CENTER FOR TRANSATLANTIC RELATIONS

CENTER FOR TRANSATLANTIC RELATIONS JOHNS HOPKINS UNIVERSITY | PAUL H. NITZE SCHOOL OF ADVANCED INTERNATIONAL STUDIES

The Transatlantic **Digital** Economy **2017**

How and Why it Matters for the United States, Europe and the World

DANIEL S. HAMILTON

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Preface and Acknowledgements

This study provide metrics to assess how and why digitalization and digital links across the Atlantic are becoming so critical to both U.S. and European economic health.

A growing amount of transatlantic commerce is underpinned by cross-border flows of data. Cross-border data flows between the U.S. and Europe are not only the highest in the world, far more than between either partner with any other region, the transatlantic digital economy also offers an economic foundation enabling European and American companies to be more effective global competitors.

Measuring the digital economy is difficult. However surprising it may seem, there is limited data about data! This report draws on public and private data sources to highlight 10 key measures of the transatlantic digital economy. After presenting these measures, the study addresses challenges and opportunities for the transatlantic digital economy.

This survey complements other writings in which my colleague Joseph P. Quinlan and I use both geographic and sectoral lenses to examine the deep integration of the transatlantic economy, and the role of the U.S. and Europe in the global economy, with particular focus on how globalization affects American and European consumers, workers, companies, and governments. Our other new publication, *The Transatlantic Economy 2017*, offers the most up-to-date picture of the dense economic relationship binding European countries to America's 50 states.

I would like to thank Katie Cassavell, Timo Haivala, Seva Karpauskaite, Lisa Mendelow, Susan Ness and Heidi Obermeyer, as well as Joe Quinlan, for their assistance in producing this study.

The views expressed here are my own, and do not necessarily represent those of any institution. Other views and data sources have been cited, and are appreciated.

Daniel S. Hamilton

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EXECUTIVE SUMMARY:
The Digital Top Ten

- Digital globalization evokes the image of a seamless global marketplace. Reality is different. The digital revolution is global in its reach but uneven in its effects.
- Advanced economies are nine times more connected to information and data flows than emerging economies. Digital connections between continents are thickest between Europe and North America.
- Europe is not only the world's most globally connected region, 8 of the world's 10 most connected countries are European. Europe and North America account for 21 of the top 30 most connected countries.
- Europeans and Americans literally can not afford transatlantic digital disconnects.

1. Digital and Digitally-Enabled Services

- Digitally-enabled services between the U.S. and Europe have become critical to the competitiveness of manufacturing and retail operations on each side of the Atlantic.
- Over half of digitally-enabled services imported by the U.S. from the EU is used to produce U.S. products for export, and vice versa.
- America's trade surplus in digitally-enabled services totaled $161.5 billion in 2015. Digitally-enabled services accounted for 61.6% of the overall U.S. trade surplus in services.
- Europe is the #1 market for overall U.S. services exports, as well as U.S. exports of digital services and of digitally-enabled services, and is the main source of U.S. imports of digitally-enabled services.
- The U.S. exported $180 billion in digitally-enabled services to Europe in 2015, and imported $109.1 billion, generating a trade surplus with Europe in this area of $71 billion. The U.S. is the largest supplier of digitally-enabled services to Europe.
- U.S. exports of digitally-enabled services to Europe were more than double U.S. exports to Latin America and almost double U.S. exports to the entire Asia-Pacific region.
- The U.S. is the largest non-EU consumer of EU digitally-enabled services exports, accounting for more EU exports than the rest of non-EU Europe, and more than all digitally-enabled services exports from the EU to Asia and Oceania.
- Digitally-enabled services supplied by U.S. affiliates in Europe were 2.3 times greater than U.S. digitally-enabled exports to Europe, and digitally-enabled services supplied by European affiliates in the United States were 2.4 times greater than European digitally-enabled exports to the U.S.

2. E-Commerce

- Nearly half of all U.S. companies have an online trading relationship with the EU, and almost half say that Europe is the region outside North America where they focus their cross-border strategy first.
- Over half of European companies focus first on North America as their primary e-commerce market.
- In terms of business-to-business (B2B) and business-to-consumer (B2C) e-commerce, the U.S. is the #1 foreign e-customer for German and UK companies, and is among the top five for Swedish, Italian, French and Danish companies.

- U.S. companies are the #1 foreign e-suppliers for customers in the UK and Turkey, and among the top five for customers in Germany, France, Italy, the Netherlands, Poland and Spain.
- The UK is the #1 foreign e-market in the world for U.S. companies, accounting for almost a quarter of all U.S. e-commerce exports. Germany ranks fourth as an e-supplier to the U.S.
- Americans are the #1 foreign e-customers for Chinese companies, and U.S. companies are the #1 foreign e-supplier to Chinese customers.
- Germany is the #1 European market for Chinese e-commerce exports, and fourth overall; and also the #1 European e-supplier to Chinese customers, and third overall.
- Per capita, the UK leads in B2C e-commerce; in 2015 the average e-consumer in the UK spent $4,018 online, considerably more than the average e-consumer in the U.S. ($3,428). The British conduct about 17% of their retail spending online. Americans and Germans each follow at about 14%, followed by France and Sweden each at about 9%, with Spain, Poland and Italy hovering near 3-4%.
- In 2015, the British in total spent €157.1 billion online — more than France (€64.9 billion), Germany (€59.7 billion) and Russia (€20.5 billion) combined. The UK accounts for more than one third of the entire European B2C e-commerce market.
- The U.S. and UK are each other's most important cross-border B2C e-commerce markets. In 2016 49% of all U.S. digital shoppers buying across borders purchased from UK-based companies.
- Similarly, U.S. companies are the most important foreign online sellers to UK and German consumers. 70% of all UK digital shoppers buying across borders purchased from U.S. companies.

3. The Transatlantic Platform Economy

- The U.S. and European economies, as well as the digital connections between them, are being reshaped by platform companies that connect individuals directly to each other via consumer-to-consumer (C2C) e-commerce. While services that serve as platforms are also B2C or B2B, and while C2C still commands a small share of the e-commerce market, platforms have supercharged C2C potential. Annual growth currently exceeds 25%, and some sectors are projected to even reach 63% by 2025.
- 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. 46% of EU28 GDP is considered to be amenable to the C2C platform economy.
- The U.S. remains the leader of the C2C platform economy, but it is also robust in the UK. A third of UK adults are engaging in C2C platform economy transactions, compared to 19% of U.S. adults.
- London is the C2C platform economy capital of Europe. San Francisco and New York are the only cities to have produced more C2C platform economy startups than London. The UK is home to 10% of global C2C platform economy companies — more than France, Germany and Spain combined.
- The San Francisco Bay Area is home to one out of every four digital platforms in the world.

4. Transatlantic Data Flows

- Global data flows are increasing at rates approaching 50 times those of the last decade, far outpacing goods trade and financial flows, according to McKinsey.
- The U.S. ITC estimates that the internet reduces average trade costs by 26%.
- Used cross-border bandwidth between North America and Europe is far thicker than that between any other two continents.

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

- Undersea cables transmit 99% of all intercontinental telecommunication traffic, and transatlantic cable connections represent the densest and highest capacity cable routes, with the highest traffic, in the world.
- Between 2011 and 2016 total available transatlantic capacity increased 240%. 2 new transatlantic cables will be needed every year between now and 2025 just to keep up with demand.
- Private networks, mainly providers of content and cloud services, are displacing backbone operators as the major buyers of international capacity and the major investors in transatlantic subsea cables.
- Europe is the global leader in cross-border interconnection hubs. Frankfurt, London and Amsterdam substantially outpace North American and Asian cities. Frankfurt's connected capacity is over 3 times greater than that of New York and almost 5 times greater than that of Singapore, the Asian leader.
- South Americans rely almost exclusively on international interconnections routed through U.S. data centers, and Africa and the Middle East rely heavily on European centers.
- Frankfurt, Amsterdam and London are the largest non-profit entrepôts for the world's Internet Exchanges (IXs), with more than double the average throughput of IXs elsewhere outside the U.S., and U.S. for-profit IXs are large and central to the digital economy.
- Data centers are also concentrated in the transatlantic space. Of 24 data centers slated to begin operations in the next two years, 17 will open in Europe (9) and the U. S. (8), compared to one each in Brazil, India and China, and four in the rest of Asia.
- New York and London are the primary colocation markets in the world, followed by San Francisco and Hong Kong, and then Frankfurt and Singapore.

6. The ICT Sector

- 18 of the top 25 economies in the annual ICT Development Index are from Europe or North America, and 8 of the top 10 economies are from Europe.
- Denmark is Europe's top performer. Countries in northern and western Europe mostly are ranked higher than those in southern and eastern Europe.
- The U.S. ranks first in Huawei's Global Connectivity Index; 6 of the top 10 are European.

7. Digital Density and Investment in Intangible Assets

- When it comes to "digital density" — the amount of data used per capita in an economy — the U.S. clearly leads, followed by Sweden and the UK.
- If "digital density" is defined more broadly as the extent to which economies or industries use digital technologies for economic activity, then 11 of the top 17 economies globally are from North America or Europe. The Netherlands ranks as the most "digitally dense" country in the world, followed by the U.S. and Sweden.

8. Apps, Bots and the Conversational Economy

- As of January 2016 Europe and the U.S. had each generated similar numbers of App Economy jobs, 1.64 million versus 1.67 million, respectively. This corresponds to 0.7% of all jobs in Europe and 1.2% of all U.S. jobs — still small, but growing fast.
- By 2018, the App Economy will employ 4.8 million people in Europe, contributing €63 billion to the EU economy. Globally, the App Economy could double in size to $101 billion by 2020.

- EU citizens download more computer apps than Americans — although less than the Chinese.
- EU and U.S. app companies each account for 42% of app revenue across the U.S. and the EU.
- One important difference between the U.S. and European App Economy is that the success of EU app companies is still largely confined to national markets.
- Roughly half of Europe's App Economy jobs are in just three countries — the UK, Germany, and France.
- California accounted for 22.7% of U.S. App Economy jobs in 2015, down from 29% in 2012; New York, Texas, and Illinois quadrupled their App Economy jobs.
- If one compares European countries and U.S. states in terms of "app intensity" — i.e. App Economy jobs as a percentage of all jobs — then California, the District of Colombia and Massachusetts rank as the most "app intensive" in the transatlantic space. Finland ranks 4th, and tops in Europe. Norway ranks second in Europe, just behind New York, followed by the Netherlands. Washington. New Jersey, Virginia and Sweden round out the top spots.
- The Bot Economy is growing faster today than the App Economy did when it began. Bots may be the new apps.
- Chatbots are opening the door to the emerging "conversational economy." Here, Asia — not the United States or Europe — is leading the way.

9. Crowdworkers in the Gig Economy

- The digital economy is changing work on both sides of the Atlantic, yet there are currently no reliable ways to estimate the number or nature of digital jobs of jobs affected.
- Despite these limitations, the total value of skilled freelance crowd work online is estimated to reach $5 billion by 2018 and the value of the online gig economy could increase to as much as $47 billion by 2020.
- Roughly 1% of the U.S. working-age population, or about 2.5 million people, is estimated to participate each month in contingent work transacted on a digital marketplace. For many online giggers, crowd work is not their main job.
- Over a three year period between 2012 and 2015, 4.2% of U.S. adults, an estimated 10.3 million people — more than the total population of New York City — earned income on the platform economy, and this number increased 47-fold over that period.
- As in the U.S., many Europeans use crowd work to supplement their income; it is not their main occupation. However 5% in the UK, Netherlands and Sweden perform crowd work at least weekly and 6% monthly. Germany 6% weekly, 8% monthly. Austria is tops — 9% weekly, 13% monthly.

10. Digital America, Digital Europe

- The U.S. has become highly digitized, but McKinsey estimates that the U.S. economy as a whole is reaching only 18% of its digital potential, which it defines as the upper bounds of digitization in leading sectors of the economy.
- The U.S. ranks 5th in the 2016-2017 Networked Readiness Index, moving up from 7th in 2015 and 9th in 2013.
- Americans who *are* online lead highly digital lives. But U.S. households and individuals, on average, are less wired than those in northern Europe, Japan, South Korea, New Zealand and Israel.
- Like Americans, Europeans are heavily engaged in the digital world, but McKinsey estimates that Europe overall operates at only 12% of its digital potential.
- Europe accounts for seven out of the top ten countries in the 2016-2017 Networked Readiness Index. Nonetheless, Europe's divisions run essentially between "network-ready" western and northern Europe and less-ready countries in southern and eastern Europe.

- Overall, Europe underperforms on its digital potential relative to the United States. The European digital frontier is only 60% as digitized as the U.S. frontier. There are also large differences among Europe's countries. The UK operates at 17% of its digital potential, France at the EU average of 12%, and Germany at only 10%.
- In sum, McKinsey estimates that, due to the digital gap between leading and lagging sectors and countries, Europe's economy operates at only 12% of the digital potential exhibited by companies at the U.S. digital frontier.
- The U.S. is the dominant supplier of digital technologies to the world, including Europe. Among all publicly listed companies in the global ICT sector, U.S.-based firms account for nearly half of worldwide sales and two-thirds of post-tax profits. European firms generate 17% of global revenue and 14% of worldwide profits. Of the 250 largest ICT firms in the world, 75 are from the U.S., 50 from Japan, and 45 from the EU-15.
- Nevertheless, the smaller number of European companies account for 22% of global sales, only slightly less than U.S. firms' 30% share.
- U.S. companies account for a 74% share, and European companies for a 21% share, in Internet of Things companies globally, compared to only a 5% share by Chinese and Japanese companies.
- U.S. companies account for a 60% share, and European companies for a 32% share, of big data companies, compared to only a 6% share by Chinese and Indian companies and a 2% share by Japanese and Korean companies.
- 42% of all online services trade volume in the EU is domestic; 54% comes from the U.S. Two-thirds of all EU online services suppliers do not operate in more than four countries.

EXECUTIVE BRIEF:
Challenges and Opportunities

Challenges

- The U.S. and Europe each faces a divide between economic sectors pushing towards the digital frontier and those lagging behind. The same industries tend to be at the frontier — ICT, media and finance. The same industries also tend to lag behind — hospitality and construction.
- A second common digital divide is that between large and small firms in the U.S. and Europe.
- Europe's fragmented markets and regulatory heterogeneity not only hamper its digital potential, they hold back the full promise of the transatlantic digital economy.
- E-commerce within individual European markets is growing exponentially, yet cross-border e-commerce within Europe still accounts for only a small fraction of the total.
- Localization requirements are another prominent hurdle, reducing market access, increasing costs to firms, resulting in less efficient business processes, and presenting consumers with fewer choices at higher prices.
- ECIPE estimates that if these localization measures were removed, EU GDP would increase by €8 billion a year, which is on par with the gains of recent EU free trade agreements.
- The EU Digital Single Market still faces hurdles to its realization, costing up to €18 billion in the shorter-term and up to €134 billion in the medium and longer term.
- The Digital Market strategy is focused almost exclusively on tackling digital barriers, yet the main obstacles to the EU's digital future are its non-digital barriers.
- A narrow focus on digitization also forgoes the opportunity to use the digital transformation to open up EU services markets, the EU's biggest untapped source of jobs, economic growth, and digital transformation.
- Europe and the U.S. are vulnerable to a breathtaking set of cyberthreats, many of which can only be addressed if tackled by Europeans and Americans together.
- The transatlantic digital economy is also held back by basic EU-U.S. differences on a range of issues, including privacy and personal data, rules regarding hate speech and fake news, and intellectual property protection.
- Perhaps the most significant challenge facing the U.S. and Europe is the potential impact of the digital economy on jobs and the nature of work, accentuated by widening skills gaps and concerns about growing income disparities.

Opportunities

- The digital transformation is becoming the single most important means by which both sides of the Atlantic can reinforce their bonds and position themselves for a world of more diffuse power and intensified competition.
- The digital economy is both strengthening the transatlantic economy and transforming it. It is lowering marginal production and distribution costs, reducing the cost of participating in cross-border trade, helping to match supply and demand in real time, sparking innovation, and offering consumers more choices at lower prices.
- Individuals are participating in the transatlantic digital economy directly, using platforms to learn, build personal networks, find and offer work, showcase their talent, and make more effective use of unused or underutilized assets.

- Digital transformation is expanding the potential of many traditional jobs and creating new jobs that were unimaginable only a few years ago. Digital marketplaces for services are creating flexible work opportunities that could boost labor force participation.
- Digital transformation is at the heart of a transatlantic economy that is stronger, faster, and more dynamic. McKinsey estimates that by 2025, digitization could boost EU GDP by up to $2.5 trillion and U.S. GDP by up to $2.2 trillion through changes in the labor market, improved capital efficiency, and greater multifactor productivity.
- That's just the beginning. The digital transformation of the transatlantic economy is akin to a transatlantic "Big Bang," a game-changing dynamic that would propel growth and competitiveness in the United States and Europe, improve societal outcomes in areas such as health care, education, and infrastructure, and further deepen linkages between the two parties while strengthening their ability to remain rule-makers, rather than become rule-takers, in the economy of the 21st century.

SECTION ONE

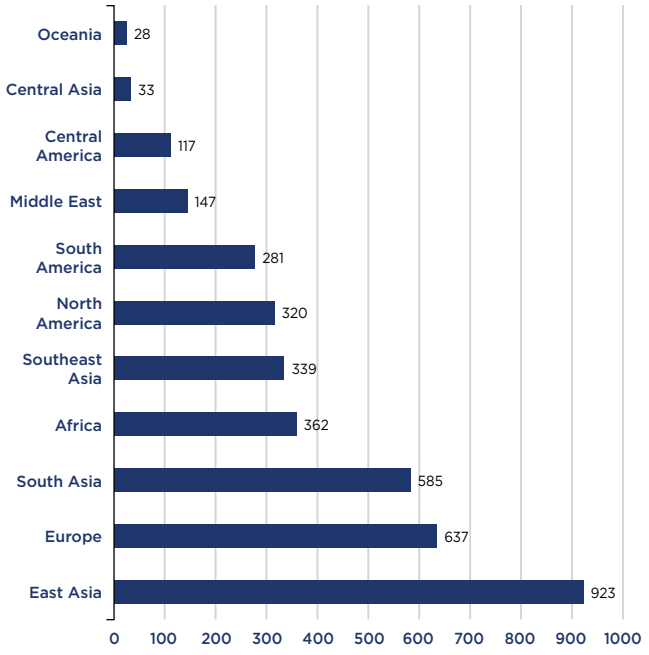
The United States, Europe and the Digital Frontier

The United States, Europe and the Digital Frontier

Ten years ago, the Apple iPhone was introduced. What was then a novelty is now one of the most ubiquitous appliances in the world. Ten years ago, less than 1.7 billion people were accessing the internet. Now 3.5 billion do.[1]

Ten years ago, Facebook had yet to go public, autonomous vehicles were a dream, and the App Economy didn't exist. Now Facebook is valued higher than IBM, autonomous vehicles are reality, and the App Economy employs over 1.6 million workers in both the United States and Europe. Ten years ago, the Rocket Internet start-up was launched in Germany. Today it has more than 36,000 employees.[3] On it goes.

TABLE 1.1: NUMBER OF WORLDWIDE INTERNET USERS, 2017 (IN MILLIONS)



Source: Statista.[2]

Every day, 7.7 billion searches are made on Google, 152 million calls are placed on Skype, 115 million videos are viewed on DailyMotion, 58 million Tweets are tweeted, 50 million users stream music from Spotify, 36 million purchases are made on Amazon, and 2.3 billion gigabytes course around the web.

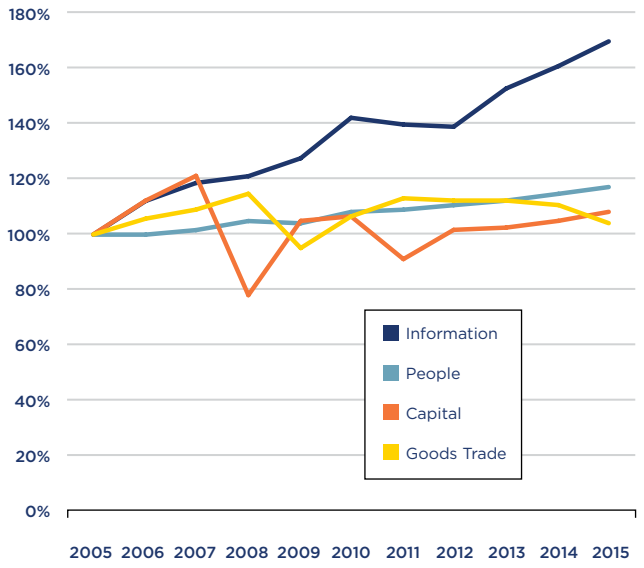
Every minute of every day, 204 million emails are sent, 2.4 million pieces of content are posted on Facebook, 72 hours of video are posted on YouTube, and 216,000 new photos are posted to Instagram.[4]

Digitization has become as important to traditional industrial firms as it is to internet start-ups. McKinsey estimates that three-quarters of the economic value of the internet is captured by manufacturing, financial services and other industries.[5] Moreover, the digital economy ranges far beyond the internet economy, e-commerce companies or the Information Communications Technology (ICT) sector. The digital economy includes these activities, but extends also to include non-internet, digital technologies, for instance software innovation and 'big data' collection and analysis. It encompasses cloud computing, mobile web services, smart grids, social media and many other activities, all of which are all radically changing the economic landscape and reshaping the nature of work.[6]

Digital information, services and products, and the ecosystems that supports them, have become the backbone of the modern global economy. They are transforming how we live, work, play, travel, interact, and do everything in between. They are changing how business is done, who is involved, and where economic benefits flow.[7]

At the heart of this transformation is data and the ability to analyze data, which today is spurring growth, innovation, productivity and competitiveness. In just the last two years,

TABLE 1.2: INTERNATIONAL INFORMATION FLOWS OUTPACING ALL OTHERS



Source: DHL Global Connectedness Index 2016.

90% of the world's digital data has been generated. Every year, the amount of digital data grows by 50%.[8] Global flows of information and communications, transactions, video, and intra-firm traffic underpin and enable virtually every other kind of cross-border flow. According to McKinsey, these global data flows now contribute more to global growth than global trade in goods.[9]

Table 1.2 makes the point. Since 2005, cross-border information flows have grown rapidly, while flows of people have grown modestly, flows of capital have been limited, and trade flows have been stagnant.

The pace of change is remarkable. Mobile data traffic has grown 4,000-fold over the past 10 years and almost 400-million-fold over the past 15 years. In 2005, mobile networks carried fewer than 10 gigabytes per month in 2000 and less than 1 petabyte per month in 2005. By 2016, global mobile data traffic had reached 7 exabytes per month (1 exabyte is equivalent to 1 billion gigabytes, and 1,000 petabytes). At the end of 2015, the mobile sector generated $3.1 trillion in economic value.[10]

Despite these incredible transformations, we're still in what Scott Cook of Intuit calls "the first minutes of the first day" of the digital revolution. Cisco projects that by 2020 monthly global mobile data traffic will grow nearly eightfold and mobile network connection speeds will increase more than threefold, there will be 1.5 mobile-connected devices per capita, 98% of mobile data traffic will originate from smart devices, and three-fourths of the world's mobile data traffic will be video.[11] In just two years, three-fourths of the world's population will be connected to a mobile network.[12] The number of jobs directly and indirectly generated by the ecosystem surrounding mobile technology alone will reach 20 million and 16 million respectively.[13]

That's just the beginning. The Internet of Things, 5G technologies, big data analytics, quantum computing, energy storage, precision agriculture, aquaponics, artificial intelligence and other innovations will further accelerate digital growth around the world.

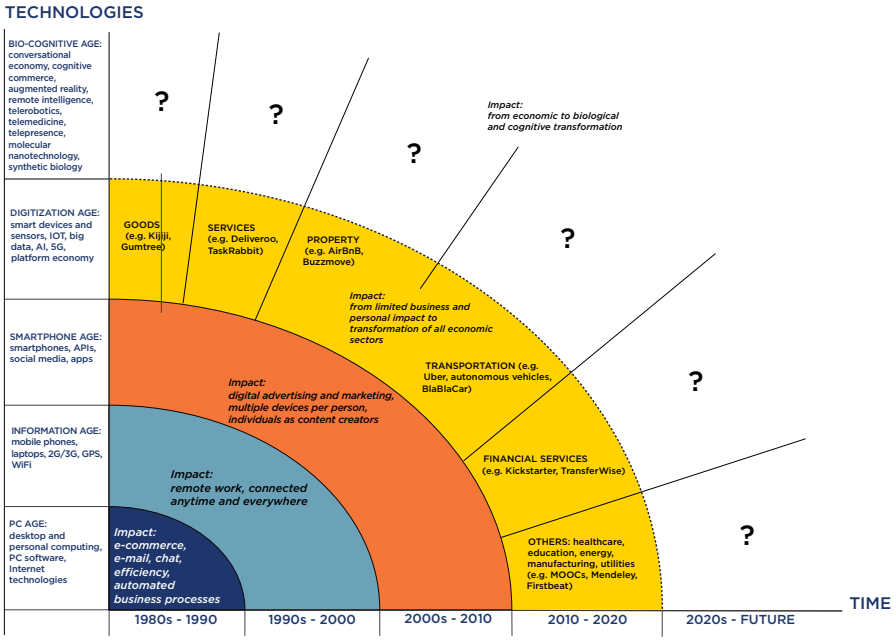
In their book *The Second Machine Age,* Erik Brynjolfsson and Andrew McAfee summarize digitization's impact. "Computers and other digital advances," they note, "are doing for mental power — the ability to use our brains to understand and shape our environments — what the steam engine and its descendents did for muscle power. They're allowing us to blow past previous limitations and taking us into new territory."[14]

Table 1.3 charts the digital frontier. We have moved into an age in which digitization is not just affecting our businesses and our personal lives, it is transforming all sectors of the economy. New enterprises are seizing digital opportunities in goods and services, property, transportation, financial services and a host of other areas ranging from healthcare and education to manufacturing and energy.

