3

The Transatlantic Digital Economy

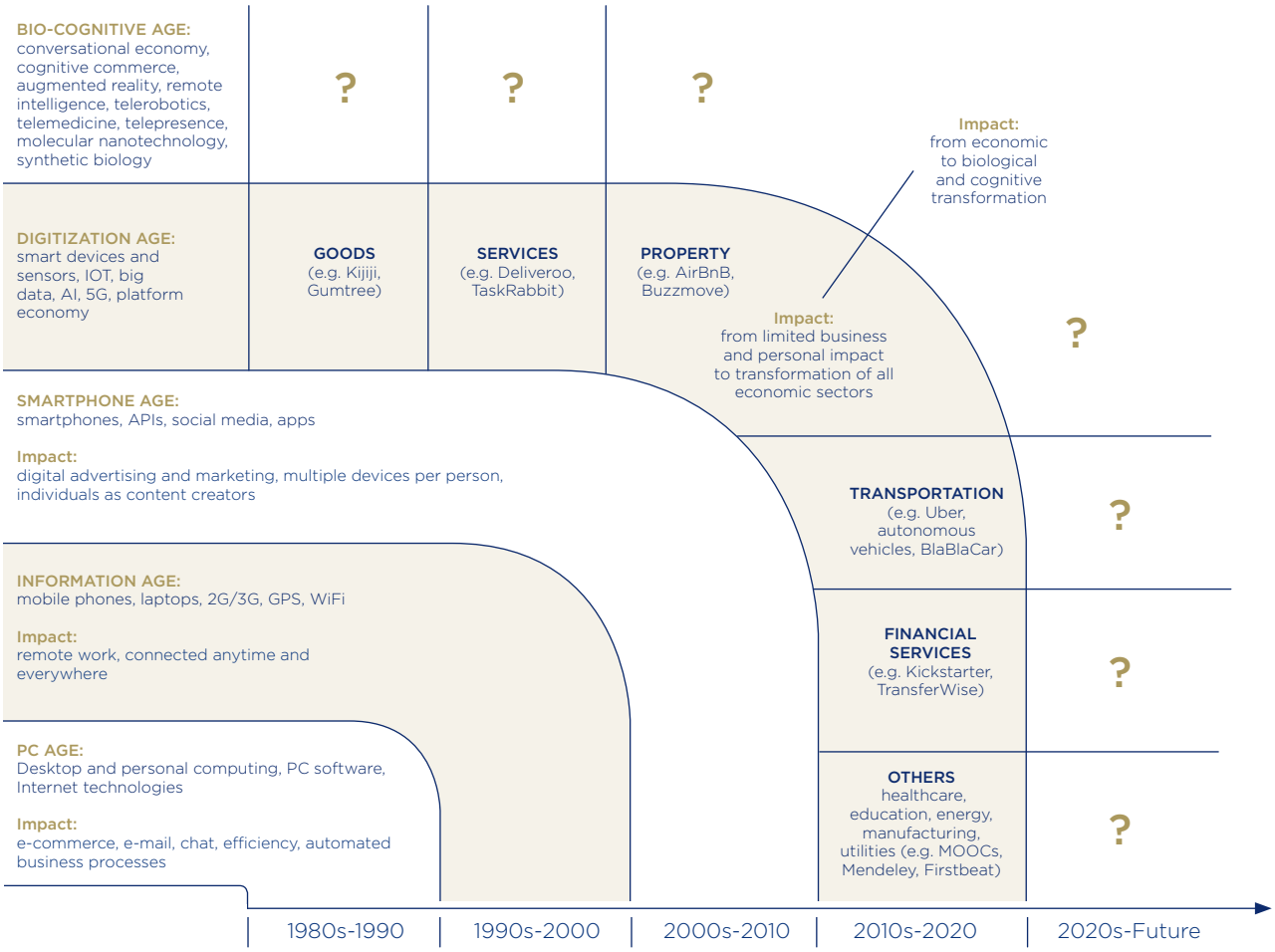
Global data flows now contribute more to global growth than global trade in goods

Digital information, services and products, and the infrastructure that supports them, have become the backbone of the modern global economy. They are transforming how we live, work, play, travel, interact, and do everything in between. Global data flows now contribute more to global growth than global trade in goods.[1] They also underpin and enable virtually every other kind of cross-border flow.

Moreover, despite these incredible transformations, we're still in what Scott Cook of Intuit calls "the first minutes of the first day" of the digital revolution. The Internet of Things, 5G technologies, big data analytics, quantum computing, energy storage, precision agriculture, aquaponics, artificial intelligence and other innovations will further accelerate digital growth around the world.

Table 1 charts the digital frontier. We have moved into an age in which digitization is not just affecting our businesses and our personal lives, it is transforming all sectors of the economy. New enterprises are seizing digital opportunities in goods and services, property, transportation, financial services and a host of other areas ranging from healthcare and education to manufacturing and energy. Moreover, there are many signs that our current "Digitization Age" will soon give way to a "Bio-Cognitive Age," yet another transformative period in which revolutionary advances in digitization, biology, nanotechnology, behavioral and cognitive sciences will combine to affect not only our economic and social lives, but life itself.

