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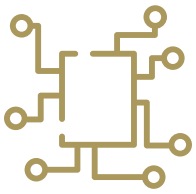
From Pipes to Platforms: The Transatlantic Digital Economy



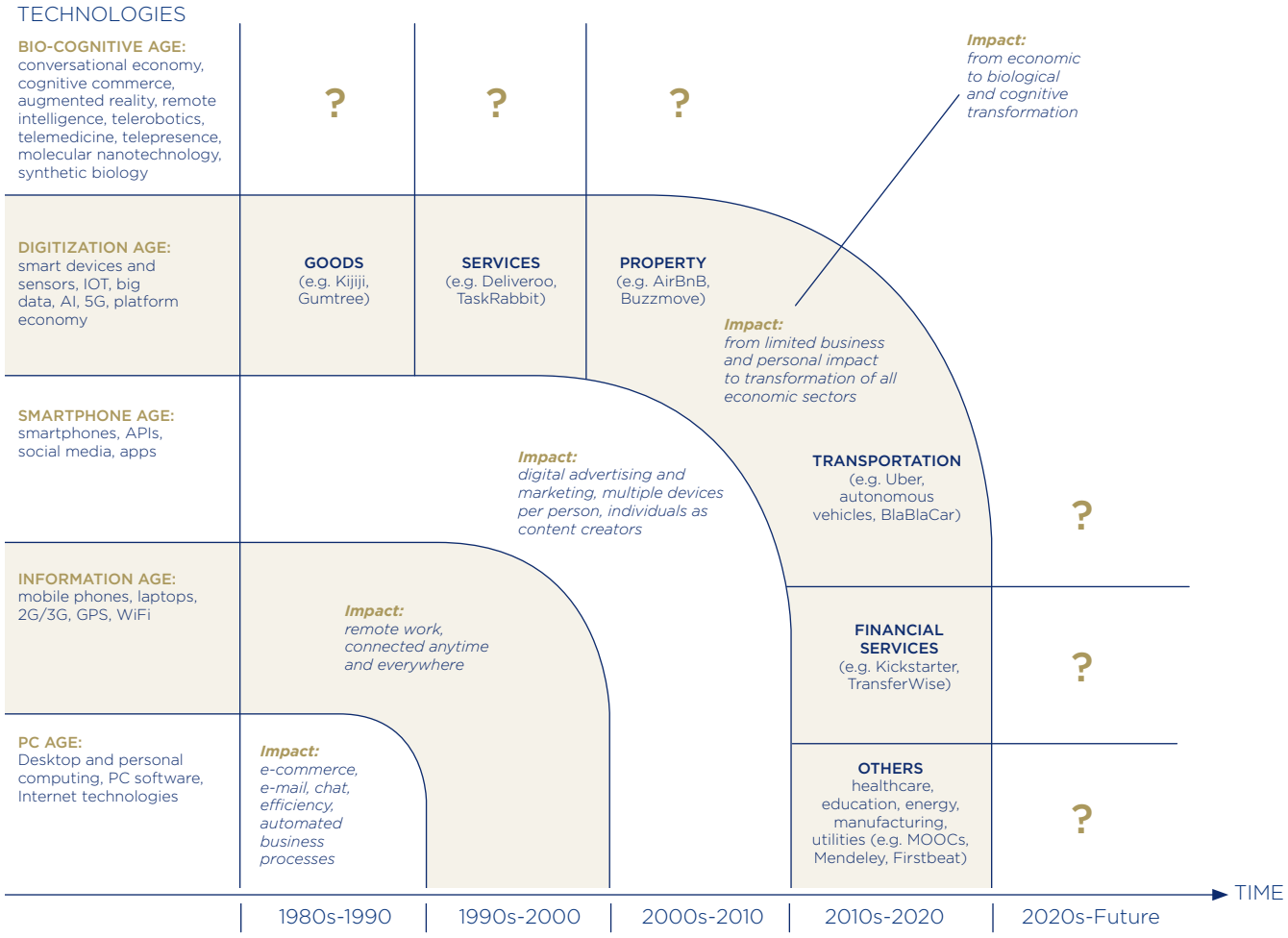
60%

of global GDP will be digitized by 2022

The digital revolution is transforming the strategic landscape for all industries, in all sectors, across the transatlantic economy as well as around the world. The numbers are staggering. In 2018, internet connectivity reached over half the world's population, companies spent over $1.2 trillion on digital transformation, the cloud computing industry's global market worth was at least $127 billion, and value-added services related to the Internet of Things (IoT) topped $120 billion.[1] Average international bandwidth grew 330-fold between 2000 and 2015, and continues to expand rapidly.[2] Total digital information is projected to expand 60-fold from 2012-2025 to 16.1 trillion gigabytes.[3] By 2022, 60% of global GDP will be digitized.[4]

The digital revolution is both an enabler and a disruptor. It is amplifying the efficiency and effectiveness by which businesses produce, market, sell and disseminate goods and services. It is also uprooting entire sectors of the economy. The media has learned that people no longer need a newspaper to get news; the retail sector has realized that customers don't need to go to a store to buy goods. We're now learning that we don't need a hotel to stay overnight, don't need to call a cab or own a car to get around, don't need a bank for banking services, don't need a television to watch TV, don't need a phone to make a call, don't need a camera to take a photo, and don't have to come to class to take a course.

Table 1 The Expanding Digital Frontier



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

The digital revolution has also turned some goods into services. Instead of buying a CD or a DVD, consumers simply access or download content.[5]

Disruption is unrelenting, even for the disruptors. The Smartphone Age has given way to a Digitization Age of smart, pervasive, and increasingly automated connectivity. The Internet of Things, 5G technologies, big data analytics, quantum computing, energy storage, precision agriculture, aquaponics, artificial intelligence, blockchain and distributed ledger technologies and other innovations are fast-tracking digital growth around the world. Moreover, some pathfinders are already charting the frontier of a "Bio-Cognitive Age" 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.[6]

These breathtaking changes promise untold opportunities for economic growth and prosperity, human health, and simple ease of life. They have also given rise to concerns on both sides of the Atlantic: worries about lesser privacy and greater insecurity; market dominance; impact on jobs; manipulation of democratic processes; and persistent digital divides across regions and classes. And as each side of the Atlantic has addressed these concerns differently, frictions have arisen. Yet given the dense interlinkages between the United States and Europe in the digital economy, we literally cannot afford to be disconnected.[7]

