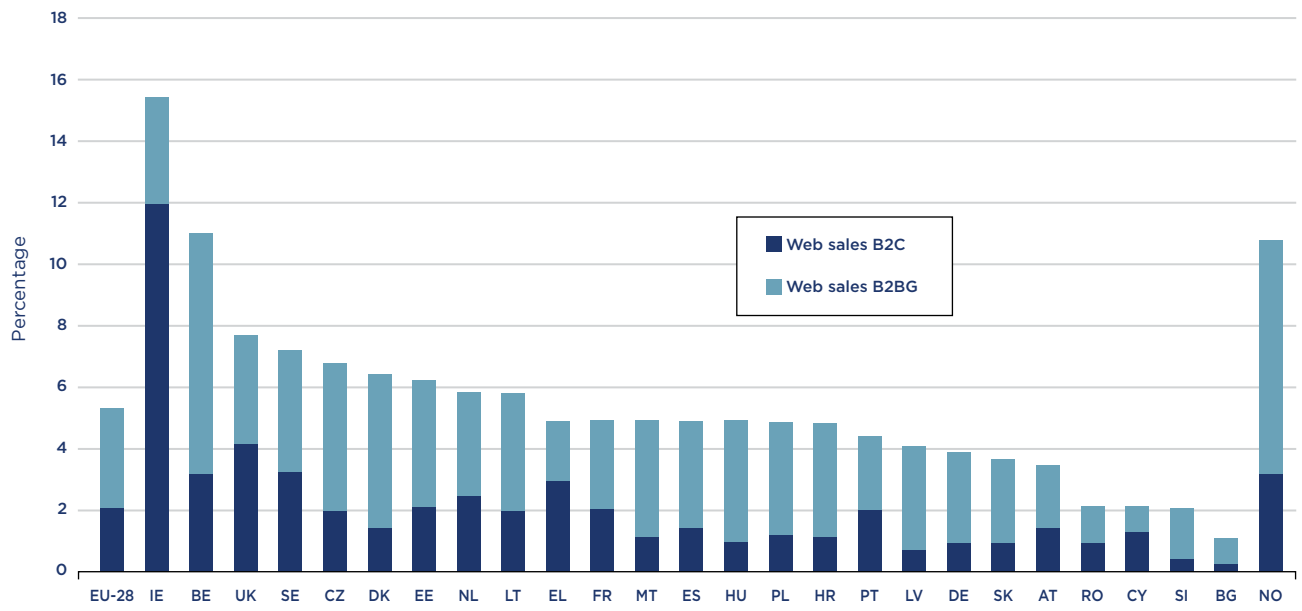
Here again we run into some definitional and data challenges. Most estimates of e-commerce do not distinguish whether such commerce is domestic or international. In addition, many metrics do not make it clear whether they cover all modes of e-commerce (See Box 2.2.1) or only the leading indicators of business-to-business (B2B) and business-to-consumer (B2C) e-commerce. Finally, there are no official data on the value of cross-border e-commerce sales broken down by mode; official statistics on e-commerce are sparse and usually based on surveys rather than on real data.[2]

Nonetheless, we can evaluate and compare many different estimates and surveys that have been conducted. McKinsey Global Institute, for instance, estimates that 600 million individuals around the world participate in cross-border e-commerce, and the Ecommerce Foundation expects that number to climb to almost 1 billion in 2020.[3]

Combined B2B and B2C Cross-Border E-Commerce

McKinsey concludes that B2B and B2C e-commerce combined reached $2.2 trillion in 2015, or 12% of total goods trade. And while goods trade growth has flattened worldwide, the share enabled by e-commerce is growing 27% per year.[4] McKinsey did not separate out transatlantic e-commerce trade in goods, but a substantial portion of this global figure is undoubtedly between the EU and the United States. Nearly half of all U.S. companies polled by

TABLE 2.2.1: TURNOVER FROM WEB SALES BROKEN DOWN BY B2BG AND B2C



Source: Eurostat.[5] B2BG means business-to-business and government.

BOX 2.2.1: TYPES OF E-COMMERCE

Business-to-business (B2B). B2B e-commerce involves companies doing business with each other, such as manufacturers selling to distributors and wholesalers selling to retailers. B2B accounts for the bulk of the value of e-commerce, and is much larger than the other modes. There are various specialized B2B platforms, typically catering to certain industries or value chains. B2B e-commerce was well underway already in the 1970s, before the World Wide Web was created, via Electronic Data Interchange (EDI), an electronic communication method that provides standards for exchanging data such as purchase orders, invoices and shipping notices.

Business-to-consumer (B2C). B2C e-commerce involves businesses selling to the general public, typically utilizing shopping cart software, through a wide range of digital channels, including dedicated e-commerce websites, social networks, crowdsourcing platforms, mobile applications and more. Consumers may buy physical goods or digital products and services. Although smaller in value than B2B e-commerce, B2C e-commerce is what most people think of when they hear the term 'e-commerce'.

Consumer-to-consumer (C2C). C2C e-commerce takes place within online classified ads, forums, marketplaces or auctions where individuals can buy and sell goods or services. While smaller than B2B and less traditional than B2C, C2C e-commerce is exploding due to the prominent role played by digital platforms in such exchanges. It has been characterized variously as the 'sharing', or 'collaborative' or 'gig' economy, or as peer-to-peer (P2P) e-commerce. Because of its transformative potential, we consider it on its own in the next section of our study.

Consumer-to-business (C2B). C2B includes types of e-commerce in which individuals sell products or services to businesses, or in which consumers post a price for a service or a set budget for a project, and companies bid on the service or project. Examples include Priceline, Elance, Zonzoo, Fotolia, and Google Adsense.

Government-related e-commerce. These are forms of e-commerce that involve transactions with government agencies, such as obtaining or renewing licenses, filing taxes or registering business. Sub-categories include G2G (Government-to-Government), such as the Schengen Information System; G2B (Government-to-Business), such as AEPM or Certificado Digital; B2G (Business-to-Government), such as public procurement; G2C (Government-to-Citizen) such as e-government, eDNI, or USA.gov; or C2G (Citizen-to-Government), such as Agencia Tributaria, Spain's online tax agency. This category is difficult to measure and not central to our transatlantic focus, and so is beyond the scope of this report.

Sources: UNCTAD, U.S. International Trade Commission, Digitsmith.[6]

the U.S. International Trade Commission indicated that they had an online trading relationship with the European Union,[7] and almost half say that Europe is the region outside North America where they focus their cross-border strategy first, far ahead of other regions. Over half of European companies also focus first on North America as their primary e-commerce market outside of Europe, again far more than on other regions.[8]

Still, e-commerce, especially via cross-border sales, is still emerging. Among the EU-28, one out of five enterprises made e-sales in 2015 (Table 2.2.1). Enterprises making e-sales ranged from highs of 30% in Ireland, 29% in Denmark and 28% in Germany and Sweden, to a low of 7% in Romania.[9]

While the European Single Market offers an opportunity for more vigorous cross-border e-commerce within the EU, and while 57% of European internet users shop online, European markets remain fragmented and the potential for cross-border e-commerce has not yet been fully exploited. Only 8% of EU enterprises made e-sales to other EU countries in 2014, and only 16% of consumers shopped online from another EU country in 2015 — although according to Eurostat that figure jumped 33% from just two years earlier.

In Ireland, the EU's e-sales leader, 17% of enterprises sold to customers in other EU countries in 2014. For many other countries, however, the potential was much higher. For example, enterprises in Sweden and Denmark rank high in e-sales (28% and 27% respectively) but only 10% (each) of them sold to other EU countries. Outside the EU, Norway has the highest potential for enterprises to expand into foreign markets, with 29% of enterprises making e-sales, but only 5% to customers in EU countries.[10]

Table 2.2.2 shows combined B2B and B2C cross-border e-commerce of selected European countries. It shows that most European cross-border e-commerce is conducted mainly with other European countries, and highlights the outsized role of Germany and the UK. Germans rank as the number one cross-border e-customers for companies based in Turkey, Sweden, Poland, the Netherlands, Italy, France, Denmark and Belgium and among the top five for the rest. German companies are the number one e-suppliers to customers in Sweden, the Netherlands, Greece and Denmark. Britons rank among the top five e-customers for all the European countries included in this table except Greece, and UK-based companies are among the top five e-suppliers for all except Greece and Denmark.

Table 2.2.2 also refutes European angst that U.S. companies are dominating Europe's digital economy, while underscoring the importance of the transatlantic link to the digital economy on each side of the Atlantic. U.S. companies play a significant, yet by no means dominant, role in cross-border e-commerce with Europe. The United States is the number one e-customer for German and UK-based companies, and is among the top five for companies based in Sweden, Italy, France and Denmark. U.S. companies, in turn, are the number one e-suppliers for customers in the United Kingdom and Turkey, and are among the top five for customers in Germany, France, Italy, the Netherlands, Poland and Spain.

Table 2.2.3 shows combined B2B and B2C cross-border e-commerce for North America. It underscores the importance of intra-North American e-commerce for all three countries. The United Kingdom, however, is the top foreign e-market in the world for U.S.-based companies, accounting for almost a quarter of all U.S. e-commerce exports. Germany ranks fourth as an e-supplier to the United States. These two tables, as well as Table 2.2.4, also highlight China's importance to both North America and Europe when it comes to e-commerce. Americans are the number one e-customer for Chinese-based companies, and U.S.-based companies are the number one e-supplier to Chinese customers. Germany ranks as the most important European market for Chinese e-commerce exports, and fourth overall; and also as the most important European e-supplier to Chinese customers, and as the third overall. China ranks as the third most important e-commerce market for UK-based companies and ranks just behind the United States as the second largest e-supplier to British customers. China is also a significant e-supplier to Turkey, and in fact is the largest e-supplier to Spain.

Table 2.2.5 shows the value of combined B2B and B2C cross-border e-commerce for selected countries, as well as the cross-border share of each country's total e-commerce sales. The United Kingdom again emerges as a major e-commerce player, with cross-border e-commerce approximating that of the United States, which has a much larger economy. Yet cross-border e-commerce accounts for a larger share of overall e-commerce sales in Spain (31.6%) and Italy (27.9%) than in the UK. And despite Germany's importance in e-commerce, France's cross-border e-commerce exceeds that of its neighbor, both in absolute terms and as a share of total e-commerce sales. Small open economies will tend to have greater share of cross-border activity than larger economies, and that is borne out by the relatively high degree of cross-border e-commerce as a share of overall e-commerce sales for countries such as Sweden (45.2%) and Norway (38.8%). Canada's high share of cross-border e-commerce (36.8%) is due to its proximity and deep integration with the United States, which accounts for

TABLE 2.2.2: EUROPEAN AND TRANSATLANTIC CONNECTIONS: COMBINED B2B AND B2C CROSS-BORDER E-COMMERCE, SELECTED EUROPEAN COUNTRIES, 2015

EXPORTS		IMPORTS	
United Kingdom	1. United States (11%) 2. Germany (9.8%)	United Kingdom	1. United States (24%) 2. China (21%) 3. Germany (9%)
Germany	1. United States (8.6%) 2. France (8.5%) 3. United Kingdom (7.1%) 4. China (6.9%)	Germany	1. United Kingdom (14%) 2. United States (13%) 3. China (12%) 4. Netherlands (5%)
France	1. Germany (15%) 2. Benelux (8.3%) 3. United Kingdom (7.3%) 4. United States (7.1%)	France	1. United Kingdom (17%) 2. Germany (14%) 3. United States (10%) 4. China (10%)
Italy	1. Germany (12%) 2. France (9.8%) 3. United States (8.8%) 4. United Kingdom (5.5%) 5. Switzerland (4.4%)	Italy	1. United Kingdom (16%) 2. Germany (15%) 3. China (8%) 4. United States (7%) 5. France (5%)
Spain	1. France (14%) 2. Germany (11%) 3. Portugal (8.4%) 4. United Kingdom (7.3%) 5. Italy (7.2%)	Spain	1. China (21%) 2. United Kingdom (12%) 3. United States (12%) 4. Germany (9%) 5. France (6%)
Poland	1. Germany (25%) 2. United Kingdom (6.3%) 3. Czechia (5.9%) 4. France (5.6%) 5. Italy (4.6%)	Poland	1. United Kingdom (7%) 2. Germany (7%) 3. United States (5%) 4. China (3%) 5. France (2%)
Turkey	1. Germany (10%) 2. Iraq (6.5%) 3. United Kingdom (6.2%) 4. France (4.7%)	Turkey	1. United States (36%) 2. China (30%) 3. Hong Kong (14%) 4. United Kingdom (11%) 5. Germany (9%)
Netherlands	1. Germany (22%) 2. Belgium-Luxembourg (16%) 3. United Kingdom (9.7%) 4. France (6.1%) 5. Italy (5.2%)	Netherlands	1. Germany (14%) 2. United States (11%) 3. United Kingdom (10%) 4. China (10%) 5. Russia (7.1%)
Sweeden	1. Germany (11%) 2. United Kingdom (7.7%) 3. Denmark (7.3%) 4. Norway (7.2%) 5. United States (6.4%)	Sweeden	1. Germany (17%) 2. Netherlands (8.1%) 3. Denmark (7.2%) 4. Norway (6.6%) 5. United Kingdom (6%)
Norway	1. United Kingdom (19%) 2. Germany (17%) 3. Netherlands (14%) 4. Sweden (6.7%) 5. France (6.1%)	Norway	1. Sweden (13%) 2. Germany (12%) 3. China (9.1%) 4. United Kingdom (6.5%) 5. Denmark (6.1%)
Denmark	1. Germany (14%) 2. Sweden (11%) 3. United Kingdom (7.8%) 4. United States (7.7%) 5. Norway (5.6%)	Denmark	1. Germany (20%) 2. Sweden (12%) 3. Netherlands (7.7%) 4. China (7.1%) 5. Norway (5.5%)
Belguim	1. Germany (15%) 2. France (15%) 3. Netherlands (14%) 4. United Kingdom (9.3%) 5. Italy (5.5%)	Belguim	1. Netherlands (25%) 2. Germany (7%) 3. United Kingdom (6%) 4. China (5%) 5. France (3%)

Source: Payvision, acapture 2016.

TABLE 2.2.3: NORTH AMERICA: COMBINED B2B AND B2C CROSS-BORDER E-COMMERCE, 2015

	EXPORTS		IMPORTS
United States	1. United Kingdom (24%) 2. Canada (17%) 3. Mexico (13%) 4. China (9.2%) 5. Japan (4.2%)	United States	1. China (20%) 2. Canada (15%) 3. Mexico (13%) 4. Germany (5.9%) 5. Japan (5.9%)
Canada	1. United States (74%) 2. China (4%) 3. United Kingdom (2.4%)	Canada	1. United States (55%) 2. China (11%) 3. Mexico (5.6%)
Mexico	1. United States (73%) 2. Canada (6%) 3. China (2%) 4. Spain (1.5%)	Mexico	1. United States (73%) 2. China (12%) 3. Hong Kong (8%) 4. Canada (7%)

Source: Payvision, acapture 2016.

three-quarters of Canada's e-commerce exports and over half of its e-commerce imports.