Table 1 The Expanding Digital Frontier



Sources: GSMA Intelligence; McKinsey Global Institute; Author's own estimates

Digital Globalization: Still Uneven

"Digital globalization" evokes the image of a seamless global marketplace in which unbridled data flows drive goods, services and money across national boundaries without friction. Reality is different. The digital revolution is global in its reach but uneven in its effects.

Digital connections are "thicker" between some continents and "thinner" between others – and they are "thickest" between the United States and Europe. In this chapter we offer five metrics through which we can see more clearly the importance of transatlantic digital connections.[2]

1. Digital Services and Digitally-Enabled Services

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.[3]

A broader view can be taken by looking at *digitally-enabled services*: 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."[4] Identifying potentially ICT-enabled services does not tell us with certainty whether the services are actually traded digitally.[5] But the U.S. Commerce Department notes that "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,"[6] which means a digital transaction is likely and thus can offer a rough indication of the potential for digital trade.[7]

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, and vice versa.

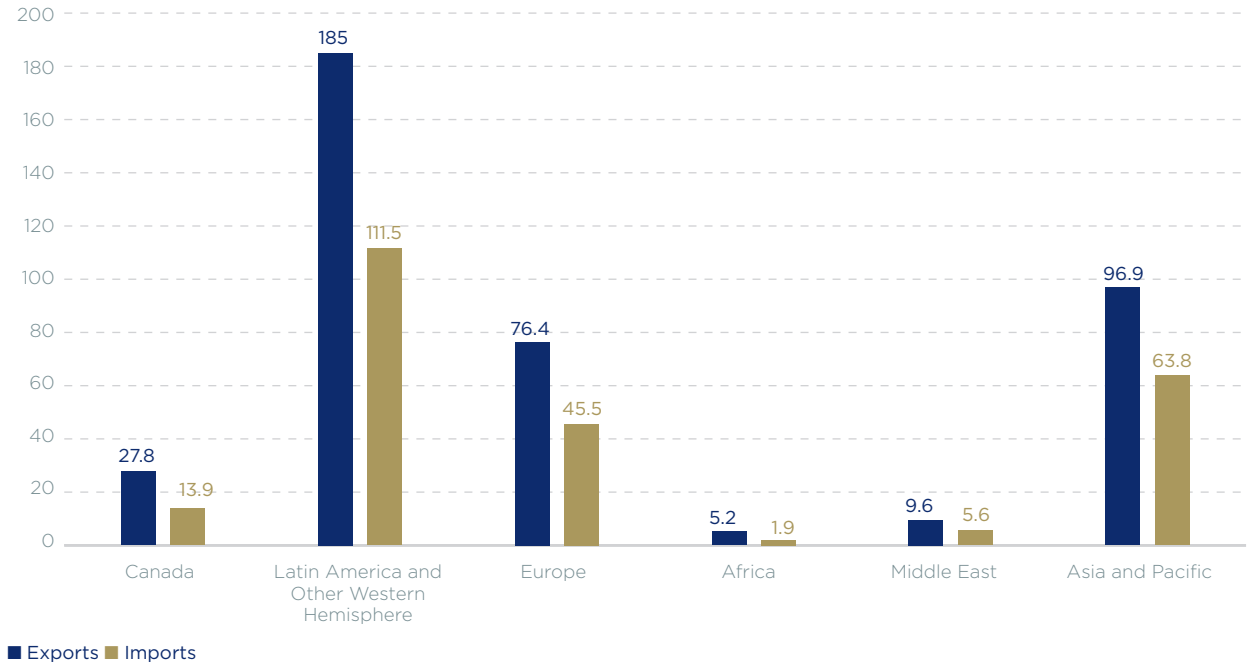
In addition, digitally-enabled services are not just exported directly, they are used in manufacturing and to produce goods and services for export. Over half of digitally-enabled services imported by the United States from the EU is used to produce U.S. products for export, and vice versa, thus generating an additional value-added effect on trade that is not easily captured in standard metrics.[8]

In 2016, digitally-enabled services accounted for 54% of all U.S. services exports, 48% of all services imports, and 64% of the U.S. global surplus in trade in services.[9]

In 2016 the United States registered a $159.5 billion trade surplus in digitally-enabled services with the world. Its main commercial partner was Europe, to which it exported over $185 billion in digitally-enabled services and from which it imported $111 billion, generating a trade surplus with Europe in this area of at least $74 billion. U.S. exports of digitally-enabled services to Europe were more than double U.S. exports to Latin America and almost double U.S. exports to the entire Asia-Pacific region (Table 2).