Moreover, there are many signs that our current "Digitization Age" will soon give way to a "Bio-Cognitive Age," yet another transformative period in which revolutionary advances in digitization, biology, nanotechnology, behavioral and cognitive sciences will combine to affect not only our economic and social lives, but life itself. Alec Ross states it succinctly: "The last trillion-dollar industry was built on a code of 1s and 0s. The next will be built on our own genetic code."[15] If, as Ross says, land was the raw material of the agricultural age, iron was the raw material of the industrial age, and data the raw material of the information age, then biology will be the raw material of the bio-cognitive age.

As the digital frontier continues to expand, it also continues to transform the basic dynamics of globalization. In his book *The Great Convergence*, Richard Baldwin discusses how globalization is essentially the story of falling barriers to goods, ideas, and people. Earlier waves of globalization were generated by the falling cost of moving goods. Today's globalization is largely due to the falling cost of moving

TABLE 1.3: THE EXPANDING DIGITAL FRONTIER



Sources: GMSA Intelligence; McKinsey Global Institute; Author's own estimates.[16]

ideas and information. In the coming bio-cognitive age, innovations such as holographic telepresence or telerobotics could also reduce the cost of moving people.[17] The implications will be profound.

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 economy may be more inclusive and closely connected, but it is not truly "flat."[18] The digital revolution is global in its reach but uneven in its effects. It has created global markets, but cannot erase local geographies. It has reduced many barriers to trade, investment, capital and ideas, but its impact has been greatest within countries, rather than between them. Most cross-border flows — including those of data — still take place within, rather than between, continents.[19]

Mainland Chinese online shoppers, for instance, buy heavily from Hong Kong and Japan, while German shoppers buy from their neighbors in Austria and the Netherlands.[20] To take another example, even though the intensity of international internet traffic and telephone calls has roughly doubled since 2005, only 22% of internet traffic actually crosses a border, and that is five times as high as telephone calls.[21] While the growth of Skype-to-Skype calls over the internet has outstripped the growth of international calls via fixed and mobile telephone networks, the international proportion of telephone call minutes (including Skype) between 2005 and 2014 only increased from about 3% to 5%. Both are far below the level one would expect in a flat world.[22]

Even in the digital world, distance can still matter.[23] So can connectivity.

The digital revolution places a premium on connectedness. In the Cold War, Tom Friedman recalls, the most frequently asked question was: "Whose side are you on?" Today, he says, the most frequently asked question is "To what extent are you connected to everyone?"[24] Parag Khanna drives home the point: "Today power derives from leverage exercised through connective reach. The paramount factor in determining the importance of a state is not its location or population but its connectedness — physically, economically, digitally — to flows of resources, capital, data, talent and other valuable assets."[25]

Digitization is certainly driving greater interactions among continents. But the breadth, depth and speed of those interactions vary considerably. Rising economies trade as intensively as advanced economies, but advanced

economies in 2015 were about four times more deeply connected into international capital flows, five times more with regard to people flows, and nine times more with respect to information and data flows.[26]

Despite the hype about the death of distance and the end of geography supposedly wrought by the digital revolution, the international movement of knowledge has in fact been very geographically concentrated — and those developing economies that have benefitted most from digitization are those who have been most deeply tied into the value chains of developed economies, particularly the United States and Europe.[27]

As we look to the expanding digital frontier, connectivity matters. And as we shall see, while digital connections are relatively "thin" between some continents and "thicker" between others, they are "thickest" between the continents of Europe and North America.[28]

Who is Connected to Whom?

According to the 2016 DHL Connectedness Index, Europe

BOX 1.1. FROM THE INTERNET OF THINGS TO THE INTERNET OF EVERYTHING

The digital economy is not just connecting billions of people to each other, it is connecting them to billons of things, and it is connecting those billions of things to each other as well — home appliances, buildings, smart meters, cars and trucks, planes and trains, oil rigs, manufacturing and farm equipment, even watches and clothing. By drawing on innovations in cloud computing, big data analysis, internet-linked radio frequency identification [RFID], and wireless sensor network technologies, together with falling costs of sensors and data storage, the IoT (Internet of Things) is ushering in a new phase of the hyper-connected society.[29]

In 2008 the number of objects connected to the internet surpassed the number of people online worldwide.[30] That same year, the U.S. National Intelligence Council identified IoT as one of the six primary "disruptive civil technologies'' that will most significantly impact national power through 2025.[31] Kevin Ashton, who is widely credited with coining the term Internet of Things, defines it like this: "The 'Internet of Things' means sensors connected to the Internet and behaving in an Internet-like way by making open, ad hoc connections, sharing data freely and allowing unexpected applications, so computers can understand the world around them and become humanity's nervous system."[32]

Today, up to 17.6 billion devices are connected to each other worldwide.[33] Global IoT spending has reached $700 billion, and is expected to total $1.3 trillion by 2019.[34] Across industries, 72% of businesses polled in 20 countries responded that they have already introduced IoT devices into the workplace for remote monitoring, indoor location-based services, and controlling building

temperatures and lighting.[35] Early IoT adaptors in both Europe and the United States have included the healthcare, automotive, and home appliances sectors. Most IoT applications are happening within rather than between countries, yet in such areas as shipping and package delivery the IoT is already having a transformative effect.[36]

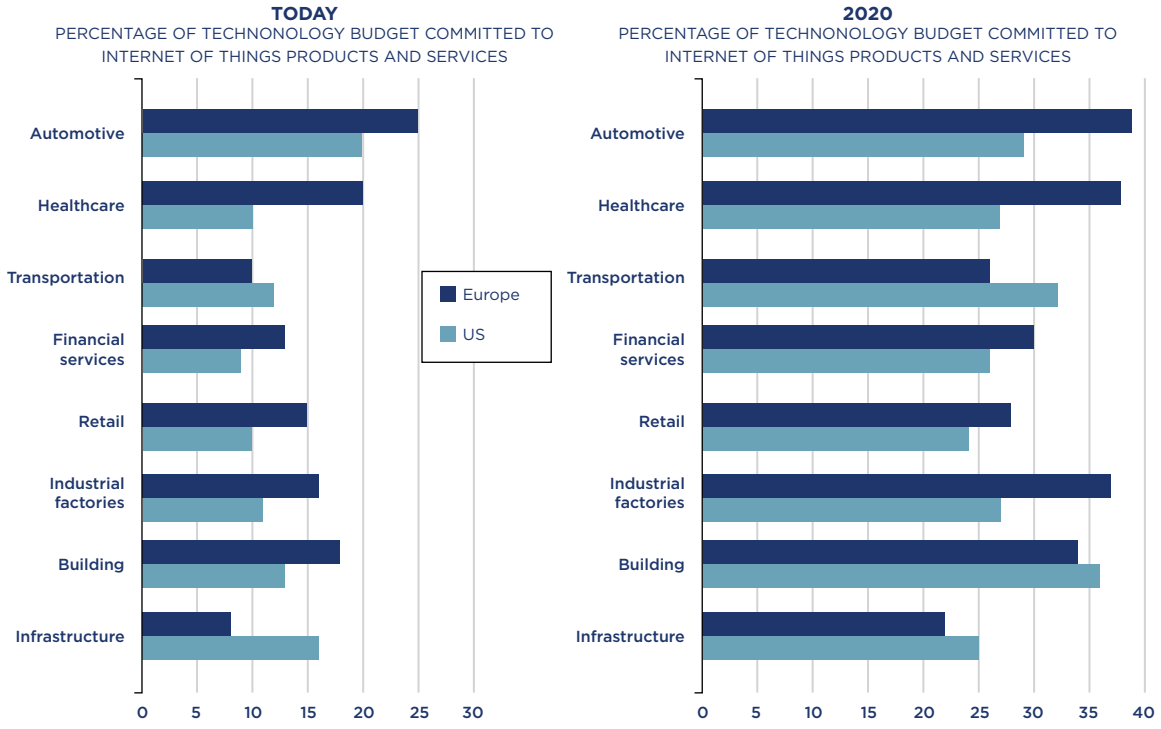
Most estimates project that there will be between 28 and 30 billion connected devices in 2020.[37] By the turn of the decade, the IoT is likely to affect nearly every industry, improving efficiencies. optimizing production processes, automating inventories, or enabling predictive maintenance and remote patient monitoring.[38]

The Boston Consulting Group estimates that companies will spend an incremental €250 billion on IoT in 2020 over and above their normal technology spending, and that IoT services and IoT analytics and applications will account for 60% of all economic growth derived from IoT by that time. They project that the value of each of these sectors will rise from $10 billion in 2015 to $60 billion in 2020.[39] Cisco projects that connected healthcare, with applications such as health monitors, medicine dispensers, first-responder connectivity, and telemedicine, will be the fastest-growing industry segment, at a 49% compound annual growth rate, and that connected car applications will have the second-fastest growth, at a 37% compound annual growth rate.[40] Boston Consulting predicts that other enabling components—identity and security, IoT backbone (cloud and platform), communications, and connected things—will also grow, but at a slower pace. McKinsey estimates that the IoT's potential economic impact on the global economy to be as much as $1.1 trillion a year by 2025.[41]

Ashton sums it up: "Since its inception in 1999, the Internet of Things has been ridiculed, criticised, and misunderstood. And yet here we are, less than two decades later, in a world where tens of thousands of organisations are saving and making hundreds of millions of dollars from the Internet of Things, using cars that drive themselves, subway stations that sense passengers, algorithms that diagnose deadly diseases using phones, and many other once apparently-impossible technologies. The future promises far more amazing things. The most important decision you can make now is how to be a part of it."[42] Cisco Chairman John Chambers goes even further, predicting that the globe is already moving beyond IoT to what he calls "the Internet of Everything: the penetration of the World Wide Web into the everyday aspects of our lives,"[43] where communications among people, devices, data and processes will be seamless and fully unified.

The IoT is a global phenomenon, but it is not unfolding evenly. Europe and the United States are leading in many areas.[44] In fact, despite media hype that the United States is leading the Internet of Things, research by Bain & Company finds that in many cases, executives in Europe are more ambitious and optimistic about their plans to deploy and integrate IoT solutions than their American peers, particularly in industrial and commercial applications. A greater percentage of European executives plan to deploy IoT solutions over the next few years than their colleagues in other regions. In a survey of 500 executives across industries in Europe and the United States, 27% of European executives said they are implementing or have already implemented IoT and analytics use cases, compared with 18% of U.S. executives. Fully one-quarter of the Europeans plan to implement IoT solutions in multiple cases and integrate them with their IT systems by 2020, compared with 16% of U.S. executives. The European automotive, retail, industrial production and building sectors are all allocating greater shares of the information technology budgets to IoT than their U.S. counterparts. Bain concludes that European firms are further along in their IoT journey from experimentation to a real commitment to integrate, scale and deploy IoT solutions.[45]

TABLE 1.4: IOT INVESTMENTS CLAIM GREATER SHARE OF IT BUDGETS IN EUROPE THAN THE U.S.



Source: Bain & Company.[46]

Enthusiasm for the Internet of Things has fueled more than $80 billion in M&A investments by major vendors and more than $30 billion from venture capital firms, with European and U.S. firms leading the way.

One study expects the number of IoT connections within the EU28 to increase to almost 6 billion by 2020, with IoT revenues totaling €1.18 trillion, including hardware, software and services, with those member states with higher accumulated information technology investments and advanced telecom networks, such as Sweden, Germany, the Netherlands and the UK to benefit most (Table 1.5).[47]

TABLE 1.5: EUROPEAN UNION IOT MARKET SIZE AND FORECAST (€ BILLIONS)

	2014	2020
UK	€ 78.68	€ 269.28
Germany	€ 71.11	€ 243.64
France	€ 55.44	€ 185.09
EU rest	€ 53.78	€ 157.15
Italy	€ 32.09	€ 97.93
Spain	€ 24.50	€ 65.57
Netherlands	€ 18.58	€ 57.92
Sweden	€ 13.46	€ 50.20
Belgium	€ 9.35	€ 28.33
Poland	€ 9.02	€ 26.49
Total	**€ 365.99**	**€ 1,181.60**

Source: IDC. [48]

Despite its rapid advance, the IoT is also facing challenges, particularly concerns about privacy protection and security risks. The swift growth of these technologies has also opened up new vulnerabilities and openings for cybersecurity threats. Aruba reports that 84% of firms it polled that had connected the IoT into their existing business networks has already experienced security breaches. National defense systems and critical infrastructures are also at risk.[49] We discuss these challenges in Section 4.

and North America are the two regions most connected to the rest of the world when it comes to cross-border flows of trade, capital, information and people. Europe leads in terms of trade and people connectedness, while North America leads in terms of information and capital connectedness. North America has the broadest international connections, while Europe has the deepest, although that reflects the intense interconnections European countries have with each other (Table 1.6).

Europe is not only the world's most globally connected region, 8 of the world's 10 most connected countries are European: the Netherlands, Ireland, Switzerland, Luxembourg, Belgium, Germany, the United Kingdom and Denmark. Of the top 10, only Singapore (2nd) and the United Arab Emirates (10th) are not European.[50] Europe and North America accounted for 21 of the top 30 most connected countries.

The Ties That Bind

Not only are Europe and North America the most connected regions in the world, they are more connected to each other than either is to any other region of the world.

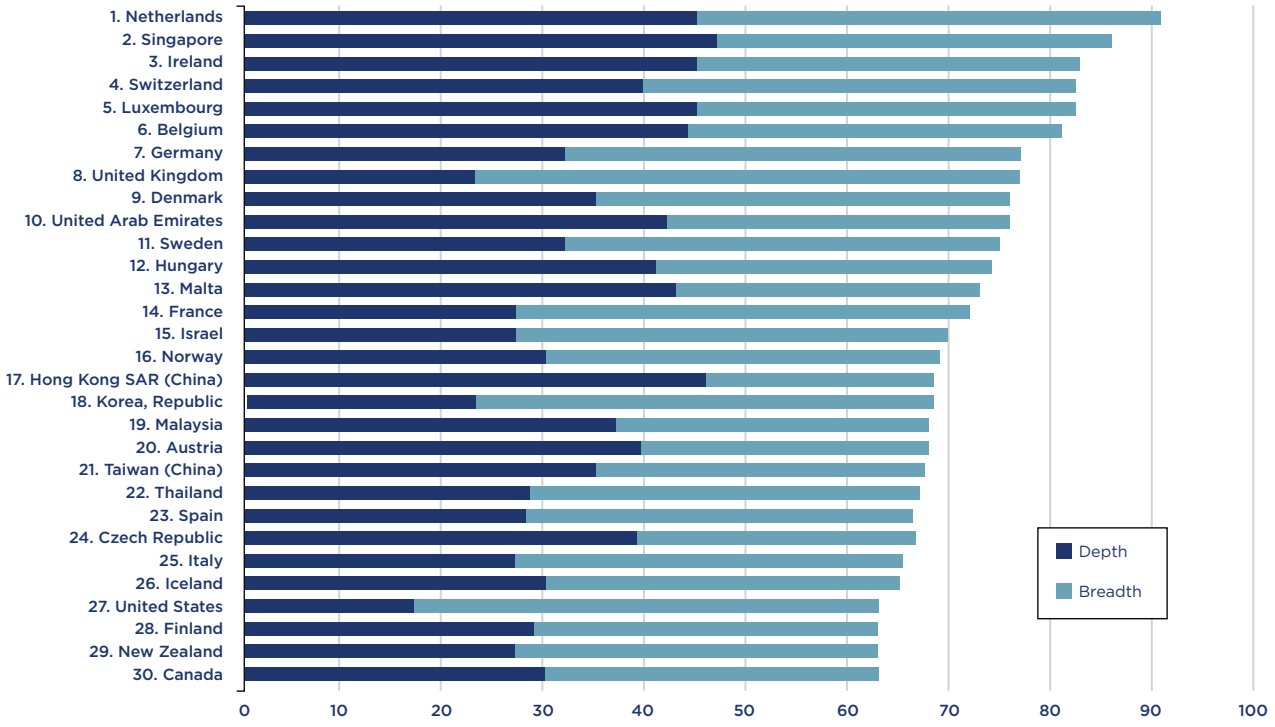
In our annual surveys of the transatlantic economy, we document the deep integrative forces binding together the two sides of the North Atlantic.[51] The U.S. and Europe remain each other's most important markets. The transatlantic economy generates $5.5 trillion in total commercial sales a year and employs up to 15 million workers in mutually "onshored" jobs on both sides of the Atlantic. Ties are particular thick in foreign direct investment (FDI), portfolio investment, banking claims, trade and affiliate sales in goods and services, mutual R&D investment, patent cooperation, technology flows, sales of knowledge-intensive services — and digital connections. No other commercial artery in the world is as integrated (Tables 1.7 and 1.8).

What is true for the transatlantic economy as a whole is true for the transatlantic digital economy. This study offers ways to understand the vital importance of the digital economy for the future health and vitality of both Europe and North America, and the extent to which each side of the Atlantic is deeply bound to the other as both explore the digital frontier.

Measuring the Transatlantic Digital Economy

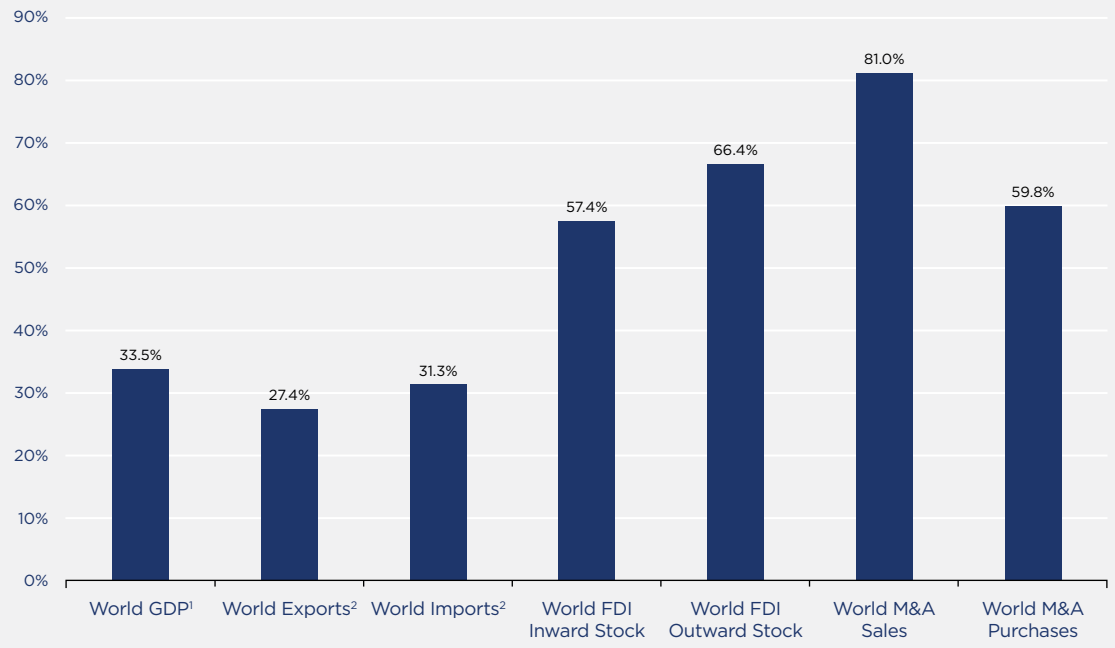
It is difficult to measure or define the digital economy. There are no consistent definitions of what comprises the digital economy or of the various types of cross-border data flows. Official metrics do not capture cross-border data

TABLE 1.6: TOP 30 MOST CONNECTED COUNTRIES



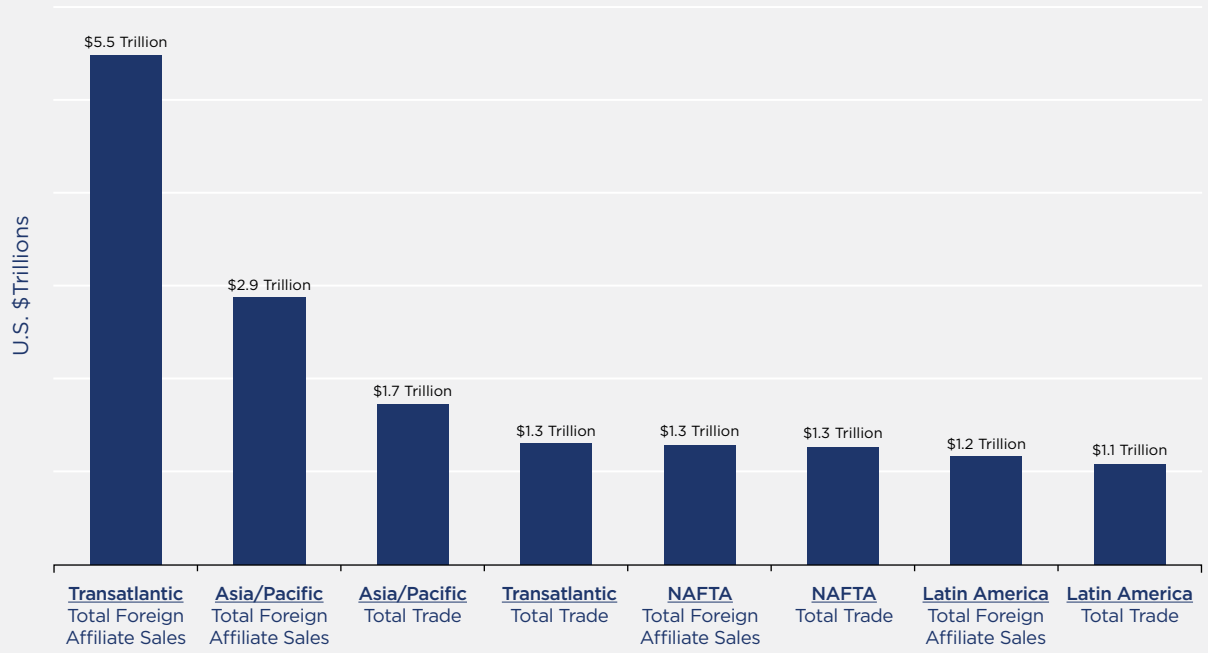
Source: DHL Global Connectedness Index 2016: The State of Globalization in an Age of Ambiguity

TABLE 1.7: THE TRANSATLANTIC ECONOMY VS. THE WORLD - SHARE OF WORLD TOTAL



Sources: UN, IMF, figures for 2015.
1. Based on PPP estimates.
2. Excluding intra-EU, Norway, Switzerland and Iceland trade.

TABLE 1.8: AMERICA'S MAJOR COMMERCIAL ARTERIES



Foreign Affiliate Sales: Estimates for 2015. Total Trade: Data for goods & services, 2015.
Source: Bureau of Economic Analysis.

flows and transactions where no money is exchanged, even though such connections, including within companies, are becoming increasingly valuable to the global economy as information moves from one country to another. Exchanges of goods and services over the internet are often untaxed, do not appear in official records, and can involve illicit activities that are difficult to measure.[52]

Many estimates equate the digital economy with the information and communications technology (ICT) sector. Yet as we will show, the ICT sector is an important yet insufficient significant measure of digitization, because, as McKinsey notes, digitization, like electricity, is a general-purpose technology that underpins a huge share of economic activity far beyond the sector that supplies it.[53]

Despite these definitional hurdles, there is massive evidence showing that the amount of data transversing the globe is rising much faster than the traditional exchange of goods and services. This is particularly true for data flows between the United States and Europe.

Because there is no single way to measure such a complex and diffuse phenomenon, this study offers various lenses

BOX 1.2. 3D PRINTING

3D printing (3DP), also known as additive manufacturing, is a process that creates physical objects directly from a digital file. 3D computer-aided design (CAD) data guide a 3D printer to add different materials, layer-by-layer, until an object is formed.

3DP is not a new technique, it originated in 1983 and came into commercial use in 1988. But it is now being deployed rapidly from the auto, aerospace and medical equipment sectors to the medical and dental sector, food, electronics, construction, clothing, and retail. It has the potential to transform product design, development and manufacturing, supply chains and trade.

3DP changes how production takes place, where manufacturing is done, what is being traded, where trade takes place, and who participates. It changes the production process by replacing intermediary goods with CAD files, making production lines shorter. Economies of scale are no longer needed; smaller numbers of customized products can be produced profitably and closer to customers. Small companies and even individuals — CAD file designers and niche producers — can profitably enter the market.

3DP is a prime example of how manufacturing and services are becoming intertwined. It is also an example of how the digital economy confounds traditional metrics for cross-border commerce. When a digital CAD file is traded, it can generate new manufacturing production, but since that process may take place locally, the 3DP production process registers only as trade in services rather than goods.[54]

TABLE 1.9: TOP 3D PRINT CITIES, 2017

	CITIES
1	New York
2	London
3	Paris
4	Amsterdam
5	Los Angeles
6	Berlin
7	Madrid
8	Chicago
9	Toronto
10	San Francisco

Source: 3DHubs.[55]

Despite its worldwide applications, 3DP remains primarily a transatlantic story. U.S. and European companies account for 9 of the top 10 3D printer companies in the world. Among the most popular 3D printers are those made by U.S. companies Makerbot, Robo 3D, and Printrbot, with Makerbot's Replicator 2 tops in North and South America, 2nd in the Asia-Pacific, and 4th in Europe. Top European models are produced by the Dutch company Ultimaker, the Polish company Zortrax, and Prusa models developed by Czech 3D innovator Josef Prusa. Ultimaker's 3D printer is the top seller in Europe and in the Asia-Pacific region, while Zortrax is 2nd in Europe and 3rd in the Asia-Pacific. China's Flashforge is the only one of the top ten companies not to hail from the United States and Europe. Its Creator Pro ranks 2nd in North America and 4th in the Asia-Pacific.

