4

Digital Hyperdrive

The Covid-19 pandemic has kicked the world into digital hyperdrive. By some accounts, the crisis has sped the adoption of a wide range of digital technologies by three to four years.[1] Health concerns and digital innovations have combined to change the way we live and learn, buy and sell, work and play. Many companies have thrived; others struggle to survive.

Digital tools powered an unprecedented worldwide sharing of gene sequencing data to track and treat SARS-CoV-2, the virus that causes the Covid-19 disease. The first breakthrough vaccine, based on messenger RNA (mRNA) technology, was a triumph of transatlantic collaboration between Germany's BioNTech and U.S.-based Pfizer. The speed at which the vaccine was developed and deployed was an amazing feat of science that was reliant on barrier-breaking synergies between digital and medical advances, and not possible for any previous pandemic.[2]

The digital hyperdrive ranges far beyond healthcare. The numbers are astounding. Since the onset of the virus, international internet traffic has jumped by 48%. By 2025, global data creation is projected to grow to more than 180 zettabytes – over 2 billion times the Internet's size in 1997. By 2026, monthly global data traffic is expected to surge to 780 exabytes – more than three times data usage rates in 2020.[3]

More than 5.29 billion people now use mobile phones. 4.88 billion are now online. People now spend almost as much time online as they do asleep. A million users a day joined social media in 2021, taking the global total to 4.55 billion people who will spend 10 billion hours a day on social media in 2022.[4]

Data analytics, machine learning, and artificial intelligence (AI) are transforming factory floors, farmers' fields, and hospital rooms. Between 2020 and 2023 companies are expected to spend $6.8 trillion on their digital transformation. In 2022, 65% of the world's GDP is projected to be digitized.[5] The worldwide market for 3D printing products and services, valued at around $12.6 billion in 2020, is expected to grow to well over $50 billion by the end of the decade.[6] The global market for quantum technology is expected to grow from $9.21 billion in 2021 to $31.6 billion by 2026 and as high as $300 billion by 2050.[7] The global Internet of Things (IoT) market, valued at $381.3 billion in 2021, is projected to grow to $1.85 trillion in 2028.[8]

What's more, the digital economy is blowing past connections between people and communication among machines on its way to what former Cisco Chairman John Chambers has called the Internet of Everything: pervasive connections among people, things, data, and processes like social networking, machine learning and artificial intelligence.[9]

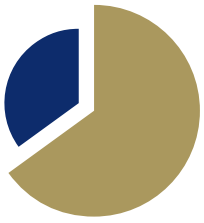
All of these areas are competitive strengths for North America and Europe. For the transatlantic economy a number of digital transformations bear watching. In last year's survey we discussed the dangers of cyberattacks and digital disruptions, as well as opportunities for small- and medium-sized enterprises and the promise of the connected factory. Each of these developments remains significant.

In particular, we noted the disruptive potential of digital money. Roller-coaster cryptocurrency markets hit an all-time high of $3 trillion in November 2021 before crashing to half that size in February 2022, amidst ongoing concerns that crypto and related aspects of what is called "decentralized finance" still need to iron out major technological kinks and risks of abuse.[10]

Despite current challenges, the prospect that decentralized finance models, big tech "stablecoins" and other digital finance innovations could gain ground is driving exploration and testing of official digital currencies by central banks. A half dozen small emerging economies have already issued official central bank digital currencies (CBDCs). The big economy most likely to join them in 2022 is China. It first ran a pilot scheme for its CBDC in December 2019. It has created millions of digital wallets to hold its new digital currency, the e-CNY, which it said was used in purchases equivalent to $315,000 a day at the Beijing Winter Olympics.[11]

Developed countries have expressed greater caution about CBDCs. Nonetheless, Sweden's Riksbank has been a first mover in exploring the possibilities, the European Central Bank is in the middle of a two-

The crisis has sped the adoption of a wide range of digital technologies by **three to four years**



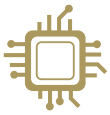
65%

of global GDP will be digitized in 2022

Digital transformations impacting the transatlantic economy

Rise of cyberattacks

Digital money and decentralized finance models



Digitization and internationalization of SMEs

Advent of the connected factory

Development of the metaverse

Web3 as a new incarnation of the digital world

year investigation into a possible digital euro, and a UK "Britcoin" is imaginable by 2025. The Bank for International Settlements has initiated a series of digital currency experiments with central banks and the private sector.[12] The U.S. Federal Reserve, while still ambivalent, has also initiated public discussion about the pros and cons of digitizing the dollar.[13]

CBDCs could reduce costs related to cross-border and domestic payments and to the printing and distribution of physical cash. They promise to be more financially inclusive and could be a check on counterfeiting and other abuses. However, privacy concerns abound, as digital currencies could become surveillance tools. And a wholesale movement to risk-free CBDC accounts away from risk-carrying commercial bank deposits would not only raise the cost of deposits and hence the cost of credit, it would disrupt the foundations of today's financial system.[14]

Other buzzwords are driving the digital discussion. One is the metaverse, a fusion of virtual gaming, social networking, and entertainment that its proponents believe can result in blended physical-virtual immersion experiences for users in interconnected spaces across a wide variety of devices.[15]

Roughly 200 companies currently consider themselves builders of the metaverse. Rivalries revolve among those seeking to become its titans. Facebook not only changed its name to Meta, it is betting a big part of its future on defining the metaverse. Microsoft says its planned $75 billion acquisition of Activision is intended to "provide building blocks for the metaverse." Microsoft co-founder Bill Gates expects the metaverse to be part of our workplaces in the next three years.[16]

For the metaverse to work, users will need to move freely between virtual domains and be able to bring content and currency with them. That's not possible today. Making it possible is much of the battle. For corporate first movers, the metaverse is a virtual-physical world that users can crisscross via proprietary entry points. Other designers suggest a far more decentralized "paraverse" of transparent, open-source, community-owned platforms that users can transverse via interoperable blockchains.[17]

Whatever its ultimate trajectory, the rapid evolution of the metaverse – as well as that of decentralized finance, blockchain innovations, non-fungible tokens and the like – is sparking discussion of a new incarnation of the digital world dubbed Web3.

Web 1.0 was the World Wide Web and the dawn of e-mail. Web 2.0 came along with a wave of interactive mobile, social, and cloud computing innovations and the rise of the platform economy, all woven together by a small core of successful digital companies. Web 2.0 has accelerated digital interactions and interconnections, but it has also generated cybercrime, amplified cancers of corruption and disinformation, and eroded trust. Web3 is a fast-growing group of technologies designed to address these failings by building on blockchain technology to shift digital power to more decentralized, transparent, and trustless models enabling users to engage across platforms and creators to keep a greater share of the value they create, moving away from reliance on walled-off proprietary platforms operated by a small number of companies – Meta for social networking, Amazon and Alibaba for e-commerce, Apple and Google for mobile app stores and mobile services, and so on. Web3 is still in its infancy. Enabling technologies still have to be developed, scaled and commercialized. Infrastructure has to be built. Standards bodies need to agree on how protocols could work. There are concerns about privacy, intellectual property, content licensing, and crypto assets. Nonetheless, the buzz is there.[18]

In so many of these areas, the digital hyperdrive is confounding traditional mores and challenging conventional disciplines. "When we thought we had all the answers," writes Mario Benedetti, "all the questions suddenly changed."[19]