> *Digitally-enabled services are not just exported directly, they are used in manufacturing and to produce goods and services for export*

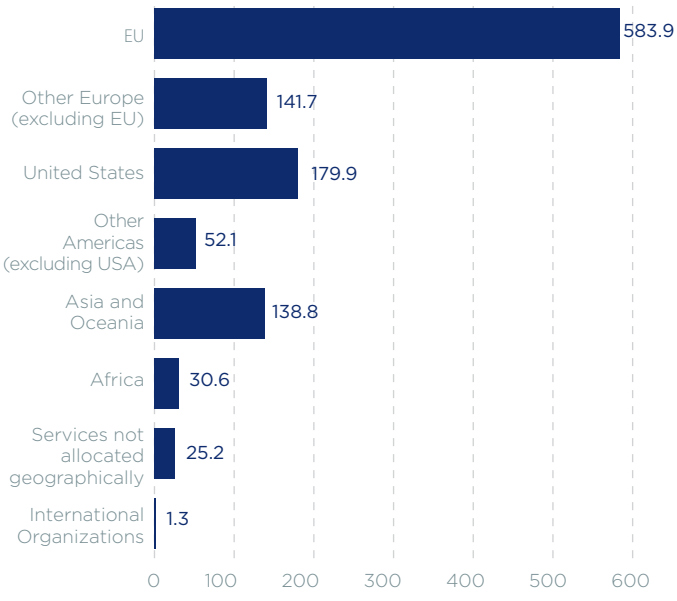
Table 2 U.S. Trade in Digitally-Enabled Services by Major Area, 2016 ($Billions)



Source: Bureau of Economic Analysis.

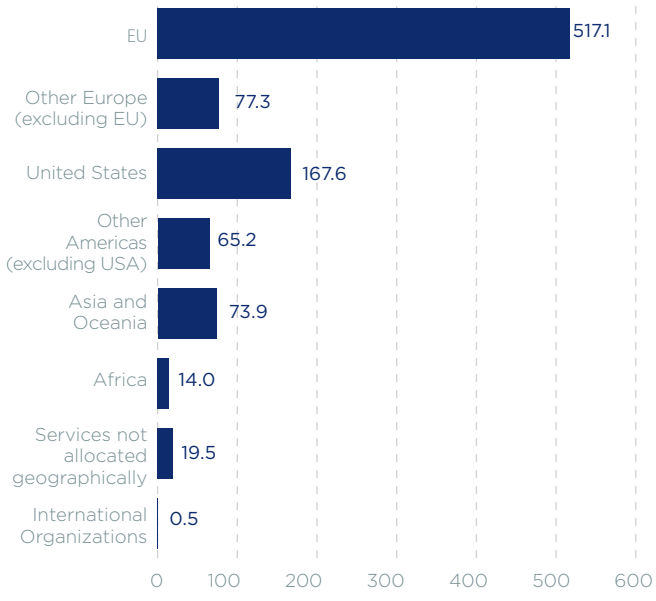
In 2014, the last year of available data, the 28 EU Member States collectively exported $1.2 trillion and imported $935.1 billion in digitally-enabled services, to countries both inside and outside the EU (See Table 3 and Table 4). Excluding intra-EU trade, EU Member States exported $569.6 billion and 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.[10]

Table 3 Destination of EU Exports of Digitally-Enabled Services, 2014 ($Billions)



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

Table 4 Origin of EU Imports of Digitally-Enabled Services, U.S. - EU ($Billions)



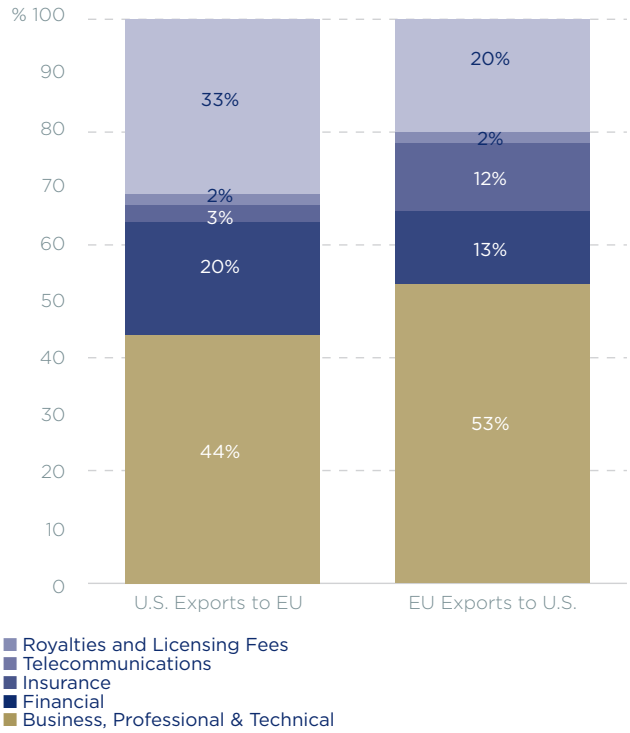
Source: U.S. Department of Commerce, Office of the Chief Economist using data from the Organization for Economic Cooperation and Development.

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.[11] 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, 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).[12]

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 4). 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.[13]

Table 5 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 44% of digitally-enabled service exports from the United States to the EU in 2016. 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.[14] The third largest digitally-enabled services export category for each side is financial services.