The top ten 3D printing cities are all either in North America or Europe (Table 1.9). New York reigns as the world's #1 3D Print City, followed by London, Paris, Amsterdam and Los Angeles.

through which we can bring greater focus to the digital economy, and then to see more clearly the importance the transatlantic digital economy.

In our annual surveys of the overall transatlantic economy, my colleague Joseph Quinlan and I go beyond standard trade metrics and use eight key indices to offer a clearer picture of the "deep integration" forces that bind the United States and Europe together. This study again goes beyond the limited view offered by metrics of the ICT sector or standard trade flows by offering a number of indices that can generate a clearer picture of the transatlantic digital economy.

These indices draw on the latest available data and a range of other studies, but given the "Five Is" I have noted — inconsistent definitions, inadequate categorizations, insufficient information, intransparent methodologies and irregular evaluations — these metrics should not be considered as entirely separate or equally comparable.[56] They cannot, nor are they intended to, serve as a standardized measure of the digital economy. There is some overlap among indices, and in some cases I have had to draw conclusions from best estimates. While each tends to highlight a specific aspect of the digital economy, together they offer a clearer picture.

This approach is akin to that of an eye doctor, who uses odd-looking instruments, flashes bright lights in your eyes, and asks you to look through an array of lenses so that in the end you have a much clearer view of the small word "digital" that is staring back at you from across the room.

As your digital ophthalmologist, I use two types of indices. In Section 2 I offer five ways to understand transatlantic digital connections. In Section 3 I then offer five ways to compare the U.S. and European digital economies, both with each other and with other digital economies around the world. In Section 4 I discuss challenges facing the transatlantic digital economy, and in Section 5 I offer some concluding thoughts about the opportunities and potential of the transatlantic digital economy.

Endnotes

1. "Number of worldwide internet users as of January 2017, by region (in millions)," Statista.com, https://www.statista.com/statistics/249562/number-of-worldwide-internet-users-by-region/.
2. Statista, https://www.statista.com/statistics/249562/number-of-worldwide-internet-users-by-region/.
3. Michael Mandel, "App Economy jobs in the United States (Part 1), and "App Economy - Top 25 States (Part 2), January 6, 2016, http://www.progressivepolicy.org/blog/app-economy-jobs-part-2/; Rocket Internet, https://www.rocket-internet.com/.
4. Alec Ross, *The Industries of the Future* (New York: Simon & Shuster, 2016), p. 154; Statistic Brain, "Google annual search statistics," http://www.statisticbrain.com/Google-searches/; Statistic Brain, "Twitter statistics," http://www.statisticbrain.com/twitter-statistics/; "Number of paying Spotify subscribers worldwide from July 2010 to March 2017 (in millions)," Statista.com, https://www.statista.com/statistics/244995/number-of-paying-spotify-subscribers/; James Manyika, Susan Lund, Jacques Bughin, Jonathan Woetzel, Kalin Stamenov, and Dhruv Dhringra, *Digital Globalization: The New Era of Global Flows*, McKinsey Global Institute, March 2016; Matthieu Pélissié du Rausas, James Manyika, Eric Hazan, Jacques Bughin, Michael Chui, Rémi Said, *Internet matters: The Net's sweeping impact on growth, jobs, and prosperity*, McKinsey Global Institute, May 2011.
5. Ibid.
6. See European Commission, "The importance of the digital economy," https://ec.europa.eu/growth/sectors/digital-economy/importance/; "Measuring the Value of Cross-Border Data Flows," Economics and Statistics Administration and the National Telecommunications and Information Administration, U.S. Department of Commerce, September 2016, https://www.ntia.doc.gov/files/ntia/publications/measuring_cross_border_data_flows.pdf.
7. Business Coalition for Transatlantic Trade, http://www.transatlantictrade.org/issues/digital-trade/; Manyika, et.al, op. cit.
8. Ross, op. cit.
9. Manyika, et. al, op. cit.
10. Projections here based on "Global mobile data traffic from 2016 to 2021 (in exabytes per month)," Statista, https://www.statista.com/statistics/271405/global-mobile-data-traffic-forecast/; Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2015—2020, February 3, 2016, http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/mobile-white-paper-c11-520862.pdf; and *The Mobile Economy 2016*, GSMA Intelligence, 2016, https://www.gsmaintelligence.com/research/?file=97928efe09cdba2864cdcf1ad1a2f58c&download.
11. Ibid.
12. GSMA Annual Report 2016, http://www.gsma.com/aboutus/annualreport.
13. The Mobile Economy 2016, op. cit.
14. Erik Brynjolfsson and Andrew McAfee, *The Second Machine Age* (New York: W.W. Norton, 2014), p. 7.
15. Ross, op. cit., p. 44.
16. *The Mobile Economy 2016*, op. cit., p. 31. McKinsey Global Institute (2016), *Digital Europe: Pushing the Frontier, Capturing the Benefits*, p.3, available at: http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/digital-europe-realizing-the-continents-potential; Author's own estimates.
17. See Richard Baldwin, *The Great Convergence* (Cambridge, MA: Harvard University Press, 2016); and Stephanie Flanders, "Tear up the rule book to secure Europe's future," Financial Times, January 9, 2016.
18. Roman Friedrich, Matthew Le Merle, Florian Gröne, Alex Koster, *Measuring Industry Digitization. Leaders and Laggards in the Digital Economy*, Booz & Company, 2011, http://docs.media.bitpipe.com/io_10x/io_102267/item_485936/BoozCo-Measuring-Industry-Digitization-Leaders-Laggards-Digital-Economy.pdf; Manyika, op. cit.
19. See Daniel Hamilton and Joseph P. Quinlan, *Partners in Prosperity: The Changing Geography of the Transatlantic Economy* (Washington, DC: Center for Transatlantic Relations, 2004); Pankaj Ghemawat and Steven A. Altman, *DHL Connectedness Index 2016*, Deutsche Post/DHL, www.dhl.com/gci. Baldwin, op. cit. p. 141.
20. https://www.paypalobjects.com/webstatic/mktg/2014design/paypalcorporate/PayPal_ModernSpiceRoutes_Report_Final.pdf
21. Ghemawat and Altman, op. cit., p. 22.
22. Accenture, "Cross-Border Ecommerce," 2016, https://www.accenture.com/t20160830T101949__w__/cn-en/_acnmedia/PDF-29/Accenture-Cross-Border-Ecommerce.pdf; Ghemawat and Altman, op. cit., p. 21.
23. Ghemawat and Altman, op. cit.
24. Thomas Friedman, *The Lexus and the Olive Tree* (New York: Simon & Shuster, 2001).
25. Parag Khanna, *Connectography. Mapping the Future of Global Civilization* (New York: Random House, 2016).
26. Ghemawat and Altman, op. cit.; Manyika, et. al, op. cit; Hamilton and Quinlan, op. cit. For the uneven nature of globalization, see John Dunning, *Globalization and the Knowledge-Based Economy* (Oxford: Oxford University Press, 2002); pp. 13-14.
27. Baldwin, op. cit., p. 139.
28. For more on the notions of "thick" and "thin" in a globalizing world, see the introductory chapter by Robert O. Keohane and Joseph S. Nye, Jr., in Joseph S. Nye, Jr. and John D. Donahue, eds., *Governance in a Globalizing World* (Cambridge, MA: Visions of Governance for the 21st Century), p. 11.; also Hamilton and Quinlan, op. cit.
29. For discussion of the IoT, see Stefania Aguzzi, David Bradshaw, Martin Canning, Mike Cansfield, Philip Carter, Gabriella Cattaneo, Sergio Gusmeroli, Giorgio Micheletti, Domenico Rotondi, Richard Stevens, *Definition of a Research and Innovation Policy Leveraging Cloud Computing and IoT Combination*, A study carried out for the European Commission, 2014, https://ec.europa.eu/digital-single-market/en/news/definition-research-and-innovation-policy-leveraging-cloud-computing-and-iot-combination; Ross, op. cit, pp. 132-135; U.S. International Trade Commission, *Digital Trade in the U.S. and Global Economies, Part 2*, August 2014, https://www.usitc.gov/publications/332/pub4485.pdf; James Manyika, Sree Ramaswamy, Somesh Khanna, Hugo Sarrazin, Gary Pinkus, Guru Sethupathy, and Andrew Yaffe, *Digital America: A tale of the haves and have-mores*. San Francisco. McKinsey Global Institute, December 2015; Jacques Bughin, Eric Hazan, Eric Labaye, James Manyika, Peter Dahlström, Sree Ramaswamy, Caroline Cochin de Billy, *Digital Europe: Pushing the Frontier, Capturing the Benefits*, McKinsey Global Institute, June 2016, http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/digital-europe-realizing-the-continents-potential; Ovidiu Vermesan and Peter Friess, eds., *Digitising the Industry Internet of Things Connecting the Physical, Digital and Virtual Worlds*. Gistrup, Denmark, 2016, http://www.internet-of-things-research.eu/pdf/Digitising_the_Industry_IoT_IERC_2016_Cluster_eBook_978-87-93379-82-4_P_Web.pdf.

30. United Nations; Ezra Greenberg, Martin Hirt, and Sven Smit, "The global forces inspiring a new narrative of progress," McKinsey Quarterly, April 2017, http://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/the-global-forces-inspiring-a-new-narrative-of-progress.
31. U.S. National Intelligence Council, *Global Trends 2025: A Transformed World*, https://www.dni.gov/files/documents/Newsroom/Reports%20and%20Pubs/2025_Global_Trends_Final_Report.pdf.
32. Chloe Rigby, "Internet of Things set to see widespread adoption by 2019, with 49% of retailers now using it," Internet Retailing, March 28, 2017, http://internetretailing.net/2017/02/internet-things-set-see-widespread-adoption-2019-49-retailers-now-using/.
33. As of 2016 estimates of connected devices globally ranged from Gartner's estimate of 6.4 billion (which doesn't include smartphones, tablets, and computers), International Data Corporation's estimate of 9 billion (which also excludes those devices), and IHS's estimate of 17.6 billion (with all such devices included). Earlier predictions that the world will have 50 billion connected devices by 2020 are unlikely to be realized. See Amy Nordrum, "Popular Internet of Things Forecast of 50 Billion Devices by 2020 Is Outdated," IEEE Spectrum, August 18, 2016, http://spectrum.ieee.org/tech-talk/telecom/internet/popular-internet-of-things-forecast-of-50-billion-devices-by-2020-is-outdated; "Gartner Says 6.4 Billion Connected "Things" Will Be in Use in 2016, Up 30 Percent From 2015," Gartner, November 10, 2015, http://www.gartner.com/newsroom/id/3165317.
34. Huawei, Global Connectivity Index 2016, http://www.huawei.com/minisite/gci/en/index.html.
35. Rigby, op. cit; Aruba, The Internet of Things: Today and Tomorrow, http://www.arubanetworks.com/solutions/internet-of-things/.
36. Susan Lund and James Manyika, "How Digital Trade is Transforming Globalisation," E15 Initiative, January 2016, http://e15initiative.org/wp-content/uploads/2015/09/E15-Digital-Economy-McKinsey-FINAL.pdf.
37. Cisco projects that globally, M2M connections will grow nearly 2.5-fold, from 4.9 billion in 2015 to 12.2 billion by 2020. There will be 1.6 M2M connections for each member of the global population by 2020. See Cisco, "The Zettabyte Era - Trends and Analysis," June 2, 2016, http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/vni-hyperconnectivity-wp.html. See also Gartner, op. cit; Nordrum, op. cit.; Ericsson Mobility Report, November 2015, https://www.ericsson.com/res/docs/2015/mobility-report/ericsson-mobility-report-nov-2015.pdf; www.stringify.com; www.ihsmarkit.com.
38. IDC, *Worldwide and Regional Internet of Things (IoT) 2014—2020 Forecast, 2014*; Nicolas Hunke, Zia Yusuf, Michael Rüßmann, Florian Schmieg, Akash Bhatia, and Nipun Kalra, "Winning in IoT: It's All About the Business Processes," BCG Perspectives, January 5, 2017, https://www.bcgperspectives.com/content/articles/hardware-software-energy-environment-winning-in-iot-all-about-winning-processes; Rigby, op. cit.
39. Hunke, et. al, op. cit.
40 Cisco, "The Zettabyte Era," op. cit.
41. J. Manyika, et. al, *Digital America*, op. cit; Bughin, et. al, op. cit.; "Unconventional Wisdom," Makeable, http://makeable.com/unconventional-wisdom/.
42. http://internetretailing.net/2017/02/internet-things-set-see-widespread-adoption-2019-49-retailers-now-using/.
43. John Chambers, "How Digitizing Europe Will Create 850,000 New Jobs," Huffington Post, http://www.huffingtonpost.com/john-chambers/digitizing-europe-jobs_b_6873984.html; see also Joseph Bradley, Joel Barbier, Doug Handler, E*mbracing the Internet of Everything To Capture Your Share of $14.4 Trillion*, Cisco, 2013, http://www.cisco.com/c/dam/en_us/about/ac79/docs/innov/IoE_Economy.pdf.
44. International Telecommunications Union, "Measuring the Information Society Report, 2015," http://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2015/MISR2015-w5.pdf.
45. Michael Schallehn, Michael Schertler and Christopher Schorling, "Finding Europe's Edge in the Internet of Things," Bain & Company, March 28, 2017, http://www.bain.com/publications/articles/finding-europes-edge-in-the-internet-of-things.aspx.
46. Ibid.
47. Aguzzi, et. al, op. cit.
48. Ibid.
49. Rigby, op. cit.; Aguzzi, et. al, op. cit.; John Naughton, "The Evolution of the Internet: From Military Experiment to General Purpose Technology," *Journal of Cyber Policy*, Vol. 1, No. 1, April 2016, pp. 5-28; Joseph S. Nye, Jr., "Deterrence and Dissuasion in Cyberspace," *International Security*, Vol. 41, No. 3, Winter 2016/17, pp. 44-71.
50. Ghemawat and Altman, op. cit.
51. We elaborate on these and other metrics in our book Daniel S. Hamilton and Joseph P. Quinlan, *The Transatlantic Economy 2017* (Washington, DC: Center for Transatlantic Relations, 2017).
52. See Erich H. Strassner, "Measuring the Digital Economy," Bureau of Economic Analysis, November 18, 2016, https://bea.gov/about/pdf/Measuring%20the%20Digital%20Economy.pdf; "Measuring the Value of Cross-Border Data Flows," Economics and Statistics Administration and the National Telecommunications and Information Administration, U.S. Department of Commerce, September 2016, https://www.ntia.doc.gov/files/ntia/publications/measuring_cross_border_data_flows.pdf; Brynjolfsson and McFee, op. cit., pp. 122-124; OECD, "Measuring the Internet Economy," 2013, pp. 22—23; James Manyika, "Digital Economy: Trends, Opportunities and Challenges," presented at the Department of Commerce Digital Economy Board of Advisors (DEBA) meeting, (May, 2016), https://www.ntia.doc.gov/files/ntia/publications/james_manyika_digital_economy_deba_may_16_v4.pdf; Manyika, et. al, op. cit.
53. Ibid.
54. Swedish Board of Trade, *Trade Regulation in a 3D Printed World — a Primer*. Stockholm, 2016, http://kommers.se/Documents/dokumentarkiv/publikationer/2016/Publ-Trade-Regulation-in-a-3D-Printed-World.pdf; International Telecommunications Union, "Measuring the Information Society Report 2015," http://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2015/MISR2015-w5.pdf; Sharon L.N. Ford, "Additive Manufacturing Technology: Potential Implications for U.S. Manufacturing Competitiveness," U.S. International Trade Commission, September 2014, https://www.usitc.gov/journals/Vol_VI_Article4_Additive_Manufacturing_Technology.pdf.
55. 3DHubs, "3D Printing Trends Q2-2017," https://www.3dhubs.com/trends.
56. "Measuring the Value of Cross-Border Data Flows," op cit.

SECTION TWO

Transatlantic Digital Connections

CHAPTER 1

Digital Services and Digitally-Enabled Services

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

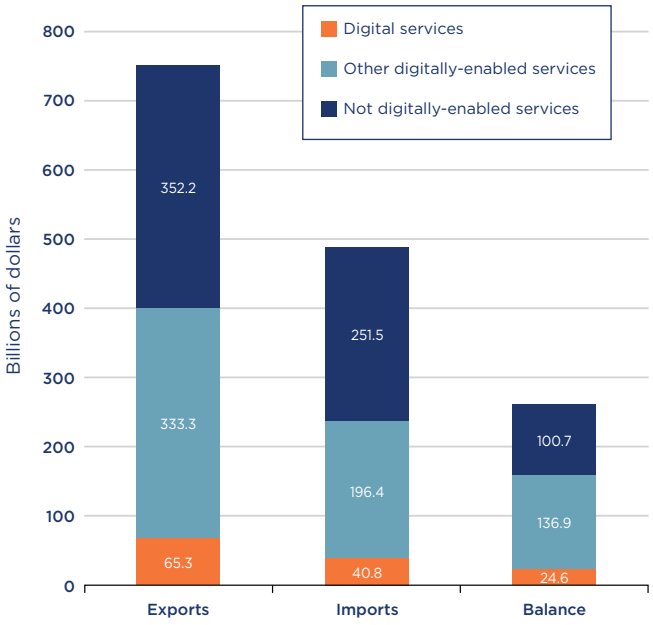
To get a clearer picture of transatlantic connections in digital services, we can use two metrics.

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

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

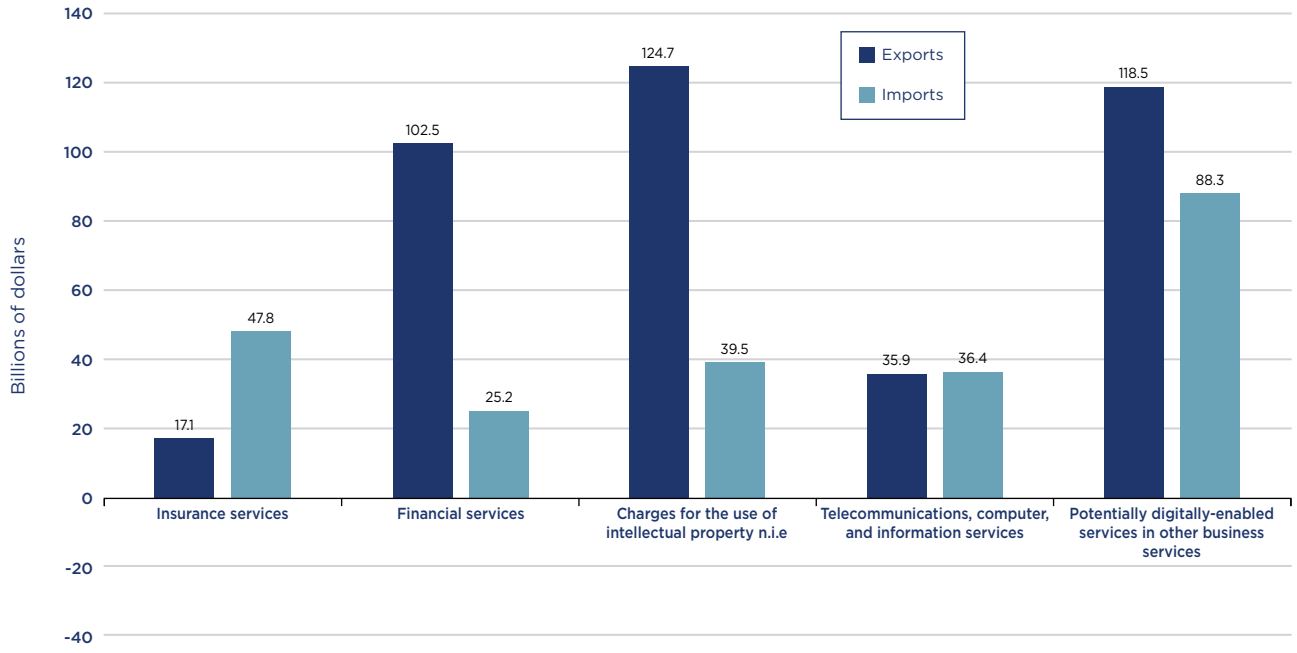
To put the reader's brain at ease, we will use "digital services" to mean ICT services, and "digitally-enabled services" to mean potentially ICT-enabled services.

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



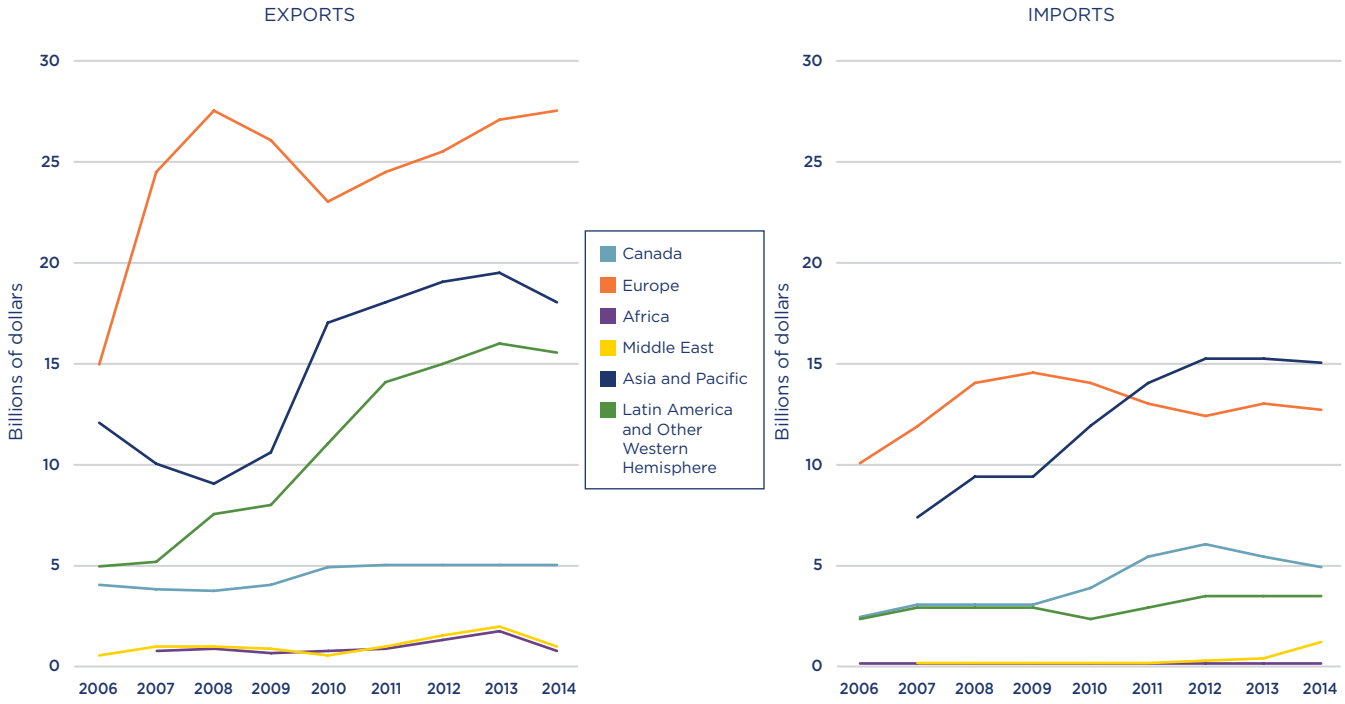
Source: Adapted from U.S Bureau of Economic Analysis, "U.S. International Services Trade in Services in 2015 and Services Supplied Through Affiliates in 2014," December 2016, https://www.bea.gov/scb/pdf/2016/12%20December/1216_international_services.pdf.