The Dawning Bio-Cognitive Age

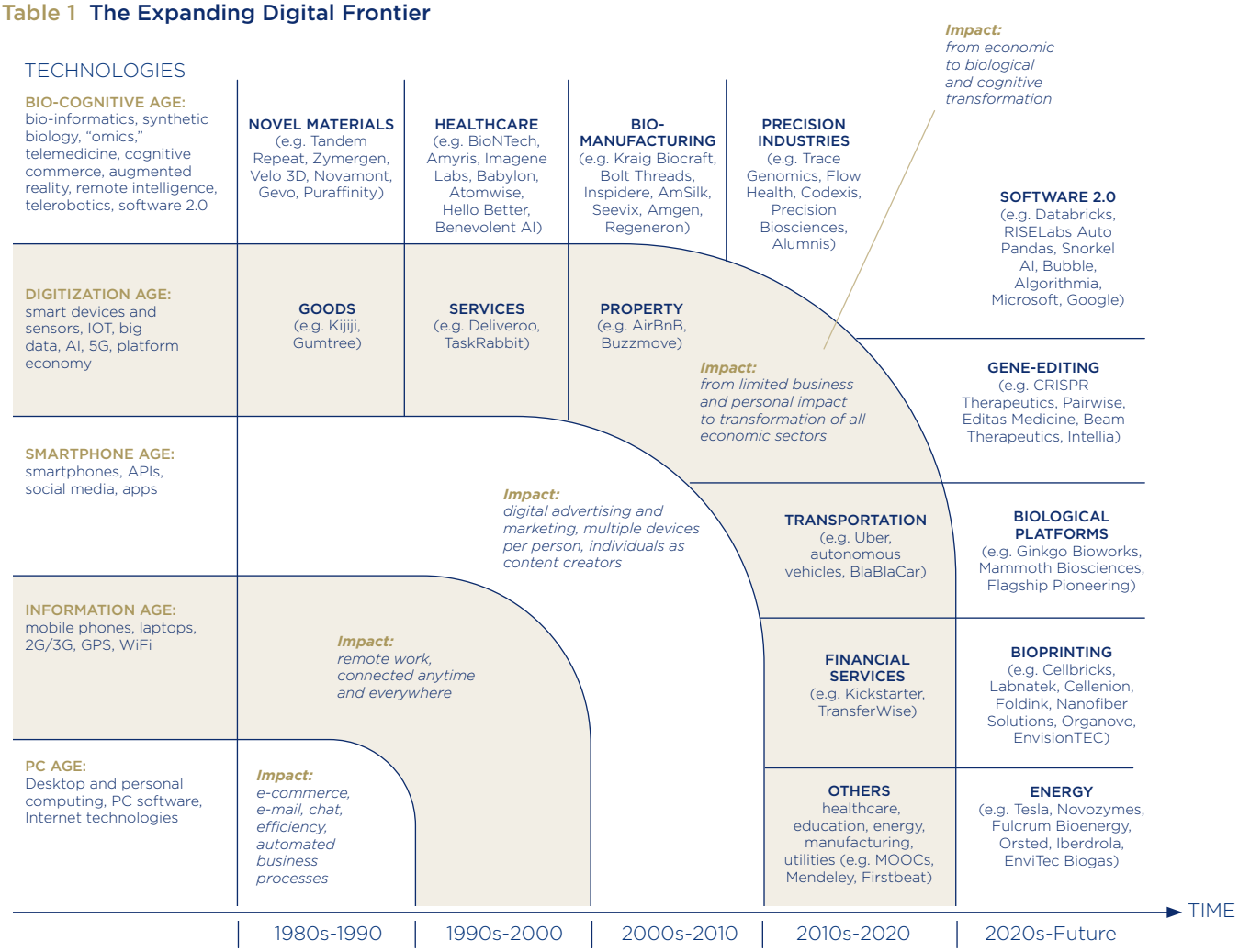
Even as we grapple with the advances and challenges of the digital age, some pathfinders are charting further revolutionary advances in quantum physics, biology, nanotechnology, behavioral and cognitive sciences and AI.[20] In previous surveys we used Table 1 to herald the possibilities. Last year we were able to give this chart greater detail, as this new age has already arrived, due to scientific breakthroughs and to the cascading changes wrought by the pandemic. This year the chart continues to evolve as new industries and applications appear, led by pioneering companies on both sides of the Atlantic.

The pandemic has been a major accelerant of the biological revolution. A decade ago, mRNA vaccines were a dream. In 2020, they changed the world. BioNTech, Moderna, and other companies are already applying mRNA technology to deal with diseases such as malaria, tuberculosis, and HIV. In the future, mRNA drugs could be used for allergies, autoimmune conditions, individualized cancer therapies, regenerative medicine, and for a wide variety of illnesses, from flu and heart disease to yellow fever and the Zika virus. BioNTech believes that in 15 years, one-third of all newly approved drugs will be based on mRNA.[21]

Beyond the pandemic, digital transformations are redefining health in all areas of life. By 2025, 40% of the global datasphere will be in health – the largest of any sector or industry. This explosion of genetic and health data – and increasing abilities to process it – holds significant potential for scientific and medical achievement worldwide, assuming the ability to transfer data across borders, subject to certain privacy and data protection standards, is not undermined. The market for goods and services related to synthetic biology is expected to reach $15 billion by 2025.[22]

Digital innovations have improved remote care and doctor-patient communication. Telemedicine, telepresence, and telesurgery are transforming medical techniques and generating greater cross-border trade in healthcare services. AI-designed drugs have entered human testing. 3D-printed bones will be ready for human transplantation in 2022. Contact tracing apps,

Table 1 The Expanding Digital Frontier



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

predictive analytics, geospatial modelling of viral spread dynamics, and data sharing have supported public health surveillance and decision-making, even as concerns have grown about privacy and the online diffusion of dis- and misinformation.[23]

No less important is the cognitive revolution, led by the transformation of software. In our decades-old Software 1.0 system, humans write code for machines. In the emerging Software 2.0 system, humans coach machines to write code themselves. Software 1.0 will continue as a major approach to software development, but Software 2.0 will enable software to address more complex problems. Software 1.0 is driven by software developers and computer programmers. Software 2.0 is driven by software teachers and computer trainers.[24]

Software 2.0 is likely to unfold unevenly, as significant challenges remain. Bottlenecks in talent and the availability of labeled data hamper the development of training datasets. There are concerns about privacy, security and accuracy. Nonetheless, Software 2.0 promises to unlock new applications never previously possible, including by empowering non-technical users to do all kinds of things they couldn't do before.

Changing the Nature of Trade

Digitalization is not just changing the scale, scope and speed of trade, it is changing its very nature. Many services sectors that were once non-tradable – because they had to be delivered face-to-face – have become highly tradable – because they can now be delivered over long distances.[25]

Digitalization even blurs the distinction between trade in goods and services. Automakers are now also service providers; online retailers are now also manufacturers. 3D-printing generates products that are a mix of goods and services. Digitalization increases the importance of data flows and intellectual property. It has boosted trade in software design over trade in final products. It offers alternative means of payment and finance. It has lowered shipping and customs processing times and reduced the cost of creating, copying and accessing text, video content and music, while enhancing our ability to access goods and services without owning them.[26]

How Prepared are Europe and the United States for Digital Transformation?

The 2021 Network Readiness Index measures how prepared countries are to leverage the opportunities offered by technological innovation. It does so by looking at the state of technology infrastructure, the ability of individuals, businesses and governments to use ICT productively, how conducive the national environment is for a country's participation in the network economy, and the economic, social, and human impact of a country's participation in the network economy. Based on these metrics, Europe and North America represent 9 of the top 10 countries, and 16 of the top 20, when it comes to technology readiness and adoption (Table 2). Singapore was the lone Asian country in the top ten. The Republic of Korea ranked 12th, Australia 13th, Japan 16th, New Zealand 20th and China 29th.

Table 2 Top Ten Network-Ready Countries, 2020

Country	NRI Rank	Technology	People	Governance	Impact
Netherlands	1	3	7	2	3
Sweden	2	4	4	5	2
Denmark	3	7	2	3	7
United States	4	1	5	7	16
Finland	5	10	3	4	5
Switzerland	6	2	12	11	6
Singapore	7	8	9	12	1
Germany	8	5	8	13	10
Norway	9	13	6	1	11
United Kingdom	10	6	16	14	9

Source: Soumitra Dutta and Bruno Lanvin, eds., The Network Readiness Index 2021 (Washington, DC: Portulans Institute, 2021), https://networkreadinessindex.org/wp-content/uploads/reports/nri_2021.pdf.

Five Lenses on the Evolving Transatlantic Digital Economy

Although "digital globalization" evokes the image of a seamless global marketplace, digital connections are "thicker" between some continents and "thinner" between others – and they are "thickest" between the United States and Europe.

Given data's peculiar qualities, economists and governments have struggled to devise quality metrics to measure the digital economy.[27] Failing standard measurements, we present five ways to look at the transatlantic digital economy. These metrics are not mutually exclusive; they are better understood as different lenses through which one can better understand the importance of transatlantic digital connections.

1. Digital Services and Digitally-Enabled Services

The digital economy is dominated by services. 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.[28] 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."[29] Identifying potentially ICT-enabled services does not tell us with certainty whether the services are *actually* traded digitally.[30] 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,"[31] which means a digital transaction is likely and thus can offer a rough indication of the potential for digital trade.[32]

Digital services and digitally-enabled services have proven to be resilient during the pandemic. While global services exports fell by 20% in 2020, global exports of digitally-enabled services declined only 1.8%. As a result, digitally-enabled services accounted for about 64% of global services exports.[33]

Germany was the top global importer of digital services in 2020, followed by the United States and France. Ireland was the top global exporter of digital services, followed by India and China (Table 3.)

Considering the broader class of digitally-deliverable services, the United States was the largest global exporter and importer in 2020 (Table 4). As with ICT services, most of the top 10 exporters and importers of digitally deliverable services in 2020 were developed countries, although India, China and Singapore were all top digital services traders.