Table 5 EU Digitally-Enabled Services Trade by Sector, 2016



Sources: U.S. Bureau of Economic Analysis. Data as of January 2018.

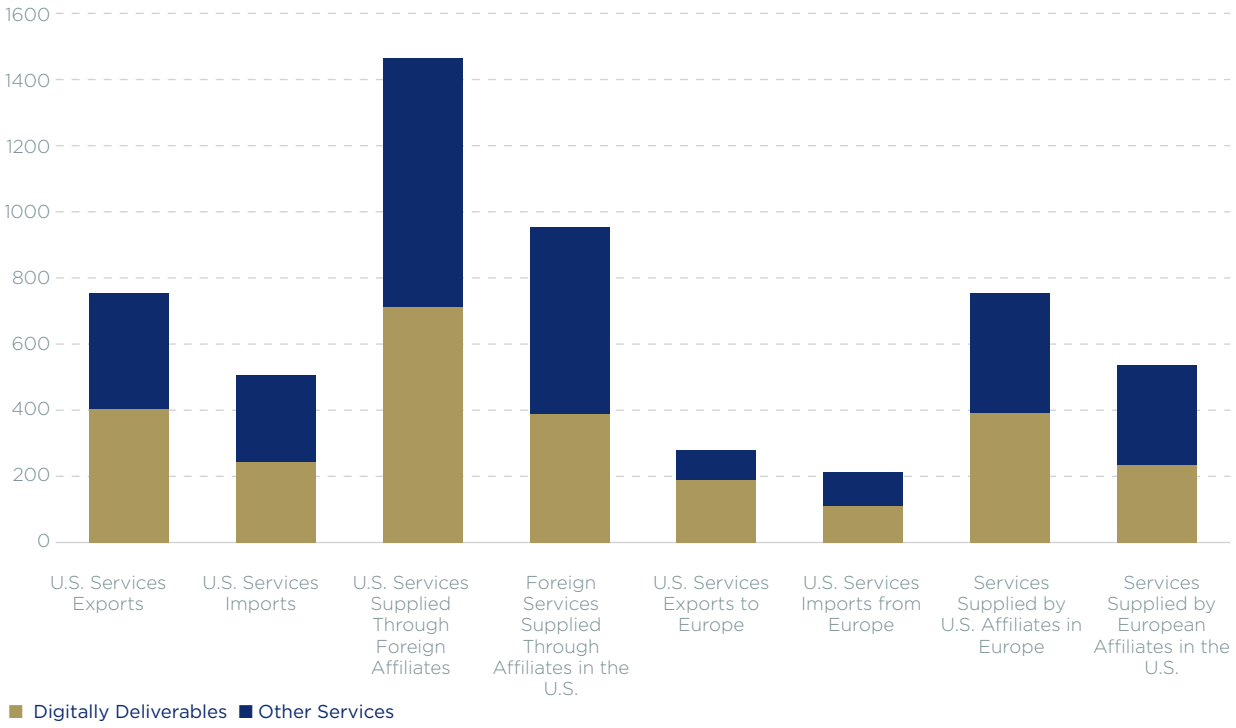
> *The United States is the largest non-EU consumer of EU digitally-enabled services*

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 have 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 6 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 United States, versus U.S. and European exports of digitally-enabled services. In 2015 U.S. affiliates in Europe supplied $391 billion in digitally-enabled services, whereas European affiliates in the United States supplied $233 billion in digitally-enabled services. Digitally-enabled services supplied by U.S. affiliates in Europe were 2.1 times greater than U.S. digitally-enabled exports to Europe, and digitally-enabled services supplied by European affiliates in the United States were 2.1 times greater than European digitally-enabled exports to the United States.

Table 6 Digitally-Enabled Services Trade and Services Supplied through Affiliates ($Billions)



Trade data are for 2016. Affiliate data are for 2015, the latest available year.
Source: U.S. Bureau of Economic Analysis.

The significant presence of leading U.S. services and technology leaders in Europe underscores Europe's position as the major market for U.S. digital goods and services. Table 7 underscores this dynamic. In 2015, Europe accounted for two-thirds of the $244.1 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 66% of U.S. overseas direct investment in the "information" industry was in Europe in 2016.[15]

Table 7 Information Services Supplied Abroad by U.S. Multinational Corporations Through Their MOFAs ($Millions)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Canada	3,595	4,140	3,971	5,996	6,316	7,135	7,595	7,401	8,487	8,856
Europe	67,270	76,156	85,450	84,117	96,310	110,525	119,123	120,796	157,811	161,877
France	4,045	3,794	4,475	4,713	4,582	5,013	4,768	5,258	6,085	5,932
Germany	5,260	6,031	6,104	6,456	7,143	7,798	7,970	10,599	12,018	11,182
Netherlands	5,925	8,152	9,980	8,674	8,719	9,313	10,196	9,117	12,686	13,157
Switzerland	2,871	2,527	3,197	3,747	4,034	4,419	5,243	4,778	(D)	5,480
United Kingdom	28,073	30,500	31,479	29,906	24,941	26,446	25,996	23,876	30,228	33,368
Latin America and Other Western Hemisphere	7,255	10,845	13,165	13,798	17,578	20,943	21,887	21,751	22,457	20,536
Australia	5,722	6,365	6,369	5,961	6,852	6,960	5,531	7,735	7,045	6,275
Japan	3,447	(D)	6,224	7,856	4,575	4,828	5,204	5,807	7,796	7,825
Other Asia-Pacific and MENA Countries	5,217	(D)	(D)	8,875	10,215	11,947	13,244	15,883	36,477	38,714
TOTAL	**92,507**	**(D)**	**(D)**	**126,603**	**141,846**	**162,338**	**172,583**	**179,372**	**240,073**	**244,084**