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. The transatlantic theatre is the fulcrum of global digital connectivity. North America and Europe generate approximately 75% of digital content for internet users worldwide. U.S. and European cities (Frankfurt, London, Amsterdam, Paris, Stockholm, Miami, New York, Marseille, Los Angeles, San Francisco) represent the world's foremost hubs for international communication and data exchange.[8] In this chapter we offer five metrics through which we can see more clearly the importance of transatlantic digital connections.[9]

1. Digital Services and Digitally-Enabled Services

The digital economy is dominated by services, which accounted for 87.5% of total digital economy current-dollar value added in 2016.[10] Two metrics offer us a clearer picture of transatlantic connections in digital services. 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.[11] A broader view can be taken by looking at *digitally-enabled services*: services that can be but are not necessarily delivered remotely over ICT networks. These include digital services as well as "activities that can be specified, performed, delivered, evaluated and consumed electronically."[12] Identifying potentially ICT-enabled services does not tell us with certainty whether the services are *actually* traded digitally.[13] 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,"[14] which means a digital transaction is likely and thus can offer a rough indication of the potential for digital trade.[15]

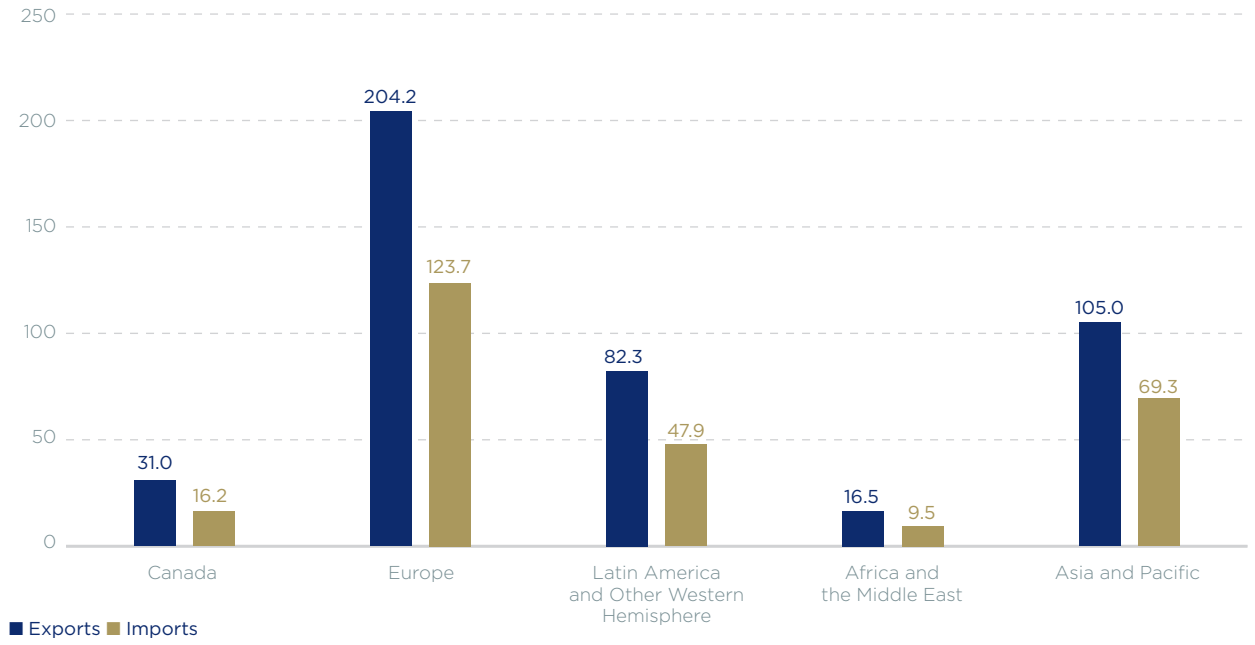
The transformative impact of each of these types of digital services is not limited to just the services sector but extends to manufacturing and the traditional bricks-and-mortar economy as well. Digitally-enabled services such as consulting, engineering, software, design and finance are used in manufacturing 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.[16]

In 2017, digitally-enabled services accounted for 55% of all U.S. services exports, 49% of all services imports, and 68% of the U.S. global surplus in trade in services.[17]

In 2017, the United States registered a $172.6 billion trade surplus in digitally-enabled services with the world. Its main commercial partner was Europe, to which it exported $204.2 billion in digitally-

Table 2 U.S. Trade in Digitally-Enabled Services by Major Area, 2017 ($Billions)



Source: Bureau of Economic Analysis, Trade in Potentially ICT-Enabled Services Database. Data as of October 2018.

enabled services and from which it imported $123.7 billion, generating a trade surplus with Europe in this area of $80.5 billion, according to figures from the U.S. Bureau of Economic Analysis. U.S. exports of digitally-enabled services trade to Europe were 2 ½ times greater than U.S. digitally-enabled services exports to Latin America, and almost double U.S. digitally-enabled services exports to the entire Asia-Pacific region (Table 2).

In 2017, the 28 EU member states collectively exported $1.24 trillion and imported $1.02 trillion 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 $579.2 billion and imported $459.6 billion in digitally-enabled services, resulting in a surplus of $119.6 billion for these services.

Table 3 Destination of EU Exports of Digitally-Enabled Services, 2017 ($Billions)