Table 3 Digital Services Trade: Top Exporters and Importers, 2020

Exporters	Value($billions)	Importers	Value ($billions)
1. Ireland	151.5	1. Germany	39.7
2. India	68.0	2. United States	35.6
3. China	59.0	3. France	22.2
4. United States	49.8	4. Japan	20.1
5. Germany	32.2	5. Singapore	16.6
6. United Kingdom	22.4	6. Italy	11.9
7. Israel	19.2	7. United Kingdom	11.8
8. France	18.0	8. Belgium	10.8
9. Singapore	15.0	9. Netherlands	10.7
10. Sweden	14.9	10. India	10.5

Source: UNCTAD.

Table 4 Digitally-Deliverable Services Trade: Top Exporters and Importers, 2020

Exporters	Value($billions)	Importers	Value ($billions)
1. United States	533.1	1. United States	317.6
2. United Kingdom	286.7	2. Ireland	280.7
3. Ireland	244.2	3. Germany	183.4
4. Germany	203.7	4. United Kingdom	146.3
5. India	154.8	5. China	139.6
6. China	154.4	6. France	135.3
7. France	142.9	7. Japan	133.3
8. Netherlands	126.8	8. Netherlands	124.0
9. Singapore	122.3	9. Singapore	107.0
10. Japan	114.7	10. Switzerland	88.1

Source: UNCTAD.

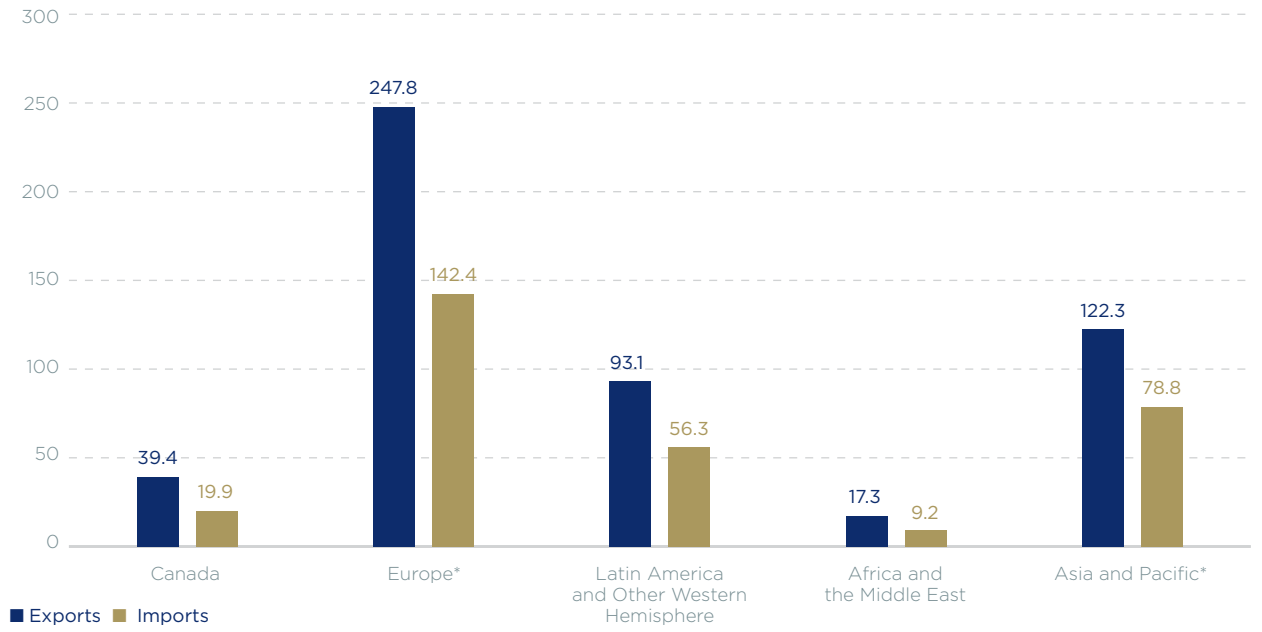
Ireland's high rankings underscore both its preferred location for many multinational companies, and its high reliance on digital trade. Its imports of digitally-deliverable services were equivalent to 67%, and its exports 58%, of its GDP.

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.[34]

In 2020, digitally-enabled services accounted for 73% of all U.S. services exports, 67% of all services imports, and 87% of the U.S. global surplus in trade in services (Table 9). The significant rise in the share of digitally enabled services in 2020 is primarily due to a large drop in travel (down 79% or -$36 billion) and transport (down 40% or -$13 billion) due to Covid-19.

In 2020, the United States registered a $213.6 billion trade surplus in digitally-enabled services with the world. Its main commercial partner was Europe, to which it exported $247 billion in digitally-enabled services and from which it imported $142 billion, generating a trade surplus with Europe in this area of $105 billion. U.S. exports of digitally-enabled services to Europe were about 2.7 times greater than U.S. digitally-enabled services exports to Latin America, and roughly double U.S. digitally-enabled services exports to the entire Asia-Pacific region (Table 5).

Table 5 U.S. Trade in Digitally-Enabled Services by Major Area, 2020 ($Billions)



Source: Bureau of Economic Analysis, Trade in Potentially ICT-Enabled Services Database. Data as of July 2021.

In 2020, the 27 EU member states collectively exported €1.0 trillion and imported €1.0 trillion in digitally-enabled services to countries both inside and outside the EU (See Tables 5 and 6). Excluding intra-EU trade, EU member states exported €551 billion and imported €594.5 billion in digitally-enabled services, resulting in a deficit of €43.3 billion for these services.

Digitally-enabled services represented 61% of all EU27 services exports to non-EU27 countries and 68% of all EU services imports from non-EU countries.

In 2020, the United States accounted for 22% of the EU27's digitally-enabled services exports to non-EU27 countries, and 34% of EU27 digitally-enabled services imports from non-EU27 countries.[35] The United States purchased €122.1 billion, according to Eurostat data for 2020, making it the largest country for imports of EU27 digitally-enabled services exports – ahead of even the United Kingdom (€121.1 billion). The entire region of Asia and Oceania imported just slightly more than the U.S. (€138.1 billion).

In 2020, EU member states imported just over €1.0 trillion in digitally-enabled services, according to Eurostat data. 41% originated from other EU member states (See Table 6). Another 20% (€204.7 billion) came from the United States, making it the largest supplier of these services. The EU imports of these services from the U.S. were almost double the imports from the UK (€114.2 billion).

Table 6 Destination of EU27 Exports of Digitally-Enabled Services, 2020 (€Billions)

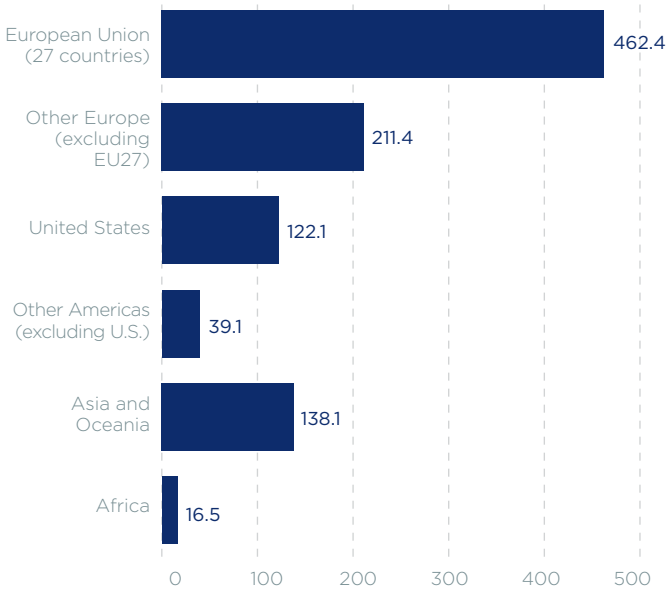
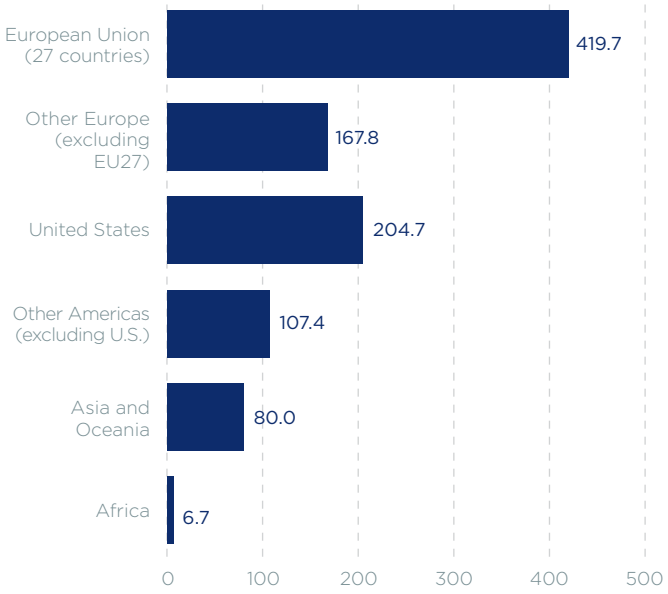