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

66%

of U.S. overseas **direct investment in the "information" industry** is in Europe (2016)

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.[16]

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 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.[17]

Nonetheless, we can evaluate and compare many different estimates and surveys that have been conducted. The U.S. Department of Commerce estimates that global e-commerce (domestic and cross-border) grew from $19.3 trillion in 2012 to $27.7 trillion in 2016, of which $23.9 trillion was B2B e-commerce and $3.8 trillion was B2C e-commerce.[18] McKinsey Global Institute 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 one billion in 2020.[19] McKinsey concludes that B2B and B2C cross-border e-commerce combined reached $2.2 trillion in 2015, or 12% of total goods trade. And while goods trade growth has been flattening worldwide, the share enabled by e-commerce is growing 27% per year.[20]

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 the U.S. International Trade Commission indicated that they had an online trading relationship with the European Union,[21] 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.[22]

Still, e-commerce, especially via cross-border sales, is still emerging. 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.[23]

Table 8 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.

Table 8 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 8 **European and Transatlantic Connections: Combined B2B and B2C Cross-Border E-Commerce, Selected European Countries, 2015**

Exports		Imports	
Country	**Top Markets**	**Country**	**Top Suppliers**
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%)
Sweden	1. Germany (11%) 2. United Kingdom (7.7%) 3. Denmark (7.3%) 4. Norway (7.2%) **5. United States (6.4%)**	Sweden	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%)
Belgium	1. Germany (15%) 2. France (15%) 3. Netherlands (14%) 4. United Kingdom (9.3%) 5. Italy (5.5%)	Belgium	1. Netherlands (25%) 2. Germany (7%) 3. United Kingdom (6%) *4. China (5%)* 5. France (3%)

Source: Payvision, acapture 2016.

Table 9 North America: Combined B2B and B2C Cross-Border E-Commerce, 2015

Exports		Imports	
Country	Top Markets	Country	Top Suppliers
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.

Table 9 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.

B2B e-commerce accounts for up to 86% of global e-commerce and is therefore also likely to be the most important component of cross-border sales online.[24] 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.[25]

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 a fraction of the size of B2B e-commerce,[26] B2C e-commerce is what most people think of when they hear the term "e-commerce."[27]

Most of the EU's B2C e-commerce transactions are conducted between EU countries.[28] 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.[29] Similarly, U.S. companies are the most important foreign online sellers to UK and German consumers. 70% of all UK digital shoppers, and 48% of all German digital shoppers, buying across borders purchased from U.S.-based companies.[30]

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%).[31] 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.[32]

3. The C2C Platform Economy

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 swiftly becoming a dominant business model in the transatlantic digital economy.[33] 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 C2C platform economy model – with main sectors including lending and community financing, online distance work, home sharing, car sharing, online music and video streaming – is spreading quickly to new and more established sectors, such

as medical equipment and healthcare, retail, legal services, human resources and food delivery.[34]

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.[35] PriceWaterhouseCoopers estimates 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.[36]

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. The study extends its analysis to include B2C transactions, so should be considered an expansive projection. Nonetheless, the potential is significant.[37]

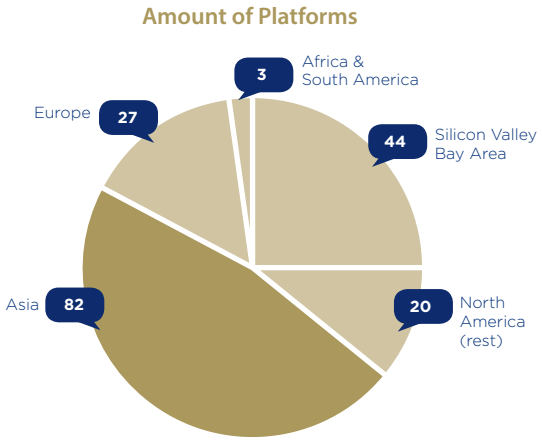
Overall, the United States remains the leader of the C2C platform economy, but this sector of the UK economy is also robust. A third of UK adults are engaging in C2C platform economy transactions, compared to 19% of U.S. adults.[38] London is the C2C platform economy capital of Europe and home to one 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.[39]

Some of the more expansive projections for the growth 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. Nonetheless, even with a more sober appreciation of the future possibilities, the potential is significant.