Business-to-Business (B2B) E-Commerce

Business-to-business (B2B) e-commerce accounts for the dominant share of global e-commerce and is therefore also likely to be the most important component of cross-border sales online. B2B generally involves multiple transactions among companies, and covers any type of transactions, such as that involving a manufacturer and wholesaler, or a wholesaler and a retailer.[11] Data on B2B e-commerce, however, are generally scarce. Official estimates put the value of global B2B e-commerce in 2013 at over $15 trillion, with three-quarters of the total accounted for by, in order of magnitude, the United States, the United Kingdom, and China.[12]

Forrester Research estimates B2B e-commerce sales to be more than twice the size of business-to-consumer (B2C) e-commerce. Forrester projects the B2B e-commerce market just in the United States alone to account for 12.1% of all B2B sales and to top $1.1 trillion in 2020 — twice the size of the U.S. B2C e-commerce market and slightly more than all global cross-border B2C e-commerce sales.[13] B2B e-commerce in China in 2015 also dwarfed B2C e-commerce, accounting for 70% of revenue. Payvision expects China to emerge as the largest B2B e-commerce market with an estimated potential of $2.1 trillion by 2020.[14] The European B2B e-commerce sector is also much larger and growing faster than the B2C market, with potential for even greater growth, as more than 50% of European companies make purchases through e-commerce, but less than 22% actually sell through e-commerce.[15]

Cross-border B2B e-commerce, however, accounts for a much smaller share — in 2014 it was an estimated $1.8-$2 trillion market.[16]

In Spain, for example, of total web sales of €61 billion between June 2014 and June 2015, 67% were B2B, 31% B2C and 2% B2G. By destination, 83% of sales were within Spain, 13% to the rest of the EU, and only 4% to the rest of the world.[17]

B2B e-commerce is of particular importance to the U.S. and European manufacturing industries, as their supply chains have become longer and more complex, often straddling borders. Such industries have been engaged in B2B e-commerce for decades, even before the World Wide Web was created, by relying on Electronic Data Interchange (EDI), an electronic communication method that provides standards for exchanging data such as purchase orders, invoices and shipping notices.[18] As of 2013, the internet-generated share of B2B shipments/sales/revenues was 57% for manufacturing, 26.5% for merchant wholesalers, and only 3.5% for services.[19]

TABLE 2.2.4: CHINA: COMBINED B2B AND B2C CROSS-BORDER E-COMMERCE, 2015

EXPORTS - TOP MARKETS	IMPORTS - TOP SUPPLIERS
1. United States (18%)	**1. United States (8.8%)**
2. Hong Kong (11%)	2. Japan (8.5%)
3. Japan (7%)	**3. Germany (6.3%)**
4. Germany (4.3%)	4. Australia (5.4%)

Source: Payvision, acapture 2016.

TABLE 2.2.5: COMBINED B2B AND B2C CROSS-BORDER E-COMMERCE BY VALUE ($ BILLION), SELECTED COUNTRIES, 2015

	CROSS-BORDER E-COMMERCE VALUE*	TOTAL E-COMMERCE SALES	SHARE OF CROSS-BORDER E-COMMERCE OF TOTAL E-COMMERCE
United States	40.8	340.6	12.0%
United Kingdom	38	155	24.5%
France	14.7	71.8	20.5%
Germany	11.3	66.2	17.1%
Canada	10.9	29.6	36.8%
Spain	5.9	18.7	31.6%
Italy	5.3	19	27.9%
Netherlands	2.4	11.5	20.9%
Sweden	2.4	5.3	45.2%
Norway	1.9	4.9	38.8%
Poland	1.7	9.3	18.3%
Turkey	1.3	7	18.6%
Belgium	1.2	4.2	28.6%
Denmark	1	4	25.0%
Greece	0.5	5	10.0%

** Estimate. Source: Payvision, acapture 2016.*

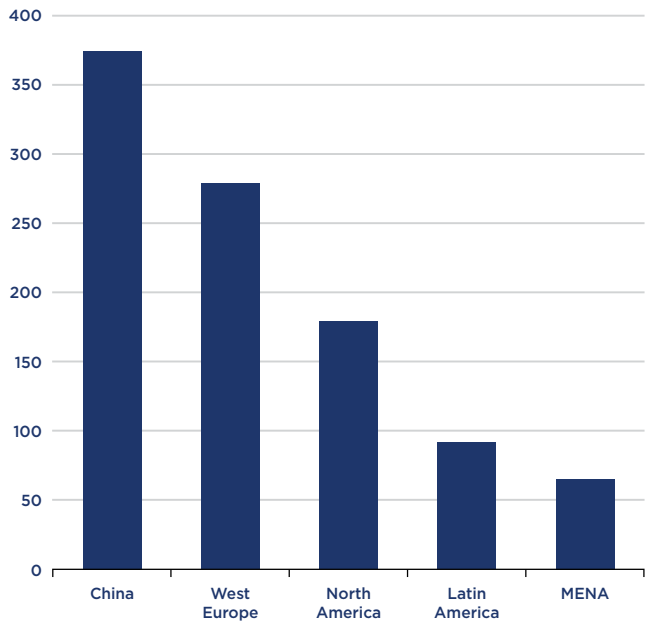
Companies that lead in B2C commerce do not tend to be as involved in B2B e-commerce. A notable exception is China's Alibaba, which is engaged in both domestic and international wholesale platforms. Its international B2B platform generated $761 million in revenue in 2014, with membership fees accounting for 88% and marketing services for the remaining 12%. One source estimated Chinese cross-border B2B ecommerce sales at $680 billion in 2014.[20]

Business-to-Consumer (B2C) E-Commerce

B2C e-commerce involves businesses selling to the general public through a wide range of digital channels, including dedicated e-commerce websites, social networks, crowdsourcing platforms, mobile applications and more. Although smaller in value than B2B e-commerce, B2C e-commerce is what most people think of when they hear the term 'e-commerce'.

Globally, B2C e-commerce transactions amounted to $1.9 trillion in 2014. In medium and low connectivity countries, e-commerce makes up to 5.2% or 2.3% of GDP respectively, and in developed countries it reaches up to 5.7% of GDP.[21] With 711 million digital shoppers — half the world total —

TABLE 2.2.6: DIGITAL BUYERS BY COUNTRY, 2015* MILLIONS OF PEOPLE



**Estimate.*
Source: eMarketer.

TABLE 2.2.7: RETAIL E-COMMERCE SALES (EXCLUDES TRAVEL, BILLIONS OF $)

	2014	2015	2016	2017	2018	2019
Worldwide	1,336	1,671	2,050	2,498	3,015	3,578
Asia-Pacific	647	878	1,152	1,488	1,892	2,336
North America	321	367	416	467	522	580
Western Europe	281	318	351	386	418	449
Central & Eastern Europe	43	52	63	74	86	99
Latin America	33	41	50	60	69	80
Middle East & Africa	11	15	19	23	29	35

Source: eMarketer Data as of December 2015.

TABLE 2.2.8: RETAIL E-COMMERCE SALES GROWTH (EXCLUDES TRAVEL)

	2015	2016	2017	2018	2019
Worldwide	25%	23%	22%	21%	19%
Asia-Pacific	36%	31%	29%	27%	23%
North America	14%	13%	12%	12%	11%
Western Europe	13%	11%	10%	8%	7%
Central & Eastern Europe	23%	19%	18%	16%	15%
Latin America	23%	22%	20%	15%	16%
Middle East & Africa	28%	27%	25%	23%	21%

Source: eMarketer Data as of December 2015.

TABLE 2.2.9: PROJECTED RETAIL E-COMMERCE SALES (EXCLUDES TRAVEL, BILLIONS OF $)

	2017	2018	2019
China	1,208	1,568	1,973
United States	432	482	535
United Kingdom	121	132	143
Japan	111	122	134
Germany	76	83	88
France	50	53	57
South Korea	47	51	54
Canada	35	40	45
Australia	22	24	26
Brazil	25	27	30
Russia	26	30	35
Spain	20	22	23
Italy	16	17	18
Norway	12	12	13
Sweden	11	12	13
Netherlands	11	12	13
Denmark	10	10	11
Finland	8	8	8

Source: eMarketer Data as of December 2015.

the Asia-Pacific region is the strongest B2C e-commerce region in the world. With turnover of $1.1 trillion, it ranked ahead of North America ($664.0 billion) and Europe ($505.1 billion). China increased its lead on the United States as the country with the highest B2C e-commerce turnover last year. With $766.5 billion, it ranked above the United States ($595.1 billion) and the UK ($174.5 billion). Together, these three countries account for 68% of total global B2C e-commerce turnover.[22]

B2C e-commerce represents another significant growth area for the transatlantic partnership. The share of e-commerce in GDP is at least 3.1% in North America and 2.6% in Europe (compared to 4.48% of Asia-Pacific GDP),[23] portending tremendous upside in the future. Already, of the top ten e-commerce markets in the world, six are transatlantic players. Ranked in order, China leads the way, followed by the United States, the United Kingdom, Japan, Germany, France, Canada, Russia, Spain and Australia. Table 2.2.6 shows that in terms of digital buyers, western Europe ranks second to China, with nearly 300 million shoppers counted as digital buyers in 2015 versus roughly 175 million in North America. Combined e-commerce sales in North America and Western Europe (including central and eastern Europe) totaled $645 billion in 2014, with North America sales of $321 billion and $281 billion in Europe, according to data from eMarketer, as presented in Table 2.2.7. The figure is on par with total ecommerce sales in Asia, and represents just the tip of the iceberg in terms of future B2C e-commerce if the United States and Europe can partner to create a dynamic and more integrated transatlantic digital market. Tables 2.2.8 and 2.2.9 show that double-digit growth rates in B2C e-commerce are expected over the next few years.

In terms of the share of B2C e-commerce in GDP per country, China and the UK are clearly above the rest, with a share of 7.1% and 6.1%, respectively. China's share is more than twice as high as that of the United States (3.3%).[24] Northern European countries score quite well in terms of

eGDP. Denmark (4.4%), Finland (3.5%), Norway (2.3%) and Sweden (2.2%) are all in the top 10.

Over the past six years the EU28 doubled their B2C e-commerce sales from €224.7 billion in 2011 to €455.5 billion in 2016. The UK, France and Germany together accounted for 60% of European e-commerce sales, and the top ten EU countries accounted for over 93% of total EU e-commerce sales.[25] Ecommerce Europe estimates that nearly 2.5 million European jobs are related directly and indirectly to the B2C e-commerce sector.[26]

Per capita, the UK leads; in 2015 the average e-consumer in the UK spent $4,018 online, considerably more than the average e-consumer in the United States ($3,428).[27] The British conduct about 17% of their online retail spending. Americans and Germans each follow at about 14%, followed by France and Sweden each at about 9%, with Spain, Poland and Italy hovering near 3-4%.[28] In 2015, the British in total spent €157.1 billion online — more than France (€64.9 billion), Germany (€59.7 billion) and Russia (€20.5 billion) combined. The UK accounts for more than one third of the entire European B2C e-commerce market.[29]

In chapter 3 we discuss the tremendous transformative potential that platform services are having on the U.S., European and global economies. Most of the focus on this "platform economy" has been to consumer-to-consumer (C2C) platform services, in which the platform companies act as intermediaries. Yet there is also a B2C platform economy in which the provider of the service and the operator of the intermediation channel are the same: users obtain the resources they need from one company, via its own platform, rather than through a different intermediary platform. An increasing number of traditional companies globally are using this new B2C business model to supply products to their consumers. Examples include Daimler (car2Go), BMW (DriveNow), and Hungarian company MOL's Bubi community bicycle scheme.[30]

Cross-border B2C

Today McKinsey estimates that 21% of B2C e-commerce transactions are cross-border. That share is projected to reach almost 30% by 2020, when international sales could hit $1 trillion, or slightly less than one-third of a global e-commerce market estimated to be $3.4 trillion. Cross-border e-commerce has also supplanted domestic e-commerce as the growth engine for B2C commerce.[31] For example, while online retail orders in the UK rose by 11.3% in January 2017, 32% of all orders were heading out of the UK.[32]

TABLE 2.2.10: TOP COUNTRIES' SHARE OF E-COMMERCE IN GDP

China	7.1%
UK	6.1%
South Korea	4.7%
Denmark	4.4%
Finland	3.5%
United States	3.3%
France	3.0%
EU 28	2.8%
Ireland	2.8%
Japan	2.8%
Czechia	2.6%
Netherlands	2.4%
Canada	2.3%
Norway	2.3%
Austria	2.2%
Sweden	2.2%
Germany	2.0%
Australia	1.8%
Spain	1.7%

GDP at market prices, GDP per capita at market prices and share of e-commerce in GDP, 2015. Sources: Eurostat, Ecommerce Foundation, IMF and World Bank, 2016.

The Asia-Pacific region not only leads in overall gross merchandise value, it is projected to lead in volume growth of cross-border e-commerce, contributing 53.6% of incremental trade volume between 2014 and 2020. Western Europe and North America trail at 18.9% and 14.4% respectively.[33]

Most of the EU's B2C e-commerce transactions are conducted between EU countries.[34] Between August and November 2016, however, for the first time a higher percentage of the UK's B2C e-commerce sales went to non-EU destinations, most likely due to the devaluation of the British pound following the UK's June 2016 referendum to leave the European Union. By December 2016, though, the EU had regained its position as the primary destination of UK cross-border B2C e-commerce sales.[35] In January 2017, 59% of the UK's cross-border B2C e-commerce sales were to buyers in other member states

TABLE 2.2.11: B2C CROSS-BORDER E-COMMERCE, 2015 [AT LEAST 1 PURCHASE OVER 1 YEAR], SELECTED COUNTRIES

UK	31%
US	21%
France	19%
Germany	18%
Russia	12%
Japan	10%
China	10%
Mexico	7%
Turkey	7%

Sources: eMarketer, Google & TNS: Consumer Barometer, Jul. 2015, EIU, Accenture analysis.

of the European Union.[36]

In terms of individual countries, however, the United States and UK are each other's most important cross-border B2C e-commerce markets. In 2016 49% of all U.S. digital shoppers buying across borders purchased from UK-based companies, followed by those from China (39%), Canada (34%), Hong Kong (20%) and Australia (18%).[37] Similarly, U.S. companies are the most important foreign online sellers to UK and German consumers. 70% of all UK digital shoppers buying across borders purchased from U.S.-based companies, followed by those in China (23%), Hong Kong (21%), Germany (19%), and Ireland (15%). 48% of all German digital shoppers buying across borders purchased from U.S.-based companies, followed by those in the UK (46%), Austria (33%), China (17%), and the Netherlands (16%).[38]

In terms of global cross-border B2C e-commerce sales, the United States and the United Kingdom are the leading buyers. Over a third of British online consumers purchase from other countries. China is the most popular market for consumers around the world to shop from, accounting for 26% of most recent cross-border purchases, followed by the United States (16%), Germany (15%) and the UK (15%).[39] The United States and China are the main markets for cross-border shoppers from the Asia Pacific and from Canada, whereas China is the overall favored cross-border market for Europeans. In some European countries, however — for instance Luxembourg, Belgium, and Austria — cross-border shoppers mainly buy from neighboring countries with shared languages.[40] Switzerland has tended to fall into this category, but between 2012 and 2016 online purchases at foreign commerce websites doubled, with most of the

TABLE 2.2.12: TOP TEN COMPANIES BY RETAIL E-COMMERCE REVENUE, 2014

	COMPANY	COUNTRY	TOTAL		INTERNATIONAL		GMV
			US$M	% of Total Sales	US$M	% of Total E-Commerce Sales	US$M
1	Amazon	US	83,391	94%	33,307	40%	83,391
2	JD Com.Inc	China	18,535	100%	<1%	<1%	41,937
3	Walmart	US	12,200	3%	3,440	28%	12,200
4	Apple	US	10,200	6%	6,355	62%	10,200
5	AliBaba	China	9,921	81%	285	3%	394,257
6	eBay	US	8,817	49%	4,633	53%	82,954
7	Otto Group	Germany	8,622	54%	3,051	35%	8,622
8	cnova	Netherlands	4,619	100%	2,499	54%	6,005
9	Best Buy	US	3,533	9%	...	11%	3,533
10	Rakuten	Japan	3,431	61%	468	14%	22,141
	TOTAL		**163,269**	**19%**	**54,038**	**33%**	**665,240**

Note: Excluding companies principally involved in the food industry. Source: Porges and Enders, adapted from company reports.[41]

growth due to Swiss consumers shopping online from Chinese websites.[42]

One survey estimates that by 2018 there will be 41.8 million online cross-border shoppers in the United States, spending $80.2 billion; 18.5 million online cross-border shoppers in the UK spending $23.1.0 billion; and 15.8 million online cross-border shoppers in Germany spending $11.77 billion.[43]

Accenture estimates that B2C cross-border e-commerce trade volume will account for 34% ($261 billion) of the $767 billion in total B2C e-commerce it expects to be conducted in Europe in 2020; 19% ($243 billion) of $918 billion in total B2C e-commerce it expects to be conducted in North America; and 31% ($476 billion) of the $1.535 trillion in B2C e-commerce it expects to be conducted in the Asia-Pacific region in 2020.[44]

Companies

The top 10 companies by retail e-commerce revenues are shown in Table 2.2.12. Their combined online Gross Merchandise Value (GMV) is estimated to account for roughly half the global retail e-commerce market.[45]

Of the top 10, five are from the United States and two from Europe. The list includes companies whose core business is e-commerce (e.g., Amazon, JD.com, AliBaba and cnova) as well as traditional retailers, for whom e-commerce still accounts for a relatively small share of total revenue (e.g., Walmart, Best Buy). Note that Apple does not disclose its total online revenue so the figures shown are only for its online music store.[46]

Amazon, eBay and Alibaba were the top three websites used by cross-border consumers in almost all countries. Overall, they accounted for 65% of most recent cross-border purchases.[47] About 40% of Amazon's net sales in 2014 came from sales outside of North America. Alibaba, the leading e-commerce platform in China that includes marketplaces for business to business (B2B); business to consumer (B2C); and peer to peer (P2P) e-commerce, posted gross merchandise value of $370 billion in 2014, larger than Amazon and eBay combined.[48]

There is another striking difference in the way that companies derive their cross-border e-commerce revenues. Several companies receive over half of their estimated retail e-commerce from international subsidiaries (e.g., Apple, eBay and cnova). By contrast, for the top Chinese e-commerce companies, only a fractional amount is related to international undertakings. Table 14 underscores that the major Chinese retail e-commerce companies are oriented almost exclusively to their home market, while sales of U.S. and European companies are far more tied to buyers abroad.[49]

Amazon was the best-selling e-commerce company in Europe in 2014, the last year of available comparative data. With a total annual turnover of €24.2 billion. Amazon's European-based workforce totals over 50,000 today, and the company has announced that it will create 15,000 new full-time jobs in Europe in 2017.[50] German e-commerce company Otto, which ranked second at €6.5 billion, also ranks among the world's top five largest ecommerce companies.[51]

Consumer-to-Business (C2B) and Consumer-to-Consumer (C2B) E-Commerce

While B2B and B2C remain the prevalent modes of e-commerce activity, from a transatlantic perspective two other models — consumer-to-business (C2B) and consumer-to-consumer (C2C), sometimes known as peer-to-peer (P2P) — bear watching, as they represent fast-growing emergent sectors of the digital economy.