Table 7 Origin of EU27 Imports of Digitally-Enabled Services, 2020 (€Billions)



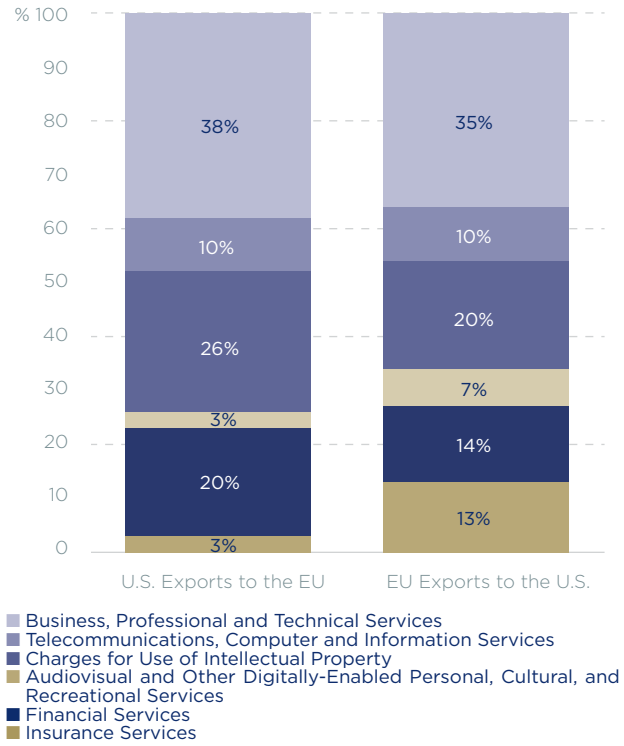
Note: Digitally-Enabled Services includes finance; insurance; IP charges; telecommunications, computer, information services; R&D services; professional and management services; architectural, engineering, scientific and other technical services; trade-related services; audiovisual services; and other personal, cultural, and recreational services. Asia includes Middle East countries. Line items for "international organizations" and "EU27 unallocated" excluded.
Source: Eurostat. Data as of January 2022.

Digitally-enabled services supplied by affiliates
(2019)

$529 billion
U.S. affiliates in Europe

$287 billion
European affiliates in the U.S.

Table 8 U.S.-EU Digitally Enabled Services Trade by Sector, 2020



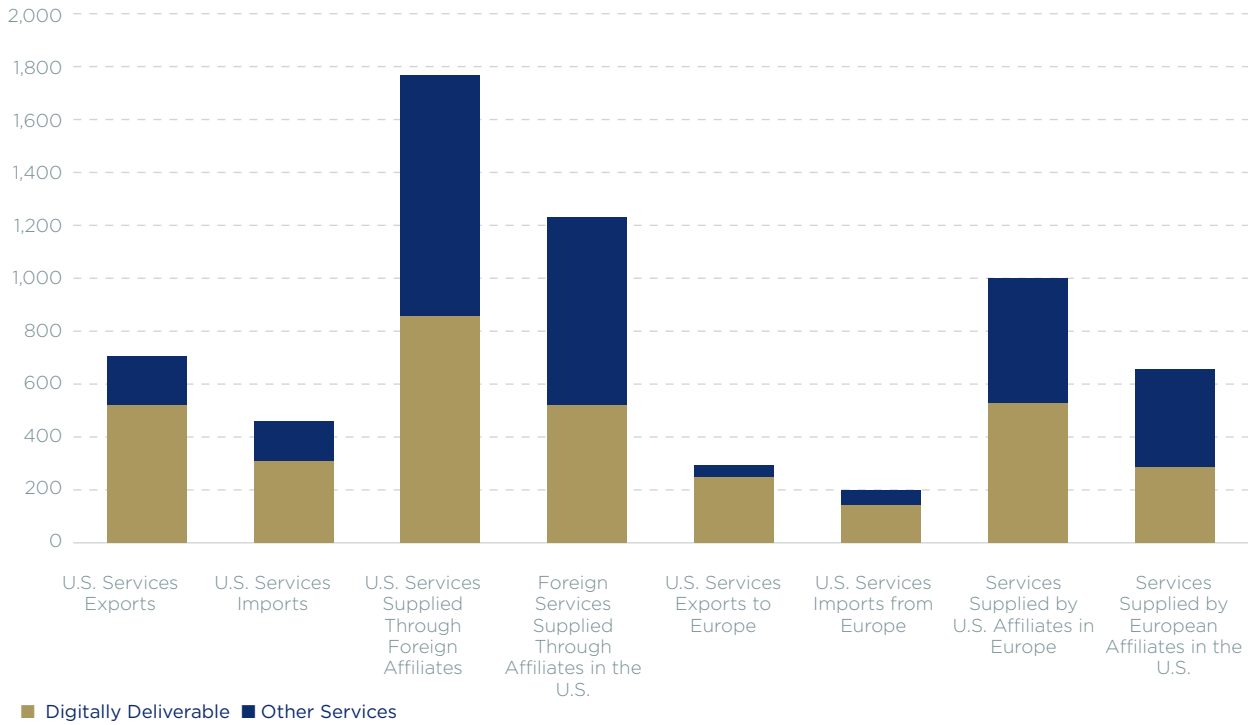
Sources: U.S. Bureau of Economic Analysis.
Data as of July 2021.

Table 8 categorizes U.S.-EU digitally-enabled services trade into six sectors. For both economies, the most important exports are represented by digitally-deliverable business, professional and technical services, which accounted for 38% of digitally-enabled services exports from the EU to the United States and 35% of digitally-enabled services exports from the United States to the EU in 2020. The second most important category consists of intellectual property. This usually comes in the form 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. 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 – another indicator reinforcing the importance of foreign direct investment, rather than trade, as the major driver of transatlantic commerce. U.S. services supplied by affiliates abroad were $1.8 trillion, roughly 2.5 times U.S. global services exports of $705.6 billion. Moreover, half of all services supplied by U.S. affiliates abroad are digitally-enabled (Table 9).

Table 9 Digitally-Enabled Services Trade and Services Supplied through Affiliates* ($Billions)



**Trade data are for 2020. Affiliate data are for 2019, the latest available year.*
Source: U.S. Bureau of Economic Analysis.
Data as of October 2021.

Table 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 United States, versus U.S. and European exports of digitally-enabled services. 53% of the $998 billion in services provided in Europe by U.S. affiliates in 2019 was digitally-enabled. In 2019, U.S. affiliates in Europe supplied $529 billion in digitally-enabled services, whereas European affiliates in the United States supplied $287 billion in digitally-enabled services. Digitally-enabled services supplied by U.S. affiliates in Europe were more than double U.S. digitally-enabled exports to Europe, and digitally-enabled services supplied by European affiliates in the United States were 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 10 underscores this dynamic. In 2019, Europe accounted for 71% of the $303.8 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. U.S. overseas direct investment in the "information" industry in the UK alone, for instance, was 66% more than such investment in the entire Western Hemisphere outside the United States, roughly the same as such investment in all of Asia, the Middle East and Africa combined, and 14 times such investment in China. Equivalent U.S. investment in Germany was 2.7 times more than in China.[36]

Table 10 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	2017	2018	2019
Canada	3,595	4,140	3,971	5,996	6,316	7,135	7,595	7,401	8,487	8,342	9,161	8,991	9,403	9,480
Europe	67,270	76,156	85,450	84,117	96,310	110,525	119,123	120,796	157,811	162,409	175,105	174,396	200,600	215,158
France	4,045	3,794	4,475	4,713	4,582	5,013	4,768	5,258	6,085	5,894	5,927	6,265	7,036	6,657
Germany	5,260	6,031	6,104	6,456	7,143	7,798	7,970	10,599	12,018	11,191	11,394	12,589	13,624	10,657
Netherlands	5,925	8,152	9,980	8,674	8,719	9,313	10,196	9,117	12,686	13,590	13,938	16,617	20,252	17,417
Switzerland	2,871	2,527	3,197	3,747	4,034	4,419	5,243	4,778	(D)	5,452	5,435	5,404	5,733	6,952
United Kingdom	33,512	35,711	31,479	29,906	24,941	26,446	25,996	23,876	30,228	33,512	35,854	37,684	38,426	53,550
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	20,320	21,698	23,822	22,755
Australia	5,722	6,365	6,369	5,961	6,852	6,960	5,531	7,735	7,045	6,266	6,431	7,018	8,349	8,334
Japan	3,447	(D)	6,224	7,856	4,575	4,828	5,204	5,807	7,796	7,821	11,252	9,856	11,416	12,534
China	n/a	n/a	n/a	1,252	1,633	1,627	1,581	1,656	3,016	2,675	2,726	3,250	3,620	3,813
Other Asia-Pacific, Middle East and African Countries	5,217	(D)	(D)	7,623	8,582	10,320	11,663	14,226	33,461	36,891	36,293	30,498	32,363	31,773
TOTAL	**92,507**	**(D)**	**(D)**	**126,603**	**141,846**	**162,338**	**172,583**	**179,372**	**240,073**	**245,076**	**261,288**	**255,707**	**289,573**	**303,847**

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.
Data as of October 2021.