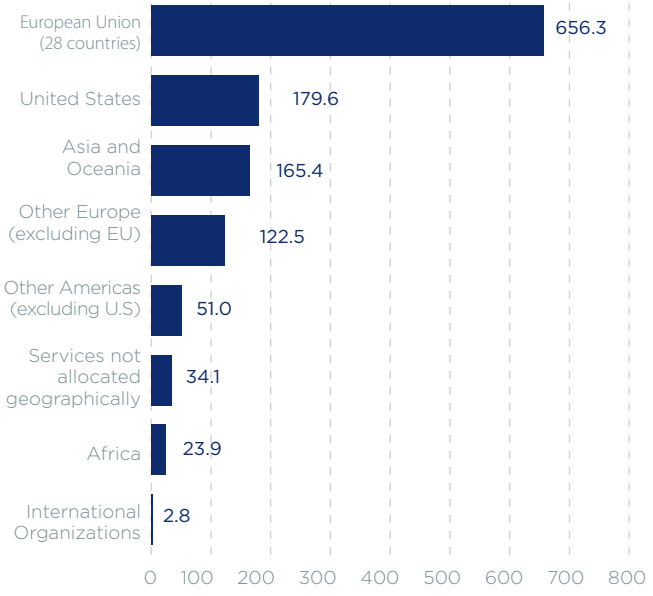
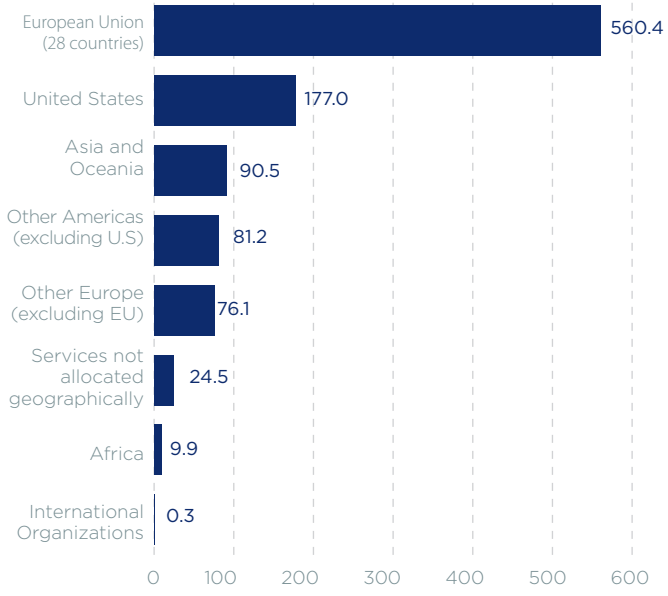


Table 4 Origin of EU Imports of Digitally-Enabled Services, 2017 ($Billions)



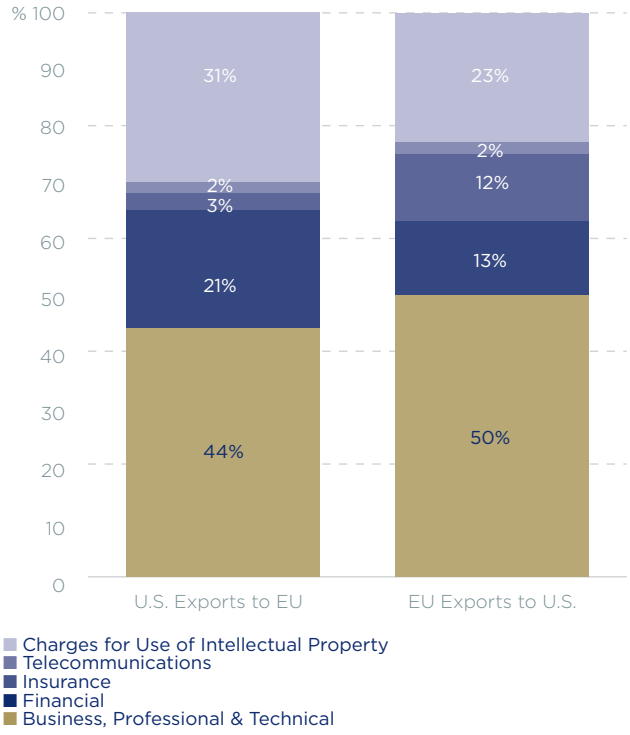
Note: Digitally-Enabled Services include finance; insurance; IP charges; telecommunications, computer, information services; R&D services; professional and managemet services; architectural, engineering and other technical services; and other business services. Source: Organization for Economic Cooperation and Development.

Digitally-enabled services represented 56% of all EU services exports to non-EU countries and 57% of all EU services imports from non-EU countries.

In 2017, the United States accounted for 31% of the EU's digitally-enabled services exports to non-EU countries, and 39% of EU digitally-enabled services imports from non-EU countries.[18] The United States purchased $179.6 billion, according to OECD data for 2017, 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 ($122.5 billion), and more than all digitally-enabled services exports from the EU to Asia and Oceania ($165.4 billion).[19]

EU member states with the largest estimated value of digitally-enabled services exports were Germany ($171.6 billion), the United Kingdom ($149.3 billion), Ireland ($142.6 billion), and the Netherlands ($134.1 billion).

Table 5 EU Digitally-Enabled Services Trade by Sector, 2017



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

In 2017, EU member states imported $1.02 trillion in digitally-enabled services, according to OECD data. 55% originated from other EU member states (See Table 4). Another 17% ($177.0 billion) came from the United States, making it the largest supplier of these services. The EU imported more of these services from the U.S. than from EU member states Germany ($95.3 billion) and the UK ($112.7 billion).

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 50% of digitally-enabled services exports from the EU to the United States and 44% of digitally-enabled services exports from the United States to the EU in 2017. The second most important category consists of intellectual property, including 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. Strong European demand for U.S. digitally-enabled intellectual property is reflected in the fact that this category accounts for 31% of all U.S. exports of digitally-enabled services to the EU.[20] Financial services comprise the third largest digitally-enabled services export category.

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. 52% of the $767.99 billion in services provided in Europe by U.S. affiliates in 2016 were digitally-enabled. In 2016, U.S. affiliates in Europe

Digitally-enabled services supplied by affiliates
(2016)