C2C still commands a small share of the e-commerce market, but given the rise of the "platform economy," it has the potential to catch up and surpass the B2C model within the next 8 years. C2C, super-empowered by the platform economy, is so potentially transformative for the transatlantic economy as a whole that we explore it in greater depth in the next chapter on the transatlantic platform economy.

C2B is also still small, yet is important for different reasons, particularly because it is a sector in which Asia, and specifically China, could steal the march on the United States and Europe.

The C2B model reverses the B2C model; the whole process is consumer-driven. Designers, producers and consumers connect directly via the internet, attuned to consumer needs and preferences to business. Under such model, businesses profit from the willingness of consumers to name their own price or contribute data or marketing to the company, while consumers profit from flexibility, direct payment, or free or reduced-price products and services. Individuals now have access to technologies (digital printing and acquisition technology, high performance computer, powerful software) that were once only available to large companies, enabling them to offer new types of services and products to businesses, and when enable businesses in turn to provide more tailored products and services, build direct relationships with consumers, optimize their supply chains with flexible production lines, and reduce production costs and risks.

Products are produced in smaller batches and delivered to customers in a timely manner.[52] C2B products can range from apparel and furniture to travel, car rental, weddings, to 3D printing.

China is embracing C2B with vigor. Half of China's Haier Group's refrigerator orders are now based on customized consumer designs. Internet giants such as Alibaba have also placed increasing focus on this new game-changing business model. Already in 2014 Alibaba founder Jack Ma has characterized C2B as "a new customer-driven disruption." Zeng Ming, Executive Vice President of Alibaba Group, has declared that "B2C is only a transitional business model, the real e-commerce model in the future is C2B."[53] Even Chinese Premier Li Keqiang has been a vocal advocate of the approach.

TABLE 2.2.13: ONLINE TURNOVER INTERNET RETAILERS IN EUROPE

COMPANY	COUNTRY OF ORIGIN	ONLINE TURNOVER IN EUROPE (€ BILLION)
Amazon	U.S.	24.230
Otto	Germany	6.452
Apple	Luxembourg	3.750
Tesco	UK	3.533
Home Retail Group	UK	2.328
Cdiscount	France	2.235
Zalando	Germany	2.214
E. Leclerc	France	1.900
Shop direct	UK	1.876
Next Plc	UK	1.863
Carrefour	France	1.800
Vente Prive	France	1.700
Asda	UK	1.700
Metro Group	Germany	1.500
John Lewis	UK	1.460

Source: Retail-index.com, 2016.[54]

The C2B approach is of course familiar in the West. Priceline popularized the "name your own price" model, where travelers name their price for airline tickets, hotel rooms, and car rentals. C2B business models include reverse auctions, in which customers name the price for a product or service they wish to buy. Another form of C2B occurs when a consumer provides a business with a fee-based opportunity to market the business's products on the consumer's blog. For example, food companies may ask food bloggers to include a new product in a recipe, and review it for readers of their blogs. YouTube reviews may be incentivized by free products or direct payment. This could also include paid advertisement space on the consumer website. Google Adwords/Adsense has enabled this kind of relationship by simplifying the process in which bloggers can be paid for ads. Services such as Amazon Affiliates allow website owners to earn money by linking to a product for sale on Amazon.[55] Platforms like Fotolia or Google Video are also very good examples of emerging C2B models. On these websites, anyone is able to sell digital contents (photos, images, icons, animation, and video) to companies.[56]

BOX 2.2.2: M-COMMERCE VS. E-COMMERCE

Definitional confusion abounds in the digital world. E-commerce refers to the exchange of any product or service across the internet while using electronic mode. It includes all those activities that help in concluding the transaction, i.e. transportation, banking, insurance, warehousing, advertising, etc. M-commerce is an upgraded subset of e-commerce. It refers to commercial activities with the help of cellular devices. It includes browsing, buying, selling, dealing, ordering, paying and many other activities.[57] E-commerce is available only to places with electricity connected to the net, whereas m-commerce is free from such limits. Video conferencing, for instance, has become possible with m-commerce even in places where there is no internet.

Most consumers today use mobile devices to make purchases or transactions, and revenue from mobile purchases now exceed desktop purchases. European retail merchants report that up to 80% of consumer browsing occurs via mobile devices, both smartphones and tablets,[58] and 54% of European consumers regularly use mobile devices to make payments. The number of European consumers making mobile payments tripled in 2015 alone.[59] M-commerce sales are projected to grow from around $204 billion in 2014 to $626 billion in 2018.[60] M-commerce accounted for 30% of all e-commerce sales in the U.S. in 2015 — a 38.7% increase over 2014, putting revenues to just over $104 billion.[61] Total m-commerce sales of $117.8 billion in 2015 accounted for 16% of all retail dollars spent in the United States.[62] M-commerce also keeps growing in the United Kingdom: it accounted for more than €30 billion in 2016, a 25% increase from 2015.[63] E-commerce is becoming increasingly dependent on m-Commerce: 49% of all UK e-commerce transactions took place on a mobile device during the first quarter of 2016 and 39% of all e-commerce transactions involved using multiple devices during the purchase journey.[64]

Amazon was the best-selling m-commerce company in the world in 2013. With a total annual turnover of $16.8 billion through mobile devices, such as smartphones and tablets, Amazon was ahead of Apple ($14.0 billion) and Chinese online shopping mall JD ($5.8 billion). With a total m-commerce turnover of nearly $1.4 billion, German online shop Otto is the only European company in this top 10, which is mainly dominated by American companies. The difference between the top 2 companies and the rest is significant, but it is expected that particularly Chinese companies will more and more close this gap over the next few years.[65]

The digital frontier continues in fast-forward, however. M-commerce, as a single channel, already seems to be giving way to omnichannel retail, where customers can access contextual information without having to sign in across multiple devices, accounts or platforms.[66]

TABLE 2.2.14: MOBILE SHARE OF RETAIL E-COMMERCE TRANSACTIONS, SELECTED COUNTRIES

COUNTRY	M-COMMERCE SHARE
United Kingdom	52%
Japan	51%
Australia	45%
South Korea	44%
Netherlands	39%
Germany	38%
United States	36%
Spain	35%
Italy	30%
France	28%
Brazil	24%
Russia	22%

All categories, excluding apps, 4th quarter, 2016. Source: Criteo.[67]

Endnotes

1. For official definitions and discussion of e-commerce, see U.S. International Trade Commission, *Digital Trade in the U.S. and Global Economies, Part 2*, Publication Number 4485, August 2014, https://www.usitc.gov/publications/332/pub4485.pdf; U.S. Census Bureau, https://www.census.gov/programs-surveys/e-stats.html; OECD, "E-commerce uptake," http://www.oecd-ilibrary.org/sites/sti_scoreboard-2011-en/06/10/index.html.
2. See UNCTAD, "In Search of Cross-Border E-Commerce Trade Data," Technical Note NO 6 Unedited, April 2016, available at http://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d06_en.pdf.
3. Ecommerce Foundation, "Global B2C E-Commerce Report 2015, https://www.ecommerce-europe.eu/app/uploads/2016/07/global-b2c-e-commerce-report-2015-light.pdf.pdf; James Manyika, Susan Lund, Jacques Bughin, Jonathan Woetzel, Kalin Stamenov, and Dhruv Dhingra, *Digital globalization: The new era of global flows*, McKinsey Global Institute, March 2016, pp. 8, 23.
4. Ibid, p. 34.
5. http://ec.europa.eu/eurostat/statistics-explained/images/2/26/Turnover_from_web_sales_broken_down_by_B2BG_and_B2C%2C_2015_%28%25_total_turnover%29_F9.png.
6. UNCTAD, op. cit.; U.S. International Trade Commision, op.cit.; "Ecommerce definition," Digitsmith, http://www.digitsmith.com/ecommerce-definition.html.
7. U.S. International Trade Commission, op. cit.
8. Keira McDermott, "Key Business Drivers and Opportunities in Cross-Border Ecommerce," Payvision, 2016, http://www.payvision.com/downloads/key-business-drivers-and-opportunities-2016.pdf.
9. http://ec.europa.eu/eurostat/statistics-explained/index.php/E-commerce_statistics.
10. Ibid.
11. Kyklo, "B2B and B2C E-Commerce: Why They Are Different and How To Win the B2B Digital Challenge," https://www.kyklo.co/b2b-b2c-e-commerce-different-win-b2b-digital-challenge/.
12. Two-fifths of the EU firms selling goods and services over the Internet have sales to EU countries. One-quarter of these firms have sales outside of the EU. UNCTAD, op. cit., p. 2; also "Measuring Cross-Border Data Flows," Economics and Statistics Administration and National Telecommunications and Information Administration, U.S. Department of Commerce, September 2016, https://www.ntia.doc.gov/files/ntia/publications/measuring_cross_border_data_flows.pdf; Jessica R. Nicholson and Giulia McHenry, "Measuring Cross-Border Data Flows: Data, Literature, and Considerations. Pre-reading materials for May 9, 2016 roundtable on unmet data needs," https://www.ntia.doc.gov/files/ntia/publications/measuring_cross_border_data_flows_pre-roundtable_materials_2016_05_05v2.pdf.
13. Susan Wu, et. al, "US B2B eCommerce Will Be Twice The Size Of B2C eCommerce By 2020," Forrester Research, May 5, 2016, https://www.forrester.com/report/US+B2B+eCommerce+Will+Be+Twice+The+Size+Of+B2C+eCommerce+By+2020/-/E-RES122366.
14. McDermott, op. cit.
15. Rolf Visser, " B2B cross-border ecommerce in China drives the industry forward," CBEC, April 28, 2016, http://www.crossborder-ecommerce.com/b2b-cross-border-ecommerce-china-drives-industry-forward/; UNCTAD, op. cit.
16. Eurostat; UNCTAD, op. cit.; Manyika, et. al, op. cit.
17. UNCTAD, op. cit.; Amy Porges and Alice Enders, "Data Moving Across Borders: The Future of Digital Trade Policy," World Economic Forum, April 2016, http://e15initiative.org/wp-content/uploads/2015/09/E15-Digital-Economy-Porges-and-Enders-Final.pdf; Intershop E-Commerce Report 2016: Taking the Fast Track into the Digital Future of B2B Commerce, Intershop, November 2016, Jena, Germany, http://www.intershop.com/files/Intershop/media/downloads/en/studies/2016-Intershop-E-Commerce-Report.pdf.
18. Porges and Enders, op.cit.
19. U.S. Census Bureau, http://www.census.gov/econ/estats/e13-estats.pdf.
20. Frank Tong, "B2B e-commerce sales reach $1.6 trillion in China in 2014," Internet Retailer, April 13, 2015, https://www.internetretailer com/2015/04/13/b2b-e-commerce-sales-reach-16-trillion-china-2014.
21. Ecommerce Foundation, "E-commerce Europe 2015"; "Asia-Pacific B2C E-commerce Report" (LightVersion), https://www.ecommercewiki.org/wikis/www.ecommercewiki.org/images/5/56/Global_B2C_Ecommerce_Report_2016.pdf; OECD, "Measuring the Internet Economy," July 12, 2013, http://www.oecd-ilibrary.org/science-and-technology/measuring-the-internet-economy_5k43gjg6r8jf-en; Deloitte, "The Economic Impact of Disruptions to Internet Connectivity," October 2016, http://globalnetworkinitiative.org/sites/default/files/The-Economic-Impact-of-Disruptions-to-Internet-Connectivity-Deloitte.pdf.
22 McDermott, op. cit.; Ecommerce Foundation, "Global Ecommerce B2C LIGHT Report 2016," https://www.ecommerce-europe.eu/app/uploads/2016/09/Global-B2C-Ecommerce-Report-2016-Light-version.pdf.
23. Ibid.
24. Ibid.
25. Ecommerce Foundation, "European B2C E-commerce Report 2016 Light Version," https://www.ecommerce-europe.eu/app/uploads/2016/07/European-B2C-E-commerce-Report-2016-Light-Version-FINAL.pdf.
26. Ibid.
27. Ecommerce Foundation, "Global Ecommerce B2C LIGHT Report 2016," op. cit.
28. "All that is solid melts into air," *The Economist*, November 19, 2016, http://www.economist.com/news/britain/21710271-britons-do-more-their-shopping-online-almost-anyone-else-move-cyberspace.
29. Ecommerce Foundation, "European B2C E-commerce Report 2016 Light Version," op. cit.
30. PriceWaterhouseCoopers, *Sharing or paring? Growth of the sharing economy*, 2015, https://www.pwc.com/hu/en/kiadvanyok/assets/pdf/sharing-economy-en.pdf.
31. Ivan Chan, "Cross-Border Ecommerce," Accenture, 2016, https://www.accenture.com/t20160830T101949__w__/cn-en/_acnmedia/PDF-29/Accenture-Cross-Border-Ecommerce.pdf.; Manyika et. al, op cit.
32. Chloe Rigby, "Almost a third of UK online orders destined for international customers in January: IMRG," Internet Retailing, February 28 2017, http://internetretailing.net/2017/02/almost-third-uk-online-orders-destined-international-customers-january-imrg/.
33. Chan, op. cit.
34. Ibid.
35. Rigby, op. cit.