2. E-Commerce

Electronic commerce offers a second window into transatlantic digital connections and complements our lens of digitally-enabled services. It hit the stratosphere in many retail sectors during the pandemic, even as online revenues for travel, mobility and accommodation slumped.

When exploring the importance of e-commerce for the transatlantic economy, we 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.[37]

Nevertheless, we can evaluate and compare many different estimates and surveys that have been conducted. According to UNCTAD, global e-commerce was worth $26.7 trillion globally in 2019 – equivalent to 30% of global gross domestic product.[38]

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, pale in comparison to business-to-business (B2B) e-commerce. In 2020 B2B e-commerce accounted for 82% of the total value of global e-commerce, almost five times larger than business-to-consumer (B2C) transactions. The global B2B e-commerce market is slated to expand at a compound annual growth rate (CAGR) of 18.7% from 2021 to 2028, reaching a value of $25.65 trillion.[39] Cisco projects that digital manufacturer-to-manufacturer (M2M) applications, such as smart meters, transportation, and package and asset tracking, will account for about half of the world's total devices and connections by 2023.[40]

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. The sheer volume of B2B e-commerce, however, means it still is the most important component of cross-border e-commerce sales. By 2023 cross-border B2B commerce is expected to account for two-thirds ($1.78 trillion) and cross-border B2C commerce for one-third ($920 billion) of an overall global cross-border e-commerce market of $2.7 trillion.[41]

Including all types of e-commerce, the United States is the top market in the world; online sales there are 2.8 times higher than in Japan and 3.7 times higher than in China. North America and Europe account for six of the top 10 e-commerce countries (Table 11). China's large B2C e-commerce market reflects its billion-plus population. China is underweight, however, when it comes to B2B e-commerce.

Table 11 Top 10 Countries by E-Commerce Sales

Rank	Economy	Total ($ billion)	As % of GDP	B2B ($ billion)	% of all e-commerce	B2C ($ billion)
1	United States	9,580	45	8,319	87	1,261
2	Japan	3,416	67	3,238	95	178
3	China	2,604	18	1,065	41	1,539
4	Korea (Rep.)	1,302	79	1,187	91	115
5	United Kingdom	885	31	633	72	251
6	France	785	29	669	85	116
7	Germany	524	14	413	79	111
8	Italy	431	22	396	92	35
9	Australia	347	25	325	94	21
10	Spain	344	25	280	81	64
	Top 10 Total	*20,218*	*36*	*16,526*	*82*	*3,691*
	World	**26,673**	**30**	**21,803**		**$4,870**

Source: UNCTAD. Data for 2019, latest available. B2B: Business-to-Business. B2C: Business-to-Consumer.

Table 12 Cross-Border B2C Sales of Top Ten Merchandise Exporters

Rank	Economy	Total ($ billion)	As % of merchandise exports	% of B2C e-commerce sales
1	China	105	4.2	6.8
2	United States	90	5.5	7.1
3	United Kingdom	38	8.2	15.2
4	Hong Kong	35	6.2	94.3
5	Japan	23	3.3	13.2
6	Germany	16	1.1	14.7
7	France	12	2.2	10.6
8	Italy	5	0.9	13.9
9	Korea (Rep.)	5	0.9	4.4
10	Netherlands	1	0.2	4.3
	Top 10 Total	*332*	*3.4*	*9.0*
	World	**440**	**2.3**	**9.0**

Source: UNCTAD. Data for 2019, latest available B2C: Business-to-Consumer.

When it comes to cross-border B2C e-commerce sales, China and the United States lead in terms of total value, while the UK leads in terms of B2C e-commerce as a share of overall goods exports (Table 12).[42] Among 15 prominent European ecommerce markets, 22% of total B2C turnover for 2020 was cross-border. Cross-border turnover accounted for 50%+ of total ecommerce turnover for Finland, Austria, Ireland, Norway, Switzerland, and Sweden.[43]

Most consumers in North America and Europe turn to websites based in their own countries, in neighboring European countries, or in the United States. Yet inevitably many of the orders made via those websites are for goods that originate in China. China is the top origin market for cross-border e-commerce orders made in the United States and in 19 out of 26 European countries (Table 13).[44]

Table 13 Cross-Border (B2C) Shopping and Top Origin Markets, Selected Countries

	Value of cross-border ecommerce ($billion)	Cross-border share of total ecommerce	Online shoppers who shop across borders	Top Origin Markets
United States	106.3	8%	36%	China (49%), UK (10%), Canada (6%)
United Kingdom	40.4	16%	45%	China (45%), US (21%), Germany (6%)
France	20.1	15%	50%	China (40%), UK (13%), Germany (13%)
Germany	16.0	14%	37%	China (43%), UK (13%), US (13%)
Canada	14.0	20%	63%	US (49%), China (42%), UK (4%)
Spain	9.7	16%	61%	China (50%), UK (11%), Germany (8%)
Italy	6.6	17%	47%	China (32%), UK (20%), Germany (14%)
Netherlands	5.1	16%	54%	China (54%), Germany (15%), UK (7%)
Sweden	4.0	12%	49%	China (32%), Germany (19%), UK (15%)
Poland	1.0	4%	18%	China (53%), Germany (15%), UK (8%)

Source: The Paypers, Cross-Border Payments and Ecommerce Report 2021- 2022, December 2021.

Driven by the pandemic, online marketplaces in the EU, UK, Switzerland and Norway grew 37.5% in 2020, generating 58% ($131 billion) of overall cross-border B2C e-commerce market turnover of $226.3 billion (excluding travel) in 2020. U.S. platform companies accounted for six of the top ten European marketplaces; Amazon and eBay accounted for more than half the market. Marketplaces with European capital were led by Vinted, OLX, and Zalando (Table 14). In our 2020 report we offered examples of successful European cross-border marketplaces that show how companies can achieve success even from relatively small home economies. It is expected that in 2025, marketplaces will represent 65% of cross-border online sales in Europe.[45]

Table 14 Top Ten Cross-Border Marketplaces Operating in Europe

1.	eBay (US)
2.	AliExpress (China)
3.	Amazon (US)
4.	Etsy (US)
5.	Vinted (Lithuania)
6.	OLX (The Netherlands)
7.	Wish (US)
8.	Discogs (US)
9.	Zalando (Germany)
10.	Uber Eats (US)

Source: Cross-Border Commerce Europe, "2nd Edition of the Top 100 Cross-Border Marketplaces Europe," September 22, 2021, https://www.cbcommerce.eu/press-releases/second-edition-of-the-top-100-cross-border-marketplaces-europe-an-annual-analysis-of-the-best-global-cross-border-platforms/.

3. The Platform Economy

Platform companies that connect individuals and companies directly to each other to trade products and services continue to reshape the U.S. and European economies, as well as the commercial connections between them. Platforms have swiftly become a prominent business model in the transatlantic and global economy, both by matching supply and demand in real time and at unprecedented scale, and by connecting code and content producers to develop applications and software such as operating systems or technology standards.[46] Platform models have risen so quickly over the past two decades that by 2019, platform companies accounted for 7 of the 10 most valuable global firms.[47] The pandemic-driven digital acceleration has further boosted the size, profits and market value of the dominant platforms. By 2025, platform models are projected to expand to around $60 trillion, or nearly one-third of all global commerce.[48]

Size matters in the platform economy. The biggest are U.S. companies, which account for about two-thirds of the global platform economy. Next come Chinese companies. European platform companies on average are markedly smaller than their U.S. and Chinese counterparts, and together represent only 3% of global market value (Table 15).

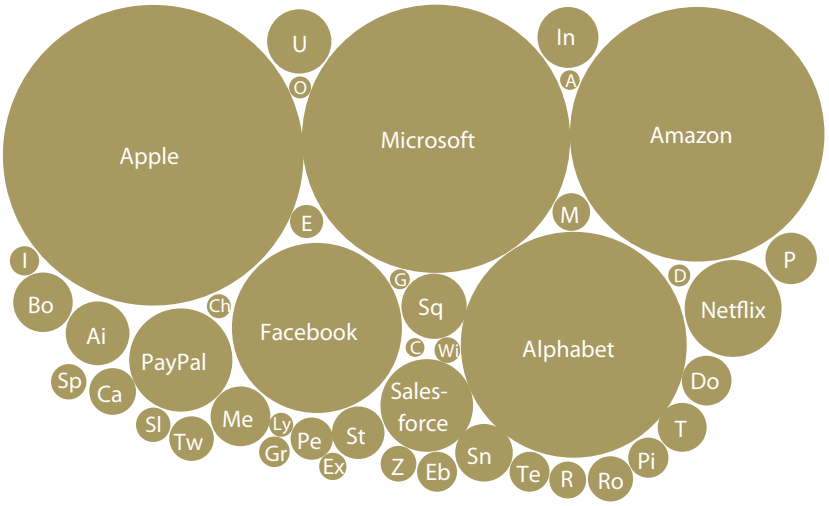
The dramatic rise of U.S. and Chinese platform companies has generated considerable concern among Europeans that they may be missing out on a major economic transformation. Europe certainly faces some challenges. However, size is not everything. Platform economics have rewarded entrepreneurship and the adoption of new business models. Those who can develop both their digital and their entrepreneurial ecosystems stand to profit greatly from the platform revolution. The Digital Platform Economy Index, which draws on 112 indicators that integrate digital and entrepreneurial ecosystems gauges, goes beyond size to offer a more differentiated view of digital platform-based ecosystem performance (Table 16).