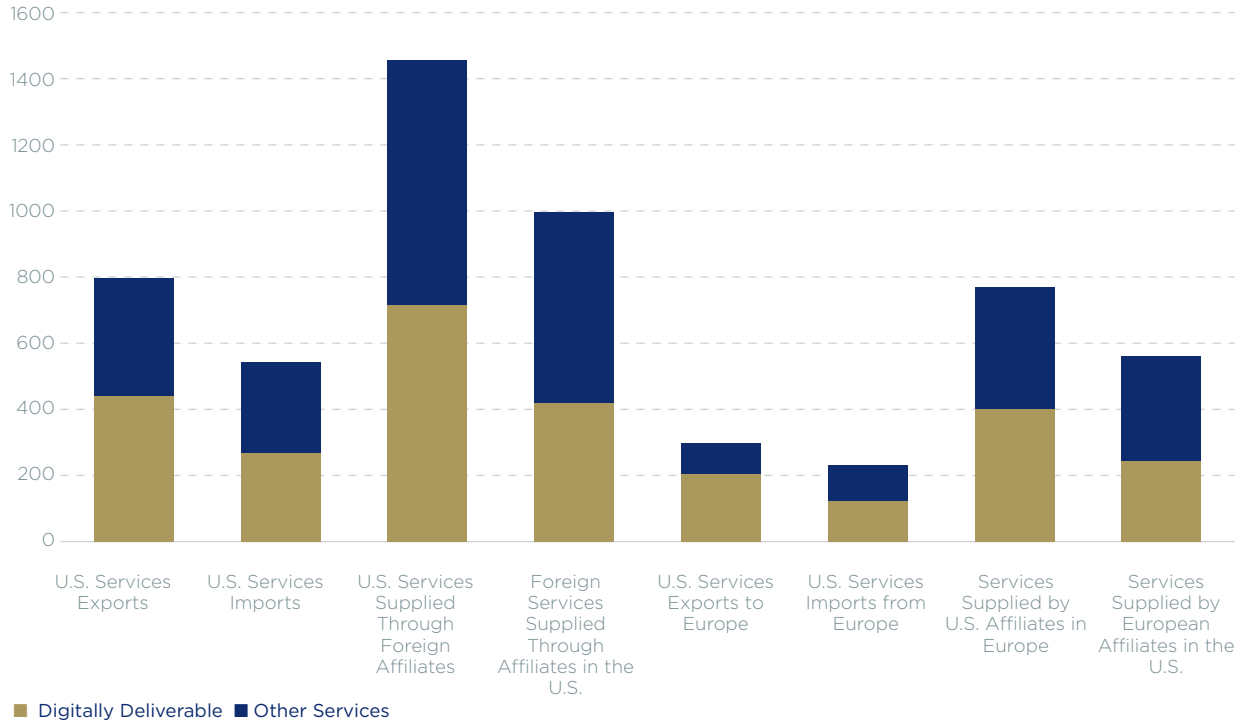
$401 billion
U.S. affiliates in Europe

$244 billion
European affiliates in the U.S.

supplied $401.47 billion in digitally-enabled services, whereas European affiliates in the United States supplied $244.35 billion in digitally-enabled services. Digitally-enabled services supplied by U.S. affiliates in Europe were double U.S. digitally-enabled exports to Europe, and digitally-enabled services supplied by European affiliates in the United States were also roughly double 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 7 underscores this dynamic. In 2016, Europe accounted for two-thirds of the $257.6 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.[21]

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



**Trade data are for 2017. Affiliate data are for 2016, the latest available year.*
Source: U.S. Bureau of Economic Analysis.

66%

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

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

Country	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Canada	3,595	4,140	3,971	5,996	6,316	7,135	7,595	7,401	8,487	8,342	9,259
Europe	67,270	76,156	85,450	84,117	96,310	110,525	119,123	120,796	157,811	162,409	170,419
France	4,045	3,794	4,475	4,713	4,582	5,013	4,768	5,258	6,085	5,894	5,887
Germany	5,260	6,031	6,104	6,456	7,143	7,798	7,970	10,599	12,018	11,191	11,464
Netherlands	5,925	8,152	9,980	8,674	8,719	9,313	10,196	9,117	12,686	13,590	13,228
Switzerland	2,871	2,527	3,197	3,747	4,034	4,419	5,243	4,778	(D)	5,452	5,833
United Kingdom	33,512	35,711	31,479	29,906	24,941	26,446	25,996	23,876	30,228	33,512	35,711
Latin America and Other Western Hemisphere	7,255	10,845	13,165	13,798	17,578	20,943	21,887	21,751	22,457	20,672	20,308
Australia	5,722	6,365	6,369	5,961	6,852	6,960	5,531	7,735	7,045	6,266	6,377
Japan	3,447	(D)	6,224	7,856	4,575	4,828	5,204	5,807	7,796	7,821	11,239
China	n/a	n/a	n/a	1,252	1,633	1,627	1,581	1,656	3,016	2,675	2,736
Other Asia-Pacific and MENA Countries	5,217	(D)	(D)	7,623	8,582	10,320	11,663	14,227	33,461	36,891	37,255
TOTAL	**92,507**	**(D)**	**(D)**	**126,603**	**141,846**	**162,338**	**172,583**	**179,372**	**240,073**	**245,076**	**257,593**

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.

2. E-Commerce

Electronic commerce offers a second window into transatlantic digital connections and complements our lens of digitally-enabled services, because most digital sales and purchases are delivered physically or in person – not digitally.[22] And while goods trade growth has been flattening worldwide, the share enabled by e-commerce has been registering double-digit growth in recent years.[23]

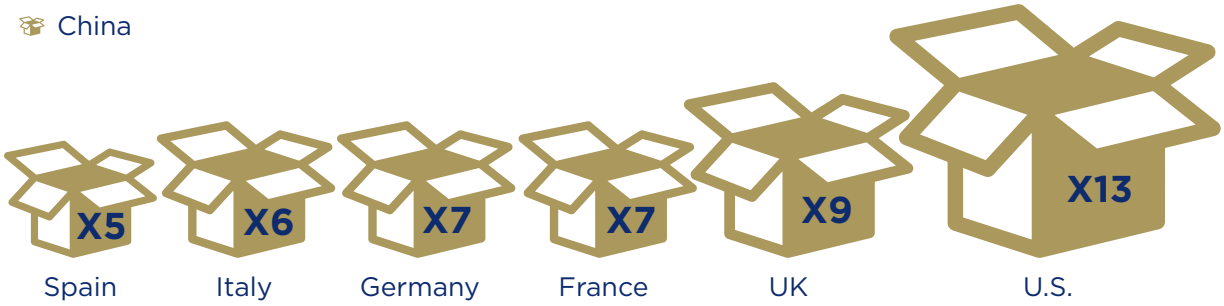
Here again we run into some definitional and data challenges. Most estimates of e-commerce do not distinguish whether such commerce is domestic or international. In addition, many metrics do not make it clear whether they cover all modes of e-commerce or only the leading indicators of business-to-business (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.[24]

Nonetheless, we can evaluate and compare many different estimates and surveys that have been conducted. According to the U.S. International Trade Commission (ITC), global e-commerce, which the ITC defines as the sale of goods and services over the internet, was worth $27.7 trillion in 2016, increasing by 44% percent from 2012 ($19.3 trillion).