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



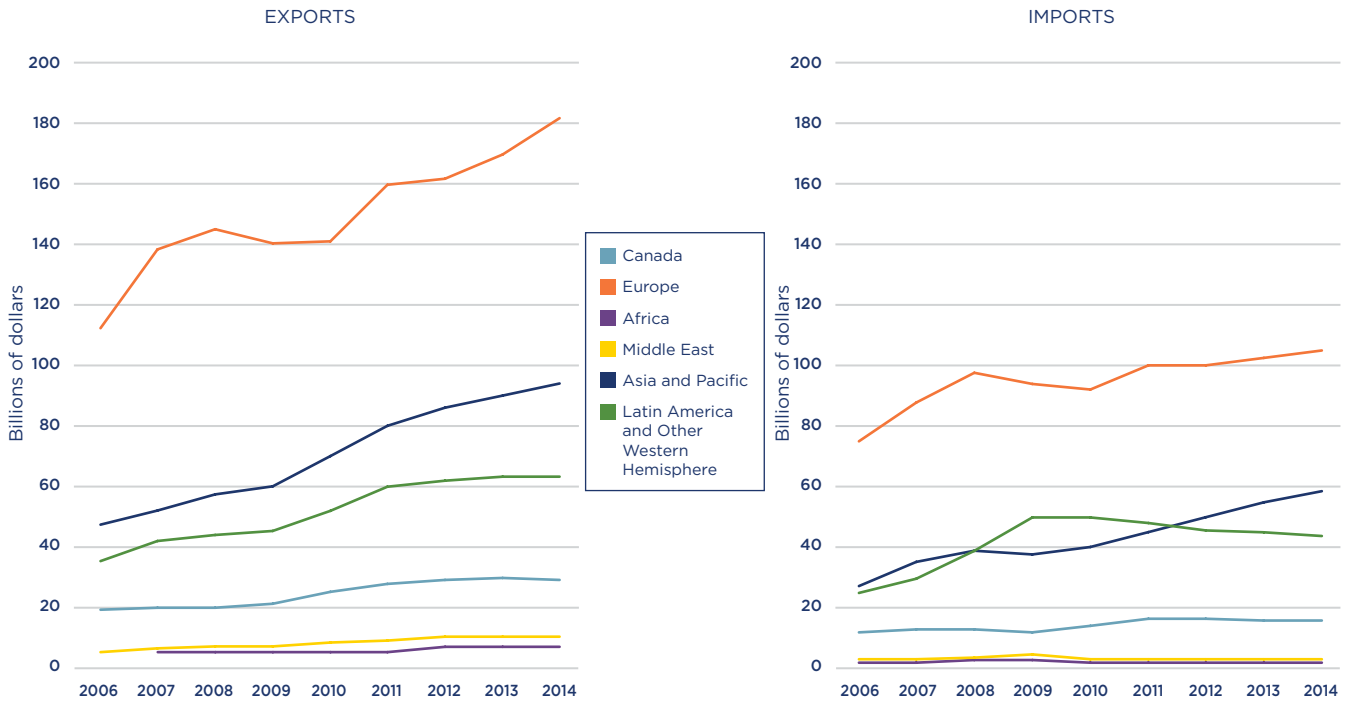
Source: Adapted from U.S Bureau of Economic Analysis, "U.S. International Services Trade in Services in 2015 and Services Supplied Through Affiliates in 2014," December 2016, https://www.bea.gov/scb/pdf/2016/12%20December/1216_international_services.pdf.

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



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

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



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

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

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

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

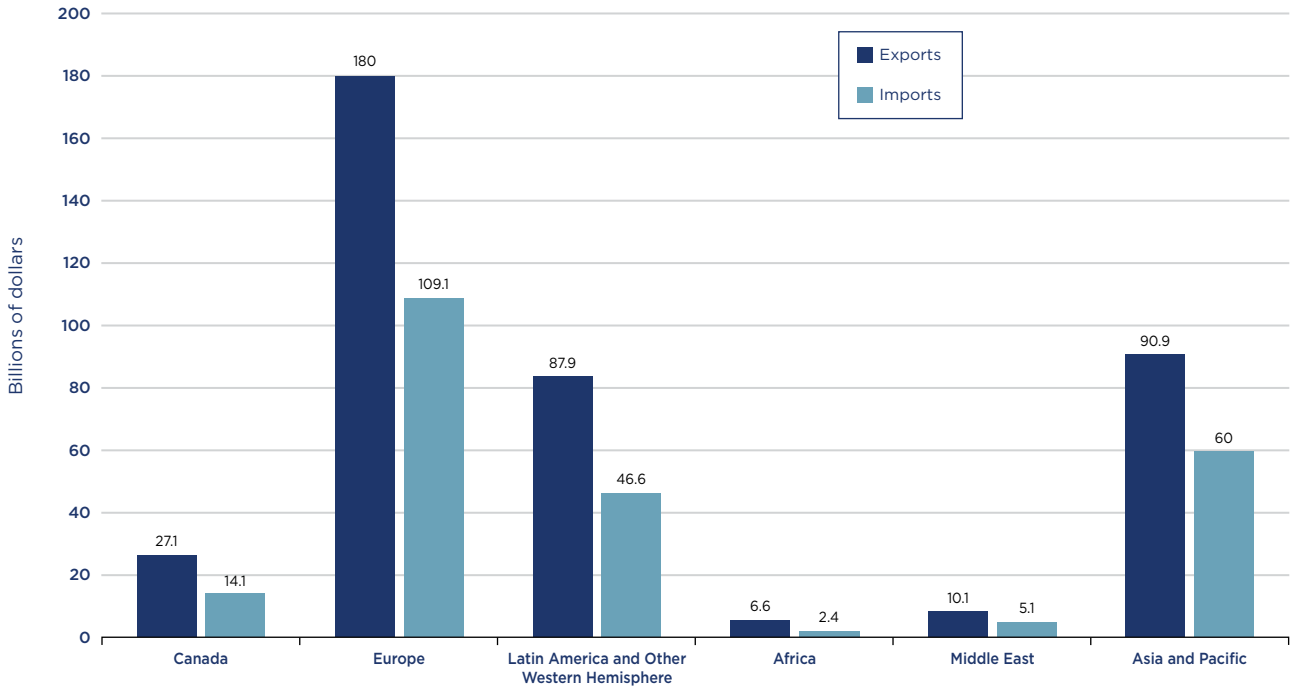
Let us first look through the narrower lens of digital services. U.S. digital services exports of $65.3 billion in 2015 represented 8.7% of overall U.S. services exports of $750.9 billion (Table 1). U.S. exports of digital services decreased 3% after decreasing 4% in 2014. More than half of the exports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

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

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

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

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



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

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

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

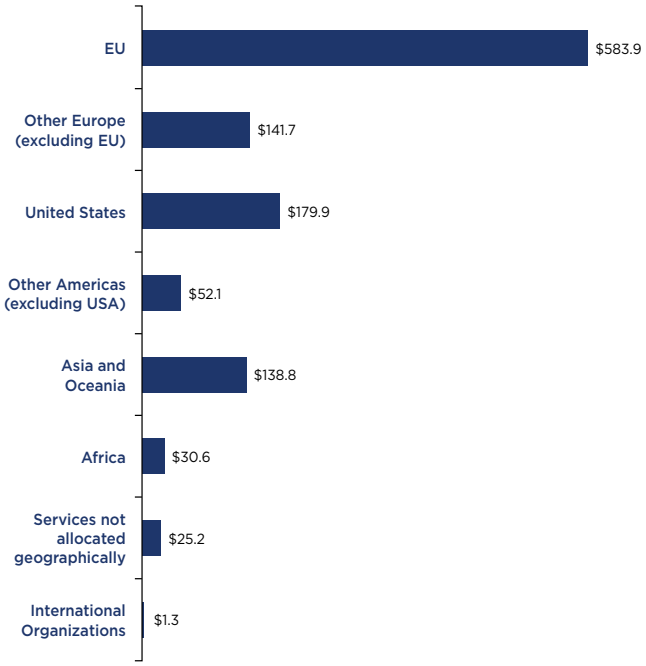
The larger decrease in exports than in imports resulted in a $2.0 billion contraction in America's trade surplus in digitally-enabled services to $161.5 billion. Digitally-enabled services accounted for 61.6% of the overall U.S. trade surplus in services, due in particular to surpluses in charges for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

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

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

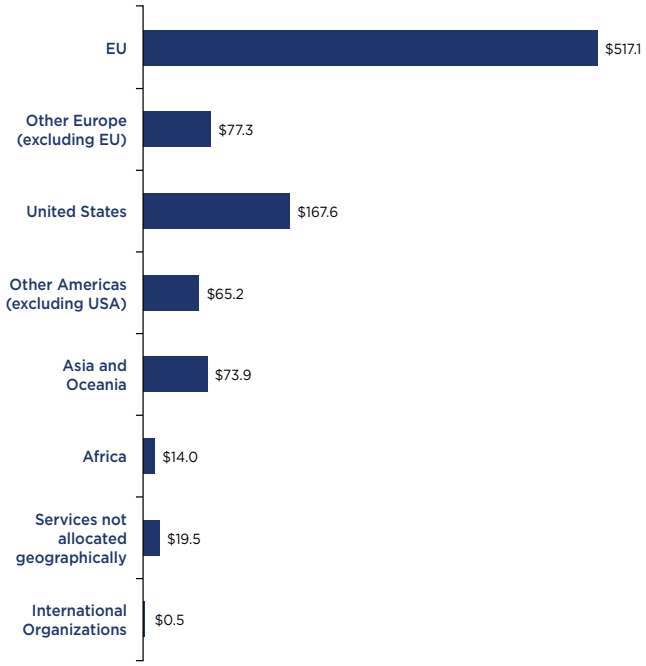
In terms of major markets, Tables 2.1.3 and 2.1.4 compare U.S. trade in the narrower category of digital services and the wider category of U.S. trade in digitally-enabled services, with major markets between 2006 and 2014. In both categories Europe is the major export market, and remains the main source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

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



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

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



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

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

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

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

EU Trade in Digitally-Enabled Services

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

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

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

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

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

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

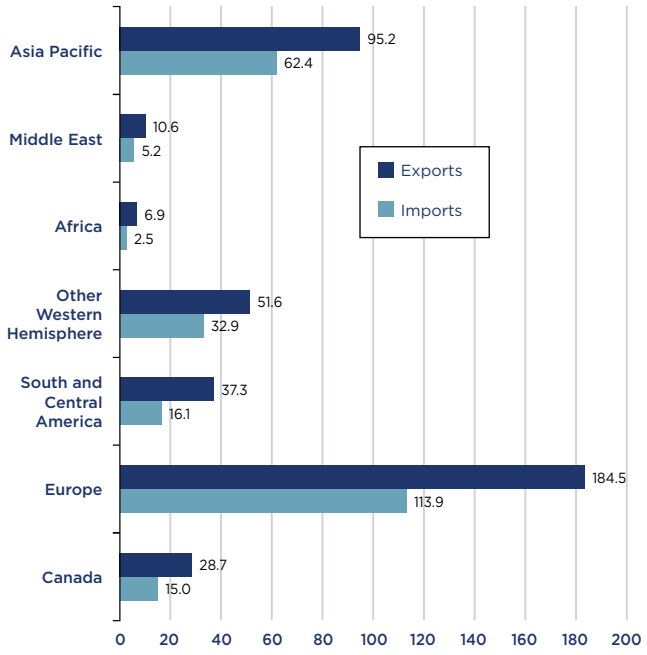
Table 2.1.8 categorizes U.S.-EU digitally-enabled services trade into five sectors. For both economies, the most important exports are represented by business, professional and technical services, which accounted for 53% of digitally enabled services exports from the EU to the United States and 42% of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

Digitally-Enabled Services Supplied Through Foreign Affiliates

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

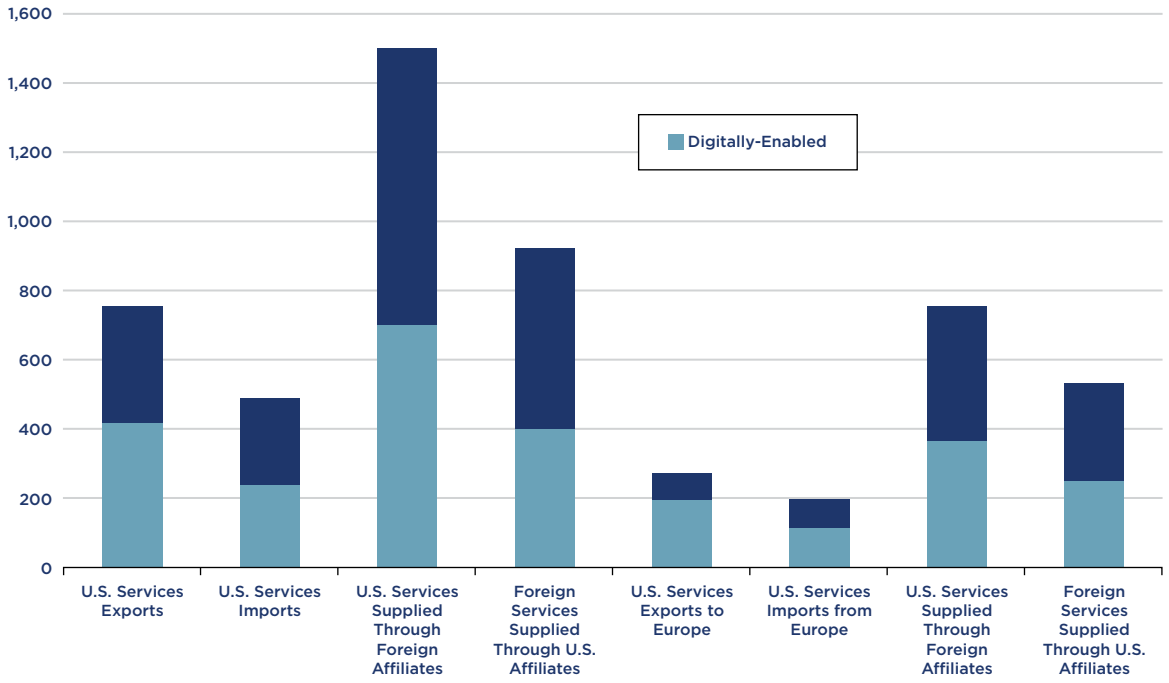
Table 2.1.9 underscores the relative importance of digitally-enabled services supplied by affiliates of U.S. companies located in Europe and affiliates of European companies in the U.S., versus U.S. and European exports of digitally-

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



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

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



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

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

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

Inter-firm Trade in the Transatlantic Digital Economy

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

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

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

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

Endnotes

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

CHAPTER 2

E-Commerce

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

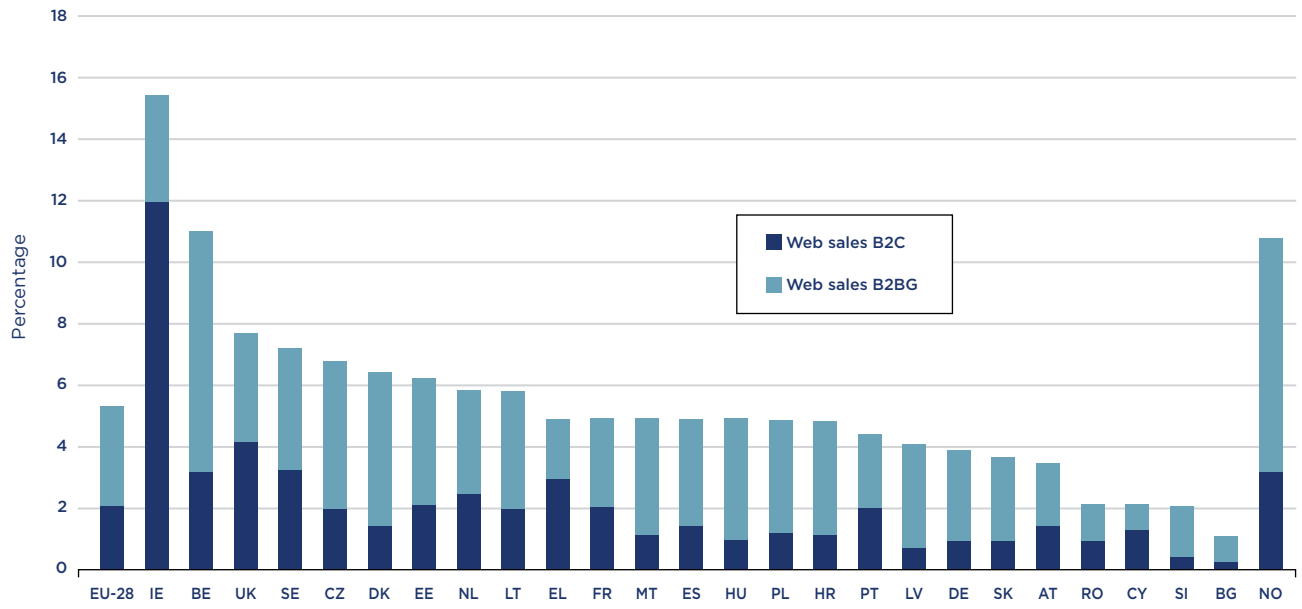
Here again we run into some definitional and data challenges. Most estimates of e-commerce do not distinguish whether such commerce is domestic or international. In addition, many metrics do not make it clear whether they cover all modes of e-commerce (See Box 2.2.1) or only the leading indicators of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

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

Combined B2B and B2C Cross-Border E-Commerce

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

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



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

BOX 2.2.1: TYPES OF E-COMMERCE

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Source: Payvision, acapture 2016.

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

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

Source: Payvision, acapture 2016.

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

Business-to-Business (B2B) E-Commerce

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

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

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

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

Source: Payvision, acapture 2016.

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

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

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

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

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

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

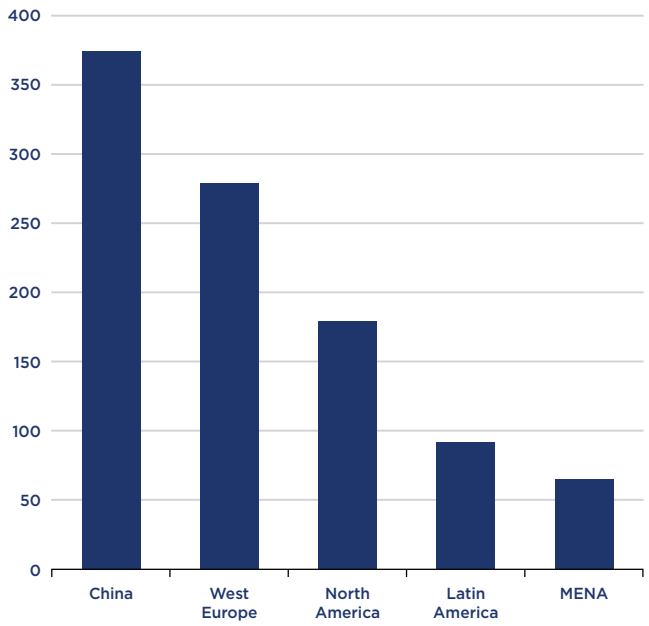
Companies that lead in B2C commerce do not tend to be as involved in B2B e-commerce. A notable exception is China's Alibaba, which is engaged in both domestic and international wholesale platforms. Its international B2B platform generated $761 million in revenue in 2014, with membership fees accounting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

Business-to-Consumer (B2C) E-Commerce

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

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

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



**Estimate.*
Source: eMarketer.

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

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

Source: eMarketer Data as of December 2015.

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

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

Source: eMarketer Data as of December 2015.

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

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

Source: eMarketer Data as of December 2015.

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

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

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

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

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

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

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

Cross-border B2C

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

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

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

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

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

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

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

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

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

of the European Union.[36]

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

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

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

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

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

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

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

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

Companies

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

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

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

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

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

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

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

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

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

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

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

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

TABLE 2.2.13: ONLINE TURNOVER INTERNET RETAILERS IN EUROPE

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

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

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

BOX 2.2.2: M-COMMERCE VS. E-COMMERCE

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

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

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

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

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

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

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

Endnotes

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

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

CHAPTER 3

The Transatlantic Platform Economy

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

Tom Goodwin[1]

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

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

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

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

TABLE 2.3.1: DIGITAL PLATFORMS.....

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

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

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

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

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

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

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

BOX 2.3.1: EXAMPLES OF PLATFORM SERVICES

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

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

Music and video streaming (Spotify, iTunes)

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

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

Mobile payment (Mahala, Square)

Clean energy (Sungevity, SolarCity, EnerNOC)

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

Crowd-funding (Kickstarter)

Charity fundraising (GlobalGiving)

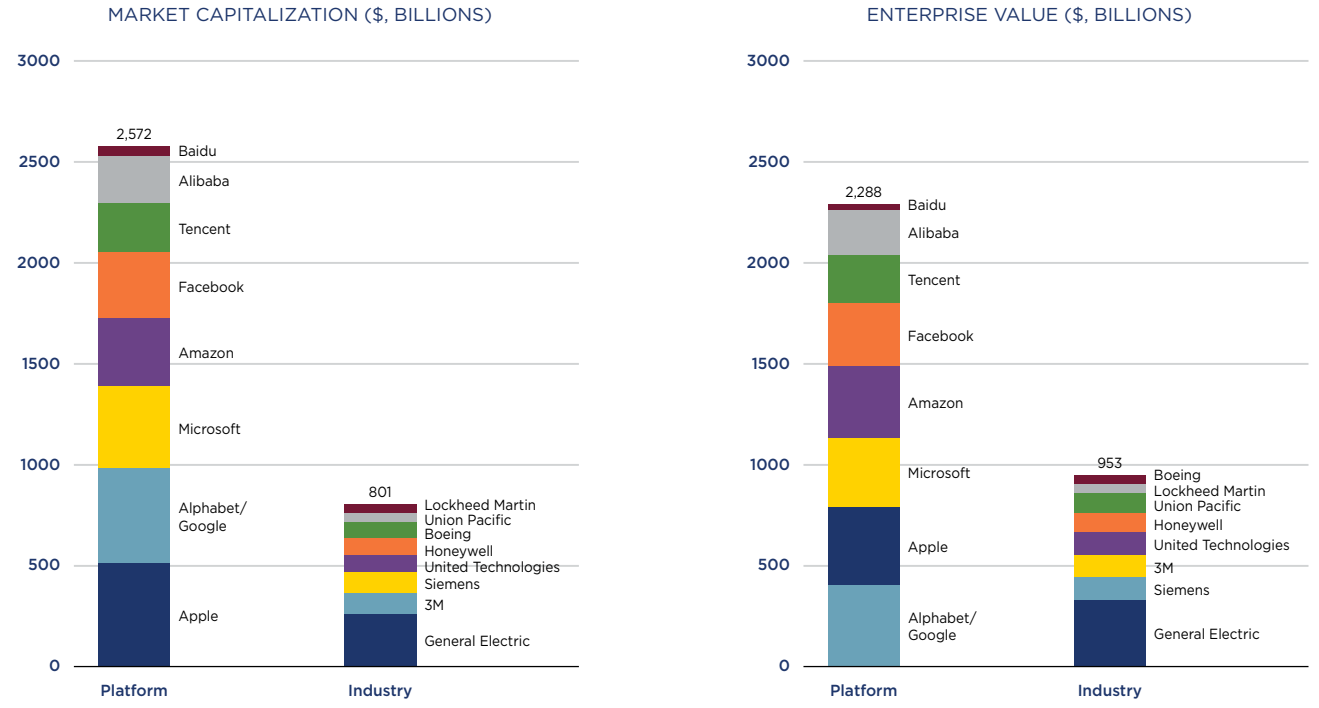
Government services (UK Government's G-Cloud)

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

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

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

TABLE 2.3.3: LEADING PLATFORMS VS. INDUSTRY GIANTS



Source: Internet Economy Foundation.[11]

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

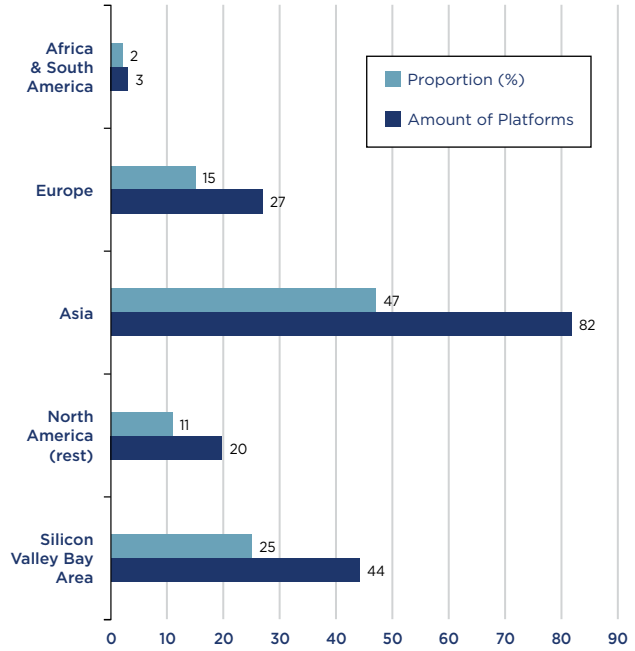
RANK	HEADQUARTERS CITY	COUNTRY	NUMBER OF PLATFORM COMPANIES	COMPANY MARKET CAPITALIZATION ($BILLIONS)
1	San Francisco Bay Area	U.S.	44	$2,229
2	Seattle	U.S.	4	$767
3	Beijing	China	30	$246
4	Hangzhou	China	6	$242
5	Shenzhen	China	5	$191
6	Tokyo	Japan	5	$109
7	Walldorf	Germany	1	$97
8	Cape Town	South Africa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

Source: Center for Global Enterprise.[12]

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

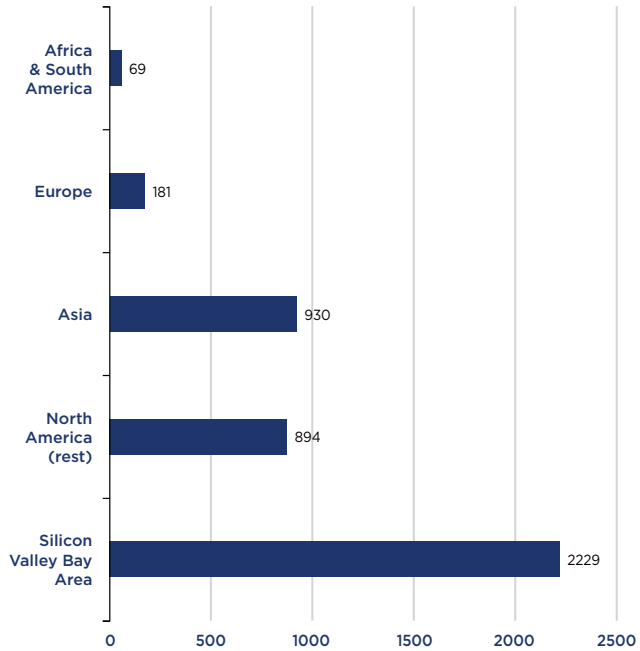
Overall, the United States remains the leader of the C2C platform economy, but this sector of the UK economy is also robust. A third of UK adults are engaging in C2C platform economy transactions, compared to 19% of U.S. adults.[14] London is the C2C platform economy capital of Europe and home to one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