According to this Index, North American and European countries account for 9 of the top 10, and 17 of the top 20, countries when it comes to combined digital and entrepreneurial ecosystem development. China's brand of state-driven capitalism ranks highly in terms of building digital ecosystems, but lags behind the leaders when it comes to digital entrepreneurship.[49] The leading countries not only host digital multi-sided platforms, they rank highly in terms of digital technology entrepreneurship, digital infrastructure governance, and "digital user citizenship."

This composite view illuminates useful areas of focus for those countries the authors call "followers" and "gainers."[50] Germany, for instance, ranks relatively highly in all areas save digital entrepreneurship. The German model has tended to reward innovation to existing processes rather than creation of never-seen-before products; such innovations have made Germany's *Mittelstand* companies global champions. Given Germany's strong manufacturing base, this suggests devoting greater attention to process innovation in the B2B platform economy, rather than vainly trying to copycat countries with very different entrepreneurial cultures.

Table 15 **Geographical Distribution of the Top Global Platforms.** Based on MarketCap/last-known venture round valuation. Overall top 100 value $12.6 trillion. (October 2020)

America

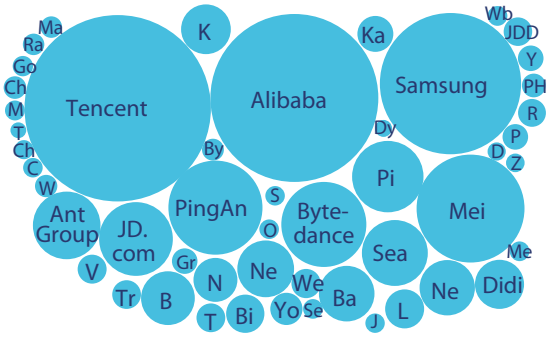


Airbnb
Alteryx
Booking
Carvana
Chegg
Doordash
Dropbox
Ebay
Etsy
Expedia
Grainger
Grubhub
Instacart
Intuit
Lyft
Match
MercadoLibre
Opendoor
Palantir
Peloton
Pinterest
Roblox
Roku
Slack
Snap
Splunk
Square
Stripe
Teladoc
Twilio
Twitter
Uber
Wish
Zillow

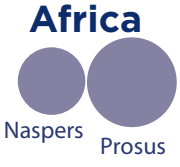
Europe

Adyen
Auto1
Checkout
Delivery Hero
Edenred
Hellofresh
Farfetch
Klarna
Spotify
Just Eat T.
Yandex

Asia-Pacific



Africa



Baidu
Beike
Bilibili
BYJU
Chehaoduo
Coupang
Dada Nexus
Didi Chuxing
Go-Jek
Grab
JD Digits
Kakao
Kuaishou
Lufax
Manbang
Meicai
Meituan
Mercari
Naver
Netease
Ola
OYO
Paytm
Pinduoduo
PindAn Health
Rakuten
Rea
Sea Group
Seek
Sensetime
Tokopedia
Trip.com
VipShop
WeBank
WeDoctor
Weibo
YonYou
Yuanfudao

Share in total value, by region (%)

Number of top 100 platforms, by region

Source: Holger Schmidt, available at www.netzoekonom.de/vortraege/#tab-id-1 (data as of May 2021).

Table 16 Cross-Border (B2C) Shopping and Top Origin Markets, Selected Countries

Rankings				
Overall	Multi-Sided Platforms	Digital Technology Entrepreneurship	Digital Infrastructure Governance	Digital User Citizenship
1 United States	1	1	2	6
2 United Kingdom	3	3	4	1
3 Netherlands	2	4	1	4
4 Canada	5	5	6	2
5 Sweden	4	6	5	5
6 Switzerland	9	2	8	7
7 Norway	6	12	3	3
8 Denmark	7	11	9	10
9 Australia	10	18	7	8
10 Finland	11	8	11	9
11 Ireland	14	7	17	15
12 Luxembourg	17	14	10	14
13 New Zealand	8	23	14	11
14 Germany	23	13	12	12
15 France	16	9	15	18
16 Iceland	13	10	16	22
17 Belgium	15	17	18	17
18 Estonia	22	21	19	16
19 Hong Kong	20	19	13	26
20 Austria	28	20	21	19

Source: Zoltan J. Acs, László Szerb, Abraham K. Song, Éva Komlósi, Esteban Lafuente, The Digital Platform Economy Index 2020, Global Entrepreneurship and Development Institute, December 2020, https://thegedi.org/wp-content/uploads/2020/12/DPE-2020-Report-Final.pdf.

In the end, it is Europe's larger ecosystem that is like to shape its future in the platform economy. This underscores the importance of a true European Single Market, including a more integrated Digital Single Market, that would transcend fragmentation of languages, consumer preferences, rules and regulations to facilitate cross-border research, development and commercialization that could introduce new technologies and fresh business models to reach the kind of scale that platform companies have achieved in the large continental markets of the United States or China.[51]

4. Cross-Border Data Flows

Another way to understand 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. By the end of this year, cross-border bandwidth is slated to be 400 times what it was in 2005. By that time, Global Internet Protocol (IP) traffic, a proxy for data flows, is projected to reach 150,700 gigabytes (GB) per second, over 3 times more than three years ago.[52]

Most cross-border data flows continue to run between North America and Europe.[53] The sheer dominance of transatlantic flows dissipating, however, as data flows diffuse and as companies face significant and growing legal uncertainty in transferring personal information out of the European Union. In July 2020, the Court of Justice of the European Union invalidated

Cross-border data flows contribute more to global growth than global trade in goods and enable every other kind of cross-border flow

the Privacy Shield framework that enabled over 5,000 mostly small- and medium-sized enterprises to transfer personal data for commercial purposes. The Court and European privacy regulators have also raised questions about the use of other data transfer tools, including standard contractual clauses, which are used by the vast majority of companies sending personal information out of Europe. This reopened transatlantic disputes over privacy protections, disrupted transatlantic data flows, and further chilled the transatlantic economy. Negotiators are currently in the final stages of negotiating a successor agreement to the Privacy Shield, which would theoretically also bolster the legal clarity around the use of other transfer tools. However, since the Court's judgment is rooted in differences in law rather than in policy, even a Privacy Shield 2.0 is likely to face legal challenges from within the EU.[54]

According to Nikkei, the Chinese mainland and Hong Kong, the telecommunications gateway to the mainland, together account for 23% of the world's data.[55] That is almost double that of the United States (Table 17). In part because of China's burgeoning mobile payments platforms and its Belt and Road infrastructure initiatives, Chinese data flows are growing substantially with other Asian countries, which accounted for more than half of data flows in and out of China in 2019. The U.S. share of data flows in and out of China fell from 45% in 2001 to 25% in 2019.

Table 17 Countries with the Most Cross-Border Data, 2001-2019

2001	Rank	2019
United States	1	China/Hong Kong
United Kingdom	2	United States
Germany	3	United Kingdom
France	4	India
Japan	5	Singapore
China/Hong Kong	6	Brazil
Brazil	7	Vietnam
Russia	8	Russia
Singapore	9	Germany
India	10	France

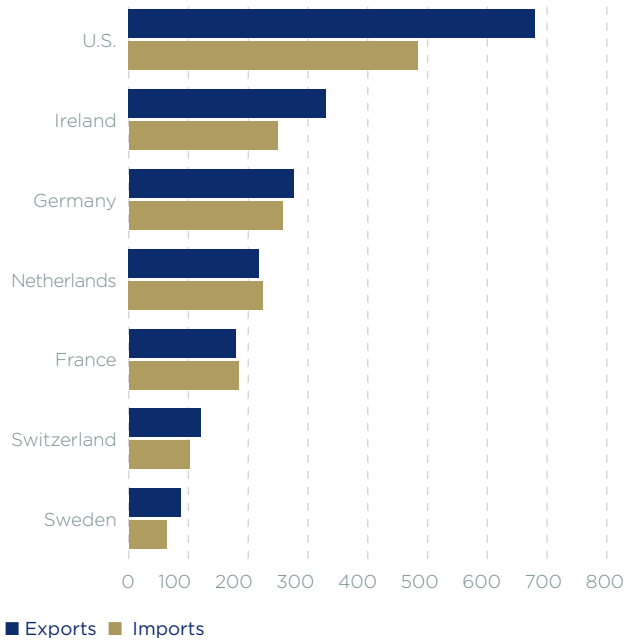
Source: Nikkei Asia, November 25, 2020, https://vdata.nikkei.com/en/newsgraphics/splinternet/.