When most people hear the term "e-commerce," they think of consumers buying things from businesses via websites, social networks, crowdsourcing platforms, or mobile apps. These business-to-consumer transactions (B2C), however, currently pale in comparison to business-to-business (B2B) e-commerce. In 2016, B2B e-commerce accounted for more than 86% ($23.9 trillion) of the total value of global e-commerce, six times larger than business-to-consumer (B2C) transactions ($3.8 trillion).[25]

Current statistics do not break down e-commerce transactions by origin. As a result, domestic and cross-border transactions are not separately identifiable.[26] Consultancy firm Forrester forecasts annual international e-commerce growth of 17% through 2022, and 12% for overall e-commerce (cross-border and domestic, B2B and B2C).[27] According to DHL, cross-border e-commerce accounted for 15% of e-commerce merchandise sales in 2015, and is expected to grow at nearly twice the expected growth rate of domestic e-commerce, by 25% annually until 2020, and account for 22% of global e-commerce merchandise sales in that year.[28]

Per capita e-commerce consumption expenditure compared to China



While B2B e-commerce accounts for the bulk of global e-commerce, most B2B e-commerce does not cross a border. Most B2B e-commerce users are manufacturers or wholesalers who are dependent on physically moving goods, and often heavy freight; the lack of freight digitalization ultimately poses a barrier to cross-border B2B e-commerce.[29]

The sheer volume of B2B e-commerce, however, means it still is the most important component of cross-border e-commerce sales.[30] Forrester estimates that cross-border B2B e-commerce transactions will reach $1.2 trillion by 2021.[31] Yet given the domestic orientation of B2B e-commerce and the relative ease with which B2C commerce can be conducted online, it is likely that B2C could catch up with B2B when it comes to cross-border e-commerce. Accenture and Alibaba project that cross-border B2C e-commerce will explode from $230 billion to $1 trillion by 2020.[32] By 2020, over 2 billion e-shoppers could be transacting 13.5% of their overall retail consumptions online, equivalent to a market value of $3.4 trillion.[33] By 2022, cross-border shopping could make up 20% of e-commerce, with sales of $627 billion.[34]

China was the biggest B2C e-commerce market ($636.1 billion) in 2018. Revenues are expected to grow at a compound annual growth rate (CAGR) of 11.3% up to 2023, resulting in revenues of $1.09 trillion. The U.S. B2C e-commerce market generated revenues of $504.6 billion in 2018. Revenues are expected to grow 7.8% CAGR to reach $735.4 billion by 2023. Europe's B2C e-commerce market generated $346.5 billion in revenues in 2018. An annual growth of 6.9% will lead to revenues of $483.8 billion by 2023.

China's e-commerce market is large, reflecting its population. Per capita e-commerce consumption expenditure, however, tells a different story: it is more than 13 times higher in the United States, 9 times higher in the UK, 7 times higher in Germany and France, 6 times higher in Italy, and 5 times higher in Spain than in China.

The nature of B2C e-commerce is also changing quickly, and the Asia-Pacific region is setting the pace. Consumers are increasingly paying for their purchases via e-wallets. They have already taken over from credit or debit cards in China, and are projected to do so in the United States and Europe by 2023.[35] Moreover, while most cross-border B2C e-commerce purchases are made on a computer or laptop, alternative devices (tablet, smartphone, Smart TV, games console, feature phone) are becoming more important. Asia-Pacific markets are more likely than those in North America or Europe to make cross-border purchases on an alternative device.[36]

Most reports do 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,[37] 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.[38]

Table 8 Who's Shopping Online, 2018

	Do You Shop Online?	If So, Do You Shop Internationally?
Norway	**89%**	65%
Sweden	**85%**	56%
United Kingdom	**85%**	38%
Austria	**84%**	82%
Italy	**84%**	54%
Netherlands	**84%**	49%
Poland	**83%**	38%
Greece	**83%**	67%
Spain	**83%**	60%
Ireland	**82%**	84%
United States	**81%**	34%
France	**81%**	40%
Germany	**81%**	32%
Belgium	**81%**	72%
Russia	**80%**	70%
Czech Republic	**80%**	51%
Hungary	**79%**	57%
Canada	**77%**	63%
Switzerland	**74%**	66%
Turkey	**73%**	35%
Portugal	**70%**	87%

B2C E-Commerce. Source: PayPal, https://www.paypal.com/us/webapps/mpp/passport/tools#consumer-purchasing-trends.

Table 9 Table 9. When You Buy Online Across Borders, From Which Countries Do You Buy?

Customers in...	Buy Mainly from....
United States	China (16%) Canada (10%) UK (8%)
Austria	Germany (71%) China (19%) USA (18%)
Belgium	Netherlands (38%) France (28%) Germany (21%)
Canada	USA (53%) China (22%) United Kingdom (8%)
Czech Republic	China (38%) USA (11%) Germany (9%) UK (7%)
France	China (17%) USA (13%) UK (12%) Germany (10%)
Germany	China (13%) USA (11%) United Kingdom (9%)
Greece	China (37%) UK (29%) USA (23%)
Hungary	China (43%) UK (12%) Hong Kong (12%) Germany (11%) USA (9%)
Ireland	UK (64%) USA (32%) China (26%)
Italy	China (23%) UK (21%) Germany (21%) USA (16%)
Netherlands	China (27%) Germany (17%) USA (11%) UK (11%)
Norway	USA (30%) China (29%) United Kingdom (26%)
Poland	China (22%) Germany (10%) UK (8%) USA (7%)
Portugal	United Kingdom (42%) China (41%) Spain (38%)
Russia	China (60%) USA (14%) Hong Kong (11%)
Spain	China (35%) UK (20%) USA (20%)
Sweden	China (25%) UK (20%) USA (18%) Germany (16%)
Switzerland	Germany (47%) USA (17%) France (16%)
Turkey	USA (18%) China (17%) Germany (8%)
United Kingdom	USA (17%) China (17%) Germany (6%) Hong Kong (6%)

B2C E-Commerce, 2018. Source: PayPal, https://www.paypal.com/us/webapps/mpp/passport/tools#consumer-purchasing-trends.