36. Rigby op. cit.
37. PayPal, "Modern Spice Routes. The Cultural Impact and Economic Opportunity of Cross-Border Shopping," https://www.paypalobjects.com/webstatic/mktg/2014design/paypalcorporate/PayPal_ModernSpiceRoutes_Report_Final.pdf.
38. Ibid.
39. McDermott, op. cit.; Porges and Enders, op. cit.
40. International Post Corporation, "Cross-Border E-Commerce Shopper Survey 2016," January 2017, ,"https://www.ipc.be/~/media/documents/public/markets/2016/ipc-cross-border-e-commerce-shopper-survey2017.pdf; "IPC: Amazon, eBay and Alibaba account for two-thirds of cross-border purchases," Post and Parcel, February 20, 2016, http://postandparcel.info/77647/news/ipc-amazon-ebay-and-alibaba-account-for-two-thirds-of-cross-border-purchases/.
41. Porges and Enders, op. cit.
40. "Swiss consumers spent €1.22 billion online at foreign stores," Ecommerce News, March 2, 2017.
41. PayPal, op. cit.
42. Cited in Ecommerce Foundation, "Global Ecommerce B2C LIGHT Report 2016," op. cit.
43. Chan, op. cit.; In 2016 China announced a cross-border e-commerce policy that would allow a maximum of only 2,000 yuan per single cross-border transaction and a maximum of 20,000 yuan per person per year. Goods that exceed these limits are to be levied the full tax for general trade. The policy has not been fully implemented yet. See TMO Group, " Now Chinese Can Check Their Yearly Spent on Cross Border eCommerce," January 5, 2017, http://www.tmogroup.asia/now-chinese-can-check-their-yearly-spent-on-cross-border-ecommerce/.
44. Cited in Chan, op. cit.
45. Porges and Enders, op. cit.
46. Ibid.
47. Ibid.
48. International Post Corporation, op. cit.; Post and Parcel, op. cit.
49. Ibid.
50. Porges and Enders, op. cit.; Tong, op. cit.
51. "Amazon to create 15,000 jobs in Europe this year," Ecommerce News, February 20, 2017.
52. Ecommerce Foundation, "European B2C E-commerce Report 2016 Light Version," op. cit.; "Otto Group's ecommerce revenue will grow to €7 billion," Ecommerce News, February 24, 2017.
53. Ibid.
54. Thibaud Elzière, "The C2B Revolution," http://c2b.typepad.com/c2b/2005/08/the_c2b_revolut.html; Fung Business Intelligence, "Countdown to Alibaba's 2016 11.11 Global Shopping Festival: What To Expect," https://www.fbicgroup.com/sites/default/files/C2B_Model.pdf; Katherine Arline, "What is C2B," January 5, 2015, Business Daily, http://www.businessnewsdaily.com/5001-what-is-c2b.html#sthash.W9MeiE9N.dpuf.
55. Fung Intelligence, op. cit.
56. Ibid; Arline, op. cit.
57. Elzière, op. cit. http://www.differencebetween.com/difference-between-m-commerce-and-e-commerce/; https://www.quora.com/What-is-the-difference-between-e-Commerce-and-mobile-commerce.
58. McDermott, op. cit.
59. "54% of Europeans regularly make mobile payments," Ecommerce News, October 19, 2016.
60. Ecommerce Foundation, "Global Ecommerce B2C LIGHT Report 2016," op. cit.
61. https://www.internetretailer.com/2015/08/18/mobile-commerce-now-30-all-us-e-commerce; http://paybefore.com/retail/the-rise-of-m-commerce-tips-for-effective-mobile-marketing-sales/.
62. Ecommerce Foundation, "United States B2C Ecommerce Light Report 2016, https://www.ecommerce-europe.eu/app/uploads/2016/08/United-States-B2C-E-commerce-Light-Country-Report.pdf.
63. eMarketer.
64. Business Insider; Conversational Commerce 2017 Trends, iAdvize, http://info.iadvize.com/hubfs/Content_INT/WP_EN_/EN%20-%20WP%20-%202016%20Retrospective.pdf.
65. Ecommerce Foundation, "North America B2C Ecommerce Light Report 2015," https://www.ecommerce-europe.eu/app/uploads/2016/07/north-america-b2c-e-commerce-light-report-2015-.pdf.pdf
66. McDermott, op. cit.
67. "The State of Cross-Device Commerce, Criterio, 2017, http://www.criteo.com/media/6619/criteo-state-of-cross-device-commerce-2016-h2-uk.pdf.

CHAPTER 3

The Transatlantic Platform Economy

"Uber, the world's largest taxi company, owns no vehicles. Facebook, the world's most popular media owner, creates no content. Alibaba, the most valuable retailer, has no inventory. And Airbnb, the world's largest accommodation provider, owns no real estate. Something interesting is happening."

Tom Goodwin[1]

The economies of Europe and the United States, as well as the digital connections between them, are being reshaped by platform companies that connect individuals directly to each other to trade products and services. By matching supply and demand in real time, and at unprecedented scale, platforms are revolutionizing how business is done, and by whom, in the transatlantic digital economy.[2] While they have become important for business-to-consumer (B2C) e-commerce, as we discussed in the previous chapter, they have simply supercharged consumer-to-consumer (C2C) e-commerce (also known as peer-to-peer or P2P e-commerce) in ways that are potentially transformational.

The platform model of C2C e-commerce has been dubbed the "sharing" or "collaborative" economy by its proponents, and the "gig" economy by its critics.[3] In some cases it is the digital version of looking at classified ads in the local newspaper or going to an auction. But is quickly spreading to many other areas where users connect to arrange such things as online distance work, home and car sharing, crowdfunding, and online music and video streaming.

In his book *The Industries of the Future*, Alec Ross characterizes the phenomenon succinctly:

> "I think of the sharing economy as making a market out of anything and a microentrepreneur out of

TABLE 2.3.1: DIGITAL PLATFORMS.....

DRIVE INNOVATION	GENERATE CUSTOMER VALUE	OPEN MARKETS	REDUCE TRANSACTION COSTS	IMPROVE WELFARE EFFECTS
Customized products and services	Increased choices	Aggregated supply and demand	Lower information, communication, logistics and negotiation costs	Overcome market frictions
New types of product bundling	Convenience	Improved market entry opportunities for small and medium-sized enterprises	Risk can be better contained	Greater allocative efficiency
Innovative business models	Greater price and market transparency	Global export opportunities	Increased flexibility of production	Standardization
Flexible organizational structure	Sharing of resources and financial assets	Optimized marketing		Greater trust
				More effective utilization of technology

Source: Fair Play in der digitalen Welt. Wie Europa fur Plattformen den richtigen Rahmen setzt. Internet Economy Foundation. 2016.

> anybody. The sharing economy uses a combination of technology platforms packaged as apps on mobile phones, behavioral science, and mobile phone location data to create peer-to-peer marketplaces. These marketplaces take underused assets (e.g. an empty apartment, empty seats in a car, or skill as a math tutor) and connect them with people looking for a specific service."[4]

C2C has been popularized by websites offering free classified advertisements, auctions, forums, and individual pages for start-up entrepreneurs. U.S. firms such as Etsy, eBay, Craigslist, Amazon, Uber, Airbnb, Couchsurfing and Kickstarter; European companies such as JustPark, Peerby, Gumtree, Snappcar, BlaBlaCar, Yummber, Spotify; and Chinese entities such as Taobao and JD each provide a medium over which users can auction, sell, and/or buy goods.[5] Box 2.3.1 outlines a range of current platform services.

While C2C still commands a small share of the e-commerce market, the platform economy has supercharged its potential. Annual growth currently exceeds 25%, and some sectors are projected to even reach 63% by 2025.[6] Over half of today's platform economy companies were founded in 2013 or later. More than 80% of the companies were founded since the start of 2011.[7]

PriceWaterhouseCoopers estimates that the five main sectors of the global C2C platform economy market — C2C lending and community financing, online distance work, home sharing, car sharing, online music and video streaming — achieved sales revenue in 2013 of around $15 billion — only 6% the size of the traditional B2C model of $240 billion. They project, however, that the revenue of C2C platform economy companies will grow 22-fold by 2025 and catch up to the B2C model, with each model achieving sales revenue in 2025 of $335 billion.[8] The C2C platform economy model is spreading quickly to new and more established sectors, such as medical equipment and healthcare, retail, legal services, human resources and food delivery. Moreover, the user base is expanding significantly in both the United States and Europe. While millennial digital natives were the early adopters fueling the rise of the sharing economy, so-called over-50 'silver surfers' — with more resources at their disposal — have now become the fastest-growing user group for many channels.[9]

A study undertaken for the European Parliament estimates that the EU could gain €572 billion in annual consumption if it could harness the platform economy model to take more effective advantage of underutilized capacities across the Single Market. It estimates the value of underutilized labor across the EU28 at €309 billion; the average under-utilization of accommodation at 3%, which equates to around €35 billion per year; under-utilization of cars at €152 billion annually;

BOX 2.3.1: EXAMPLES OF PLATFORM SERVICES

Social and business networking (Facebook, Xing, LinkedIn, Snapchat, Pinterest)

Internet auctions and retail (Amazon, eBay, Angie's List, Snapdeal, Flipkart)

Music and video streaming (Spotify, iTunes)

Online financial and human resource functions (Workday, Elance-oDesk, Freelancer, WorkFusion)

Transportation (Didi Chuxing, Ola, BlaBlaCar, JustPark, Uber, Lyft, moovel, Sidecar)

Mobile payment (Mahala, Square)

Clean energy (Sungevity, SolarCity, EnerNOC)

Peer-to-Peer- and Micro-lending (Zopa, Kiva)

Crowd-funding (Kickstarter)

Charity fundraising (GlobalGiving)

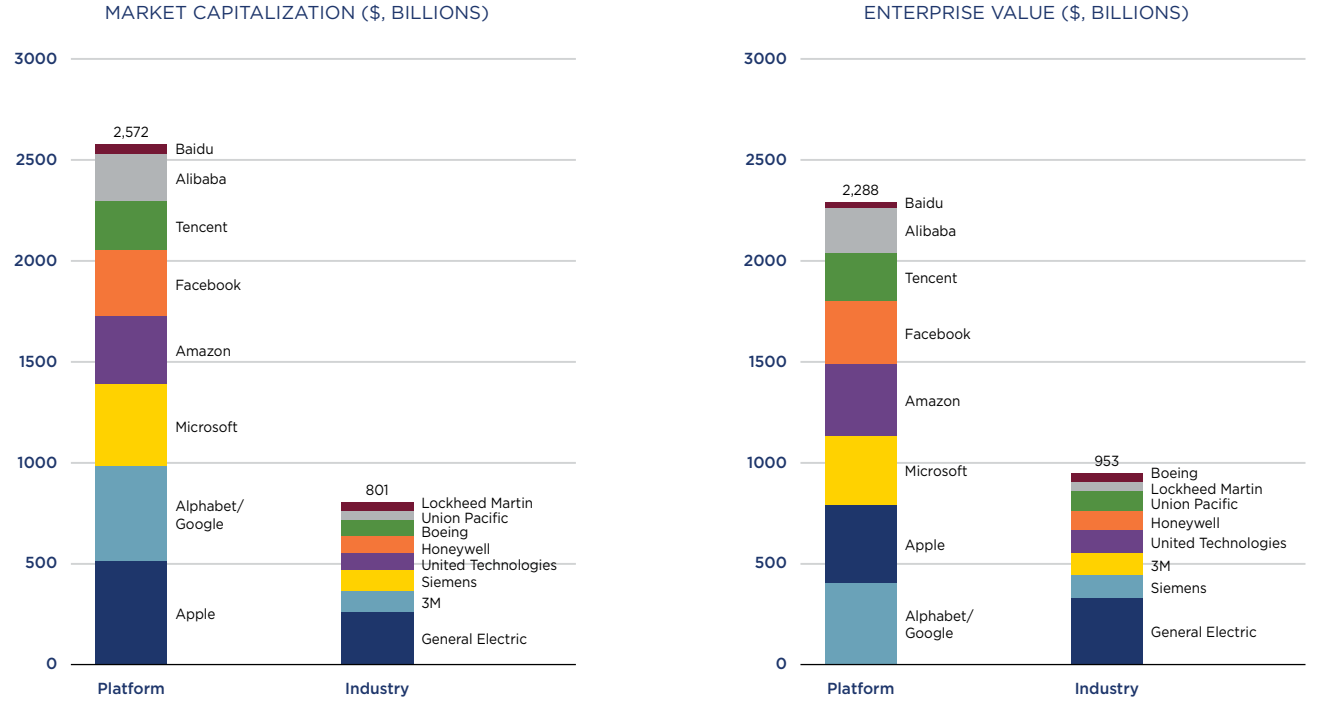
Government services (UK Government's G-Cloud)

TABLE 2.3.2: THE C2C PLATFORM ECONOMY: AMENABLE SECTORS BY EU MEMBER STATE

COUNTRY	C2C PLATFORM ECONOMY AMENABLE PORTION	COUNTRY	C2C PLATFORM ECONOMY AMENABLE PORTION
Ireland	52%	Italy	46%
United Kingdom	51%	**EU 28**	**46%**
Cyprus	51%	Czechia	44%
Finland	50%	Belgium	42%
Spain	50%	Portugal	42%
Sweden	48%	Slovakia	40%
Luxembourg	48%	Latvia	39%
Austria	48%	Estonia	37%
Malta	47%	Hungary	37%
Greece [2011]	47%	Slovenia	37%
Denmark	46%	Romania [2010]	35%
Germany	46%	Bulgaria [2011]	34%
Netherlands	46%	Poland	33%
France	46%	Lithuania	31%

Sources: European Parliamentary Research Service; Eurostat.[10]

TABLE 2.3.3: LEADING PLATFORMS VS. INDUSTRY GIANTS



Source: Internet Economy Foundation.[11]

TABLE 2.3.4: PLATFORM GEOGRAPHY: CITIES BY NUMBER OF COMPANY HEADQUARTERS

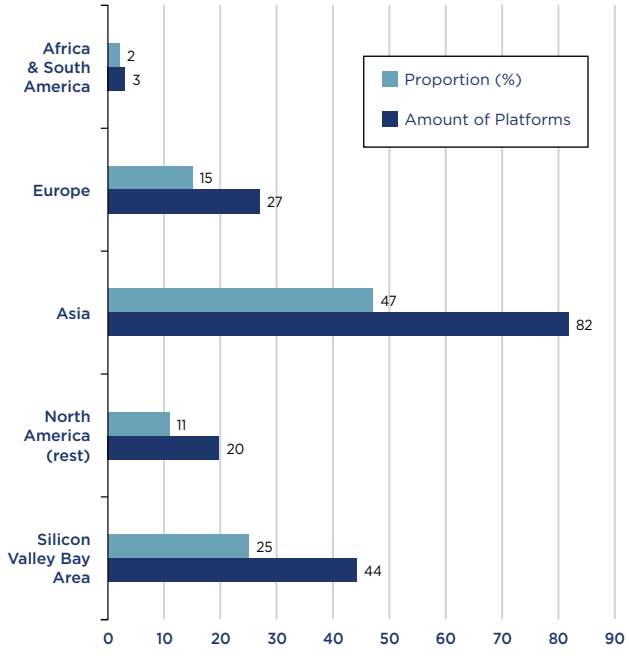
RANK	HEADQUARTERS CITY	COUNTRY	NUMBER OF PLATFORM COMPANIES	COMPANY MARKET CAPITALIZATION ($BILLIONS)
1	San Francisco Bay Area	U.S.	44	$2,229
2	Seattle	U.S.	4	$767
3	Beijing	China	30	$246
4	Hangzhou	China	6	$242
5	Shenzhen	China	5	$191
6	Tokyo	Japan	5	$109
7	Walldorf	Germany	1	$97
8	Cape Town	South Africa	1	$63
9	Norwalk	U.S.	1	$62
10	Shanghai	China	14	$55

Source: Center for Global Enterprise.[12]

and under-utilization in other sectors at between €38 and €76 billion.[13] The study extends its analysis to include B2C transactions, so should be considered an expansive projection. Nonetheless, the potential is significant.