Data is a special resource different than goods and services. UNCTAD calls cross-border data flows "a new kind of international economic flow, which lead to a new form of global interdependence."[56] Data flows are not necessarily a proxy for commercial links, since data traffic is not always related to commercial transactions.[57] 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."[58]

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.[59] 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.[60]

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. The OECD has devised metrics to determine the most active countries when it comes to delivering products across borders through data flows, as opposed to considering all transactions facilitated through data flows. It has determined that the United States is a major hub for international trade in products delivered through data flows, and that France, Germany, India, Ireland, the Netherlands, Switzerland, and the United Kingdom also feature heavily in trade underpinned by data, all ahead of China (Table 18).[61]

Table 18 International Trade Underpinned by Data Flows, Top Countries ($Billions)



Note: Trade underpinned by data flows includes four categories: (1) "ISIC J production", or trade in products produced by firms classified in ISIC section J (Information and Communication); (2) "ISIC J products," or trade in the products mainly associated with firms classified in ISIC section J but including production by firms classified in other sectors; (3) "Digitally deliverable services," or "potentially ICT-enabled products" per UNCTAD (2015); and (4) "Digitisable products," or products within the WTO HS commodity classification per Banga (2019). UK is not included due to differing data calculations, but OECD indicates the UK also ranks among the top traders in this category.
Source: OECD, Perpectives on the Value of Data and Data Flows, December 2020.
Data as of October 2020.

5. Digital Wiring: Land-Based Hubs and Sea-Based Spokes

The Digital Landscape: Hubs and Hyperscalers

The United States and Europe host key land-based hubs and sea-based spokes of the global digital economy. On land, the United States accounts for about 40% and Europe for an additional 35% of so-called colocation data centers. When it comes to cross-border digital connectivity, European and U.S. cities are major hubs. Europe is the global leader, with tremendous connected international capacity. Frankfurt, London, Amsterdam and Paris – together known as FLAP – substantially outpace North American and Asian cities (Table 19). 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.[62] Investments in European data centers are now expanding beyond FLAP to encompass sites like Dublin, Ireland – home to many digital companies – and Marseille, France, which has become a major hub for traffic between Europe, Africa and the Middle East. Sweden, Finland, Italy, Switzerland, Portugal, Spain, Wales, and Poland are some of the fastest-growing European locations of large-scale data center development.[63]

Table 19 Highest Capacity International Internet Hub Cities

City	2020 Bandwidth (Tbps)
Frankfurt, Germany	110.6
London, UK	74.8
Amsterdam, Netherlands	71.2
Paris, France	67.9
Singapore, Singapore	56.3
Hong Kong, China	33.8
Stockholm, Sweden	32.0
Miami, U.S.	30.9
Marseille, France	28.8
Los Angeles, U.S.	25.2

Domestic routes omitted.
Source: Telegeography, The State of the Network 2021, https://www2.telegeography.com/hubfs/assets/Ebooks/state-of-the-network-2021.pdf.

The hard-wiring of the transatlantic digital landscape continues to evolve. One key development is the shift in providers of data centers and cloud-like services from European and U.S. telecoms and related data-center management companies to "hyperscalers," mainly from the United States. Traditional data centers are centralized facilities that use computing and networking systems and equipment to store data and to enable users to access those resources. Now, the opportunity to use applications that work together via the web and the cloud has given birth to more cost-effective hyperscale data centers that can store more data and scale up or down in quick response to shifting demand for computing tasks. There are now more than 700 hyperscale data centers around the world, double the amount of five years ago. Hyperscale data centers accounted for more than half of all installed data-center servers and total data center traffic in 2021.[34]

The numbers are huge. For example, as of 2021, Google had invested more than $14 billion in data centers and related infrastructure across Europe, supporting a further $18 billion of economic activity and around 13,100 jobs per year on average.[65] Similar figures can be found with Facebook, Microsoft, and AWS. Large colocation players such as Equinix, Digital

Realty, CyrusOne and Vantage Data Centers are all investing heavily in the construction of hyperscale sites. The global hyperscale data center market is set to grow by $107.60 billion between now and 2025. The Western Europe and Nordic hyperscale data center market is forecast to be generating revenues of around $29 billion by 2023.[66]

While European providers have more than doubled their cloud revenues since 2017, their market share in Europe has declined from 27% to under 16%, whereas Amazon Web Services (AWS), Microsoft Azure and Google Cloud now account for 69%.[67] This has generated concerns within Europe about U.S. dominance, which could inhibit some possible avenues for deeper transatlantic cooperation. Two other trends have the potential to mitigate such concerns, depending on how they unfold: migration to the "edge;" and the evolution of "cloud-as-a-service" to "cloud-as-a-product."

Today, most cloud computing still happens in centralized rather than decentralized data centers. By 2025, this trend will reverse: 80% of all data is expected to be processed in smart devices closer to the user, known as edge computing. This could open opportunities for European providers able to offer multi-cloud options that ensure local control over data with the amplified possibilities that come from hyperscaled connections. Cloud/edge computing is likely to be critical to the EU's ability to realize its European Green Deal, particularly in areas such as farming, mobility, buildings and manufacturing.[68]

These opportunities are likely to be influenced by the evolution of the cloud from being a platform on which a business runs, to becoming the product itself. Rather than considering hyperscalers as direct competitors, some European telecoms operators and companies in a range of other businesses now see their biggest opportunities in the cloud building on top of the basic infrastructure already rolled out by U.S. companies. For instance, Siemens is building an ambitious "industrial cloud platform" on top of the basic cloud infrastructure provided by Amazon, to enable it to become a key player in digital industrial manufacturing services. Thales, a French defense company, is forming a joint company with Google to provide a sovereign hyperscale cloud service in France. Vodaphone has also formed a partnership with Google, and AWS will soon start selling private 5G networks direct to businesses.[69]

Cloud computing means that network functions do not need to be housed in centralized data centers, but can be decentralized and dispersed to the "edge," giving customers faster response times, cheaper service tied to actual usage rather than fixed costs, and more local control over their data. Edge computing holds the promise of supporting a wider range of suppliers beyond the current oligopoly of providers.

The Digital Seascape: Wiring the Pan-Atlantic

Land-based digital hubs are connected to sea-based digital spokes – the undersea fiber optic cables that transmit 95% of all intercontinental telecommunication traffic.[70] These cables serve as an additional proxy for the ties that bind continents. Globally, the market for submarine fiber optic cables is estimated to reach $30.8 billion by 2026, growing at an annual rate of 14.3%.[71]

The transatlantic data seaway is the busiest in the world. Submarine cables in the Atlantic already carry 55% more data than transpacific routes. Telegeography estimates a compound annual growth rate of 38% in transatlantic capacity until 2025.[72]

Sines, Portugal, an old fishing town of around 14,000 people, is where the digital sea- and landscapes meet. Sines is quickly becoming a central node in Europe's digital future. Already Portugal's top port for ocean faring container ships, Sines is now Portugal's top under-the-ocean connector binding Europe to North America, South America, and Africa. It also hosts one of the world's most modern hyperscale data centers.