TABLE 2.3.5: WORLD REGIONS BY NUMBER OF PLATFORMS



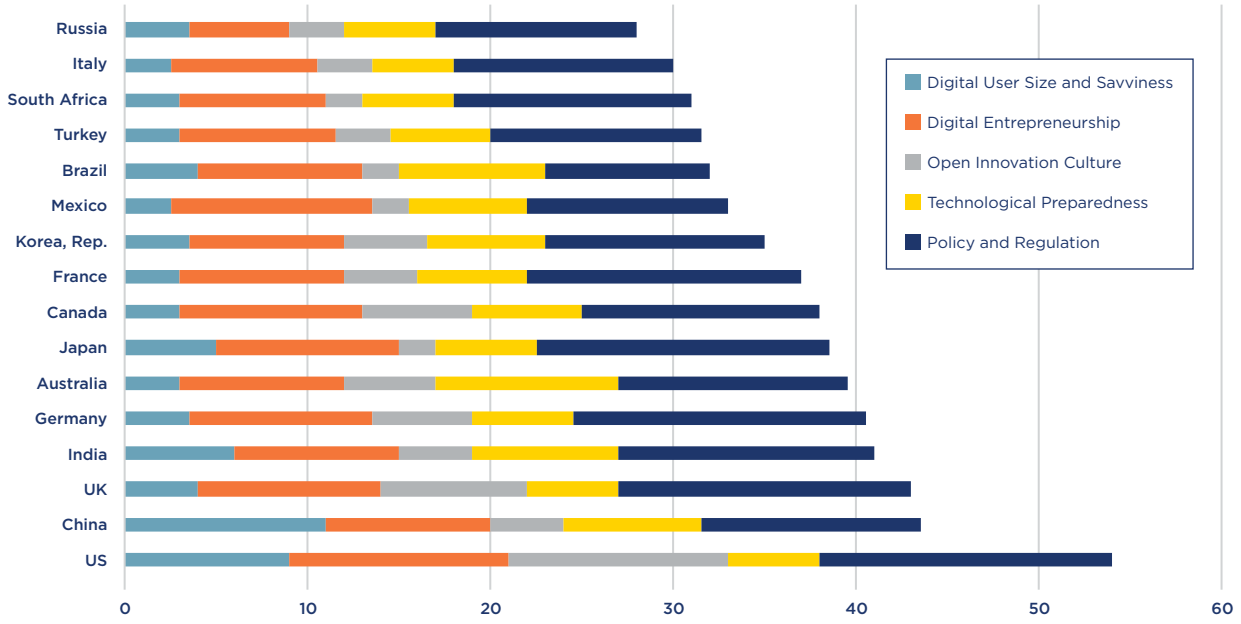
Source: Center for Global Enterprise; Internet Economy Foundation; Roland Berger.[16]

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



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

TABLE 2.3.7: PLATFORM READINESS INDEX, SELECTED COUNTRIES 2015



Source: Accenture.[18]

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

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

Platform Anxiety

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

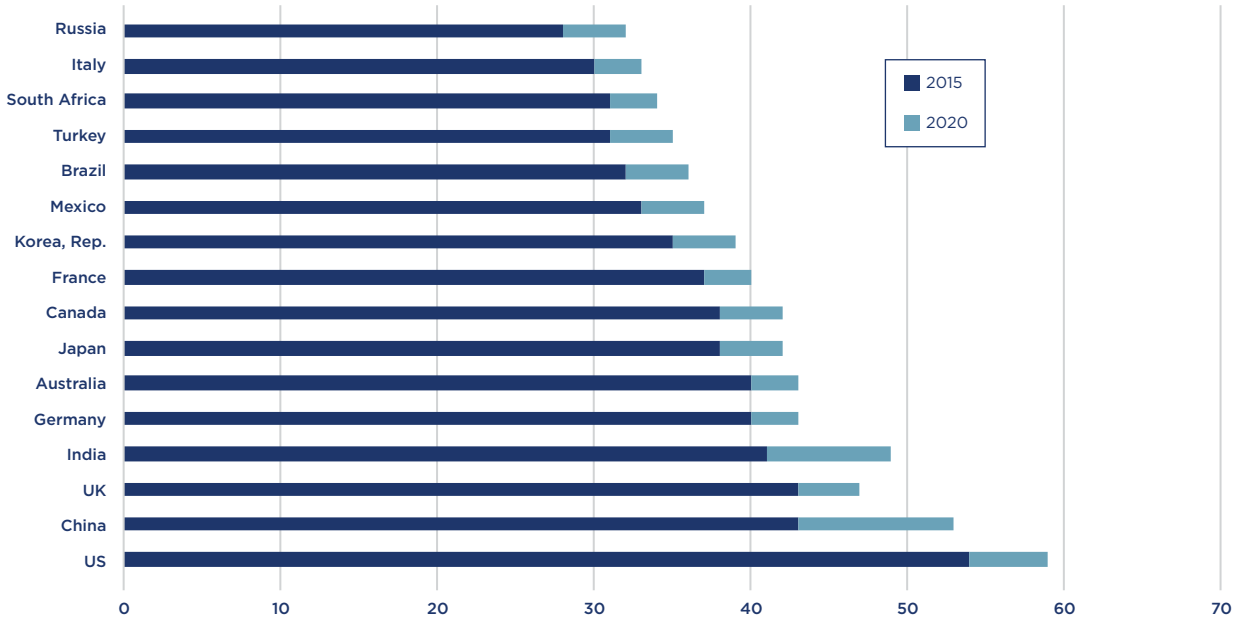
Worldwide, platform companies have a market value of over $4.3 trillion and employ millions directly and indirectly. Analytics leaders such as Apple, Alphabet/Google, Amazon, Facebook, Microsoft, GE, Baidu, Alibaba Group, and Tencent have established themselves as some of the most valuable companies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

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

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

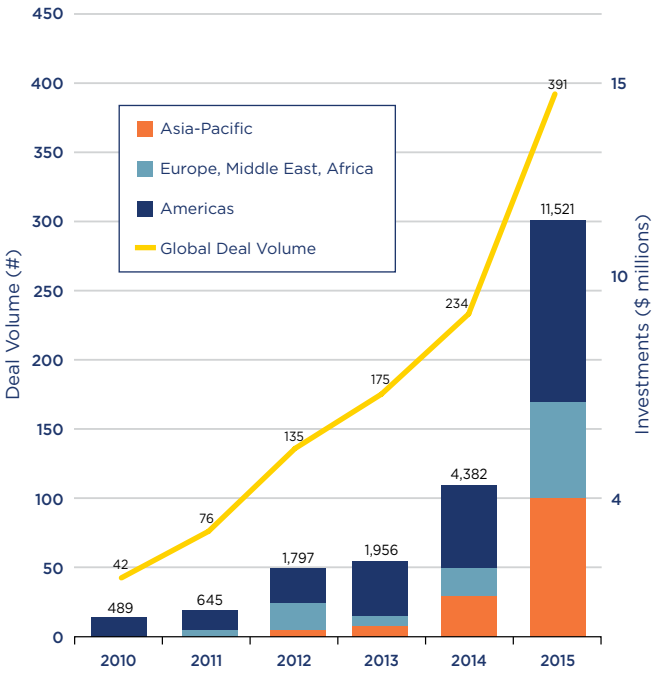
Nonetheless, on balance Europe is lagging significantly behind North America and Asia, each of which is home to a large and diverse group of platform companies. If America's digital leaders are driven by WeChat envy, European companies are haunted by platform anxiety.[23] The Center for Global Enterprise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

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



Source: Accenture.[24]

TABLE 2.3.9: INVESTMENT IN DIGITAL PLATFORMS



Source: Accenture.[26]

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

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

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

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

Endnotes

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

CHAPTER 4

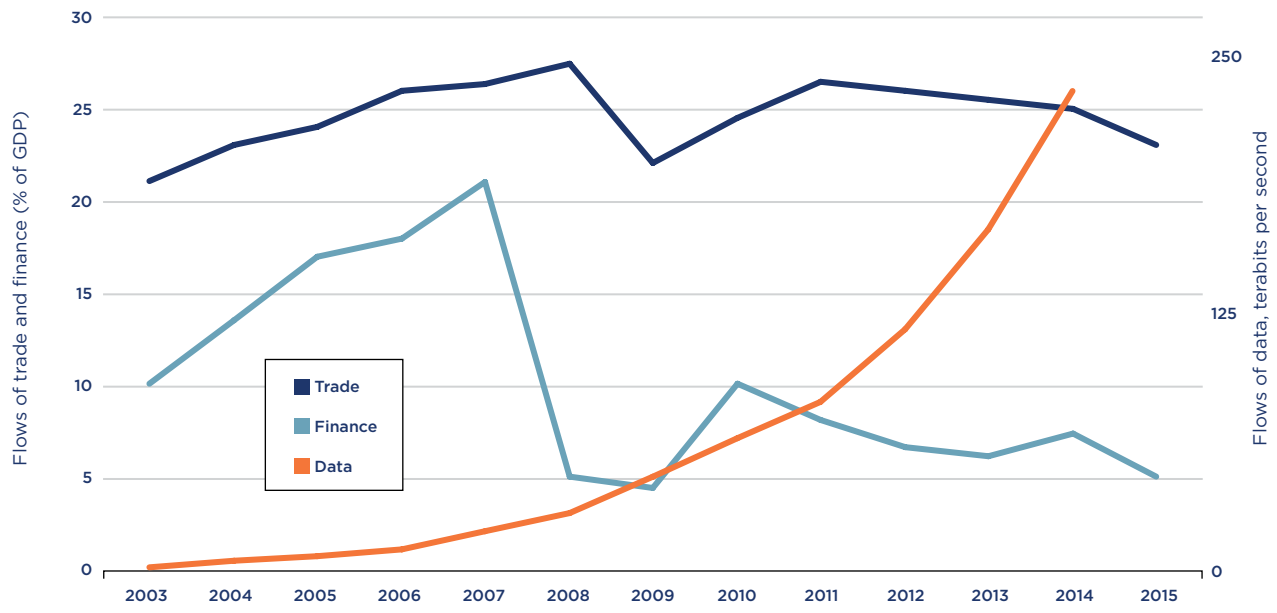
Transatlantic Data Flows

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

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

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

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



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

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

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

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

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

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

Digital collaboration. Companies increase communication and collaboration between teams.

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

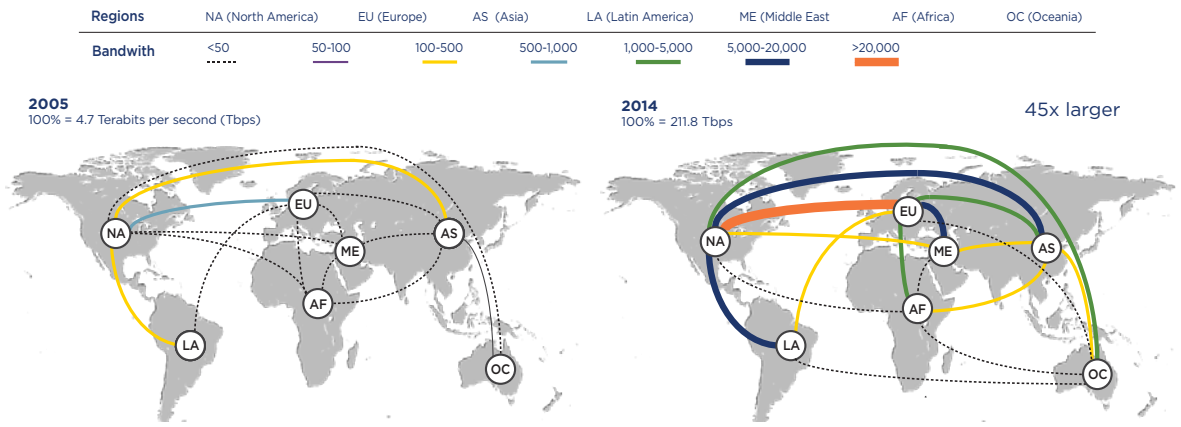
Source: Business Roundtable.[4]

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

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

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

TABLE 2.4.2: TRANSATLANTIC TIES: USED CROSS-BORDER BANDWIDTH



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

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

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

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

BOX 2.4.2: THE TRANSATLANTIC SOCIAL NETWORK

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

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

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

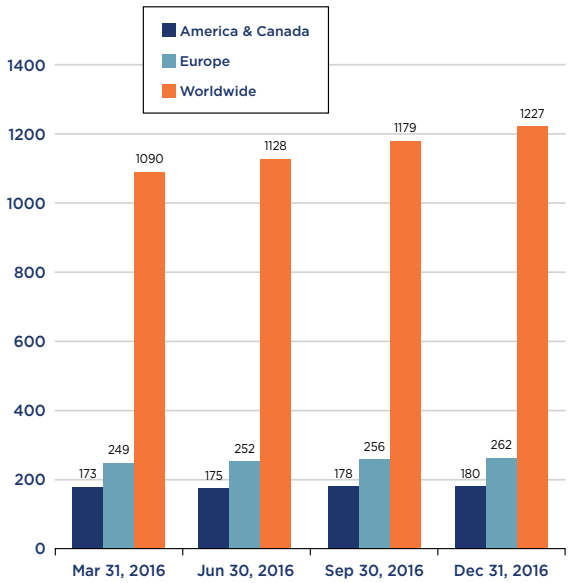
Facebook revenues in the United States, Canada and Europe are also significantly higher than in other world regions, primarily because of the size and maturity of those online and mobile advertising markets. Facebook revenue in the United States and Canada was more than eight times higher, and Facebook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

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

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

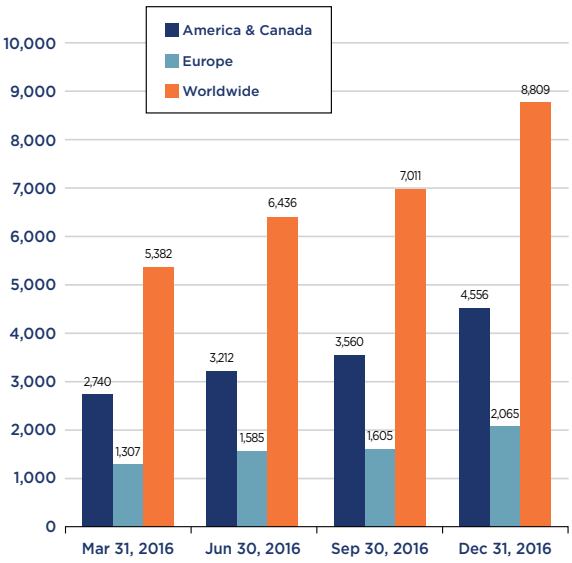
Alphabet, the parent company of Google and You Tube, generated $90.3 billion in consolidated revenue in 2016, 53% of which stemmed from outside the United States, primarily Europe and Japan. The United Kingdom alone accounted for 9% ($7.8 billion) of Alphabet's annual revenue.[18]

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



Source: Facebook, Form 10-K filing.

TABLE 2.4.4: FACEBOOK REVENUES ($, MILLIONS)



Facebook, Form 10-K filing.

Endnotes

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

CHAPTER 5

Under the Sea: The Infrastructure of the Transatlantic Digital Economy

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

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

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

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

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

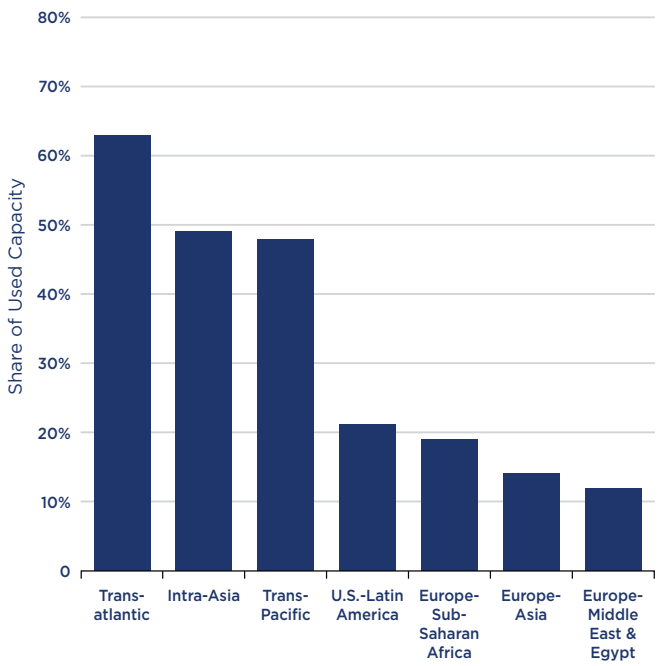
The Growing Role of Private Networks

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

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

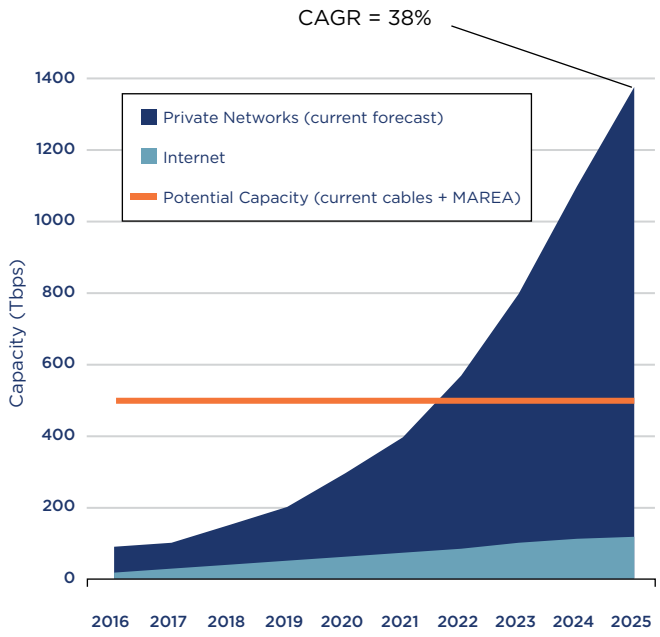
This new dynamic is a major reason for the surge in new investments in the transatlantic submarine cable network. Microsoft has been a major buyer for three

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



Source: Telegeography.[14]

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



Source: Telegeography.[15]

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

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

Hubs, Nodes and Trombones

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

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

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

TABLE 2.5.3: MAJOR INTERCONNECTION HUBS

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

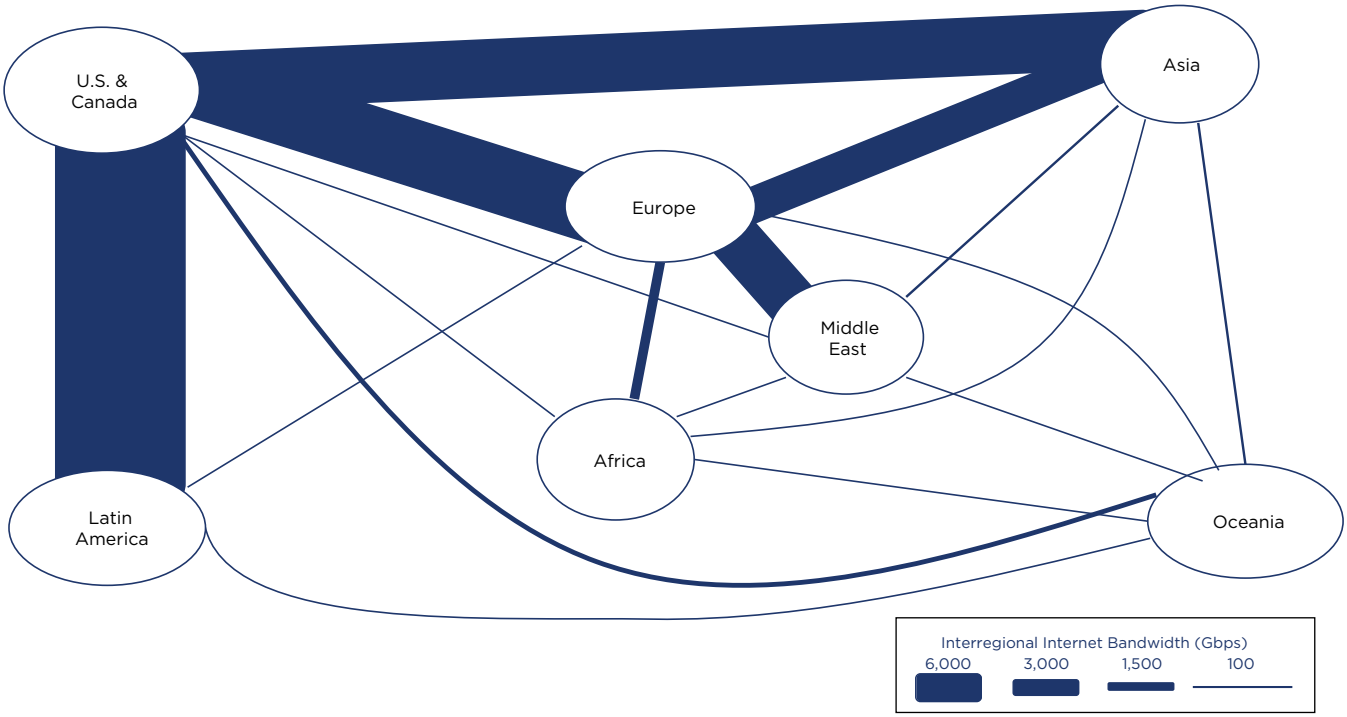
Tbps: Terabits per second. Source: Telegeography.[21]

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

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

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

TABLE 2.5.4: INTER-REGIONAL INTERNET BANDWIDTH, 2016



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

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

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

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

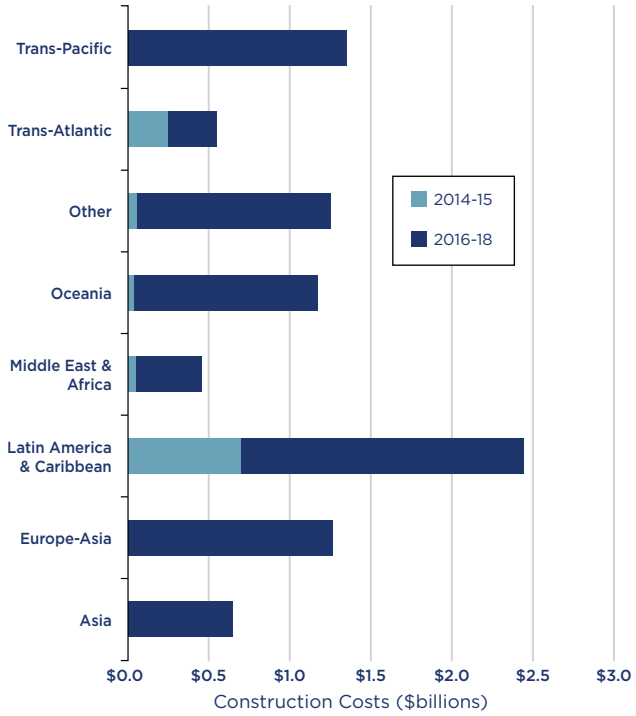
The United States and Europe may have their own interests in diversifying from such heavy reliance on transatlantic connections, in particular as a way to build resilience to cyberattacks. 75% of all current transatlantic cables are along the traditional northern Atlantic route; recent distributed denial-of-service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

Peering, Content, and Colocation

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

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

TABLE 2.5.5: INVESTMENT SURGING IN NEW SYSTEMS



Source: TeleGeography, SubOptic 2016.[26]

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

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

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

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

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

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

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

BOX 2.5.1. THE CHANGING NATURE OF TRANSATLANTIC TRAFFIC

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

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

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

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

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

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

Endnotes

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

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

SECTION THREE

Transatlantic Digital Comparisons

CHAPTER 1

The ICT Sector

Although the digital economy is more than the information and communications technology (ICT) sector, ICT is at the heart of the digital economy.

The ICT Development Index (IDI), a composite index produced by the International Telecommunications Union, compares ICT developments among countries. It uses a three-stage framework called the ICT development process:

- Stage 1: ICT readiness — reflects the level of networked infrastructure and access to ICTs;
- Stage 2: ICT intensity — reflects the level of use of ICTs in the society;
- Stage 3: ICT impact — reflects the results/outcomes of more efficient and effective ICT use.

Advancing through these stages depends on a combination of three factors: the availability of ICT infrastructure and access, a high level of ICT use, and the capability to use ICTs effectively, derived from relevant skills. These three dimensions — ICT access, use and skills — form a framework through which countries can be compared.

Table 3.1.1 presents the findings. The Republic of Korea is ranked highest, while 18 of the top 25 economies are from Europe or North America, and 8 of the top 10 economies are from Europe. The difference in overall IDI values between these top-ranking countries is relatively small, reflecting the high level of ICT development that has been achieved in most developed countries and some high-income developing economies, where there are continued high levels of investment in ICT infrastructure and innovation, as well as high levels of adoption of new services by consumers.

All countries in Europe, apart from Albania, rank above the global average and fall within the high and upper quartiles of the Index, reflecting the region's high levels of economic development. Nonetheless, disparities are evident, as countries in northern and western Europe mostly are ranked higher than those in southern and eastern Europe. The five Nordic countries — Denmark, Iceland, Sweden, Norway and Finland — all rank within the top nine in the region and the top twelve worldwide. Denmark is Europe's top performer.