Still, e-commerce, especially via cross-border sales, is still evolving. In 2017, E-commerce sales accounted for 19.1% of total retail sales in the UK, 12.6% in Denmark, 9% in the United States, 7.9% in Germany, and only 3.2% in Italy.[39] 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 7% of EU enterprises made e-sales to other EU countries in 2016, although in 2018, 36% of e-buyers made purchases from sellers in other EU countries, up 10% from 2013, and 26% made purchases from sellers outside the EU, up 12% from 2013.[40] In the United States, 34% of online consumers indicated they engaged in cross-border shopping in 2018.[41] According to PayPal, the most popular destinations for cross-border shoppers to buy from online are China (26%), the United States (21%), the UK (14%), Germany (10%), and Japan (5%). Clothing and footwear, consumer electronics and toys are the most popular products purchased online internationally.[42]

3. The C2C Platform Economy

Platforms and collaborative networks are at the heart of the new digital economy; 60–70% of new value created in the next ten years is expected to be based on data-driven digitally enabled networks and platforms.[43]

Platform companies that connect individuals and companies directly to each other to trade products and services are reshaping the U.S. and European economies, as well as the commercial connections between them. 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.[44] While they have become important for B2C e-commerce, as we discussed in the previous chapter, and are beginning to impact B2B commerce, 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.

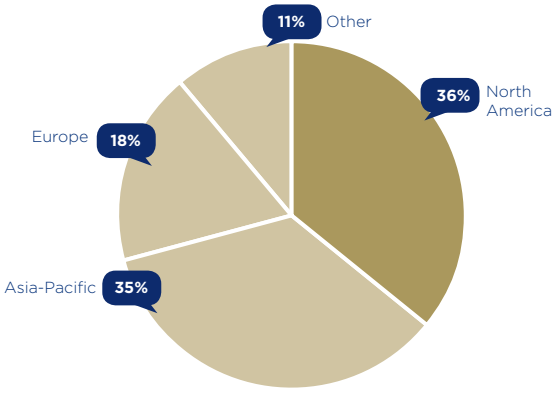
The C2C platform economy model – with main sectors including lending and community financing, online distance work, home sharing, car sharing, online music and video streaming – is spreading quickly to new and more established sectors, such as medical equipment and healthcare, retail, legal services, human resources and food delivery.[45]

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.[46] 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.[47]

The top 242 platform companies in the world now represent a market value of $7.176 trillion.[48] Just seven so-called "super platforms" account for 69% ($4.923 trillion) of this total: U.S.-based Apple, Amazon, Microsoft, Google, Facebook and China-based Alibaba and Tencent.[49]

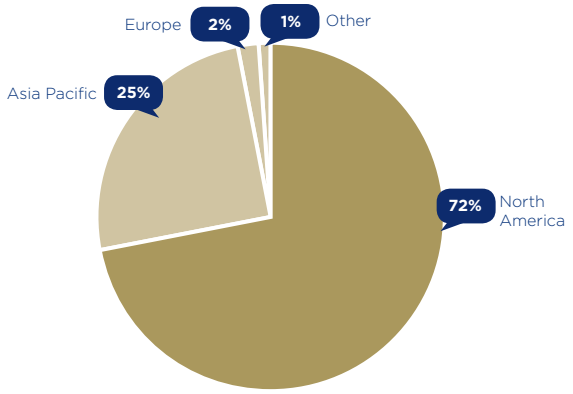
The platform economy is dominated by the United States and China. According to KPMG, 46% of platform companies valued at over $1 billion are based in the United States, 35% in Asia (mostly China), 18% in the EU and 1% in Latin America. Total platform market value is even more skewed, with 72% going to the United States, 25% to China, and just 2% to the EU. Europe has markedly fewer platforms, and on average they are also significantly smaller ($6.6 billion) than their U.S. ($63 billion) and Asian ($23 billion) counterparts.[50]

Table 10 World Regions by Number of Platforms



Source: KPMG

Table 11 World Regions by Value of Platforms



Source: KPMG

These figures are causing considerable anxiety in European capitals that Europe is missing the platform revolution. Despite the EU's effort to create a Digital Single Market, the European market remains relatively fragmented in terms of languages, consumer preferences and rules and regulations, which makes it much harder to achieve the kind of scale that platform companies have achieved in the large continental markets of the United States and China. There is also a more risk-averse culture that makes it generally harder to secure funding for potentially chancy bets on unproven technologies. More Chinese and U.S. platform companies operate multiple platforms than do their European counterparts, which means they can more easily use revenues from one platform to grow others.[51]

Nonetheless, Europe can look to some successes. Swedish company Spotify, for instance, is now worth $25 billion, accounts for over 38% of all recorded music revenue, and is the largest music company in the world. It is deeply tied to the transatlantic economy: North Americans and Europeans accounted for 68% of all active monthly users (32% and 36%, respectively) and 71% of all subscriptions (31% and 40%, respectively). Spotify and other European platforms such as Booking.com or Adyen underscore that companies can achieve success even from relatively small home economies.[52]

There is certainly potential for European success in the platform economy. 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.[53]

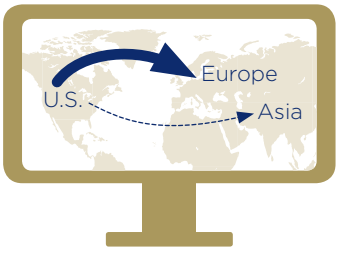
In addition, while the United States and China lead the C2C platform economy, this sector of the UK economy is also robust. The UK is home to 10% of the businesses involved in the global C2C platform economy – more than France, Germany and Spain combined – and London is the C2C platform economy capital of Europe.[54]

Experts expect the platform economy to continue its rapid growth trajectory, and believe a next wave of platforms will transform the financial sector, the automotive industry, energy and construction services.[55] 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.[56]

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, which not only contribute more to global growth than global goods trade in goods, they underpin and enable virtually every other kind of cross-border flow. According to McKinsey, the volume of data crossing borders has risen by 64 times during the course of this decade.[57] Globally, demand for international bandwidth increased at a rate of 52% in 2017. The amount of capacity deployed on international networks doubled between 2015 and 2017, rising to 684 Tera bits per second (Tbps).[58] According to the U.S. International Trade Commission, fully half of all global trade in services now depend on access to cross-border data flows.[59]

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.[60]



Cross-border data flows between the United States and Europe are **400% higher** than data flows between the United States and Asia on a per capita basis
(2015)

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

Researchers are reluctant to use data flows as a proxy for commercial links, since data traffic is not always related to commercial transactions.[61] 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."[62]

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.[63] User-generated content on blogs and on YouTube drives very high volumes of internet traffic both within countries and across borders, but consumers pay for very little of this content. 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.[64]

In other words, data flows are commercially significant, yet their extent, as well as their commercial value, are hard to measure and are in constant flux. It is possible to get a better sense of their importance to the transatlantic economy, however, by literally taking a "deep dive" into the world of undersea cables.[65]

5. Under the Sea: The Hardware of the Transatlantic Digital Economy

The digital economy evokes images of electrons speeding through the ether. The reality is that subsea cables bring the internet to life. They transmit 99% of all intercontinental telecommunication traffic – data, content, financial payments, phone calls, tweets, texts, emails.[66] They serve as an additional proxy for the ties that bind continents, particularly Europe and North America.