Sines is emblematic of how digital infrastructure expansions on land and at sea are now wiring the pan-Atlantic, turning the Iberian Peninsula into a strategic point of interconnection and convergence for data traffic between Europe, the Americas, Africa, the Middle East and Asia. The stage was set by the 6,600-kilometer (km) Marea cable, a project of Facebook, Microsoft and Telefonica connecting Virginia Beach, Virginia with Bilbao, Spain, which came online in 2018. Now countries and companies are literally branching out connect the full Atlantic Basin. A cable dubbed Firmina will run from the East Coast of the United States to Las Toninas, Argentina, with landings in Praia Grande, Brazil, and Punta del Este, Uruguay. The 9,656 km Ella Link from Sines to Fortaleza, Brazil, came online in the first half of 2021. Two Google-funded state-of-the-art subsea cables are due to come online in 2022: Grace Hopper, connecting Spain and the UK to the United States; and Equiano, linking Portugal to South Africa. An 8,700 km cable named Medusa will link Lisbon with Port Said in Egypt, with connections in France, Spain, Italy, Morocco, Tunisia, Greece and Cyprus. And a consortium of Meta, Nokia, Alcatel and other telecom operators is constructing 2Africa, the world's longest subsea cable system, extending over 45,000 km to connect 33 countries and 36%

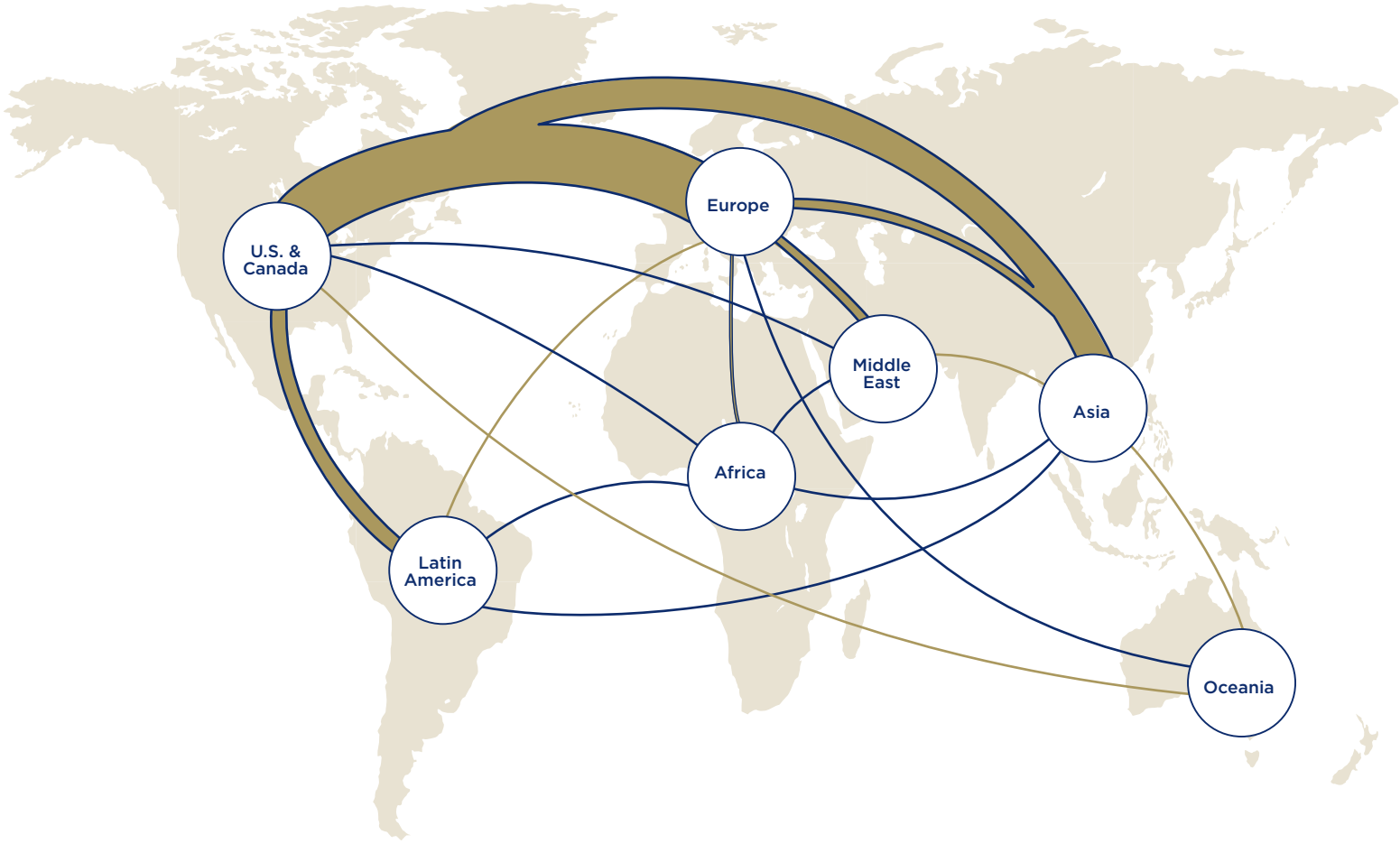
of the world's population across Europe, Africa, the Middle East and Asia.[73]

The Hyper-Providers

The new surge in transatlantic capacity is being driven by private networks, mainly providers of content and cloud services, which have displaced national telecommunication carriers as the major investors in subsea cables and the largest source of used international bandwidth. Content providers keen on getting closer to customers and achieving economies of scale are quickly pushing the digital frontier. Rather than rely on leasing arrangements with backbone providers, they see advantages in owning these cable networks themselves as they anticipate galloping demand for international bandwidth, which is slated to double every two years.[74] Their densest connections are between North America and Europe (Table 20).

Table 20 Inter-regional Capacity and the Cloud

Used inter-regional bandwidth showing content providers share



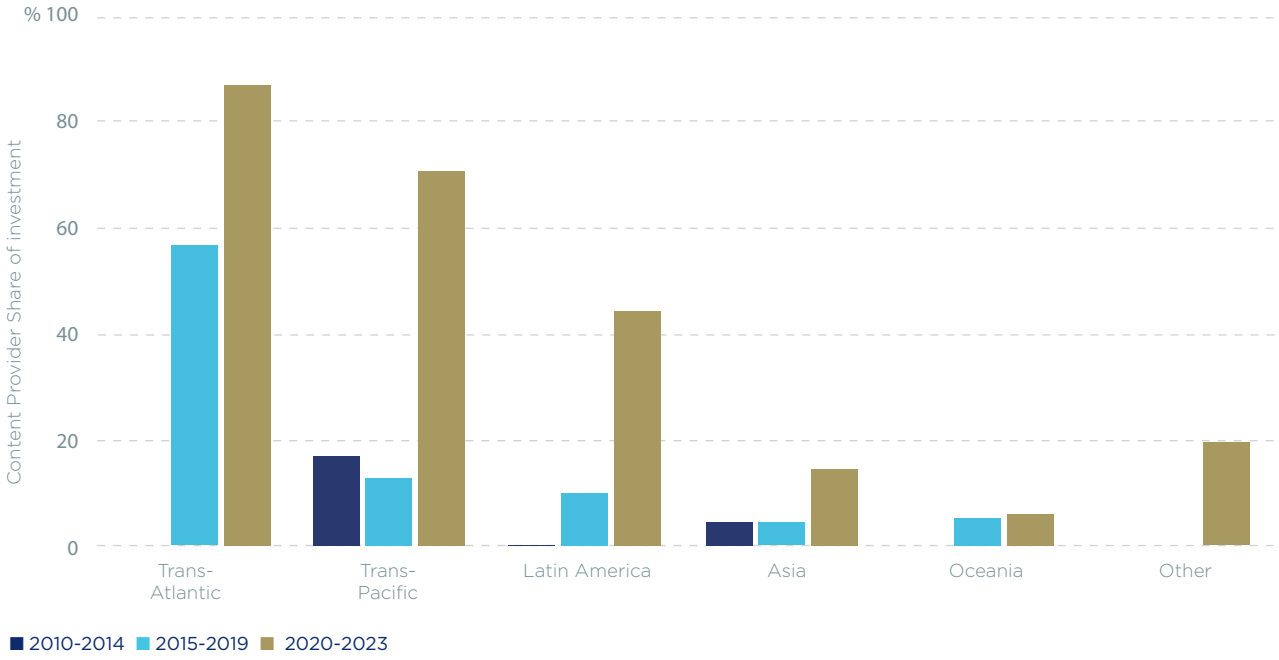
Used Inter-Regional Bandwidth (Tbps)

200 100 50 10<

Content Providers Share

Source: Telegeography.

Table 21 Content Provider Investments Share as % of CAPEX on New Submarine Cables



Source: Telegeography.

In 2006 backbone providers accounted for over 80% of international bandwidth. By 2020, content providers were accounting for 66% of used international bandwidth globally.[75] Between now and 2023, content providers are slated to account for a whopping 85% of capital investments in new transatlantic subsea cables (Table 21). Between 2020-2027, Telegeography projects 40% CAGR growth of overall global and transatlantic bandwidth, about 50% in transpacific bandwidth, and over 80% for bandwidth connecting Europe and Sub-Saharan Africa.[76]

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. Businesses are moving their computing from centralized data centers to more distributed locations. Analysts estimate that more than 50% of enterprise-generated data will be created and processed outside centralized data centers or cloud by 2023.[77]

This move is exponentially increasing demand for "interconnection" – direct, private digital data exchanges that bypasses the public internet – and is another fundamental driver behind the proliferation of transatlantic cable systems. Private interconnection bandwidth is not only distinct from public internet traffic, it is already 9 times larger and is slated to grow much more quickly.[78]

The public internet will remain a pervasive force in most people's lives and a key to digitally-delivered services, e-commerce and the platform economy.[79] Yet private interconnection is rising alongside the public internet as a powerful vehicle for business. And as we have shown here, its deepest links are across the Atlantic.

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