A second metric offering comparative data is Huawei's Global Connectivity Index (Table 3.1.2), which defines ICT in terms of five key technologies that enable economic digitization: broadband, data centers, cloud services, big data, and the Internet of Things. Huawei argues that investing in these five ICT tech enablers — especially broadband — lays a

TABLE 3.1.1: ICT DEVELOPMENT INDEX - TOP 20 COUNTRIES

ECONOMY	RANK 2015	SCORE
Republic of Korea	1	8.93
Denmark	2	8.88
Iceland	3	8.86
United Kingdom	4	8.75
Sweden	5	8.67
Luxembourg	6	8.59
Switzerland	7	8.56
Netherlands	8	8.53
Hong Kong	9	8.52
Norway	10	8.49
Japan	11	8.47
Finland	12	8.36
Australia	13	8.29
Germany	14	8.22
United States	15	8.19
New Zealand	16	8.14
France	17	8.12
Monaco	18	8.10
Singapore	19	8.08
Estonia	20	8.05

Source: International Telecommunications Union.

BOX 3.1.1: DENMARK: A GLOBAL ICT LEADER

Denmark ranks second in the ICT Development Index, just behind the Republic of Korea. It ranks first globally in ICT use, due to its third-highest fixed-broadband penetration ranking at 41.38 subscriptions per 100 inhabitants, and ninth-highest mobile-broadband penetration ranking at 115.77 subscriptions per 100 inhabitants. Almost all households have access to a computer and an Internet connection at home (94.99% and 93.12%, respectively), and Denmark has the third-highest percentage of individuals using the Internet in the world, at 95.99%. Among the most important ICT developments in Denmark since 2010 has been the roll-out across the country of high-speed wireless Long-Term Evolution (LTE) networks, which by 2020 are expected to connect more subscribers around the world than any other mobile technology.[1] Fixed-broadband coverage is 99%, while LTE mobile-broadband coverage increased from 74% in 2013 to 99% in 2015, well above the European Union average of 59%.[2]
Denmark's national broadband strategy aims to enable all households and businesses to have access to at least 100 Mbps download speeds by 2020. An estimated 70% of all households and businesses had access to infrastructure that could support such speeds by mid-2013, an increase from 60% in the previous year.[3] Data on the uptake of high-speed broadband plans shows that currently 33% of all fixed-broadband subscriptions are at speeds above 30 Mbps (compared with an EU average of 26% per cent), and that 3% of all connections are at speeds above 100 Mbps.[4]

BOX 3.1.2 ICT INNOVATION IN ROMANIA: NEIGHBORHOOD NETWORKS

Although Romania ranks 35th globally in ICT development, in terms of fixed-broadband prices it ranks higher than much richer countries such as Germany, Spain, Australia and even the Republic of Korea, the global ICT leader. The entry-level fixed-broadband plan, which costs less than $9 (corresponding to a relatively low 1.1% of gross national income), is not only affordable but also offers unlimited data at very high speeds (100 Mbit/s). The EU's Digital Agenda Scoreboard 2014 has also highlighted Romania as one of the Europe's leaders (together with Sweden, Latvia and Finland) in terms of offering the highest proportion of ultrafast broadband access (at 100 Mbit/s and above).

A key to the success of Romania's affordable and fast Internet access has been the country's "Neighborhood Networks," a unique networking scheme developed to overcome limited broadband connectivity.

In the early 2000s small, low-cost local area networks (LANs) run by small Internet service providers (ISPs), often using aerial fiber, emerged to generate very high connection speeds among homes within a neighborhood. As more people joined these networks, the large number of LANs increased competition and brought down prices. Consequently, and unlike many countries where the incumbent provider has wide command over the market, broadband service providers in Romania remain diverse, with intra- and inter-modal competition.[5]

Romania faces many digital challenges, particularly mediocre fixed-broadband penetration, and coverage to include rural areas. But the country's Ro-NET Project is expected to reduce Romania's digital urban/rural divide and to hundreds of thousands of new users.[6]

TABLE 3.1.2: GLOBAL CONNECTIVITY INDEX 2016

FRONTRUNNERS		ADOPTERS		STARTERS	
1	United States	17	Spain	38	Philippines
2	Singapore	18	Portugal	39	Egypt
3	Sweden	19	United Arab Emirates	40	Venezuela
4	Switzerland	20	Czech Republic	41	Indonesia
5	United Kingdom	21	Qatar	42	Morocco
6	Denmark	22	Italy	43	Vietnam
7	South Korea	23	China	44	India
8	Netherlands	24	Chile	45	Algeria
9	Japan	25	Malaysia	46	Kenya
10	Norway	26	Russia	47	Ghana
11	Australia	27	Poland	48	Nigeria
12	Germany	28	Saudi Arabia	49	Bangladesh
13	France	29	Romania	50	Pakistan
14	New Zealand	30	Brazil		
15	Canada	31	South Africa		
16	Belgium	32	Mexico		
		33	Colombia		
		34	Thailand		
		35	Turkey		
		36	Argentina		
		37	Peru		

Source: Global Connectivity Index 2016, Huawei Technologies Co., Ltd.

muscular infrastructure for digital transformation and long-term economic health, competitiveness, innovation, and productivity. The Index uses 40 indicators to assess the global connectivity of 50 countries representing 90% of global GDP and 78% of the global population.[7]

According to the Global Connectivity Index, the United States ranks first, followed by Singapore. The Republic of Korea, the leader in the ITU's Index, ranks seventh on Huawei's scale. Six of the top ten performers are European, and once again northern and western European countries are considered "frontrunners," while eastern and southern European countries are considered "adopters," i.e. their focus is on increasing ICT demand to facilitate industry digitization and high-quality economic growth, and register the biggest GDP growth from such efforts in the Index.

While the two Indexes use somewhat different metrics, they underscore a basic point: overall, North America and Europe are both advanced in term of ICT development and connectivity. There are disparities within societies on both sides of the Atlantic, but in general the ICT sector is a muscular backbone of the transatlantic digital economy.

Endnotes

1. International Telecommunications Union (ITU), *Measuring the Information Society Report 2015*, http://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2015/MISR2015-w5.pdf; European Commission (2015), *Implementation of the EU Regulatory Framework for Electronic Communication*, http:// ec. europa. eu/ newsroom/ dae/ document. cfm? doc_ id= 9990.
2. Ibid.
3. Danish Business Authority (2013), *Broadband Mapping 2013*. http:// w2l. dk/ file/ 475201/ broadband- mapping. pdf; ITU, op. cit.
4. European Commission, 2015, op. cit.
5. Broadband Commission for Digital Development (2012), *Strategies for the Promotion of Broadband Services and Infrastructure: A Case Study on Romania*. International Telecommunications Union, Broadband Commission for Digital Development. Geneva, Switzerland, https:// www. itu. int/ ITU- D/ treg/ broadband/ BB_ MDG_ Romania_ BBCOM. pdf.
6. ITU, op. cit.
7. Huawei, 2016, *Connect where it counts. Mapping your transformation into a digital economy with GCI 2016*, http://www.huawei.com/minisite/gci/pdfs/Global_Connectivity_Index_2016_whitepaper.0614.pdf.

CHAPTER 2

Digital Density and Investment in Intangible Assets

Cross-border data flows differ fundamentally from traditional trade in goods and services. When a good or a service is sold from Country A to Country B, it is considered an export in Country A's accounts and an import in Country B's accounts. But cross-border data flows defy this logic. When data moves from Country A to Country B, it usually does so because it is copied and then sent digitally to Country B, rather than sent physically. That means even after the sale the item in question did not leave Country A, it is still potentially available in both Country A and Country B.[1] The result: cross-border trade dramatically increases the utility of data to the global economy. The value of these so-called "intangible assets" to the modern knowledge-driven economy is growing in leaps and bounds, but they cannot be measured by traditional means.[2] Important as investments in intangible assets are to companies and countries, in general economists have not properly accounted for them, and official GDP ignores them. How, then, should we quantify the economic value of data flows to a country?

Paul Hofheinz and Michael Mandel attempt to answer that question by comparing the "digital density" of a country — which they define as the amount of data used per capita in an economy — with the amount of money invested in intangible assets as a share of GDP. They define intangibles as investments made by firms in, for instance, research and development (R&D), computerized information, product development or training, and branding. They show that investments in so-called "intangibles" correlate directly with the production and use of data within an economy and is associated with greater digital density.[3] They suggest that digital density may be used as a proxy for consumption of cross-border data flows, and that those countries that improve their digital density through greater data usage will also experience a corresponding rise in investment in intangible assets, which, they conclude, "is the fuel, if not actually the engine, of modern economic success."[4]

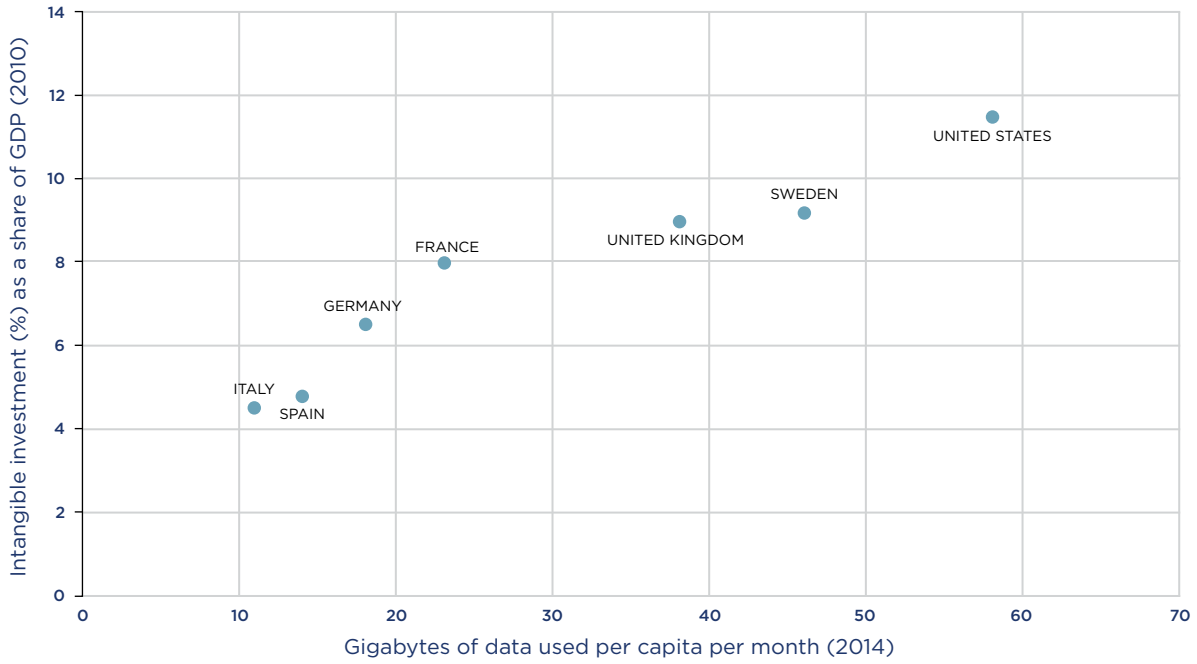
The Hofheinz/Mandel results for 2014 reveal that the United States is clearly in the lead with regard to digital density, followed by countries such as Sweden and the United Kingdom. These countries invest heavily into intangible assets, and individuals living there are heavy consumers of digital data. However, things look less rosy for countries such as Spain, Italy, France and Germany, which are lagging behind. It is estimated that a total of €209 billion worth of investments into intangible assets would be required for these four countries in order to raise their individual digital density level to that of the UK.

The results are similar if one concentrates on the estimated usage of data per capita in 2014. Again, countries like South Korea, the United States and Canada make up the first three places respectively, while countries such as Italy, Spain and Germany have fallen behind and find themselves below the western European average for per capita usage of data.

Accenture and Oxford Economics expand the definition of digital density beyond the limited Hofheinz/Mandel focus on a country's per capita data use. Instead, they define "digital density" as the extent to which economies or industries use digital technologies for economic activity.[6] They take account of more than 50 indicators across four broad activity areas of a business or economy:

- 'Making Markets,' including the digitalization of existing markets and creation of new digital markets;
- 'Running Enterprises,' or businesses' use of digital technologies and activities to execute key business functions;

TABLE 3.2.1: DIGITAL DENSITY AND INVESTMENT IN INTANGIBLE ASSETS



Source: Hofheinz and Mandel.[5]

» "Sourcing Inputs," or the use of digital technologies to source and/or use factors of production such as land, capital, talent, plant, and property; and

» "Fostering Enablers," or changes in institutional and socio-economic environments to facilitate digitalization.

The resulting Accenture Digital Density Index looks at the breadth and depth of digital technologies utilized by an economy or business, as well as the skills, ways of working, and regulatory frameworks needed to realize their economic potential (Table 3.3.2).

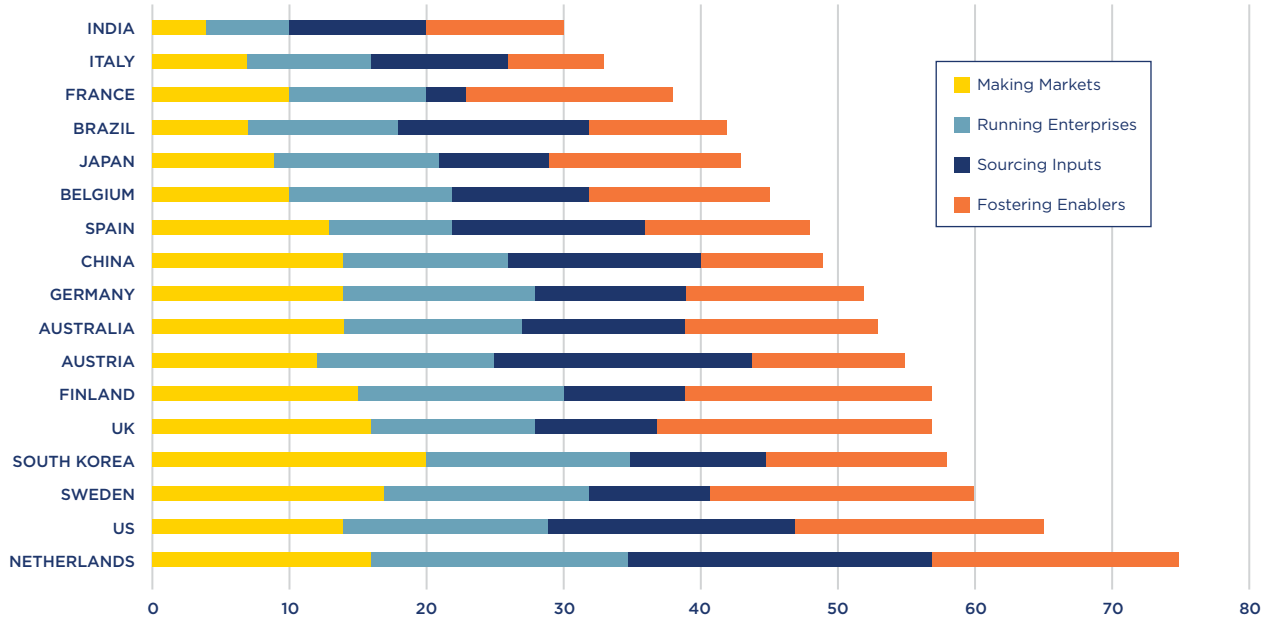
According to the Accenture Index, 11 of the top 17 economies were from North America or Europe. The Accenture Index ranks the Netherlands as the most "digitally dense" country in the world, followed by the United States and Sweden. The Netherlands outpaced other countries in two major areas. The first is "sourcing inputs," meaning the Dutch tend to make better use of digital technologies to source and/or use factors of production such as land, capital, talent, plant, and property. The second is "running enterprises," meaning that in general Dutch firms tend to outpace others when it comes to using digital technologies and activities to execute key business functions. The Netherlands was also similar to other leaders such as the U.S., Sweden, the UK and Finland in terms of "fostering enablers," meaning a regulatory framework conducive to digital use; and slightly behind South Korea, similar to Sweden, and slightly ahead of the U.S. and the UK in terms of "making markets," i.e. digitizing existing markets and creating new digital markets.

A November 2016 study by the Information Technology & Innovation Foundation offers a comprehensive digital look at the United States. The report draws on 20 indicators of the innovation economy to paint statistical portraits of all 435 U.S. congressional districts, 50 states, plus the District of Columbia. The metrics do not align directly with those used in the other studies for Europe, but they do offer relevant insights.

The indicators include measures of innovative vitality in four main areas:

1. Exports of high-tech goods and services, including manufacturing, IT services, and royalty and license services;
2. Workforce education and skills, including the numbers of workers in high-tech sectors and STEM occupations, and
3. the number of highly educated immigrants;
4. Innovative ideas, including patent-related activity and public funding for R&D; and

TABLE 3.2.2: DIGITAL DENSITY, 17 LEADING ECONOMIES (RANKING SCALE 0-100)



Source: Accenture Digital Density Index, 2015.[7]

5. Digital infrastructure, including the share of households with access to broadband Internet services and the number of broadband providers in each district.

The ITIF study shows that digital technology has become a critical driver of productivity and competitiveness not just for the U.S. ICT sector, but for the whole U.S. economy. It belies the widespread yet myopic view that America's innovation-driven, high-tech economy has centered on just a few iconic places, such as the Route 128 tech corridor around Boston, Massachusetts; Research Triangle Park in Raleigh, Durham, and Chapel Hill, North Carolina; Austin, Texas; Seattle, Washington; and, of course, California's white-hot Silicon Valley. Many other metropolitan areas and regions — from Phoenix to Salt Lake City to Philadelphia — are innovative hot spots, too, and many more areas are developing tech capabilities. The report sheds light on just how widely diffused the country's innovation-driven, high-tech economy really is. The high-tech sector employs nearly 30,000 people per congressional district, on average, totaling just under 13 million people nationwide.[8] Even though many Europeans work in the digital industries, the largest tech companies still have their headquarters in the United States.

Endnotes

1. This section draws on Paul Hofheinz and Michael Mandel, "Uncovering the Hidden Value of Digital Trade: Towards a 21st Century Agenda of Transatlantic Prosperity", Lisbon Council/PPI institute, Issue 19, 2015, http://www.progressivepolicy.org/wp-content/uploads/2015/07/2015.07-Mandel-Hofeinz-Uncovering-the-Value-of-Digital-Trade_Towards-a-21st-Century-Agenda-of-Transatlantic-Prosperity.pdf; also Ian Hargreaves and Paul Hofheinz (eds.), *Intellectual Property and Innovation: A Framework for 21st Century Growth and Jobs* (Brussels: the Lisbon Council, 2012).
2. Intangible assets are resources a company or country holds which have no physical presence, but which nonetheless amount to the actual materials the company uses to do business. Examples include patents, copyrights, user-generated digital content, franchises, goodwill, trademarks, trade names and technology — the types of assets created through investment in research and development (R&D), know-how, organizational capital like new business processes, and human capital. These investments lack physical form, but they do not lack value. According to Dale Jorgensen and Barbara Fraumeni, the value of human capital in the United States is five to ten times larger than the value of all the physical capital in the United States. See Dale Jorgenson and Barbara M. Fraumeni, "The Accumulation of Human and Nonhuman Capital, 1948—84," National Bureau of Economic Research, 1989, http://www.nber.org/chapters/c8121. Also Erik Brynjolfsson and Andrew McAfee, "Beyond GDP: How Our Current Metrics Mismeasure the Digital Economy," Markle Foundation, January 2014, http://www.markle.org/sites/default/files/Beyond%20GDP.pdf; Hofheinz and Mandel, op. cit.; Jürgen H. Daum, *Intangible Assets and Value Creation* (London: Wiley, 2012); Carol Corrado, Jonathan Haskel, Cecilia Jona-Lasinio and Massimiliano Iommi. "Intangibles and Industry Productivity Growth: Evidence from the European Union," INTAN-Invest database working papers (New York: The Conference Board, 2014); Ibid, "Intangible Capital and Growth in Advanced Economies: Measurement Methods and Comparative Results," INTANInvest database working papers (New York: The Conference Board, 2012).
3. Hofheinz and Mandel, op. cit. For a different approach, see Erik van der Marel, "Digital Investments, Data and Growth in Europe: A Framework for Analysis," ECIPE Policy Brief No. 2, 2016, http://ecipe.org/publications/digital-investments-data-and-growth-in-europe-a-framework-for-analysis/?chapter=all.
4. Hofheinz and Mandel, op. cit.
5. Hofheinz and Mandel, op. cit.
6. M. Macchi, B. Berthon and M. Robinson, M., "Digital density index: Guiding digital transformation", Accenture Strategy, 2015, https://www.accenture.com/us-en/insight-digital-density-index-guiding-digital-transformation.
7. Ibid.
8. John Wu, Adams Nager, and Joseph Chuzhin, "High-Tech Nation: How Technological Innovation Shapes America's 435 Congressional Districts," Information Technology and Information Foundation, November 2016, http://www2.itif.org/technation-2016-report.pdf.

CHAPTER 3

Apps, Bots and the Conversational Economy

Digitally-enabled services have catalyzed the growth of the App Economy on both sides of the Atlantic. Over the past decade more than 100 billion mobile apps have been downloaded, generating $40 billion in revenues for developers, billions more in subscriptions and other fees, and accounting for more than half of time users spend using digital media.[1]

The Progressive Policy Institute, a U.S. think tank, studied the App Economy in the United States and in 30 European countries, and concluded that as of January 2016 Europe and the United States had each generated similar numbers of App Economy jobs, 1.64 million versus 1.67 million, respectively. This corresponds to 0.7% of all jobs in Europe and 1.2% of all jobs in the United States — still small, but growing fast. The Institute noted that France's 229,000 App Economy jobs were only slightly less than the 289,000 net new jobs generated in the country between 2007 and 2015.[2]

By 2020, the App Economy could double in size to $101 billion, according to market researcher App Annie.[3] The European Commission estimates that by 2018, the App Economy will employ 4.8 million people in Europe, contributing €63 billion to the EU economy. Within the ICT sector, the App Economy is becoming more important. The Institute calculates that roughly 9% of ICT jobs in Europe, and roughly 11% of ICT jobs in the United States, are associated with the App Economy.[4] A study for the European Commission concludes that on balance, jobs in the App Economy are good ones.[5]

Although most app platforms are American, streaming music services are a notable but niche exception where European companies are holding their own. Nordic companies such as Rovio, King.com and Supercell or German software supplier SAP are also showing success. The App Economy is also being driven by companies whose primary business isn't apps: companies in financial services, retail, packaged goods, and media, for instance.[6]

EU citizens download more computer apps than Americans — although less than the Chinese. EU and U.S. app companies each account for 42% of app revenue across the United States and the EU.[7] Many EU developers are on contract work, or pay app platform fees, to U.S. companies — another indication of the depth of transatlantic linkages in the App Economy, and the powerful role of the transatlantic platform economy, as we discussed in chapter three of Section Two.

One important difference between the U.S. and European App Economy is that the success of EU app companies is still largely confined to national markets. Only Germany, France, and the UK have any meaningful number of app companies that are successful outside of their native markets. Some countries such as Italy have no app companies featuring in the top 50 slots outside of their domestic markets. This creates a drain on regional skills by encouraging developers in some regions of the EU to relocate to major EU app countries to seek work with the most successful app companies.[8] In addition, only five EU app companies — all of them game companies — represent 49% of EU companies in the top 50 grossing apps in the EU and in the Unite States, and only 28 EU companies account for all EU apps in the top 100 grossing apps in the EU and the United States. Large independent developer companies account for a full 86%, and small independent developers for just 9%, of the most successful EU developers.[9]

This concentration is reflected in jobs: roughly half of Europe's App Economy jobs are in just three countries — the UK, Germany, and France. App Economy jobs in the United States are less concentrated, despite anecdotes about the overwhelming importance of Silicon Valley. California still leads other U.S. states in terms of App Economy jobs, but its

TABLE 3.3.1: TOP 25 APP ECONOMY JOBS: EUROPEAN COUNTRIES AND U.S. STATES

		SHARE OF EUROPEAN APP ECONOMY JOBS	JOBS (THOUSANDS)			SHARE OF U.S. APP ECONOMY JOBS	JOBS (THOUSANDS)
1	UK	19.6%	321.2	1	California	22.7%	376.0
2	Germany	16.3%	267.9	2	New York	9.4%	156.2
3	France	14.0%	228.9	3	Texas	7.3%	121.1
4	Netherlands	7.6%	125.2	4	Illinois	5.1%	84.9
5	Italy	6.0%	97.5	5	Massachusetts	4.1%	67.2
6	Poland	5.1%	84.3	6	Florida	3.5%	58.7
7	Spain	4.8%	78.2	7	New Jersey	3.5%	58.7
8	Sweden	4.1%	67.1	8	Virginia	3.3%	55.5
9	Finland	2.9%	47.4	9	Michigan	3.2%	52.8
10	Norway	2.5%	41.6	10	Washington	3.0%	50.1
11	Denmark	2.0%	33.4	11	Ohio	3.0%	49.9
12	Switzerland	1.7%	28.5	12	Georgia	2.9%	48.6
13	Portugal	1.7%	27.4	13	Pennsylvania	2.9%	48.6
14	Belgium	1.4%	23.3	14	North Carolina	2.2%	37.0
15	Czechia	1.2%	19.7	15	Missouri	1.9%	32.1
16	Romania	1.2%	19.3	16	Indiana	1.6%	26.6
17	Hungary	0.9%	15.3	17	Arizona	1.6%	26.5
18	Ireland	0.8%	13.2	18	Maryland	1.6%	26.3
19	Austria	0.7%	11.9	19	Colorado	1.4%	22.4
	30-COUNTRY TOTAL		**1,642.0**		**UNITED STATES**		**1,670.0**

Source: Progressive Policy Institute, Indeed, ILO. Data for Europe January 2016; data for U.S. December 2015.[10]

lead is diminishing. The Golden State, which accounts for 12% of the U.S. population, accounted for 22.7% of U.S. App Economy jobs in 2015, down from 29% in 2012, whereas states such as New York, Texas, and Illinois quadrupled their App Economy jobs. Washington, which ranked 2nd in App Economy jobs behind California in 2012, actually lost jobs in this sector during this time.