Wall Township, New Jersey, a hamlet of about 26,000 people on the U.S. Atlantic coast, is charting the digital frontier in the North Atlantic. In late 2019, the first new subsea cable to connect the United States to Northern Europe in about two decades will link Wall to Blaabjerg, part of the Danish municipality of Varde, a city of about 50,000 in southern Jutland. Branches will go to Lecanvey, Ireland and Kristiansand, Norway. This new transatlantic link, called HAVRUE, is a sign that Wall Township and Blaabjerg, Denmark are not just sleepy seaside towns. Wall is home to the New Jersey Fiber Exchange, which links North America to three other continents. And Blaabjerg is the home of multiple transatlantic cable systems binding Europe to the United States.[67]

The Wall-Blaabjerg connection also heralds a significant shift in transatlantic subsea cables. For decades New York City was the center of the transatlantic digital universe, first for voice traffic and then fiber cables, until the congestion became unbearable and, in the wake of 911, the realization dawned that more than 14 transatlantic fiber cable systems had one common hub – and one single point of failure: 60 Hudson Street in the TriBeCa neighborhood of Manhattan. Since then, new cable routes have shifted away from legacy landing sites toward much greater diversity.[68]

The new diversity is exemplified by the state of Virginia. Over 70% of the world's internet traffic flows through Northern Virginia.[69] Virginia Beach, Virginia, which is the landing site for the 2018 MAREA cable connection to Bilbao, Spain, will in 2019 be home to the Dunant cable linking North America to France. Named after Henri Dunant, the first Nobel Peace Prize winner and founder of the Red Cross, the 4,100-mile cable is a partnership between Google and the French telecommunications company Orange. Once Dunant goes live, it will provide enough capacity to transfer a 1GB movie in 30 microseconds.[70]

Diversification of transatlantic routes is also happening on the European side of the Atlantic. Traditionally most subsea cables were routed

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

from the United States to the small British coastal village of Porthcurno in Cornwall. This "Cornwall concentration" is now dissipating. In 2006 there were 8 transatlantic cable spans to the UK and only 6 to all of the rest of Europe. Since then one additional span has been completed to the UK and two to continental Europe, and two more will connect the United States to continental Europe by 2021.[71]

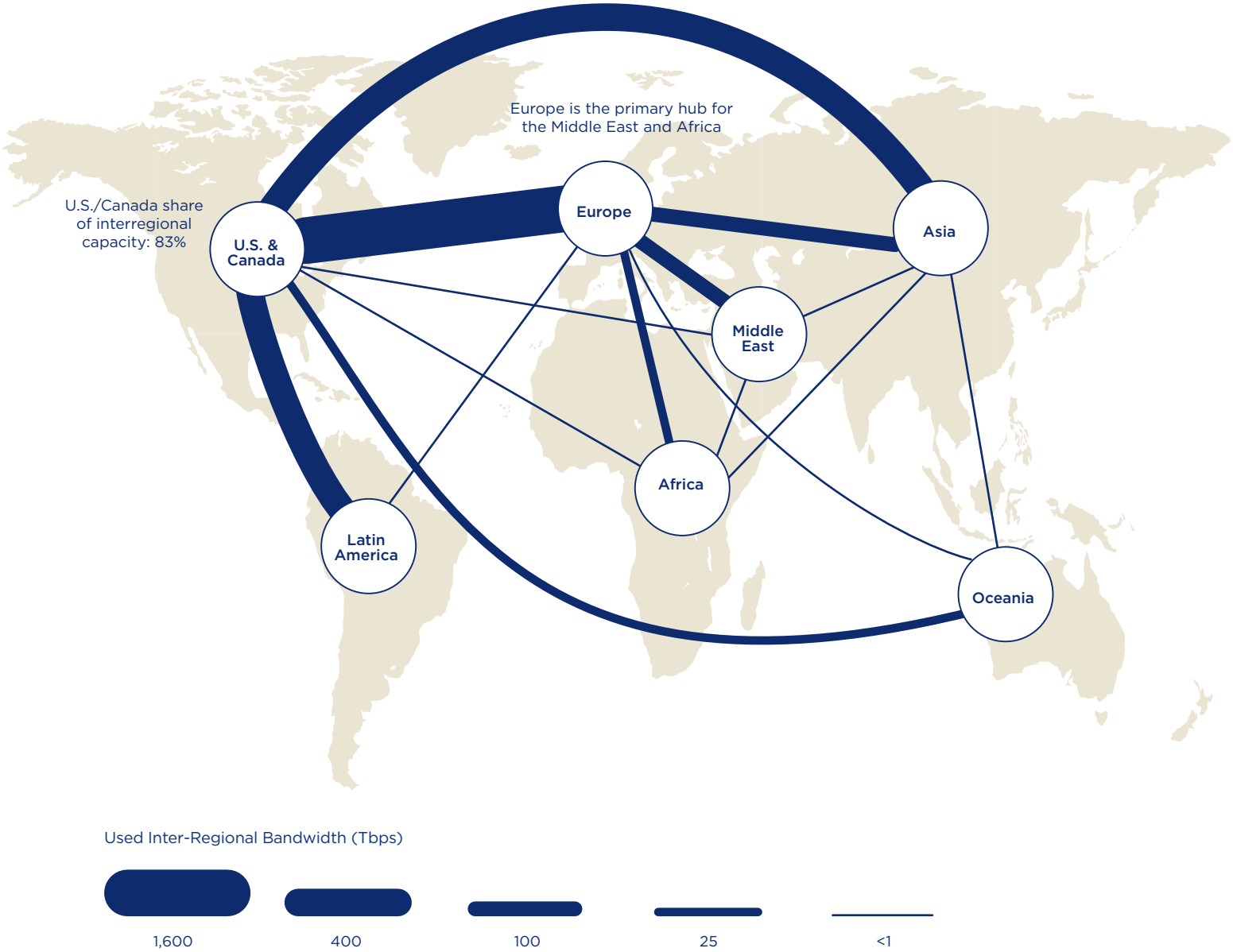
The new digital ports of the North Atlantic are emblematic of the fact that transatlantic cable connections represent the densest and highest capacity routes, with the highest traffic, in the world.[72] Between 2011 and 2016 total available capacity increased 240%, with all 13 current transatlantic systems on at least 40G technology and 85% on 100G technology.[73] 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.[74]