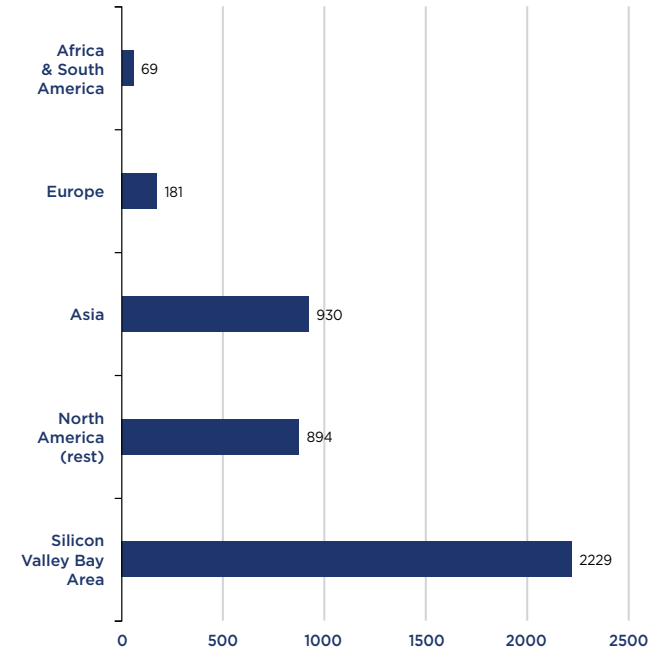
Overall, the United States remains the leader of the C2C platform economy, but this sector of the UK economy is also robust. A third of UK adults are engaging in C2C platform economy transactions, compared to 19% of U.S. adults.[14] London is the C2C platform economy capital of Europe and home to one in 12 companies in this space. Worldwide, San Francisco and New York are the only cities to have produced more C2C platform economy startups than London. The UK is home to 10% of the businesses involved in the global C2C platform economy — more than France, Germany and Spain combined.[15]

TABLE 2.3.5: WORLD REGIONS BY NUMBER OF PLATFORMS



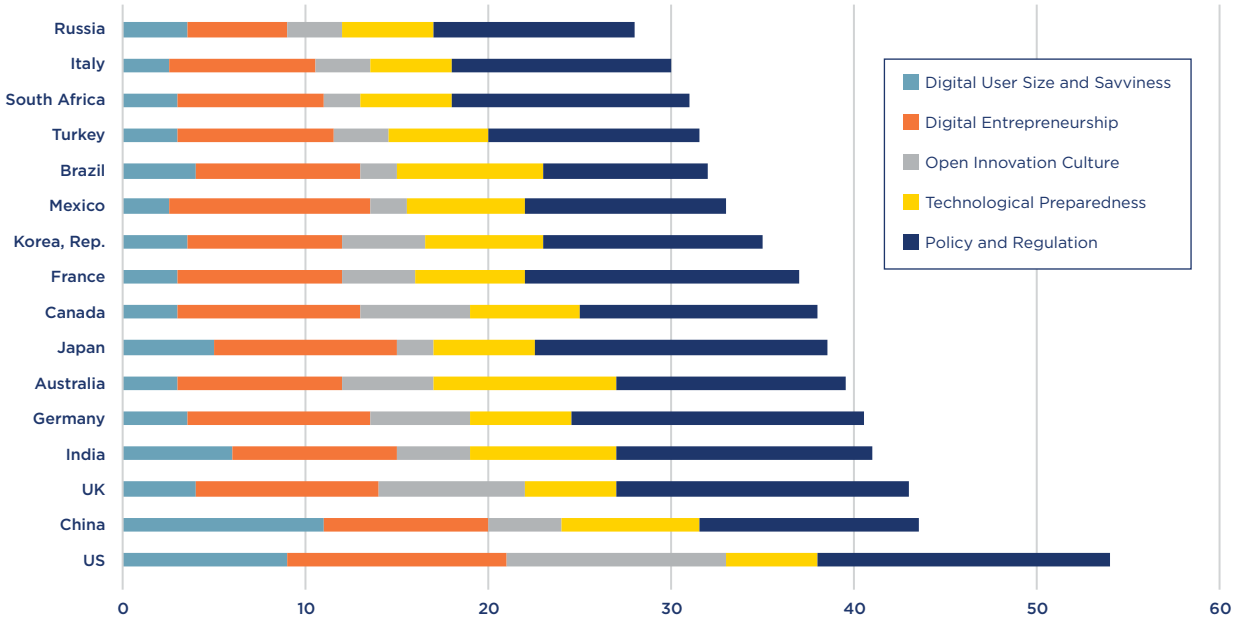
Source: Center for Global Enterprise; Internet Economy Foundation; Roland Berger.[16]

TABLE 2.3.6: WORLD REGIONS BY MARKET CAPITALIZATION OF PLATFORMS ($, BILLIONS)



Source: Center for Global Enterprise; Internet Economy Foundation; Roland Berger.[17]

TABLE 2.3.7: PLATFORM READINESS INDEX, SELECTED COUNTRIES 2015



Source: Accenture.[18]

Some of the more expansive projections for thegrowth of the platform economy should be considered with caution, as public policies, which move at the speed of law, attempt to catch up with digital innovation, which seems to move at the speed of light. The platform economy is generating major economic opportunities, but is also creating new policy challenges across a wide spectrum of issues, ranging from tax and competition policy to privacy, insurance, finance and labor markets. We address these challenges in Section 3.

Nonetheless, even with a more sober appreciation of the future possibilities, the potential is significant.Table 2.3.2 indicates the share of each EU member state's GDP considered to be amenable to the C2C platform economy. That portion across the member states is reasonably stable at around 45-50%, but is lower in some countries where perishables account for a considerably higher share of overall consumption (to be expected with lower per capita incomes).[19]

Platform Anxiety

Platforms have supercharged C2C potential. But services that serve as platforms are also B2C or B2B, ranging beyond the small but dynamic C2C sector.

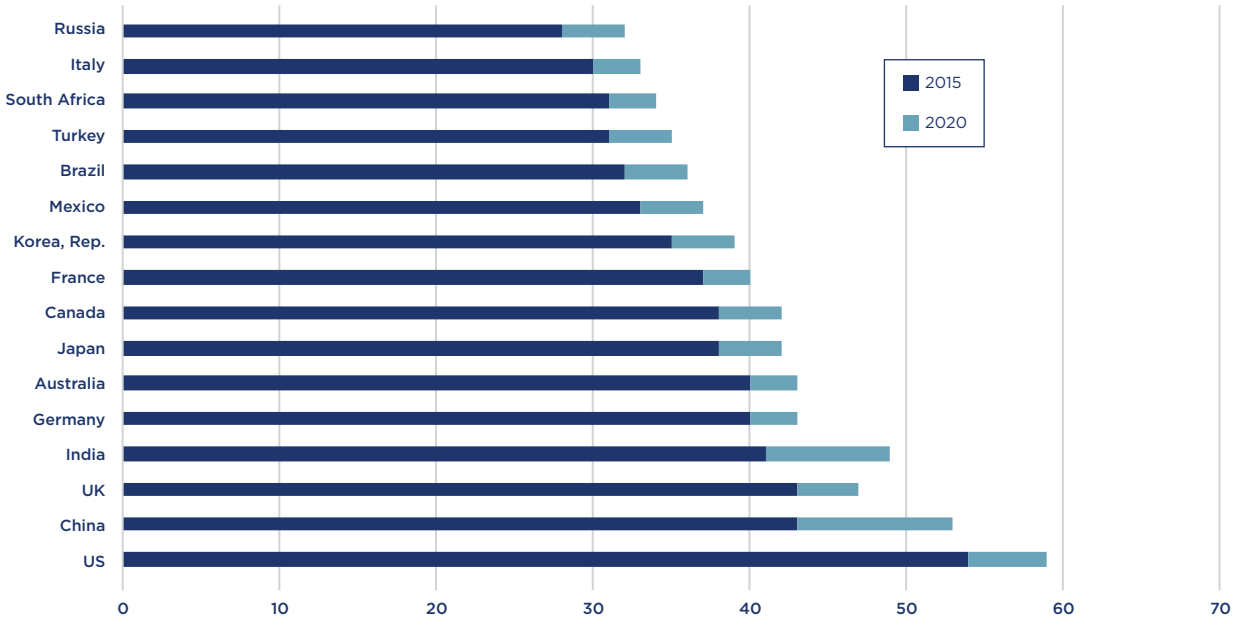
Worldwide, platform companies have a market value of over $4.3 trillion and employ millions directly and indirectly. Analytics leaders such as Apple, Alphabet/Google, Amazon, Facebook, Microsoft, GE, Baidu, Alibaba Group, and Tencent have established themselves as some of the most valuable companies in the world.[20]

Beyond the well-known brands currently associated with the platform economy, platform businesses are proliferating around the world. More than $20 billion was invested between 2010 and 2015 in the course of 1,053 publicly announced deals in digital platforms. Much of the growth took place between 2014 and 2015, with investments doubling in 2015. Less than 15% of Fortune 100 companies had a developed platform model in 2016, but by 2018, more than 50% of large enterprises are likely to have created or partnered with industry platforms.[21]

The platform economy is not only a space for digital start-ups; traditional businesses are embracing the platform model as well. Philips, for example, is using the platform model to reinvent itself in the health technology market, Daimler has developed moovel to reinvent the concept of urban mobility, and Siemens has created Mindsphere as an open operating system for the Internet of Things.[22]

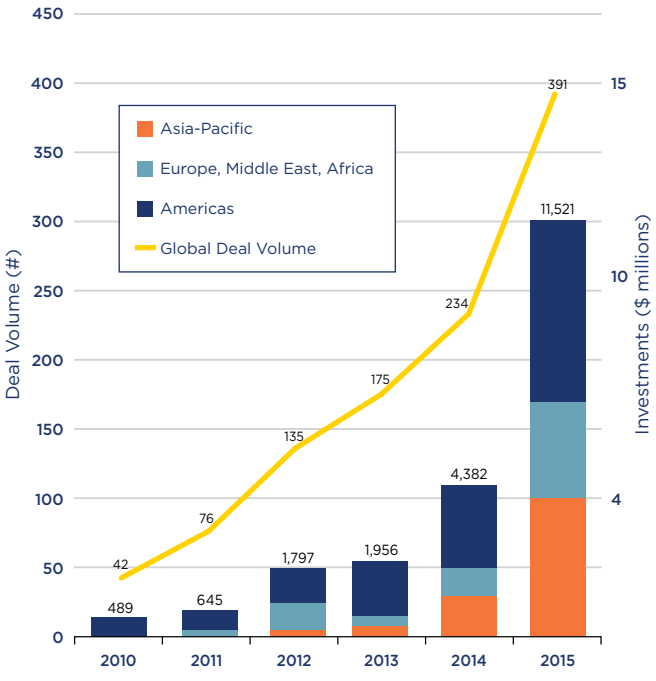
Nonetheless, on balance Europe is lagging significantly behind North America and Asia, each of which is home to a large and diverse group of platform companies. If America's digital leaders are driven by WeChat envy, European companies are haunted by platform anxiety.[23] The Center for Global Enterprise has identified 176 platform companies worldwide with a market valuation of

TABLE 2.3.8: PLATFORM READINESS INDEX, SELECTED COUNTRIES, 2015 AND 2020



Source: Accenture.[24]

TABLE 2.3.9: INVESTMENT IN DIGITAL PLATFORMS



Source: Accenture.[26]

$1 billion or more. Asia has the largest number of leading platforms with 82, exceeding those in North America and in Europe. Only 27 of these 176 digital platforms have their home in Europe. Top urban hubs for platform formation and operations include the San Francisco Bay Area, Beijing, London, New York and New Delhi. One out of four digital platforms (44) is in the San Francisco Bay Area.[25]

The financial resources of these platform companies are even more concentrated than their geography. Those from Silicon Valley and its surrounding region account for over 50% of the cumulative stock market value of all platforms.

The geography of platform investment also underscores North American and Asian leadership. North America enjoys the biggest digital platform investment by far, followed by the Asia- Pacific region, which accounts for 33% of global investment, up from just 6% in 2010. China has the lion's share of investment in the Asia-Pacific.[26]

This level of platform investment corroborates the Accenture Platform Readiness Index. The Index assesses select G20 countries and shows significant regional variations in platform readiness (see Tables 2.3.7 and 2.3.8). There is a clear correlation between the health of an economy's platform environment enablers and the levels of platform investment and activity (Table 2.3.9). Countries with the highest platform readiness—China, the United States, India, the United Kingdom and Germany—will enjoy higher levels of platform activity and harvest related economic benefits.[27]

Endnotes

1. Tom Goodwin, "The Battle is for the Customer Interface," Tech Crunch, March 3, 2015, https://techcrunch.com/2015/03/03/in-the-age-of-disintermediation-the-battle-is-all-for-the-customer-interface/.
2. Once small and novel, platform businesses have grown substantially in recent years. A platform like Uber expanded to 67 countries in seven years; it took IBM 50 years to get there. See "Sam Palmisano speaks with TechTarget about "Defining the Platform Enterprise," Center for Global Enterprise, August 26, 2016, http://thecge.net/sam-palmisano-speaks-with-techtarget-about-defining-the-platform-enterprise/; also Susan Lund and James Manyika, "How Digital Trade is Transforming Globalisation," E15 Expert Group on theDigital Economy, January 2016, http://e15initiative.org/wp-content/uploads/2015/09/E15-Digital-Economy-McKinsey-FINAL.pdf; Nicolaus Henke, Jacques Bughin, Michael Chui, James Manyika, Tamim Saleh, Bill Wiseman, and Guru Sethupathy, *The age of analytics: Competing in a data-driven world*, McKinsey Global Institute, December 2016, http://www.mckinsey.com/business-functions/mckinsey-analytics/our-insights/the-age-of-analytics-competing-in-a-data-driven-world.
3. See, for example, Federal Trade Commission, *The "Sharing" Economy. Issues Facing Platforms, Participants & Regulators. An FTC Staff Report*, November 2016, https://www.ftc.gov/system/files/documents/reports/sharing-economy-issues-facing-platforms-participants-regulators-federal-trade-commission-staff/p151200_ftc_staff_report_on_the_sharing_economy.pdf; Niam Yaraghi and Shamika Ravi, *The current and future state of the sharing economy* (Washington, DC: Brookings Institution, December 2016); Sarah O'Connor, "The Gig Economy is Neither 'Sharing' nor 'Collaborative," *Financial Times*, June 14, 2016, https://www.ft.com/content/8273edfe-2c9f-11e6-a18d-a96ab29e3c95; Adam Chandler, "What Should the 'Sharing Economy' Really Be Called?," *The Atlantic*, May 26, 2016, http://www.theatlantic.com/business/archive/2016/05/sharing-economy-airbnb-uber-yada/484505/; Gideon Lichfield, "All the Names for the New Digital Economy, and Why None of Them Fits," Quartz, Nov. 12, 2015, http://qz.com/548137/all-the-names-for-the-new-digital-economy-and-why-none-ofthem-fits/.
4. Alec Ross, *The Industries of the Future* (New York: Simon & Shuster, 2016), p. 91.
5. Statistics and Market Data on C2C E-Commerce, Statista, https://www.statista.com/markets/413/topic/983/c2c-e-commerce/; "From Peerby to SnappCar: How Europe's Sharing Economy Is Driven by Efficiency," Knowledge@Wharton, July 16, 2016, http://knowledge.wharton.upenn.edu/article/peerby-snappcar-europes-sharing-economy-driven-efficiency/
6. *The sharing economy*, PriceWaterhouseCoopers, 2015, https://www.pwc.com/us/en/technology/publications/assets/pwc-consumer-intelligence-series-the-sharing-economy.pdf.
7. "UK is sharing economy capital of Europe," Tech City News, September 21, 2015, http://techcitynews.com/2015/09/21/uk-is-sharing-economy-capital-of-europe/.
8. PriceWaterhouseCoopers, 2015, op. cit.; PricewaterhouseCoopers, "Five Key Sharing Economy Sectors Could Generate £9 Billion of UK Revenues by 2025," August 15, 2014, http://pwc.blogs.com/press_room/2014/08/five-key-sharing-economy-sectors-could-generate-9-billion-of-uk-revenues-by-2025.html. Others also project rapid growth for various sectors. See, e.g., Sam Smith, "Uber, Lyft & Other Ride Sharing Services to See Revenues Double by 2020, Reaching $6.5 Billion," Investorideas.com, April 6, 2016, http://www.investorideas.com/news/2016/main/04061.asp; Federal Trade Commission, op. cit.
9. Robert Vaughan, " Disruption in unexpected sectors and corporates adapting their business models; find out what's next for the sharing economy in our 2017 predictions," PriceWaterhouseCoopers, February 8, 2017, http://pwc.blogs.com/megatrend_matters/2017/02/disruption-in-unexpected-sectors-and-corporates-adapting-their-business-models-find-out-whats-next-f.html.
10. Pierre Goudin, *The Cost of Non-Europe in the Sharing Economy*, European Parliamentary Research Service, January 2016, http://www.europarl.europa.eu/RegData/etudes/STUD/2016/558777/EPRS_STU(2016)558777_EN.pdf.
11. *Fair Play in der digitalen Welt. Wie Europa fur Plattformen den richtigen Rahmen setzt*, Internet Economy Foundation, 2016, https://www.ie.foundation/content/5-blog/5-fair-play-in-der-digitalen-welt/rb_cop_16_011_ief_plattformstudie_de_online.pdf.
12. Peter C. Evans and Annabelle Gawer, *The Rise of the Platform Enterprise: A Global Survey*, The Center for Global Enterprise, January 14, 2016, http://www.thecge.net/wp-content/uploads/2016/01/PDF-WEB-Platform-Survey_01_12.pdf.
13. Ibid.
14. PriceWaterhouseCoopers, 2015, op. cit.; "Top tech stats: the sharing economy, Q3 UK startup funding decline & more," Tech City News, November 5, 2016, http://techcitynews.com/2016/11/05/top-tech-stats-the-sharing-economy-q3-uk-startup-funding-decline-more/; D*igital Transformation. The age of innocence, inertia, or innovation?* Microsoft, 2016, http://enterprise.blob.core.windows.net/whitepapers/Digital_Transformation_Project_Report.PDF.
15. JustPark, "The most popular ideas in the sharing economy," https://www.justpark.com/creative/sharing-economy-index/; "UK is sharing economy capital of Europe," op. cit.; "The sharing economy grows up. How the UK has embraced the sharing economy," PriceWaterhouseCoopers, 2016, http://www.pwc.co.uk/issues/megatrends/collisions/sharingeconomy/outlook-for-the-sharing-economy-in-the-uk-2016.html
16. *Fair Play*, op. cit.
17. Evans and Gawer, op. cit; *Fair Play*, op. cit.
18. "Five Ways to Win with Digital Platforms,'" Accenture, 2015, https://www.accenture.com/us-en/_acnmedia/PDF-29/Accenture-Five-Ways-To-Win-With-Digital-Platforms-Executive-Summary.pdf .
19. Goudin, op. cit.
20. Ibid.
21. Evans and Gawer, op. cit.
22. Ibid; Lund and Manyika, op. cit. For examples, see https://moovel-group.com/en, and https://www.siemens.com/global/en/home/company
22. Fair Play, op. cit.
23. See comments by Annabelle Gawer, Professor of the Digital Economy at the University of Surrey, Center for Global Enterprise, The Emerging Platform Economy, http://thecge.net/category/research/the-emerging-platform-economy/.
24. "Five Ways," op. cit.
25. Evans and Gawer, op. cit.
26. Ibid.
27. "Five Ways," op. cit.
28. Ibid.