The Center for Global Enterprise has identified 176 platform companies worldwide with a market valuation of $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 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.[40]

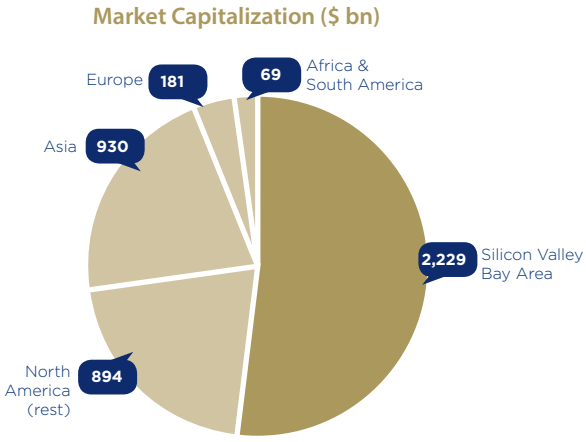
The financial resources of these platform companies are even more concentrated than their geography. Those from Silicon Valley and its surrounding region account for over 50% of the cumulative stock market value of all platforms.

Table 10 World Regions by Number of Platforms



Source: Center for Global Enterprise; Internet Economy Foundation; Roland Berger.[41]

Table 11 World Regions by Market Capitalization of Platforms



Source: Center for Global Enterprise; Internet Economy Foundation; Roland Berger. [42]

Cross-border data flows between the U.S. and Europe are by far the most intense in the world

4. Cross-Border 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. According to the U.S. International Trade Commission, fully half of all global trade in services are now depending on access to cross-border data flows. 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.[43]

As of 2015, cross-border data flows between the United States and Europe, at about 15 terabits per second, were by far the most intense in the world – 50% higher than data flows between the United States and Asia in absolute terms, and 400% higher on a per capita basis.[44]

Researchers are reluctant to use data flows as a proxy for commercial links, since data traffic is not always related to commercial transactions.[45] 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.''[46]

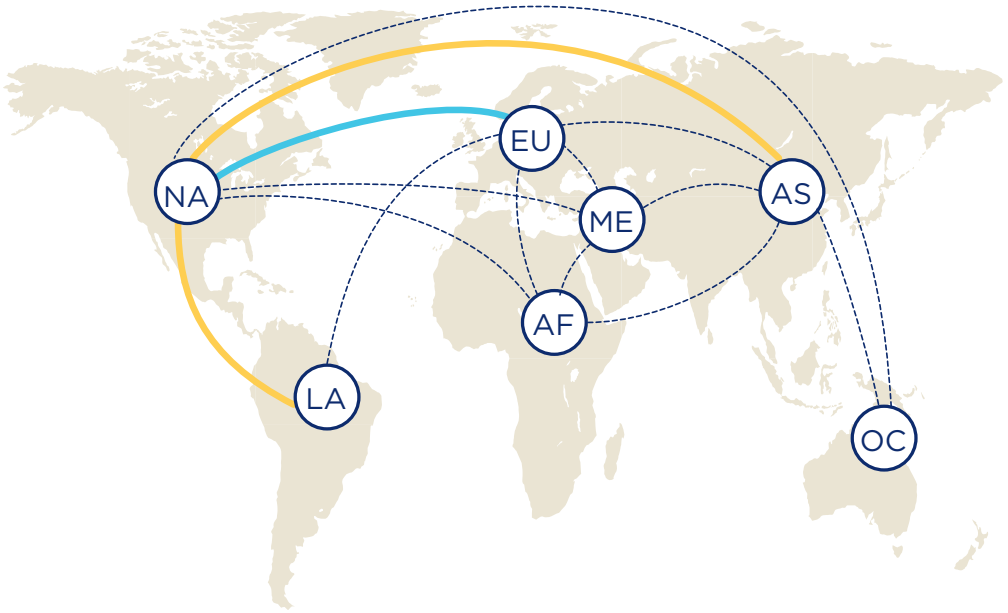
In addition, commercial transactions do not always accompany data, and data do not always accompany commercial transactions. For instance, multinational companies often send valuable, but non-monetized, data to their affiliates.[47] "Peering" agreements between networks allow traffic to traverse different 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 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.[48]

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.[49] 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."[50] Cross-border internet traffic has increased 500-fold since 2000 – and with conservative assumptions will expand another eightfold by 2025.[51]