When it comes to "app intensity," however, the picture changes. The Progressive Policy Institute compared "app intensity" — i.e. App Economy jobs as a percentage of all jobs — in both European economies and U.S. states. According to their analysis, the United States has an average app intensity of 1.2% and Europe an average app intensity of 0.7%.

Table 3.3.2 draws on this data to compare selected European countries with U.S. states. California, the District of Colombia and Massachusetts rank as the most "app intensive" when it comes to the transatlantic space. Finland ranks 4th, and tops in Europe, underscoring its role as a small country with a big presence in mobile apps, led by world-class companies such as mobile game makers Rovio Entertainment (maker of the mobile game hit Angry Birds) and Supercell. Norway ranks as the second most "app intensive" European country, just behind the state of New York, followed by the Netherlands and the U.S. state of Washington. New Jersey, Virginia and Sweden round out the top spots.

Germany ranks highly on total App Economy jobs but is only average when judged by app intensity. Italy, which is fifth in total App Economy jobs, falls to the bottom of the app intensity listings with 0.4%.

Is There a Bot for That?

Apps comprise one of the fastest-growing software markets ever, generating billions in revenue in less than a decade. But the market has matured, and many apps, once downloaded, are rarely used. As mobile messaging improves and artificial intelligence advances, the "bot" economy is poised to be another fast-growing, multi-billion dollar software market. In the rapid-fire digital economy, bots may be the new apps.[11]

TABLE 3.3.2: APP INTENSITY OF SELECTED EUROPEAN COUNTRIES AND U.S. STATES

COUNTRY/ STATE	APP INTENSITY*	COUNTRY/ STATE	APP INTENSITY
California	2.40%	Maryland	1.00%
District of Columbia	2.10%	South Dakota	1.00%
Massachusetts	2.00%	*France*	*0.90%*
Finland	*1.90%*	Ohio	0.90%
New York	1.70%	Colorado	0.90%
Norway	*1.60%*	New Hampshire	0.90%
Washington	1.60%	Utah	0.90%
Netherlands	*1.50%*	Indiana	0.90%
New Jersey	1.50%	North Carolina	0.90%
Virginia	1.50%	Pennsylvania	0.80%
Sweden	*1.40%*	*Europe*	*0.70%*
Illinois	1.40%	*Ireland*	*0.70%*
Connecticut	1.30%	*Germany*	*0.70%*
Michigan	1.30%	*Luxembourg*	*0.60%*
Oregon	1.20%	*Switzerland*	*0.60%*
Denmark	*1.20%*	*Portugal*	*0.60%*
United States	1.20%	*Poland*	*0.50%*
Oregon	1.20%	*Belgium*	*0.50%*
Missouri	1.20%	*Spain*	*0.50%*
Kansas	1.20%	*Italy*	*0.40%*
Georgia	1.20%	*Czech Republic*	*0.40%*
United Kingdom	*1%*	*Hungary*	*0.40%*
Texas	1%	*Austria*	*0.30%*
Arizona	1.00%		

**App Economy jobs as percentage of all jobs in a country/ state. Separate data unavailable for Bulgaria, Croatia, Cyprus, Estonia, Latvia, Lithuania, Malta, Slovakia, and Slovenia. Data: Progressive Policy Institute, Indeed, Eurostat. Estimates for for Europe January 2016, for top 25 U.S. states December 2015. Source: Progressive Policy Institute, Indeed. See http://www.progressivepolicy.org/blog/app-economy-jobs-part-2/.*

A "bot" is software that automates tasks. A "chatbot" is software that uses artificial intelligence to simulate conversation with humans on messaging platforms. Chatbot users can check news, organize meetings, buy movie tickets, transfer money, order food or book a flight or a hotel by sending short messages.[12] But bots may also be tweeting or retweeting your tweet or alerting you to someone's else's tweet. One study estimates that between 9% and 15% of active Twitter accounts — up to 48 million — are bots.[13] Social bots are accounts controlled by software, algorithmically generating content and establishing interactions. Many social bots perform useful functions, such as dissemination of news and publications[14] and coordination of volunteer activities.[15] However, there is a growing record of malicious applications of social bots. Some emulate human behavior to manufacture fake grassroots political support, promote terrorist propaganda and recruitment, manipulate the stock market, and disseminate rumors and conspiracy theories.[16]

Unlike most apps, instant messaging services have shown real staying power. There are currently more than 3 billion active users on messaging apps. Their usage keeps rising, everywhere in the world and across all generations. Messaging apps have already caught up with social media apps in terms of users. Facebook, Apple, Google, Microsoft and Amazon are all developing artificial intelligence-based chatbots. Kik, a Canadian company, offers another chabot service that has become increasingly popular in the United States, with more than 270 million users.[17]

A recent transatlantic innovation is a service between Facebook and London-based fintech startup TransferWise, founded by Estonians Taavet Hinrikus and Kristo Käärmann. TransferWise has developed a Facebook Messenger chatbot that enables customers to send money to friends and family to and from the United States, Britain, Canada, Australia and Europe. It is the first to enable international money transfers entirely within Messenger. Customers in more than 50 countries send roughly $1 billion through TransferWise's website every month. While the TransferWise chatbot is now only available in Facebook Messenger, it can be adapted to work with other popular chat services.[18]

While many technical hurdles are still to be overcome, the Bot Economy is growing faster today than the App Economy did when it began. Bots will become a regular feature on people's smartphones, joining websites and apps and other things yet to be invented.[19]

Ambient Computing and the Conversational Economy

Chatbots are the gateway to ambient computing — the promise of continuous, multi-modal, computer-enhanced interaction with the real world.[20] Messaging and other natural language interfaces are the key, which in turn opens the door to the emerging "conversational economy," discussion of which ignited in 2015 when Chris Messina of Uber heralded a new age of "conversational commerce," in which individuals simply use their own voice to interact with people, brands, or services in a variety of new ways.[21] As investor Sarah Guo describes it, the conversational economy is one in which voice itself is an operating

system. Instead of being prompted to "download" and "install,"users will simply be invited to talk.[22]

Some use of voice control is already mainstream—in mid-2016, 20% of Android searches were voice-based, and Siri received 2 billion requests per week.[23] Innovations in voice-enabled hardware and big voice platforms are rushing forward.[24] The rise of voice-dominant ambient computing, in turn, is only one step removed from an even bigger step forward — towards cognitive commerce.[25]

While exciting, this field also carries a warning for the transatlantic economy, because here Asia — not the United States or Europe — is leading the way. The leader is China and its increasingly ubiquitous WeChat, which is a prime example of budding conversational economy. WeChat is the most integrated app today. It encompasses a messaging app, a portal, a platform, and even a mobile operating system. Its users have access to a variety of functions: search engine, taxi hailing, food delivery, banking, news, fitness tracker, shopping, socializing, etc. It has millions of small apps within it, which function a lot like webpages that live on the Internet. WeChat generates over $1.1 billion in revenue by offering its 760 million users[26] an all-in-one approach, letting them pay their bills, hail taxis, and order products with a text. Line, a Japanese messaging app with 200 million users, has rolled out LinePay, allowing its users to make mobile payments, order groceries, book taxis, and more.[27]

Within the confines of a single "app," WeChat has built a better app store than Apple, serving a much broader set of use-cases. When U.S.-based developers, product people, and founders interact with WeChat, they inevitably see the potential as transferable. Samsung's Android, IBM's Watson, Apple's iOS8 web extensions, and next-generation artificial intelligence platforms such as Viv, developed by Dag Kittlaus, a Norwegian living in the U.S. and his fellow co-founders of Siri, are moving into this space. But for the moment, the West is driven by WeChat envy.[28]

Endnotes

1. Michael Mandel, "App Economy jobs in the United States (Part 1), and "App Economy - Top 25 States (Part 2), January 6, 2016, http://www.progressivepolicy.org/blog/app-economy-jobs-part-2/; http://www.economist.com/news/business-and-finance/21696477-market-apps-maturing-now-one-text-based-services-or-chatbots-looks-poised; http://e15initiative.org/wp-content/uploads/2015/09/E15-Digital-Economy-Porges-and-Enders-Final.pdf.
2. Mandel, op. cit.
3. Dean Takahashi, "The app economy could double to $101 billion by 2020," Venture Beat, February 10, 2016, http://venturebeat.com/2016/02/10/the-app-economy-could-double-to-101b-by-2020-research-firm-says/.
4. Mandel, op. cit.; See also European Commission, " The €63 billion app boom. Nearly 5 million jobs in European app sector by 2018, says EU report," February 13, 2014, http://europa.eu/rapid/press-release_IP-14-145_en.htm.; "Can apps like BlaBlaCar and Deliveroo help cut EU unemployment?" Debating Europe, November 8, 2016, http://www.debatingeurope.eu/2016/11/08/will-growth-app-economy-help-cut-unemployment-europe/#.WH-n5kYzXX4.
5. Robin Wauters, "Analysis: an appraisal of the burgeoning European 'app economy', and its growing pains," http://tech.eu/features/540/analysis-app-economy-europe/; Mark Mulligan and David Card, Sizing the EU app economy, Gigaom Research, February 2014.
6. Ibid.
7. Internet Economy Foundation/Roland Berger, *Fair Play in der digitalen Welt. Wie Europa für Plattformen den richtigen Rahmen setzt*, https://www.ie.foundation/content/4-publications/rb_cop_16_011_ief_plattformstudie_de_online.pdf, p. 12.
8. Mulligan and Card, op. cit.
9. Ibid.
10. Mandel, op. cit.
11. Sam Lessin, "On Bots, Conversational Apps and Fin," January 18, 2016, https://www.theinformation.com/on-bots-conversational-apps-and-fin?shared=b5fa6f,; "Technology: The rise of the bot economy," Boyden.com, 2016, https://www.boyden.com/media/technology-the-rise-of-the-bot-economy-170672/index.html.
12. Ibid; "The Rise of Chatbots: Targeting Southeast Asia's Booming Chat Commerce Space," ecommerceIQ, July 21, 2016, http://ecommerceiq.asia/chatbot-revolution-in-southeast-asia-social-commerce/.
13. Onur Varol, Emilio Ferrara, Clayton A. Davis, Filippo Menczer, Alessandro Flammini, "Online Human-Bot Interactions: Detection, Estimation, and Characterization," https://arxiv.org/pdf/1703.03107.pdf
14. This survey of bot activity is drawn from Onur Varol, Emilio Ferrara, Clayton A. Davis, Filippo Menczer, Alessandro Flammini, "Online Human-Bot Interactions: Detection, Estimation, and Characterization," March 27, 2017, https://arxiv.org/pdf/1703.03107.pdf. For impact on news, see Paul Bradshaw, "2016 was the year of the bot — here's a brief history of how they have been used in journalism," Online Journalism Blog, https://onlinejournalismblog.com/2016/12/21/how-bots-came-to-play-a-role-in-journalism-a-brief-history/; Tetyana Lokot and Nicholas Diakopoulos, "News Bots. Automating news and information dissemination on Twitter," Digital Journalism, 2015, http://www.nickdiakopoulos.com/wp-content/uploads/2011/07/newsbots_final.pdf; S. Haustein, T.D. Bowman, K. Holmberg, A. Tsou, C.R. Sugimoto, & V. Larivière, "Tweets as impact indicators: Examining the implications of automated bot accounts on Twitter," Journal of the Association for Information Science and Technology, 67(1), 2016, pp. 232—238, doi:10.1002/asi.23456.
15. Varol, op. cit.; Saiph Savage, Andres Monroy-Hernandez, and Tobias Höllerer, "Botivist: Calling Volunteers to Action Using Online Bots," in Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing (CSCW). ACM, pp. 813—822, 2016.
16. Varol, et. al, op. cit.; A. Bessi and E. Ferrara,"Social bots distort the 2016 us presidential election online discussion," First Monday 21(11), 2016; J. Ratkiewicz, M. Conover, M. Meiss, B. Goncalves, A. Flammini, and F. Menczer, "Detecting and tracking political abuse in social media," in 5th International Conference on Weblogs & Social Media, 2011, pp. 297—304; J. Berger and J. Morgan, "The isis twitter census: Defining and describing the population of isis supporters on twitter." The Brookings Project on US Relations with the Islamic World, 2015; N. Abokhodair, D. Yoo, and D.W. McDonald, "Dissecting a social botnet: Growth, content and influence in twitter," in Proceedings of the 18th ACM Conf. on Computer Supported Cooperative Work & Social Computing, 2015, pp. 839—851; E. Ferrara, W-Q Wang, O. Varol, A. Flammini and A. Galstyan, "Predicting online extremism, content adopters, and interaction reciprocity," in Social Informatics: 8th International Conference, SocInfo 2016, Bellevue, WA, USA, 2015, pp. 22—39; E. Ferrara, E., O. Varol, C. Davis, F. Menczer and A, Flammini, "The rise of social bots," Comm. ACM 59(7), 2016, pp. 96—104; A. Bessi, M. Coletto, G.A. Davidescu, A. Scala, G. Caldarelli and W. Quattrociocchi, "Science vs conspiracy: Collective narratives in the age of misinformation. PLoS ONE 10(2), 2015, e0118093.
17. Ibid; Boyden.com, op. cit.
18. Anna Irrera, "TransferWise launches international money transfers via Facebook," Reuters, February 21, 2017, http://www.reuters.com/article/us-transferwise-facebook-idUSKBN1600D0.
19. Julie Verhage, "The Bot Economy is Growing Even Faster than the App Economy did," Bloomberg News, September 15, 2016, https://www.bloomberg.com/news/articles/2016-09-15/the-bot-economy-is-growing-even-faster-than-the-app-economy-did; "Bots, the next frontier," *The Economist*, April 9, 2016, http://www.economist.com/news/business-and-finance/21696477-market-apps-maturing-now-one-text-based-services-or-chatbots-looks-poised; Sarah Guo, "The Conversational Economy Part 1: What's Causing the Bot Craze?" Venture Beat, June 13, 2016, http://venturebeat.com/2016/06/13/the-conversational-economy-part-1-whats-causing-the-bot-craze/; Sarah Guo, " The Conversational Economy—5 Reasons Mobile Apps May Still Rule," Greylock.com, June 26, 2016, https://news.greylock.com/5-reasons-mobile-apps-may-still-rule-3a0f0469cb3f#.e3s06pjya.
20. Sarah Guo, "The Conversational Economy—Voice and the New Era of Multi-Modal Computing," Greylock.com, January 9, 2016, https://news.greylock.com/https-news-greylock-com-the-conversational-economy-voice-and-the-new-era-of-multi-modal-computing-96f535c058f6#.tth7y8496; Michael Quoc, "11 Examples of Conversational Commerce and Chatbots," Chatbots Magazine, May 31, 2016, https://chatbotsmagazine.com/11-examples-of-conversational-commerce-57bb8783d332#.g15ccagsh.
21. Chris Messina, January 19, 2016, https://medium.com/chris-messina/2016-will-be-the-year-of-conversational-commerce-1586e85e3991#.cgpmyquqt; Guo, "The Conversational Economy," op. cit.
22. Ibid; Guo, "The Conversational Economy Part I," op. cit.
23. Jennifer Sleg, "20% of Google's Mobile Search Queries are Now Voice Queries," TheSemPost, May 19, 2016, http://www.thesempost.com/20-of-googles-mobile-search-queries-are-now-voice-queries/; Geoffrey A. Fowler, "Siri: Once a Flake, Now Key to Apple's Future," Wall Street Journal, June 14, 2016, https://www.wsj.com/articles/siri-once-a-flake-now-key-to-apples-future-1465905601; Guo, "The Conversational Economy," op. cit.

24. Ibid; Tom Hadfield, "Mobile Messaging Conjures a Commerce Platform," Tech Crunch, March 29 2015, https://techcrunch.com/2015/03/29/mobile-messaging-conjures-a-commerce-platform/.
25. MIS Asia.com, http://www.mis-asia.com/print-article/106850.
26. EcommerceIQ, op. cit.; Hadfield, op. cit.; Jon Russell, " Messaging App Line's Payment Service Begins Rolling Out To Users Worldwide," Tech Crunch, December 16, 2014, https://techcrunch.com/2014/12/16/line-pay-finally-rolling-out/.
27. Hadfield, op. cit.; Quoc, op. cit.; Jon Russell, " Chat App Line Moves Towards Selling And Delivering Groceries In Southeast Asia," Tech Crunch, February 1, 2015, https://techcrunch.com/2015/02/01/line-groceries-southeast-asia/; Connie Chan, "When One App Rules Them All: The Case of WeChat and Mobile in China," Andreessen Horowitz, August 6, 2015, http://a16z.com/2015/08/06/wechat-china-mobile-first/.
28. Guo, "The Conversational Economy Part 1," op. cit.; Guo, "The Conversational Economy," op. cit.; Hadfield, op. cit.; iAdvize, "White Paper Customer Experience in the Age of Conversational Commerce," http://landing.iadvize.com/en/white-paper-conversational-commerce?hsCtaTracking=dbbe632b-9bde-423c-aae2-ab3f9d5291e8%7C51079f17-2d35-47dd-9589-3c088623855c; Messina, op. cit.; Jim Rock, " Autonomous Robots Are Changing The Way We Build And Move Products Around The World," Tech Crunch, January 17, 2016, https://techcrunch.com/2016/01/17/autonomous-robots-are-changing-the-way-we-build-and-move-products-around-the-world/.

CHAPTER 4

Crowdworkers in the Gig Economy

The digital economy is changing work on both sides of the Atlantic, yet there are currently no reliable ways to estimate the number or nature of digital jobs of jobs affected, or even how to describe the phenomenon.

Various terms are being used to describe work organized digitally via online platforms; perhaps the most prominent are "online gig work" and "crowdworking."[1] This work includes both relatively low-skill clerical and data entry work as well as higher-skill work such as software development, creative services and multimedia, and professional services such as law.[2]

Researchers at the University of Hertfordshire have broken crowd work down into four categories: non-manual high-skill online workers (working for platforms like Upwork or PeoplePerHour); non-manual low-skill online workers (working for platforms like Clickworker, Crowdflower or Amazon Mechanical Turk); manual driving workers working offline but managed online (working for platforms like Uber, Blablacar or Lyft); and manual service / maintenance/construction workers working offline but managed online (working for platforms like Taskrabbit, Helpling or Myhammer).[3]

Such online gig work may be understood as a smaller subset of the "gig economy," or as "contingent workers," both of which encompass a broader set of workers who are available when someone wants to hire them, but such work may or may be performed or facilitated digitally.[4]

Government statistics do not capture the broader phenomenon of the gig economy, much less its digital component. The U.S. government, for instance, stopped counting "contingent workplace" arrangements after 2005. European governments have been similarly challenged. This means that no comprehensive database exists on either employment in the gig economy or its geography.[5] Despite these limitations, additional light can in fact be thrown on the online gig economy. A number of unofficial efforts have been made to assess the size and nature of online gigging. Staffing Industry Analysts estimates that the total value of the skilled freelance crowd work online will reach $5 billion by 2018; Elance/oDesk projected that the online gig economy would increase to as much as $47 billion by 2020.[6]

There is no simple way, however, to translate such estimates of market size into numbers of workers. Nonetheless, various studies conclude that platform-enabled freelancing encompasses a relatively small but rapidly-growing segment of the job market in both the United States and Europe, but is unevenly distributed across each continent.

Crowdworkers in the U.S. Gig Economy

Researchers at the Brookings Institution, drawing on U.S. Census Bureau data on "nonemployer firms" in the United States, conclude that gig employment — whether digital platform-enabled or not — has been growing rapidly, representing 24 million "businesses," compared with total U.S. payroll employment of about 145 million, in 2014.[7] In short, a surge of nonemployer firm activity that has been explosive in ground transportation and quite noticeable in accommodations seems to directly coincide with the large-scale expansion of the gig economy and uptake of online platform services. Whereas payroll employment in the ride-sharing industry grew by 17% between 2010 and 2014, nonemployer firms (including gigging freelancers) increased by 69%. Likewise, although payroll employment in the home-sharing industry grew by 7%, nonemployer firms grew by 17%.

Here again one must be careful about extrapolating figures to estimate the full extent of such online work, since much evidence suggests that for many online giggers, crowd work is a not their main job, but rather a supplement. Nonetheless, 56% of labor platform users say

that the money they earn from these sites is "essential" or "important" to their overall financial situations, whereas 42% say the money is simply "nice to have."[8]

Brookings researchers conclude that while platform-based freelancing is not yet substantially displacing payroll employment, that could change. Nonemployer firm growth is clearly rising, and accelerating in the ride-sharing sector. These trends raise the possibility that online marketplaces could cannibalize competing payroll businesses in some industries, particularly given the rapid deployment of new technologies. For example, Lyft recently claimed that most of its cars will be self-driving in five years.[9] While that forecast seems overly ambitious, it would clearly spell trouble for human drivers, both those on payrolls and freelancers alike.

Brookings also concludes that online gig work is unevenly distributed in the United States. They show that online gigging in the rides and rooms industries is so far concentrated in large U.S. metropolitan areas. Between 2010 and 2014 no less than 81% of the four-year net growth in nonemployer firms in the rides sector took place in the 25 largest metropolitan areas, while 92% occurred in the largest 50 metros. For rooms, those figures were, respectively, 56% and 70% — just slightly more than it was across all industries.

The Brookings data suggests that the online platform economy is mostly an urban phenomenon, at least in rides and rooms, where it is having a sizable impact locally; and that its onset in early-adopter cities like San Francisco and San Jose is now extending to other large cities all across the nation. A study by the JPMorgan Chase Institute also concluded that online gig work is unevenly distributed across the United States, but that participation in labor platforms is highest among those who experience the highest levels of income volatility — the young, the poor, and individuals living in the West.[10]

According to the Pew Research Center, 23% of those who utilize digital "gig" platforms for work are students; a majority describe themselves as being employed either full (44%) or part time (24%), but 32% say they are not employed. Workers who describe the income they earn from these platforms as "essential" or "important" are more likely to come from low-income households, to be non-white and to have not attended college. They are less likely to perform online tasks for pay, but more likely to gravitate towards physical tasks such as ride-hailing or cleaning and laundry. They are also significantly more likely to say that they are motivated to do this sort of work because they need to be able to control their own schedule or because there are not many other jobs available to them where they live.[11]

Brookings, JPMorgan Chase and McKinsey all estimate that roughly 1% of the U.S. working-age population, or about 2.5 million people, participates in contingent work transacted on a digital marketplace.[12]

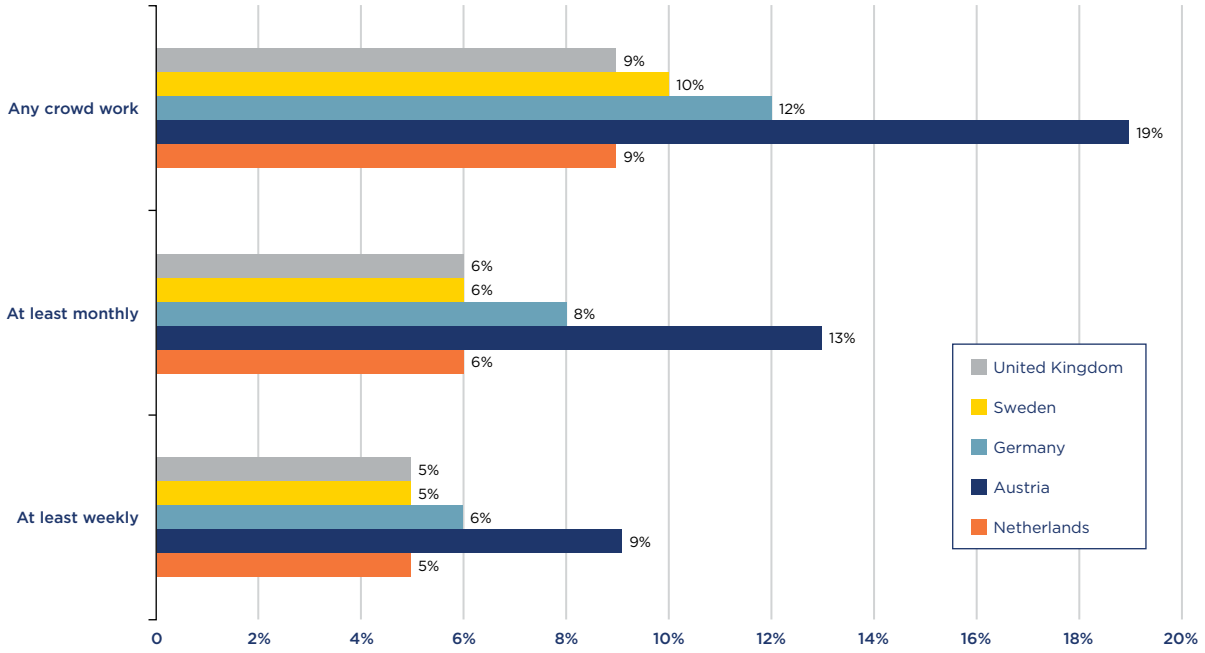
JPMorgan Chase, however, found that while only 1% of adults in their survey sample earned income from the online platform economy in a given month, 4% participated over a three year period, with most using the platform economy as a secondary source of income when outside income dipped or when they were between jobs. They estimate that between October 2012 and September 2015, 4.2% of adults, an estimated 10.3 million people — more than the total population of New York City — earned income on the platform economy, and that this number increased 47-fold over that period. They also estimate that those earnings represent roughly 20-30% of total income.[13] The Pew Research Center estimates that 2% of Americans earned money in 2016 by driving for ride-hailing services, and that an additional 6% earned money using digital platforms to take on other jobs or tasks.[14]

European Estimates

Oxford University's Online Labour Index (OLI) is a new economic indicator that provides an online labor market equivalent of conventional labor market statistics. Its weakness is that it only tracks English-language platforms, and so underplays online labor using non-English platforms. While English-language platforms are popular among employers and workers in non-English-speaking countries, the Index is likely to be biased toward English-speaking countries. Nevertheless, the OLI shows that U.S.-based employers account for 52%, and European employers an additional 16%, of the online labor market facilitated by English-speaking platforms. Of European countries, the UK accounts for 6.3% of the market, and non-UK European employers, notably from Germany, together account for approximately 10% of the market. India (5.9%), Australia (5.7%) and Canada (5%) round out the figures.[15]

The OLI also points to growth rates in online labor exceeding traditional payroll job growth. From May to September 2016, for instance, UK employers increased the volume of labor bought online by nearly 14%. Over the same period, there was a 7.5% rise elsewhere in Europe and 6% in the United States. These are striking figures when they are contrasted with growth rates in conventional labor markets. Moreover,

TABLE 3.4.1: PEOPLE DOING CROWD WORK, BY COUNTRY AND FREQUENCY



Source: Crowd Work in Europe, FEPS Studies, December 2016; Hertfordshire Business School Crowd Work Survey, 2016. Base: 2238 respondents in the UK, 2146 respondents in Sweden, 2180 Respondents in Germany, 1969 respondents in Austria and 2126 respondents in the Netherlands (weighted).

the online gig economy's growth over this period was driven more by skilled occupations than routine work.