CHAPTER 4

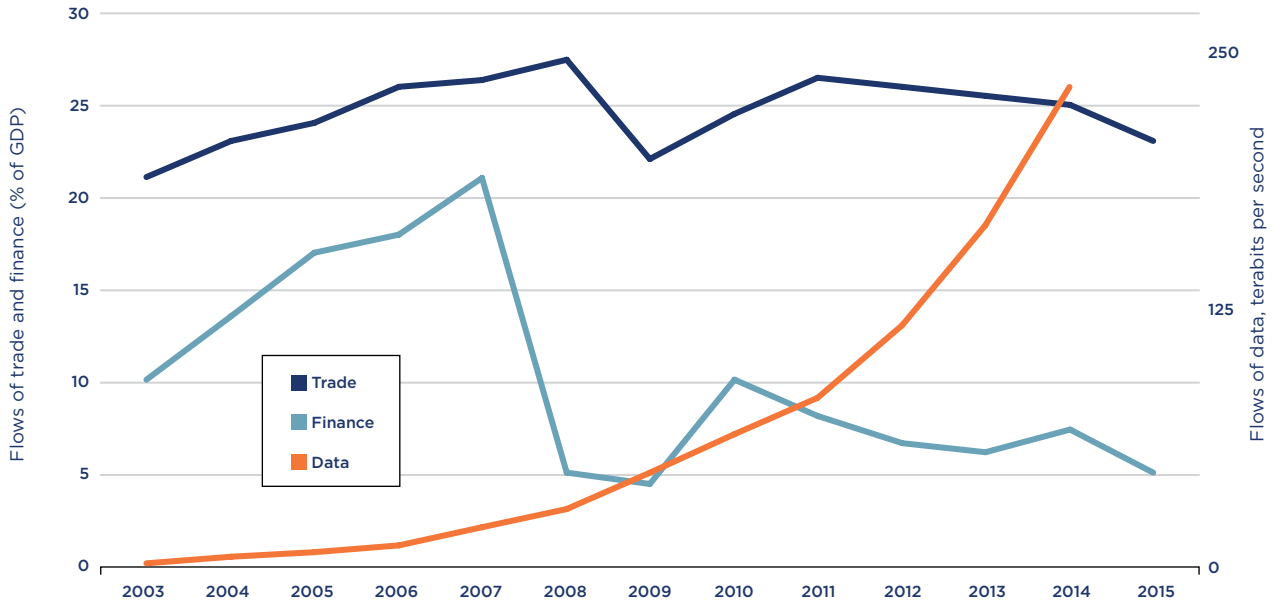
Transatlantic Data Flows

Another way to understand the nature of transatlantic digital connections is to appreciate the role of cross-border data flows. McKinsey estimated that in 2014 the value of global data flows increased worldwide GDP by $2.8 trillion. Moreover, those flows are accelerating: McKinsey estimates that cross-border data flows are increasing at rates approaching 50 times those of last decade, and are far outpacing trade and financial flows.[1]

These estimates highlight the need to capture the value of cross-border data flows and the digital economy in all sectors of the economy, rather than just the information and communication technology sector, since such flows enable other flows of goods, services, finance, and people. Cross-border data flows can be valuable to a company's operations, as shown in Box 2.4.1. A U.S. International Trade Commission study estimated that the internet reduces trade costs by 26% on average.[2] Additionally, small- and medium-sized enterprises that utilize the internet to trade on global platforms have a survival rate of 54%, which is 30% percent higher than that of offline businesses. Furthermore, online small- and medium-sized firms are almost as likely to export as are large businesses.[5]

It is difficult to measure transatlantic data flows, since there are currently no official U.S. or European statistical series that measure how cross-border data flows contribute to the overall U.S., European or transatlantic economies or various sectors within those economies.[6] In addition, as we discuss in the next chapter, data flows can be overestimated owing to internet hubs

TABLE 2.4.1: GLOBAL FLOWS OF DATA ARE OUTPACING TRADE AND FINANCIAL FLOWS



Trade and finance are inflows; data flows are a proxy to inflows, based on total flows of data.
Source: IMF Balance of Payments Statistics; TeleGeography, Global Bandwidth Forecast Service; UNCTAD; World Bank; McKinsey Global Institute Analysis.[3]

BOX 2.4.1: FIRMS' USES OF CROSS-BORDER DATA FLOWS

Interconnected machinery. Companies improve processes and optimize efficiency by interconnecting elements of the production chain, such as real-time monitoring of capital equipment to reduce downtime or to be able to prepare for immediate service replacements.

Big data analytics. Companies collect data gathered from various, or all, aspects of their operations across regions and apply advanced statistical analysis to be able to make better decisions, both for the business and for customer satisfaction.

Back-office consolidation. Companies centralize standard business operations to take advantage of economies of scale (e.g., human resources, accounting, payroll, support call centers, marketing, etc.) by improving buying power and eliminating overlap.

Supply-chain automation. Companies track inventory levels, process reordering automatically, and match supply and demand.

Digital collaboration. Companies increase communication and collaboration between teams.

Cloud scalability. Companies lower capital expenditure and cost structure of information technology (IT) hardware, infrastructure, software, and applications, all provided as a service, and they reduce capital investment in idle capacity, thus lowering the total cost of ownership and increasing business agility and resilience to failures.

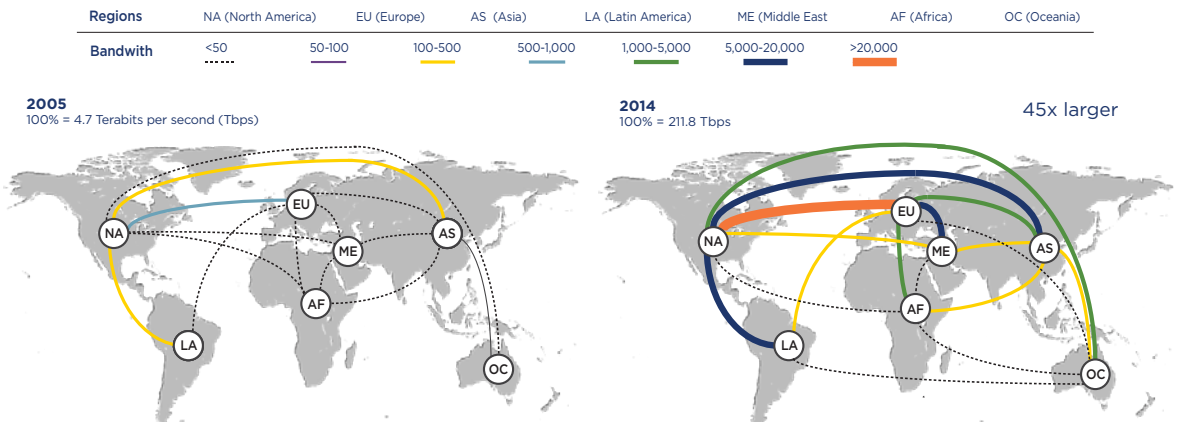
Source: Business Roundtable.[4]

that may route data across many borders to connect two endpoints.

Researchers are reluctant to use data flows as a proxy for commercial links, since data traffic is not always related to commercial transactions.[7] Knowing the volume of data flows does not necessarily provide insight on the economic value of their content. The Bureau of Economic Analysis puts it succinctly: "Streaming a video might be of relatively little monetary value but use several gigabytes of data, while a financial transaction could be worth millions of dollars but use little data."[8]

In addition, commercial transactions do not always accompany data, and data do not always accompany commercial transactions. For instance, multinational companies often send valuable, but non-monetized, data to their affiliates.[9] And as discussed in the next chapter, "peering" agreements between networks allow traffic to traverse different networks' infrastructure without payment. User-generated content on blogs and on YouTube drives very high volumes of internet traffic both within countries and across borders, but very little of this content is paid for by consumers. Since it does not involve a monetary transaction, the significant value that this content generates

TABLE 2.4.2: TRANSATLANTIC TIES: USED CROSS-BORDER BANDWIDTH



Source: Manyika, J., Lund, S. Bughin, J. Woetzel, J. Stamenov, K. and Dhingra, D. (2016) "Digital globalization: new era of global flows", McKinsey Global Institute, available at: http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/digital-globalization-the-new-era-of-global-flows (p.4 in the full report).

does not show up in economic or trade statistics but instead reveals itself as "consumer surplus." McKinsey estimates that this "consumer surplus" from the United States and Europe alone is close to €250 billion ($266.4 billion) each year.[10]

In other words, data flows are commercially significant, yet their commercial value is hard to measure. Our purpose, however, is not just to look at commercial connections across the Atlantic, but to understand how both Europe and the United States are connected in the digital space, and looking at flows of data can be helpful in this regard.

Although the amount of internet traffic coursing between countries, measured in bits, is difficult to measure and is in constant flux, it is possible to gauge the amount of international traffic by examining the levels of bandwidth provisioned by telecommunication carriers, internet service providers, content providers (like Google and Facebook), and other networking companies on the terrestrial and submarine fiber optic networks running between cities in different countries.[11] As McKinsey noted in 2016, "The amount of cross-border bandwidth that is used has grown 45 times larger since 2005. It is projected to increase by an additional nine times over the next five years as flows of information, searches, communication, video, transactions, and intracompany traffic continue to surge."[12] Cross-border internet traffic has increased 500-fold since 2000 — and with conservative assumptions will expand another eightfold by 2025.[13]

BOX 2.4.2: THE TRANSATLANTIC SOCIAL NETWORK

Data flows are about much more than social networks or even internet companies. Still, a large part of the growth in the bits and bytes of data flowing around the world is generated by communication among individuals.[14] Tremendous amounts of data flow across borders via social networking sites and platform services companies. Thus, one way to assess the impact of transatlantic data flows may be to look at user traffic and foreign revenues of such companies.

Here again we run into measurement issues, as all companies use different metrics for their international business accounting. Nonetheless, some vignettes can highlight the importance of the transatlantic connection to key digitally-intensive companies.

For instance, at the end of 2016 Facebook had 82 million more daily active users in Europe than in the United States — 262 million vs. 180 million. Europe accounted for over 21% of all Facebook daily users outside the United States. Daily Facebook users in the United States accounted for only 13% of all daily Facebook users worldwide. The trend is similar for monthly active users.

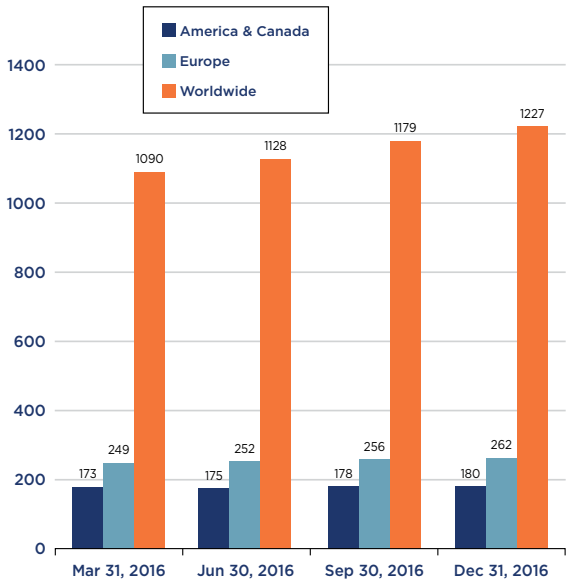
Facebook revenues in the United States, Canada and Europe are also significantly higher than in other world regions, primarily because of the size and maturity of those online and mobile advertising markets. Facebook revenue in the United States and Canada was more than eight times higher, and Facebook revenue in Europe almost four times higher, than the company's revenue in the Asia-Pacific region. Facebook's revenue of $15.98 million in 2016 was 34% higher than in 2015. While Facebook records more users in Europe than in the United States and Canada, it derives greater revenue from the latter than the former.[15]

Similarly, users outside the United States accounted for 79% of all monthly active users of Twitter in the three months ending December 31, 2016 — 252 million vs. 67 million in the United States. Twitter expects user growth rates in certain international markets, such as Canada, France, Germany, India, Japan, Mexico, the Philippines, Saudi Arabia, and South Korea, to continue to be higher than its user growth rate in the United States. Access to Twitter remains blocked in China. Nonetheless, despite its vast international user base, the company still derives greater revenue from U.S.-based advertisers than from those located elsewhere. For the final quarter of 2016, Twitter's U.S. revenue totaled $1.56 billion while its international revenue totaled $964.8 million. But international revenue grew at a 25% annual clip, compared to only 8% for U.S. revenue.[16]

Amazon's biggest foreign market is Germany, which accounted for 10.4% ($14.1 billion) of the company's total revenue, and which grew 20%, in 2016.[17] International sales accounted for 32% of Amazon's net sales in 2016, compared to 59% in domestic sales. Excluding the effect of foreign exchange rates, Amazon's international sales grew at a 26% clip, one percentage more than domestic sales growth.

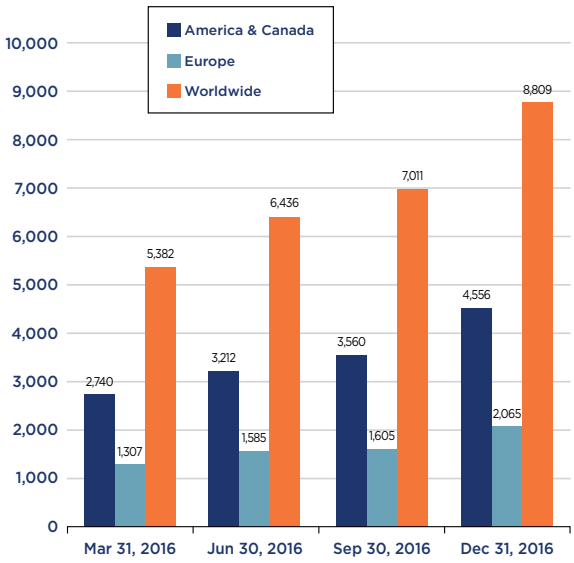
Alphabet, the parent company of Google and You Tube, generated $90.3 billion in consolidated revenue in 2016, 53% of which stemmed from outside the United States, primarily Europe and Japan. The United Kingdom alone accounted for 9% ($7.8 billion) of Alphabet's annual revenue.[18]

TABLE 2.4.3: FACEBOOK DAILY ACTIVE USERS (MILLIONS; DAILY AVERAGE OVER THE MONTH ENDED)



Source: Facebook, Form 10-K filing.