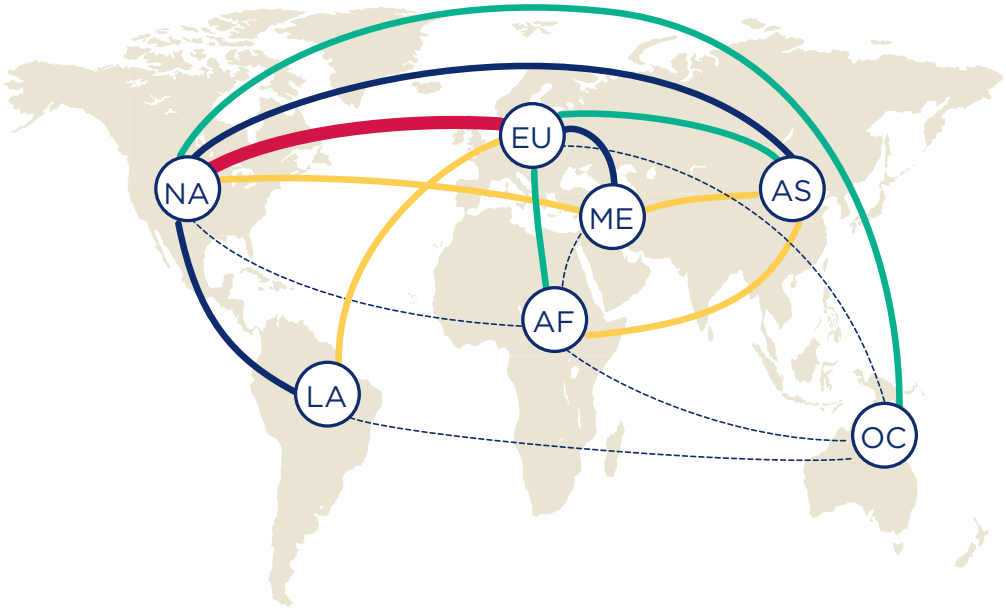
Table 12 **Transatlantic Ties: Used Cross-Border Bandwidth**

2005
100% - 4.7 Terabits (Tbps) per second



2014
100% - 211.8 Tbps

45X larger



Bandwith <50 | 50-100 | 100-500 | 500-1,000 | 1,000-5,000 | 5,000-20,000 | >20,000

Regions NA (North America) - EU (Europe) - AS (Asia) - LA (Latin America) - ME (Middle East) AF (Africa) - OC (Oceania)

Source: J. Manyika, S. Lund, J. Bughin, J. Woertzel, K. stamenov, and D. Dhingra, "Digital globalization: The new era of global flows," McKinsey Global Institute, 2016.

Undersea cables bring the internet to life: they transmit **99%** of all intercontinental telecommunication traffic

5. Under the Sea: The Hardware 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.[52] They serve as an additional proxy for the ties that bind continents, particularly Europe and North America.

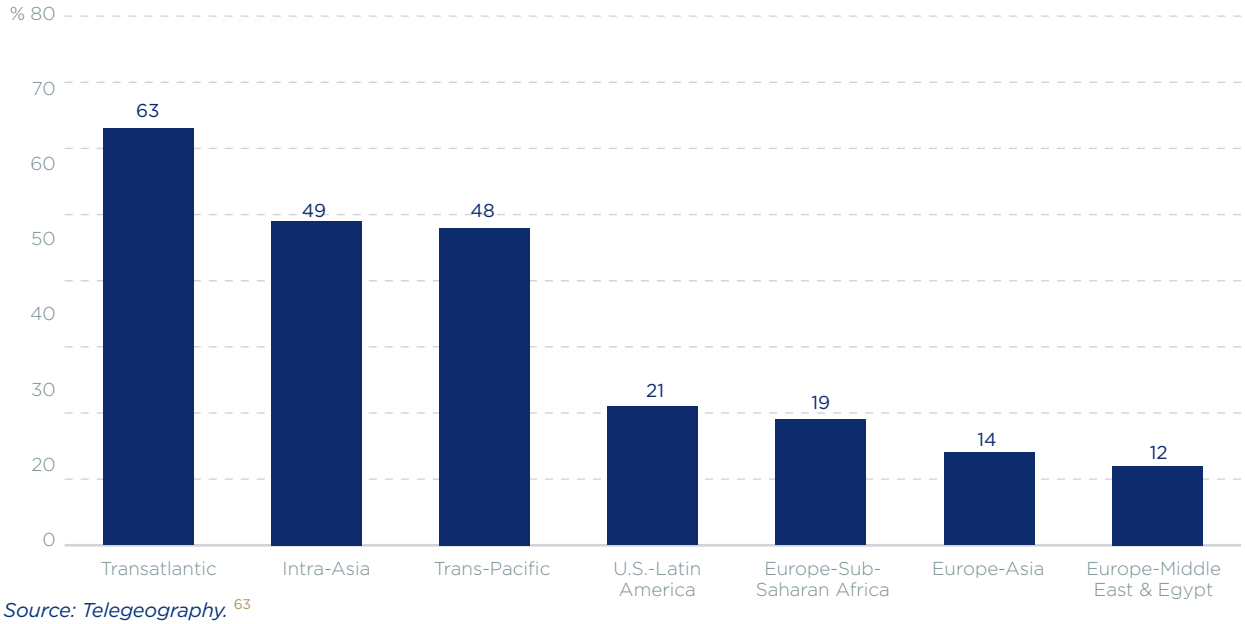
Transatlantic cable connections represent the densest and highest capacity cable routes, with the highest traffic, in the world.[53] Between 2011 and 2016 total available capacity increased 240%, with all 13 current transatlantic systems on at least 40G technology and 85% on 100G technology.[54] Military 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.[55]