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.[75] Telegeography estimates a compound annual growth rate of 38% in transatlantic capacity until 2025.[76] Eight new transatlantic cables will be needed by 2027 just to keep up with demand, compared to four for intra-Asian routes, three for transpacific routes, and just one for U.S.-Latin American routes.[77] The Dunant cable is but one of seven that Google plans to have come online in the next two years. Just those systems alone will more than double existing total transatlantic capacity.[78]

The Dunant cable is notable for yet another reason: it will be the first private transatlantic cable built by a non-telecom company.[79] 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 have displaced backbone operators as the major investors in subsea cables and the largest source of used international bandwidth.[80] In 2006, Internet backbone providers accounted for over 80% of international bandwidth. By 2018, content providers were accounting for 54% of used international bandwidth globally and 83% on transatlantic routes (Table 13). They are the sole drivers of new transatlantic cables planned through 2021.[81]

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. Their densest connections are between North America and Europe.[82]

Table 12 Used Inter-Regional Bandwidth, 2018



Tbps: Terabits per second. Source: Alan Mauldin, "Back to the Future," Telegeography, https://www.ptc.org/PTC19/Proceedings/WK_TELEGEO_Mauldin_Alan.pdf

Bypassing the Internet

The rise of private content providers as drivers of submarine cable traffic is related to yet another significant yet little understood phenomenon shaping the transatlantic digital economy: more and more companies are working to bypass the public internet as a place to do business in favor of private channels that can facilitate the direct electronic exchange of data among companies.

This demand for "interconnection" – private digital data exchange between businesses – is a fundamental driver behind the proliferation of transatlantic cable systems. Companies in a global digital economy must collaborate with partners instantly, across oceans, and they need to meet user expectations for high-performance connectivity anytime, anywhere. That is impossible for firms tethered to traditional IT architectures, in which data is shuttled back and forth between users and distant, centralized corporate data centers. They need interconnection, and the expansion of submarine cable infrastructure offers just that. Subsea cables bring companies to the digital edge, and the ability to land the cables directly inside data centers enables these systems to deliver the close, direct, many-to-many global connectivity that is the essence of interconnection.[83]

To better understand and track how industry leaders are driving business advantage with digital-ready infrastructures, Equinix developed the Global Interconnection Index, which tracks, measures and forecasts the explosive growth in digital business, in particular "interconnection bandwidth," which is the total capacity available to exchange traffic privately and directly with a diverse set of counterparties and providers at distributed IT exchange points inside carrier-neutral colocation data centers. Private interconnection bandwidth is not only distinct from public internet traffic, it is slated to grow much more quickly and become much larger.

Equinix projects that interconnection traffic – direct, private connections that bypass the public internet – will see a five-year compound annual growth rate (CAGR) of 48%. This is almost double the expected 26% CAGR of global internet traffic. By 2021, interconnection bandwidth will grow to 8,200-plus Terabits per second (Tbps) of capacity – ten times the projected capacity of internet traffic. Over the next five years, interconnection bandwidth in the United States is expected to grow at a 45% CAGR, contributing more than 40% of interconnection bandwidth globally; in Europe at 48% CAGR, contributing about 23% of interconnection bandwidth globally; in Asia-Pacific at 51% CAGR, contributing more than 27% of interconnection bandwidth globally; and Latin America at 59% CAGR, contributing more than 9% of interconnection bandwidth globally.[84]

The growth in direct interconnection traffic between businesses rather than over the public internet is being driven by security and latency concerns. Cyberhacking and theft can be costly. By 2021, the global cost of cybersecurity breaches is expected to reach $6 trillion annually. Direct, private connections help mitigate the risks. In addition, more and more countries are blocking the transfer of data outside their borders. Direct connections give organizations more control over the flow and ultimate destination of their data. Finally, customers want high-performance, instantaneous connectivity anytime, anywhere; even micro-lags associated with the public internet can be costly.[85]

Is the internet doomed? Unlikely. It is a pervasive force in most people's lives, and a key to digitally-delivered services, e-commerce and the platform economy. Yet private interconnection is likely to rise alongside the public internet as a powerful vehicle for business. And as we have shown here, its deepest links are across the Atlantic.[86]

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 U.S. and European cities play as major cross-border hubs. Europe is the global leader, with tremendous connected international capacity. Frankfurt, London, Amsterdam and Paris 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. Marseille, France has quickly become a major hub for traffic between Europe, Africa and the Middle East.[87]

The role of the United States and Europe as critical digital gateways is also underscored by looking at inter-regional connections and capacity. 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

Table 13 Major Interconnection Hubs

International Internet Bandwidth (Tbps)	2018 Bandwidth (Tbps)	CAGR 2014-2018
Frankfurt	**73.1**	30%
London	**55.7**	26%
Amsterdam	**48.4**	29%
Paris	**47.8**	29%
Stockholm	**21.3**	29%
Miami	**20**	27%
New York	**19.2**	25%
Marseille	**18.3**	55%
Los Angeles	**16.7**	30%
San Francisco	**10.2**	22%

Tbps: Terabits per second. Source: DE-CIX/Telegeography, Subsea cables and interconnection hubs: The Interplay of diversifying routes and peering markets, 2018, https://www.de-cix.net/en/about-de-cix/academy/white-papers/subsea-cables-and-interconnection-hubs-the-interplay-of-diversifying-routes-and-peering-markets/Download; Ivo Ivanov, "How Traditional Traffic Flows are Changing: The Eve of New Global Submarine Cable Networks?" Presentation to Pacific Telecommunications Council –PTC 19, January 23, 2019, https://www.ptc.org/PTC19/Proceedings/TS_CDC_Ivanov_Ivo.pdf

choose to host their content abroad because the cost is much lower. South Americans, for instance, rely almost exclusively on international connections 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. This "trombone" effect highlights why both the United States and Europe play such outsized roles in international digital traffic.[88]

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