TABLE 2.4.4: FACEBOOK REVENUES ($, MILLIONS)



Facebook, Form 10-K filing.

Endnotes

1. James Manyika, Susan Lund, Jacques Bughin, Jonathan Woetzel, Kalin Stamenov, and Dhruv Dhringra, *Digital Globalization: The New Era of Global Flows*, McKinsey Global Institute, March 2016.
2. *Digital Trade in the U.S. and Global Economies*, Part 2. Publication 4485, Investigation No. 332-540. Washington, DC: US International Trade Commission, p. 65, August, 2014. Available at www.usitc.gov/publications/332/pub4485.pdf.
3. See http://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/the-global-forces-inspiring-a-new-narrative-of-progress?cid=other-eml-alt-mkq-mck-oth-1704
4. Business Roundtable, *Putting Data to Work: Maximizing the Value of Information in an Interconnected World* (Washington, DC: Business Roundtable, 2015), http://businessroundtable.org/sites/default/files/reports/BRT%20PuttingDataToWork.pdf.
5. S. Austin, and M. Olarreaga, *Enabling Traders to Enter and Grow on the Global Stage*. An eBay Report. Brussels: eBay EU Liaison Office, 2012.; World Economic Forum, Global Information Technology Report 2016, http://reports.weforum.org/global-information-technology-report-2016/1-2-cross-border-data-flows-digital-innovation-and-economic-growth.
6. "Measuring the Value of Cross-Border Data Flows," Economics and Statistics Administration and the National Telecommunications and Information Administration, U.S. Department of Commerce, September 2016, p. 21, https://www.ntia.doc.gov/files/ntia/publications/measuring_cross_border_data_flows.pdf.
7. Susan Lund and James Manyika, "How Digital Trade is Transforming Globalization," World Economic Forum, E15 Expert Group on the Digital Economy, January 2016, http://e15initiative.org/wp-content/uploads/2015/09/E15-Digital-Economy-McKinsey-FINAL.pdf.
8. "Measuring the Value of Cross-Border Data Flows," op cit.
9. Lund and Manyika, op. cit.; Michael Mandel, "Data, Trade and Growth," Progressive Policy Institute, April 2014, http://www.progressivepolicy.org/wp-content/uploads/2014/04/2014.04-Mandel_Data-Trade-and-Growth.pdf. Ibid; http://e15initiative.org/wp-content/uploads/2015/09/E15-Digital-Economy-McKinsey-FINAL.pdf
10. Lund and Manyika, op. cit.; Raghu Das and Peter Harrop, RFID forecasts players and opportunities 2014—2024, IDTechEx, November 2013.
11. TeleGeography, Global Internet Geography, 2013; TeleGeography, Global Internet Map, 2012.
12. Manyika, et. al, op. cit.
13. Lund and Manyika, op. cit.
14. Ibid.
15. Facebook, Form 10-K, submitted to the Securities and Exchange Commission.
16. Twitter, Form 10-K, submitted to the Securities and Exchange Commission.
17. Amazon, Form 10-K, submitted to the Securities and Exchange Commission.
18. Google, Form 10-K, submitted to the Securities and Exchange Commission.

CHAPTER 5

Under the Sea: The Infrastructure of the Transatlantic Digital Economy

The digital economy evokes images of electrons speeding through the ether, but the reality is that undersea cables bring the internet to life. They transmit 99% of all intercontinental telecommunication traffic — data, phone calls, texts, emails.[1] They serve as an additional proxy for the ties that bind continents, particularly Europe and North America.

The first undersea cable connecting Europe to North America was a telegraph cable laid across the floor of the Atlantic Ocean from Telegraph Field in western Ireland to Heart's Content in eastern Newfoundland. The first communications in August 1858 reduced transatlantic communication time from days to hours. Ultimately the cable failed, however, and it was only after the U.S. Civil War, in 1866, that the first reliable transatlantic connection succeeded.

It took another ninety years, in 1956, before coaxial cables laid along the Atlantic Ocean floor could carry telephone signals as well as data.[2] It took another three decades, in 1988, until the first transatlantic fiber cable of incredible speed and bandwidth was laid. Today, another three decades later, transoceanic communication happens at 99.7% the speed of light.[3] A single hair-thin glass fiber can transmit 10 terabits (trillion bits) per second across the Atlantic. That is the equivalent of 25 double-layer Blu-ray Discs per second, and is 30,000 times the capacity of the first fiber cable laid in 1988.[4]

Transatlantic cable connections represent the densest and highest capacity cable routes, with the highest traffic, in the world.[5] Between 2011 and 2016 total available capacity increased 240%, with all 13 current transatlantic systems on at least 40G technology and 85% on 100G technology.[6] Military agencies also build submarine cables, yet those do not appear on public maps. Suffice it to say that if such connections are also considered, transatlantic submarine cables are even more dense than commonly depicted.[7]

Between 2003 and 2014, no new transatlantic cables were laid. Yet commercial and consumer demand is rapidly outpacing supply, and simple upgrades are inadequate to racing bandwidth needs and greater infrastructure requirements.[8] Telegeography projects that 2 new transatlantic cables will be needed every year between now and 2025 just to keep up with demand. If no new transatlantic cables were built, the system would run out of capacity in 2021.[9] Five more transatlantic systems are in the works, not only from Virginia to Spain but from South America to Europe and to Africa. If all planned systems for just the next 2 years become operational, they will double existing total transatlantic capacity.[10]

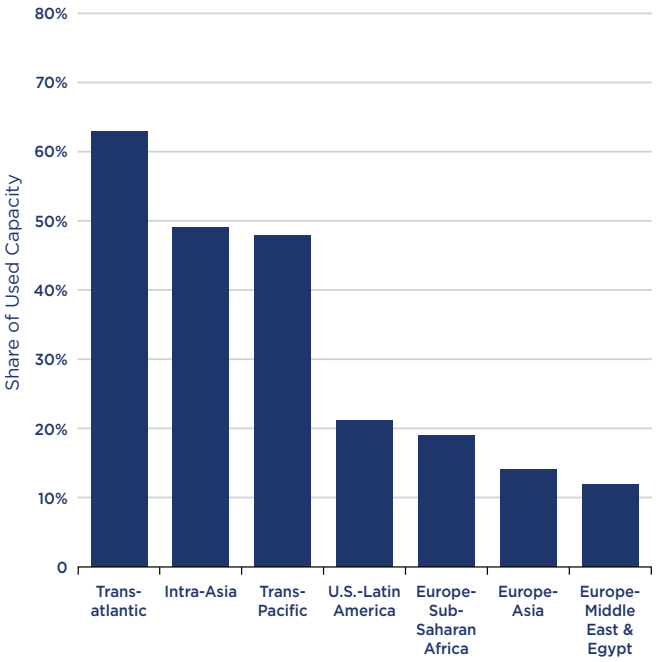
The Growing Role of Private Networks

Traditionally, transatlantic cables were laid and controlled by large consortia of national telecommunication carriers, also known as Internet Protocol "backbone" operators. This is now changing. The new surge in transatlantic capacity is being driven by private networks, mainly providers of content and cloud services, which are displacing backbone operators as the major buyers of international capacity and the major investors in subsea cables.[11]

Content providers keen on getting closer to customers and achieving economies of scale are moving quickly to the digital frontier. Rather than rely on leasing arrangements with backbone providers, they see advantages in owning these cable networks themselves as they anticipate continuing massive growth in bandwidth needs.[12] They are building up new nodes in both primary and secondary user markets, driving long-haul demand and routing patterns, and their densest connections are between North America and Europe.[13]

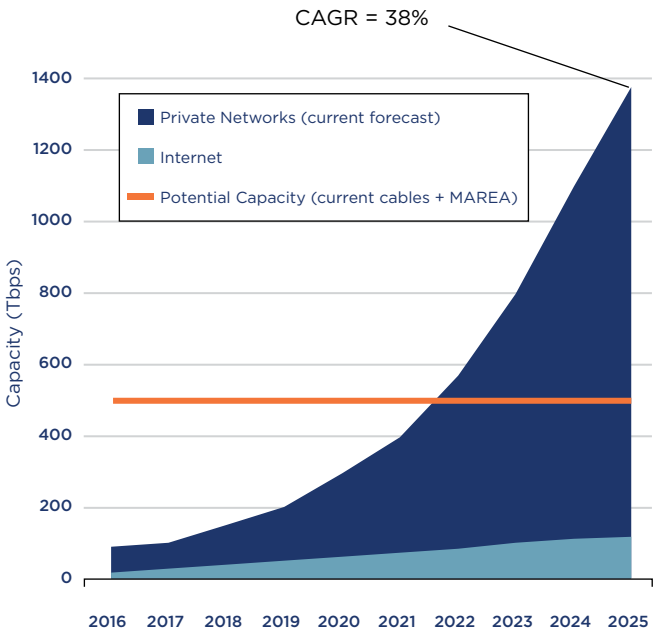
This new dynamic is a major reason for the surge in new investments in the transatlantic submarine cable network. Microsoft has been a major buyer for three

TABLE 2.5.1: PRIVATE NETWORKS' SHARE OF USED BANDWIDTH BY ROUTE, 2015



Source: Telegeography.[14]

TABLE 2.5.2: LIT VS. POTENTIAL CAPACITY ON ALL TRANSATLANTIC CABLES



Source: Telegeography.[15]

new transatlantic systems. The first, called Hibernia Express, was the first transatlantic cable system deployed in more than 12 years. It began service in September 2015, connecting North America and Europe through landing points in Halifax, Nova Scotia, Brean, England and Cork, Ireland. The second, AE Connect, entered into service in 2016. Billed "the most secure transatlantic cable in existence," AE Connect boasts the highest capacity of any cable along the transatlantic route, and alone has boosted total transatlantic capacity by 34%.[16] An even higher-capacity cable called MAREA (Spanish for "tide"), being built by Microsoft and Facebook, is slated for completion by October 2017. It will be operated by Telxius, the infrastructure unit of Spain's Telefónica, and run from Virginia Beach in the United States to Bilbao, Spain, and then to network hubs in Europe, Africa, the Middle East and Asia. MAREA alone will more than double existing transatlantic capacity and will be highest-capacity commercial submarine cable in service anywhere.[17]

If current transatlantic demand trends, continue, Telegeography estimates a compound annual growth rate of 38% in capacity until 2025 (See Table 2.5.2).[18]

Hubs, Nodes and Trombones

The internet is structured as a hub-and-spoke system: the hubs are the internet exchanges located in cities around the world, and the spokes are the undersea fiber optic cables that run between these exchanges.

This submarine cable system underscores the unevenness of the digital economy and the critical roles the United States and Europe play as central hubs in the global system. For instance, 30% of all internet capacity in 2015 was connected to the United States.[19] Yet when it comes to major cross-border interconnection hubs, Europe is the global leader, with tremendous connected international capacity. Frankfurt, London and Amsterdam substantially outpace North American and Asian cities (Table 2.5.3). Frankfurt's connected capacity, for instance, is over 3 times greater than that of New York and almost 5 times greater than that of Singapore, the Asian leader. Europe has increased its position, while leading Asian cities have surpassed U.S. cities.[20]

The roles of the United States and Europe as critical digital gateways are also underscored by looking at inter-regional connections and capacity. Of the 241 Terabits per second (Tbps) of international internet capacity in 2016, 79 Tbps was between each of the major world regions and 162 Tbps was within those regions. Yet in the digital economy, data doesn't always travel directly from point A to Point B. If a server at Point C hosts the relevant content being transmitted, then the content travels first between

TABLE 2.5.3: MAJOR INTERCONNECTION HUBS

International Internet Bandwidth (Tbps)	2016	2012
Frankfurt	48.5	15.7
London	43.1	15.1
Amsterdam	34.6	11.7
New York	14.6	6.1
Singapore	10.5	2.1
Hong Kong	9.2	2
Tokyo	7.3	2.3
San Francisco	7	2.8
Washington, DC	4.9	2.5

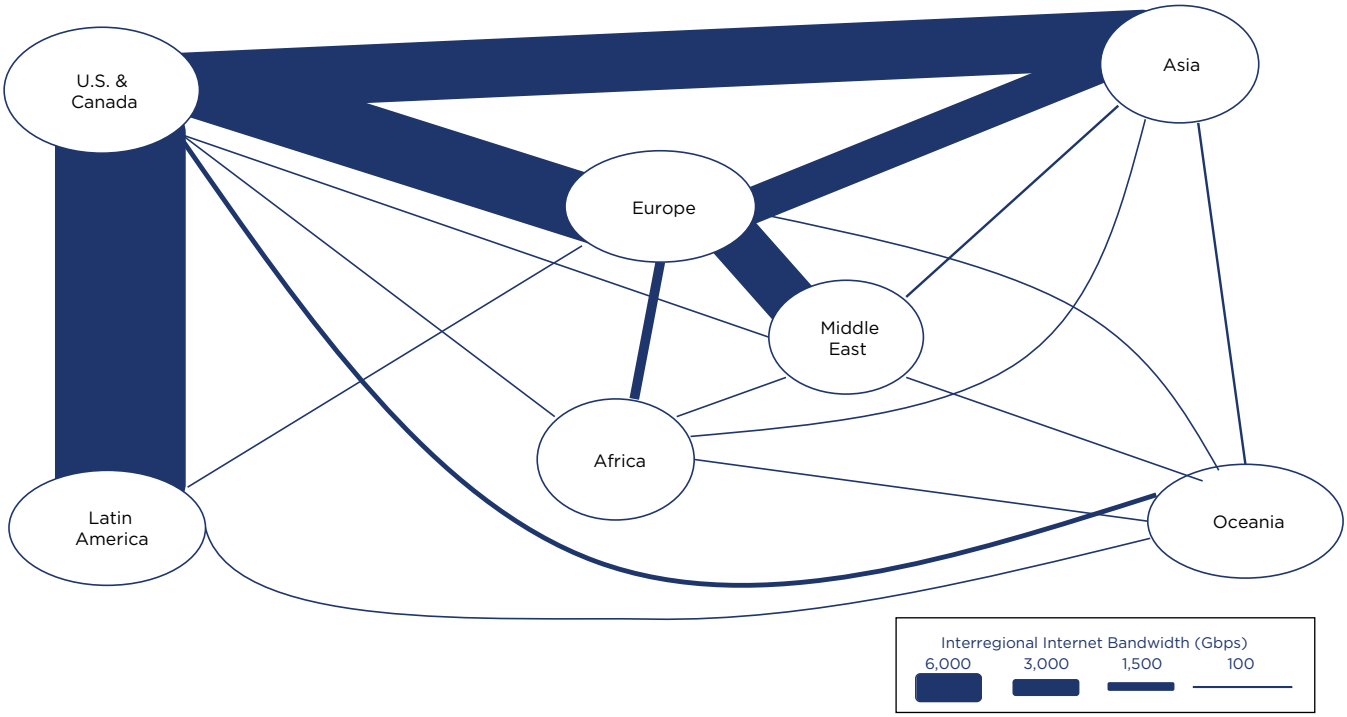
Tbps: Terabits per second. Source: Telegeography.[21]

C and A before it travels from A to B. This so- called "trombone effect" highlights the sometimes circuitous nature of the digital economy, and the central role of the transatlantic economy.[22]

Rising economies are becoming more integrated into the submarine cable network, yet few have data centers and so are reliant on content that is not stored locally. In addition, local content providers in many emerging economies choose to host their content abroad because the cost is much lower. South Americans, for instance, rely almost exclusively on international interconnections routed through data centers in the United States. Similarly, 85% of international traffic emanating from the Middle East travels to centers in Europe. Africa is equally dependent: most traffic travels the trombone-like path from Africa through Europe and back to Africa, even if the African user is browsing a local website for a business just down the street.[23]

The trombone effect highlights why both the United States and Europe play such outsized roles in international digital traffic, even when a cursory glance at data flows may lead one to other conclusions.[24] For instance, until 2013 the highest-capacity inter-regional route had always been the transatlantic link between Europe, the United States and Canada. This changed, however, as capacity on the Latin America-U.S./Canada route exceeded the transatlantic route. In 2016, the Latin America-U.S. & Canada route extended its lead, expanding 33% to reach 23.4 Tbps (see Table 2.5.4). This surprising shift is understandable if one takes account of the fact that Latin America's international internet bandwidth is almost completely connected to the United States. In other words, the Latin America-North America link has gained so much so quickly because Latin America's traffic is routed first to North America before it

TABLE 2.5.4: INTER-REGIONAL INTERNET BANDWIDTH, 2016



Source: Data as of mid-2016. Source: TeleGeography.

travels elsewhere. And content sent within Latin America could very well travel the trombone route to the United States and then back to a Latin American sender before it travels to his next door neighbor.