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.[56] Telegeography projects that two 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.[57] Five more transatlantic systems are in the works. If all planned systems for just the next two years become operational, they will double existing total transatlantic capacity.[58]

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.[59]

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.[60] 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.[61] If current transatlantic demand trends, continue, Telegeography estimates a compound annual growth rate of 38% in capacity until 2025.[62]

Table 13 **Private Networks' Share of Used Bandwidth by Route, 2015**



Source: Telegeography. [63]

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.[64] 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 14). Frankfurt's connected capacity, for instance, is over three times greater than that of New York and almost five times greater than that of Singapore, the Asian leader. Europe has increased its position, while leading Asian cities have surpassed U.S. cities.[65]

Table 14 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

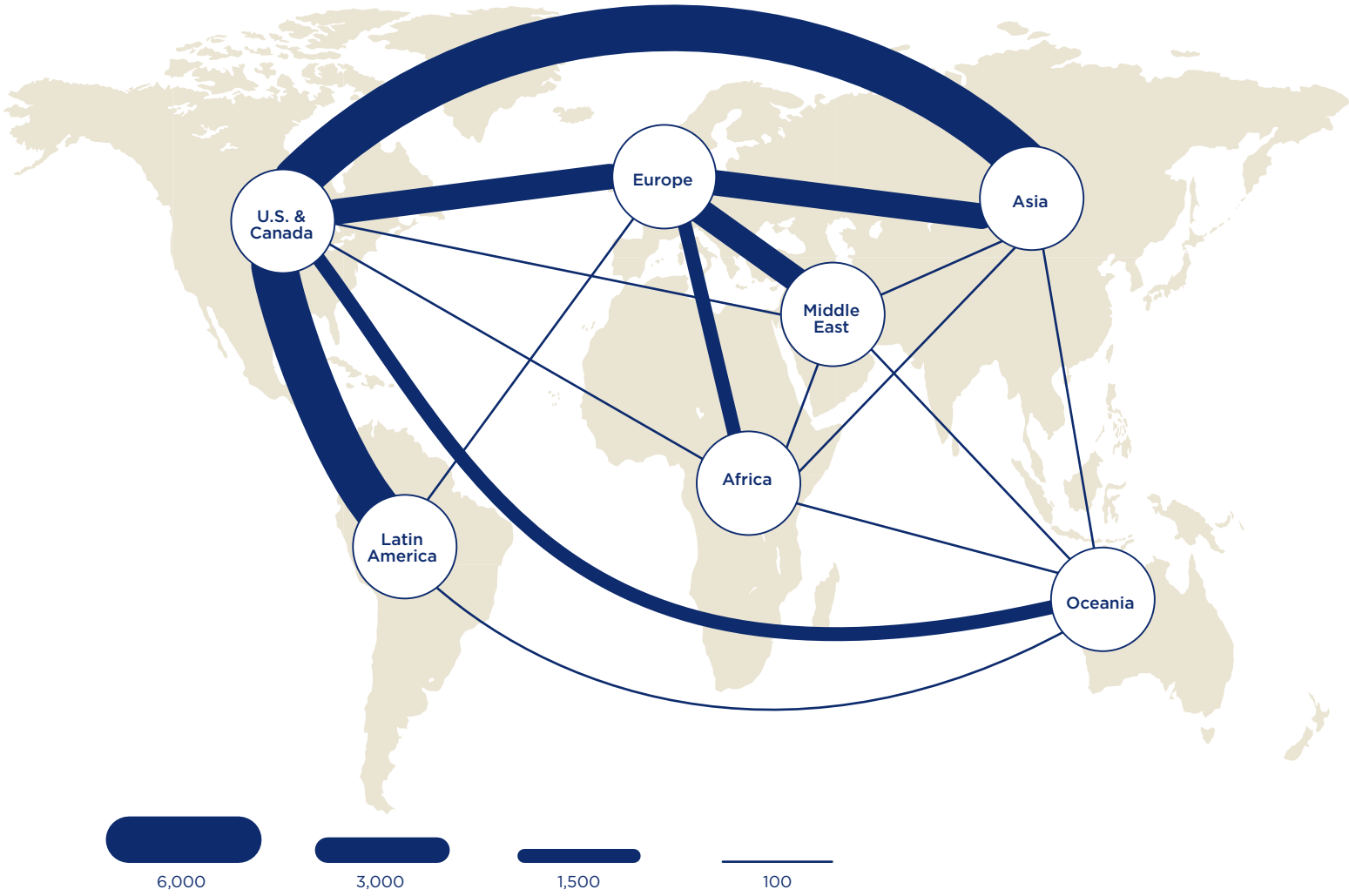
Tbps: Terabits per second. Source: Telegeography. [66]

The role of the United States and Europe as critical digital gateways is 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 does not 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 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.[67]

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.[68]

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.[69] 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 15). 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 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.

Table 15 Inter-Regional Internet Bandwidth, 2016



Data as of mid-2016. Source: TeleGeography © 2016 PriMetrica, Inc.

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12 Ibid.
13 intellectual property not included elsewhere, or n.i.e. Ibid.
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