These dynamics influence price. In part because Europe and the United States serve as critical international traffic hubs, prices are lowest there. Transit is more expensive in Africa and the Middle East, which remain largely dependent on long-haul links to Europe, and in South America, which is highly dependent on the United States to gain access to international connectivity and where service providers add the additional cost of transport to local transit prices. It is often less expensive to purchase capacity from one South American city to the United States than to a neighboring South American city. A similar situation exists with regard to Africa and Europe, which means it is likely to be more cost-effective for an African service provider to lease international bandwidth to Europe to reach other parts of Africa, rather than to lease intra-African bandwidth.

These other regions are seeking to diversify their connections. Brazil, for instance, is seeking to bypass the United States with at least one direct subsea cable link to Europe, called Eulalink. Africans are seeking to reduce their dependence on European hubs by building the first two direct connections ever with South America.[25] Table 2.5.5 shows that investment growth is higher in routes other than those crossing the North Atlantic. But construction of alternative routes takes time, and Europe and the United States remain the critical hubs in inter-regional connectivity.

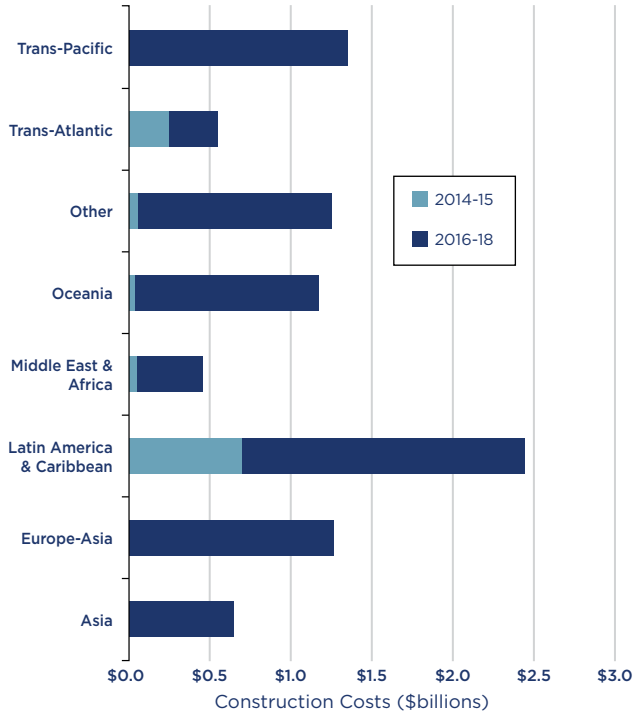
The United States and Europe may have their own interests in diversifying from such heavy reliance on transatlantic connections, in particular as a way to build resilience to cyberattacks. 75% of all current transatlantic cables are along the traditional northern Atlantic route; recent distributed denial-of-service attacks have highlighted the need for alternative routes. This is one reason why Ashburn, Virginia has emerged as an important new data center, as a means to diversify from inordinate reliance on New York/New Jersey data centers.[27]

Peering, Content, and Colocation

Wherever there is demand for international connectivity, there is also demand for peering, content, and colocation — three more areas where the United States and Europe are central hubs in the digital economy.

Peering through Internet Exchanges. The Internet is a collection of many individual networks, most of which have an interest in exchanging traffic among each other's users via neutral Internet Exchanges (IXs). Such exchanging is generally known as "peering."[28]

TABLE 2.5.5: INVESTMENT SURGING IN NEW SYSTEMS



Source: TeleGeography, SubOptic 2016.[26]

A map of IX locations around the world offers another indicator of the centrality of the United States and Europe to the global digital economy. Frankfurt, Amsterdam and London are the largest non-profit entrepôts for international operators, with more than double the average throughput of IXs elsewhere outside the United States.[29] And while for-profit IXs in the United States usually to not make traffic data public on their websites, such entities are large and central to the digital economy. Equinix, for instance, a U.S. corporation that provides data centers and IXs and data centers, is changing the competitive landscape through acquisitions around the world.[30]

Here again one sees efforts at diversification. For instance, all along the Mediterranean efforts are underway to create new IXs to avoid having traffic go through major nodes like Frankfurt or London. Telegeography estimates that in last 2 years, 20 new IXs have been created globally.[31]

Data centers. Given massive global demand for content, big Internet companies such as Google, Microsoft, Facebook and Amazon store replicas of their data in multiple server

farms around the world, and route queries to the closest in order to speed up their response time. Video cached at a local data center, for instance, is what allows a viewer to fast-forward a movie as if the file was stored on a home device.

Because of galloping demand, such data centers are proliferating. In 2016 six leading content providers created 8 new service centers or data providers, and another 24 are slated to begin operations in the next two years. 17 of those centers will open in Europe (9) and the United States (8), compared to one each in Brazil, India and China, and four in the rest of Asia.[32]

The growing availability of data centers, in turn, is a major driver of bandwidth demand: vendors' efforts to synchronize private data centers around the world now consume more bandwidth than public internet traffic. The transatlantic MAREA cable mentioned earlier is being built expressly for this purpose.[33]

Colocation Centers. Transatlantic centrality is further evident by taking one step further and looking at colocation centers, which are a type of data center where equipment, space, and bandwidth are leased by retail customers. Colocation facilities provide space, power, cooling and physical security for the server, storage and networking equipment of various firms, and facilitate peering arrangements among them. The primary colocation markets are New York and London, each with over 7 million square feet of colocation space. San Francisco and Hong Kong each have over 4 million square feet of colocation space, followed by Frankfurt and Singapore, each with over 3 million square feet. Telegeography estimates that London and Hong Kong experienced compound annual capacity growth rates of 9% and Frankfurt, Singapore and New York registering growth rates of 8% between 2012 and 2016.[34]

BOX 2.5.1. THE CHANGING NATURE OF TRANSATLANTIC TRAFFIC

According to TeleGeography, transatlantic bandwidth is in high demand and the New York-to-London route is the second-largest international internet traffic route globally, with multiple terabits of peak traffic. But the kind of traffic has changed.

Between 1927 and 1983, International phone traffic grew at a compound annual growth rate of 21% between 1927 and 1983. It then slowed to a compounded rate of 15% annually between 1983 and 2007 and 7% from 2007 to 2014. In both 2015 and 2016, however, international voice traffic actually declined 1% — the first time such traffic declined since the Great Depression.[35]

What's going on? People certainly haven't lost interest in communicating across borders. But now they are keeping in touch in other ways. For instance, by popularizing the concept of the voice-over-Internet Protocol (VoIP) in 2003, Skype changed how the world communicated and heralded the end of costly international telephone calls. Its history is rooted in a peer-to-peer music sharing program called Kazaa, and it hailed not from Silicon Valley, but Estonia and then London. Kazaa was initially built by some Estonian programmers and then purchased by Niklas Zennstrom of Sweden and Janus Friis of Denmark. They, alongside a number of Estonian developers, used the basis of Kazaa to create Skype. The company has gone through many transitions, bought in 2005 by eBay, then by various venture funds, and in 2011 by Microsoft. Even through the tumult, Skype now provides users with video voice messaging, instant messaging, file and screen sharing. It has more competition these days, but remains the market leader and an essential communications platform.

Skype's rise heralded a profound shift in the nature of international communications via the mass adoption of new "over-the-top" communications services.[36] An over-the-top (OTT) communications service is any app or service provided over the top of your internet connection, without any interaction with your internet service provider. OTT services are most typically related to media and communication and are generally, if not always, cheaper than services provided by traditional cable/satellite or telecommunications companies. Examples include Hulu or Netflix for video (replacing your regular TV provider), Facetime or Skype (replacing your long distance provider), or WhatsApp or Facebook Messenger for mobile messaging — each of which topped 1 billion monthly active users in 2016, with WeChat not far behind, with 846 million users in September 2016. In fact Telegeography estimates that six popular OTT communication apps (WhatsApp, Facebook

Messenger, WeChat, Viber, Line, and KakaoTalk) combined for over 4.4 billion monthly users in June 2016, an increase of 800 million from June 2015, and up nearly threefold from June 2014.[37]

OTT are now not just an important means of international communication, they have become the primary mode of delivery in a very short time. Telegeography estimates that cross-border OTT traffic reached 552 billion minutes in 2016, slightly more than the 546 billion minutes of carrier traffic.[38]

Endnotes

1. Satellites transmit less than one-half of 1% of such traffic. They cannot compete with submarine cables when it comes to digital communication capacity, speed, or transaction time (latency). See David W. Brown, "10 Facts about the Internet's Undersea Cables," Mental Floss, Nov 12, 2015, http://mentalfloss.com/article/60150/10-facts-about-internets-undersea-cables; Geof Wheelwright, "Undersea cables span the globe to send more data than satellites," *Financial Times*, November 2, 2016, https://www.ft.com/content/128f1368-9123-11e6-8df8-d3778b55a923. When we use our cell phones, we tend to think of it as a wireless communications device. But when we use our phone, its radio signal is converted at a nearby base station into an optical signal, and this optical signal travels to its destination through fixed fiber optic cables. See Jeff Hecht, "The bandwidth bottleneck that is throttling the internet," *Nature*, August 10, 2016, http://www.nature.com/news/the-bandwidth-bottleneck-that-is-throttling-the-internet-1.20392.
2. Phil Edwards, "A map of all the underwater cables that connect the Internet," Vox, November 8, 2015, http://www.vox.com/2015/3/13/8204655 submarine-cables-internet.
3. Sebastian Anthony, "Researchers create fiber network that operates at 99.7% speed of light, smashes speed and latency records," Extreme Tech, March 25, 2013, http://www.extremetech.com/computing/151498-researchers-create-fiber-network-that-operates-at-99-7-speed-of-light-smashes-speed-and-latency-records.
4. Hecht, op. cit.; Wheelwright, op. cit.
5. Wayne Nielsen, "North Atlantic Regional Roundup," Presentation to the 2017 Pacific Telecommunications Council, January 2017, https://www.ptc.org/assets/uploads/papers/ptc17/PTC17_Sun_Submarine%20WS_Nielsen.pdf
6. Ibid.
7. Ingrid Burrington, "What's Important About Underwater Internet Cables," *The Atlantic*, November 9, 2015, https://www.theatlantic.com/technology/archive/2015/11/submarine-cables/414942/.
8. Ibid; Nielsen, op. cit.
9. Tim Stronge, "Submarine Cables: Are We in a New Bubble?", Presentation to the 2017 Pacific Telecommunications Council, http://blog.telegeography.com/ptc-submarine-cable-bubble-presentation-2017-market-summary.
10. Nielsen, op. cit.
11. Jayne Miller, "Google and Facebook have Joined the Pacific Light Cable Project," Telegeography, October 13, 2016, http://blog.telegeography.com/google-and-facebook-have-joined-the-pacific-light-cable-project.
12. Alan Mauldin, "Rising Tide: Content Providers' Investment in Submarine Cables Continues," Telegeography, May 27, 2016, http://blog.telegeography.com/rising-tide-content-providers-investment-in-submarine-cables-continues; Wheelwright, op. cit.
13. Jayne Miller, "The Colocation Sector: Shifting Dynamics, Stable Fundamentals," Telegeography, February 3, 2017, http://blog.telegeography.com/ptc-colocation-presentation-2017-market-summary.
14. Tim Stronge and Alan Mauldin, "Revenge of the Cable Myths," Telegeography, July 7, 2016, http://blog.telegeography.com/mythbusters-revenge-of-the-cable-myths-part-ii.
15. Nielsen, op. cit.
16. Stronge, op. cit.
17. Ibid; The highest-capacity commercial submarine cable now in service is the 60-terabit-per-second FASTER system that opened in June 2016 between Oregon and Japan. It sends 100-gigabit-per-second signals on 100 wavelengths in each of 6 pairs of large-core fibers. But when MAREA is completed in October 2017, the cable will link Microsoft and Facebook data centers on opposite sides of the Atlantic at 160 terabits per second. See Wheelwright, op. cit.
18. Stronge, op. cit.
19. "Measuring the Value of Cross-Border Data Flows," Economics and Statistics Administration and the National Telecommunications and Information Administration, U.S. Department of Commerce, September 2016, https://www.ntia.doc.gov/files/ntia/publications/measuring_cross_border_data_flows.pdf; Alan Mauldin and Tim Stronge, "Mythbusters: Revenge of the Cable Myths, Part I," June 30, 2016, http://blog.telegeography.com/mythbusters-revenge-of-the-cable-myths-part-i.
21. Jon Hjembo, TeleGeography, "The Colocation Sector. Shifting Dynamics and Stable Fundamentals," presentation at Telegeography Workshop, Pacific Telecommunication Council '17, Jan 15-18, 2017.
20. Ibid
22. Ibid.
23. Jayne Miller, "Building the Local Exchange of Content in Africa: Dispatches from AfPIF," Telegeography, September 27, 2016, http://blog.telegeography.com/building-the-local-exchange-of-content-in-africa-dispatches-from-afpif
24. Jayne Miller, "The Trombone Effect, Explained," http://blog.telegeography.com/what-is-the-trombone-effect.
25. Hecht, op. cit.
26. Nielsen, op. cit.
27. Mauldin and Stronge, op. cit.
28. Nielsen, op. cit.
29. Amsterdam Internet Exchange, "What is an Internet Exchange?", https://ams-ix.net/about/about-ams-ix/what-is-an-internet-exchange; NYIIX, "About us," http://www.nyiix.net/about-us.
30. See Telegeography's Internet Exchange Map at www.internetexchangemap.com; Also "List of Internet exchange points by size," Wikipedia, https://en.wikipedia.org/wiki/List_of_Internet_exchange_points_by_size; Hjembo, op. cit.; Kenneth Neil Cukier, "Bandwidth Colonialism? The Implications of Internet Infrastructure on International E-Commerce," http://www.isoc.org/inet99/proceedings/1e/1e_2.htm.
31. Hjembo, op. cit. For differences between the European and U.S. Internet Exchange Point models, see http://peering.drpeering.net/white-papers/European-Vs-US-Internet-Exchange-Point-Model.html.
32. Hjembo, op. cit.; Telegeography Internet Exchange Map, op. cit.
33. Hjembo, op. cit.
34. Hecht, op. cit.
35. Hjembo, op. cit.; "Colocation centre," Wikipedia, https://en.wikipedia.org/wiki/Colocation_centre.
36. Patrick Christian, "Market Sees First Decline in International Voice Carrier Traffic Since Great Depression," Telegeography, January 26, 2017, http://blog.telegeography.com/market-sees-first-decline-in-international-voice-carrier-traffic-since-great-depression; Amy Porges and Alice Enders, "Data Moving Across Borders: The Future of Digital Trade Policy," World Economic Forum, April 2016, http://e15initiative.org/wp-content/uploads/2015/09/E15-Digital-Economy-Porges-and-Enders-Final.pdf.

37. Christian, op. cit.
38. Ibid; Dan York, "What is an Over-The-Top (OTT) Application or Service? - A Brief Explanation," Disruptive Telephony, July 10, 2012, http://www.disruptivetelephony.com/2012/07/what-is-an-over-the-top-ott-application-or-service-a-brief-explanation.html.Stephan Beckert, "Rise of the Apps: How OTT Traffic is Balancing a Carrier Slump," Telegeography, February 1, 2017, http://blog.telegeography.com/rise-of-the-apps-how-ott-traffic-is-balancing-a-carrier-slump; "Top 13 Vendors in the Devices and Services Market," Technavio, September 12, 2016, http://www.technavio.com/blog/top-13-vendors-ott-devices-and-services-market.