Other European studies complement the OLI. One study[16] looked at people-per-hour and found that the majority of its users (63.5%) were based in the UK, with the next largest shares in India (9.9%), the United States (5.3%), Pakistan (2.6%), the Philippines (2.0%), South Africa (0.7%) and Canada (0.7%).

The University of Hertfordshire study also corroborates the studies cited earlier that crowd work is not the largest income-earner for individuals using the internet, but that it could be a significant source of income for a minority of the population. The study reported that crowd work had generated an income for 9% of the UK and Dutch samples, 10% in Sweden, 12% in Germany and 19% in Austria (Table 3.4.1).[17]

As mentioned earlier, many people use crowd work to supplement their income; it is not their main occupation. However 5% of the sample in the UK, Netherlands and Sweden perform crowd work at least weekly, with the proportion in each of these countries going up to 6% when asked whether they perform crowd work monthly. In Germany, the proportion doing so are a little higher (with 6% crowd working weekly and 8% crowd working monthly). Austria is at the top in both cases (9% weekly, 13% monthly).

Crowd work thus constitutes more than half of all income for 2.4% of the total sample in Austria, 2.6% in Germany, 1.7% in the Netherlands and 2.8% each in the UK and Sweden — forming the main source of income for an average of 2.5% of the samples across all five countries. The majority of crowd workers do so only occasionally. However between 6% and 13% of the online population do so at least monthly and between 5% and 9% at least weekly. Even for these, it is not necessarily the only source of income. There is a small minority (ranging from 3% of crowd workers in Austria and Germany to 11% in the Netherlands) for whom crowd work provides the only source of income. More significantly, crowd work constitutes more than half the income of around a third of crowd workers in the UK and Sweden (33% and 36% respectively), 25% in Germany and the Netherlands and 14% in Austria. Nevertheless, for the majority, crowd work represents a small supplement to their main income: with the largest group (ranging from 33% in Sweden to 58% in Austria) estimating that it represents less than 10% of their total income.[19]

Just as other elements of the digital economy are in dynamic motion, so too is the nature of work in the "gig" economy. A Thumbtack study concludes that the on-demand, low-skilled gig economy is unlikely to last, since these relatively commoditized, undifferentiated services are supplementing income, not generating middle-class lifestyles. Moreover, these tasks are overwhelmingly likely to be automated over time, performed by self-driving cars and drones. They conclude that the gig economy, as currently understood, will cease to exist in 20 years. Of course, given onrushing digital and technological change, one could argue that services not considered to be commoditized today could be commoditized tomorrow.

Nonetheless, they argue that the future gig economy is likely to consist more of skilled professionals who offer specialized expertise and services for clients, rather than commodity services for employers. These professionals are likely to use technology to give themselves greater personal flexibility and choice in their careers, rather than to look for traditional 9 to 5 employment.[20] Others argue that the use of independent contractors helps labor platform companies avoid basic protection for workers, such as overtime pay and minimum wages, and that even though the types of gig work may change, companies will continue to exploit legal loopholes until new laws are in place mandating that such workers be treated as employees.[21]

These predictions notwithstanding, it is fair to say that the gig economy, both in terms of shifting commoditized services and more flexible, professionalized crowd work, will increasingly shape the nature of labor markets — and the digital economies — of both the United States and Europe.

Endnotes

1. For a favorable view, see Arun Sundararajan, *The Sharing Economy: The End of Employment and the the Rise of Crowd-Based Capitalism* (Cambridge: MIT Press, 2016). For a critical account of the "gig economy" see Steven Hill, *Raw Deal: How the "Uber Economy" and Runaway Capitalism Are Screwing American Workers* (New York: St. Martin's Press, 2015).
2. Vili Lehdonvirta, "Which countries and occupations are embracing the online gig economy?" The iLabour Project, Oxford University, September 19. 2016,"http://ilabour.oii.ox.ac.uk/which-countries-and-occupations-are-embracing-the-online-gig-economy-ask-the-online-labour-index/; O. Kässi, & V. Lehdonvirta, V., "Online Labour Index: Measuring the Online Gig Economy for Policy and Research," Paper presented at Internet, Politics & Policy 2016, September, 22-23, 2016, University of Oxford, http://ilabour.oii.ox.ac.uk/online-labour-index/.
3. Ursula Huws, Neil H. Spencer and Simon Joyce, "Crowd Work in Europe," Foundation for European Progressive Studies, December 2016, http://www.uni-europa.org/wp-content/uploads/2016/12/2016-12-Crowd-work-in-Europe.pdf.
4. Timothy Taylor, "How Many in the Gig Economy?" Seeking Alpha, February 17, 2016, http://seekingalpha.com/article/3901316-many-gig-economy.
5. Ian Hathaway and Mark Munro, " Tracking the gig economy: New numbers," Brookings, October 13, 2016, https://www.brookings.edu/research/tracking-the-gig-economy-new-numbers/.
6. See Elka Torpey and Andrew Hogan, "Working in a gig economy," Bureau of Labor Statistics, May 2016, https://www.bls.gov/careeroutlook/2016/article/what-is-the-gig-economy.htm.
7. Hathaway and Munro, op. it.
8. Aaron Smith, "Gig Work, Online Selling and Home Sharing," Pew Research Center, November 17, 2016, http://assets.pewresearch.org/wp-content/uploads/sites/14/2016/11/17161707/PI_2016.11.17_Gig-Workers_FINAL.pdf.
9. Johana Bhuiyan, "Lyft says robots will drive most of its cars in five years," Recode, September 18, 2016, http://www.recode.net/2016/9/18/12955162/lyft-gm-self-driving-cars.
10. Diana Farrell and Fiona Greig, "Paychecks, Paydays and the Online Platform Economy," J.P. Morgan Chase Institute, February 2016, https://www.jpmorganchase.com/corporate/institute/document/jpmc-institute-volatility-2-report.pdf.
11. Smith, op. cit.
12. James Manyika, Susan Lund, Kelsey Robinson, John Valentino, Richard Dobbs, *A Labor Market that Works: Connecting Talent with Opportunity in the Digital Marketplace*, McKinsey Global Institute, June 2015.
13. They further estimate that earnings from labor platforms tend to substitute for a shortfall in non-platform income, whereas capital platform earnings tend to supplement non-platform income. See Farrell and Greig, op. cit.
14. Smith, op. cit.
15. The Online Labour Index, University of Oxford, http://ilabour.oii.ox.ac.uk/online-labour-index/.
16. Green, A. de Hoyos, M., Barnes, S-A, Baldauf, B. and Behle, H., "Crowdemploy Crowdsourcing Case Studies: an Empirical Investigation into the Impact of Crowdsourcing on Employability," European Commission Joint Research Centre Institute for Prospective Technological Studies, 2013, http://ftp.jrc.es/EURdoc/JRC85751.pdf.
17. Huws, et. al, op. cit.
18. Ibid.
19. Ibid.
20. Jon Lieber and Lucas Puente, *Beyond the Gig Economy: How New Technologies Are Reshaping the Future of Work*, Thumbtack, 2016, https://www.thumbtack.com/blog/beyond-the-gig-economy/.
21. "The Gig Economy's False Promise," *New York Times*, April 10, 2017, https://www.nytimes.com/2017/04/10/opinion/the-gig-economys-false-promise.html.

CHAPTER 5

Digital America, Digital Europe

Understanding the different modes of e-commerce or the significance of data flows is important but insufficient when it comes to measuring the digital economy. An important complement to such measures is to understand how various sectors of an economy, or particular segments of a country's population, are absorbing, assimilating and deploying digital capabilities and practices. The capacity to adopt and pioneer new technologies has proven to be the key for the United States and Europe to maintain their competitive edge and support their growth potential in the long term.

Digital America

The United States has become highly digitized. 98% of adults have access to high-speed internet and 87% use it, 69% of adults use smartphones, and 28% of payments are made digitally. But while U.S. companies and universities are recognized as digital leaders, many households and individuals are not as wired. McKinsey estimates that the U.S. economy as a whole is reaching only 18% of its digital potential, which it defines as the upper bounds of digitization in leading sectors of the economy.[1]

Digitization is happening unevenly across the United States, both across states and industries. The Center for Digital Government ranks Michigan, Missouri, Ohio, Utah and Virginia as among the leading "digital states," whereas it deems states such as Alabama, Louisiana, Nevada, New Jersey Alaska, Rhode Island, Wyoming and Kansas to be struggling.[2] In terms of industry, the information and communications technology (ICT) and media sectors and financial and professional services are surging ahead. Most sectors across the economy, however, are less than 15% as digitized as the leading sectors, and the gap has barely narrowed over the past decade. McKinsey sees this pattern at the company level as well as at the sector level, and refers to a widening gap between digital "haves" and "have-mores" as the most advanced users pull away from everyone else. This growing gap has profound consequences for business as well as labor. Workers in the most digitized industries enjoy wage growth that is twice the national average, while most U.S. workers in the broader economy face stagnant incomes and uncertain prospects.[3]

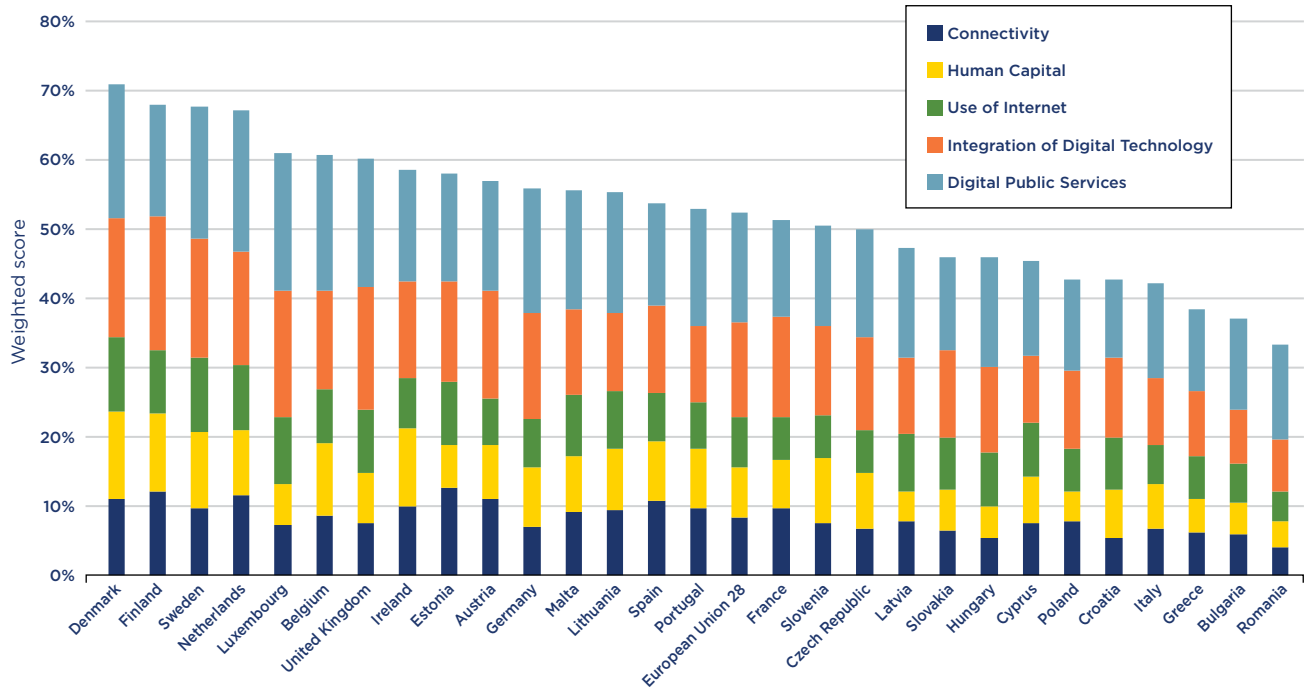
McKinsey estimates that U.S. utilities, mining and manufacturing are in the early stages of digitizing and connecting their physical assets, and could be at the forefront of a new wave of digitization. Labor-intensive industries such as retail and health care are expanding digital usage, but substantial parts of their large workforces do not use technology extensively. Industries that are both highly labor-intensive and localized, such as construction, leisure and hospitality, also tend to rank lower in usage, notably in the way they conduct customer transactions.[4]

Digital Europe

Like Americans, Europeans are heavily engaged in the digital world. 98% have advanced 3G mobile broadband coverage; 96% of millennials have used the internet in the past three months; 93% of enterprises have a fixed broadband connection; 83% of households have access to the internet in their homes; 76% of adults say they use the internet regularly; 61% look online for goods and services; 43% of individuals access the internet through a mobile phone; and 20% of enterprises buy cloud services used over the internet. Europe has been the incubator for world-beating digital firms such as Spotify, Skype, LEGO and AXA, and the home to thriving digital hubs, including Amsterdam, Berlin, Dublin, London, Paris, Helsinki, Tallinn and Stockholm. Many European firms are active in fast-growing areas; the largest digitized businesses are capturing 20-30% of revenue in big data and Internet of Things applications.[5] These and other positive developments given reason to believe that the digital gaps between Europe and the United States could narrow.

Nonetheless, Europe, like America, has a long way to go to tap fully the potential of digitization. McKinsey's

TABLE 3.5.1: DIGITAL ECONOMY AND SOCIETY INDEX, EU MEMBER STATES



Source: European Commission, Digital Scoreboard.[6]

Digitization Index shows that Europe overall operates at only 12% of its digital potential. Measured against total investment stock, McKinsey estimates Europe's asset base to be only 5% digitized. In terms of the usage of digital activities, European workplaces are only 9% digitized in terms of their digital potential.[7]

Like America, Europe is digitizing unevenly, with large variations across countries, sectors and firms. Countries like the United Kingdom and the Netherlands are net exporters of digital services to Europe, while Italy is a net importer. The ICT sector is at the digital frontier, and media, finance and professional services are close behind, but large, traditional sectors such as manufacturing and mining, quasi-public sectors such as health care and education, and highly localized and fragmented industries such as hospitality and construction, lag far behind. McKinsey estimates that qualities particular to specific economic sectors account for two-thirds of the variation in digital capability across Europe, and that the remaining third reflects individual country policies. Strategy&'s Industry Digitization Index generally corroborates those findings.[8]

The European Commission's DESI Index compares individual EU member states across five components of societal digitization. Table 3.5.1 underscores the uneven nature of the EU's digitization, with Denmark and its Nordic neighbors leading the field and northwestern EU member states turning in strong performances. The Index shows a clear divide, however, between north-western and south-eastern EU member states.

Comparing Digital America and Digital Europe

McKinsey's Country Digitization Index aggregates a variety of indicators from various sources measuring ICT supply and innovation, business use, consumer use, and government use to compare the digitization of selected economies. In each of these categories, Japan, Sweden, and the United Kingdom outperform the United States. The overall results place the United States only 11th among 34 OECD member states. Its performance is stronger on indicators that measure innovation and business use (such as business-to-business digital transactions and online advertising) than on consumer use, where it ranks 12th, reflecting the extent of its digital divide. The United States is among the lowest OECD countries for both household penetration and average speed of fixed broadband. It also posts some of the highest costs for high-speed broadband service.[9]

The World Economic Forum's Network Readiness Index compiles a related but somewhat different set of measures that assess the degree to which a particular country is

TABLE 3.5.2: THE NETWORKED READINESS INDEX 2016-2017, SELECTED COUNTRIES

RANK	COUNTRY	RANK	COUNTRY
1	Singapore	34	Malta
2	Finland	35	Spain
3	Sweden	36	Czech Republic
4	Norway	37	Slovenia
5	United States	40	Cyprus
6	Netherlands	41	Russian Federation
7	Switzerland	42	Poland
8	United Kingdom	45	Italy
9	Luxembourg	46	Macedonia, FYR
10	Japan	47	Slovak Republic
11	Denmark	48	Turkey
12	Hong Kong SAR	50	Hungary
13	Korea, Rep.	51	Montenegro
14	Canada	54	Croatia
15	Germany	59	China
16	Iceland	64	Ukraine
17	New Zealand	65	South Africa
18	Australia	66	Romania
19	Taiwan, China	69	Bulgaria
20	Austria	70	Greece
21	Israel	71	Moldova
22	Estonia	72	Brazil
23	Belgium	75	Serbia
24	France	76	Mexico
25	Ireland	84	Albania
29	Lithuania	91	India
30	Portugal	97	Bosnia and Herzegovina
32	Latvia		

Source: World Economic Forum.[10]

prepared to capitalize on the opportunities presented by the digital economy and make use of its network capital in a digitizing world.

The United States ranks 5th in the 2016-2017 Networked Readiness Index, moving up from 7th in 2015 and 9th in 2013.[11] According to the Index, the United States stands out in terms of its extremely favorable business and innovation environment (3rd), which has given rise to one of the most agile and digitized business sectors globally. The public sector is also using digital technologies effectively to deliver services to citizens (4th on Government Online Service index) and to facilitate participation (9th on the E-Participation Index). The overall impact of digital technologies in the United States is strong (it ranks 7th for both economic and social impacts) and growing.

Americans who *are* online lead highly digital lives. But U.S. households and individuals, on average, are less wired than those in northern Europe, Japan, South Korea, New Zealand and Israel. Nearly 80% of UK residents have ordered goods and services online; the share in the United States is less than 60%. More than 95% of 65-74-year-olds in Scandinavia use the internet, compared to less than 80% of U.S. seniors.[12] Much of Europe has also built impressive digital infrastructure. In fact, the United Kingdom leads the United States in terms of digital capital stock — resources that are key to developing new products and services, both tangible and intangible, for the digital economy.[13]

According to the 2016-2017 Networked Readiness Index, seven out of the top ten countries are European.[14]

The Nordic countries keep leveraging ICT and their digital economies to advance their national competitiveness strategies. Finland has extremely good access to the latest technologies (ranked 1st globally) as well as venture capital (6th), and its businesses are highly connected (5th on business usage). In Sweden, businesses are taking advantage of the fact that the country's consumer base is highly connected, which is reflected in one of the highest rates of business-to-consumer (B2C) e-commerce interaction globally (4th). Norwegian firms are also capitalizing on the high ICT literacy among the general population and workforce by using digital technologies heavily in their interactions with consumers as well as with each other (8th and 7th, respectively). Norway's digital economy is built on the very solid basis of top regulatory and innovation environments (6th and 7th, respectively) as well as the world's best ICT infrastructure. Norway is also moving up the rankings with regard to government promotion of advanced technologies, including in the digital realm, while both Finland and Sweden are perceived to be slipping.

The Netherlands remains one of the countries that makes the best use of digital technologies to achieve both economic and, in particular, social impacts. The Dutch population is one of the most technology savvy and connected in the world (8th for individual usage), an asset that both the government and the business sector are making good use of (3rd for B2C Internet use, 8th for the Government Online Service index, and 1st for the E-Participation index). Businesses are extensively deploying digital technologies to reshape their business and organizational models (4th in both indicators) and basic service providers, whether they are public or private, are working hand-in-hand with the population to facilitate access via their platforms (2nd). It

fell 2 spots from its ranking the year before because while it is near the digital frontier, other countries are moving even faster. This is true in particular for the business and innovation environment as well as ICT infrastructure. The Netherlands has enhanced its presence as a global leader in digital transfer by serving as a major port for traded goods as well as a hub for European data traffic. The McKinsey Global Institute ranks the Netherlands 2nd in country connectedness and in the top 10 for data flow, underscoring the crucial significance of open borders for data transfer and, subsequently, global competitiveness and innovation.[15]

Switzerland ranks 1st for business usage, driven by high business technology absorption and innovation capacity and high levels of digital business-to-business (B2B) interaction (interestingly, more than with consumers). This in turn has been generating strong economic impact (2nd rank), as reflected also in a steady upward trend in the share of knowledge-intensive jobs (3rd). But the government has been a less avid adopter and promoter of digitization, as reflected in a 43rd place for government usage. Although it is strong in the high-tech procurement market, it seems to be using digital technologies relatively less to interact with citizens.

The United Kingdom ranks 8th overall, thanks in particular to the fact that UK businesses are top in the world in making use of the Internet to interact with their consumers as well as with their production network (1st in B2C, 2nd in B2B). They are also pushing the boundaries in terms of using ICTs to reshape their business and organizational models (ranking 2nd and 1st, respectively). The government is also moving closer to the global frontier in terms of technology use, jumping six places into the top 10 of the government usage pillar.

Luxembourg ranks 9th, helped by its first-place showing with regard to a supportive political and regulatory environment and 2nd in individual usage. Government is perceived to play an important role in supporting Luxembourg's digital economy, with business executives attesting to a high importance of ICTs in the government's vision (5th) and its success in ICT promotion (6th). The country also achieved first place regarding the level of sophistication for ICT related laws (e.g., for e-commerce, digital signatures, and consumer protection). The country also boasts a top infrastructure with top ranks for international bandwidth (1st) and the number of secure servers per capita (3rd).

Europe's Uneven Landscape

Although Europe has high flyers, its performance range is uneven. Europe's divide runs essentially between "network-ready" western and northern Europe and less-ready countries in southern and eastern Europe. Estonia stands out as an important exception, ranking 22nd globally, ahead of countries like France and Belgium, and in terms of ICT infrastructure and digital content also ahead of Denmark, the Netherlands and the United Kingdom. Italy, the Slovak Republic, Poland, and the Czech Republic are making big strides, landing spots in the top 50. The only EU countries not among the top 50 are Croatia (54), Romania (66), Bulgaria (69), and Greece (70), all behind countries like South Africa and Ukraine.

In short, Europe is among the most networked regions in the world, but with some notable shortcomings.

Germany's 15th place rank is somewhat surprising, given the advanced nature of the German economy. It is still relatively difficult to start a new business, for example, and while Germany's infrastructure and skills base is one of the best in the world, fixed broadband prices are high and rising. Germany is one of the highest-scoring countries for business usage (6th), yet the government is not yet using digital technologies to their full potential (30th).

France is also behind in the rankings, placing 24th. France is the global leader in delivering public online services to its citizens and one of the best in terms of allowing their e-participation to the government's decision process (4th). Over the past year, the government has also increased efforts in promoting ICTs and providing a long-term vision for the sector, including a Digital Republic Bill aiming to guide the way in which the ICT revolution will shape French society in the future. French businesses have also stepped up their efforts to leverage ICTs, especially in terms of adopting new organizational models (26th, up 22 positions) and improving B2B transactions (33rd, up 11). The country can rely on a skilled workforce (18th) and on good infrastructure (22nd), allowing, among other things, one of the highest penetrations in the world of fixed broadband (4th). Issues remain especially in the environment for business, which has one of the highest taxation rates in the world.[16]

With an overall rank of 45th, Italy still ranks relatively low — but it climbed 10 places in the 2016 Index, due to a series of Italian government efforts to improve the provision of online services to its citizens and to create a better environment for start-ups and innovative companies. However, key constraints remain, including the lack of venture capital and the overall political and business environment. Here the country seems to be moving in the right direction, gaining in almost every aspect of the regulatory environment pillar, but it remaining far below the global average. Italy is currently doing best in

individual usage (37th), followed by business (52nd) and government use (62nd). Yet only a small portion of Italians are connected to fixed broadband: the number has been historically low but the gap with other advanced economies has only increased in recent years, when subscriptions per 100 people increased by less than 10 percent from 21.9 (28th highest, in 2010) to 23.5 (36th, in 2014).

While Italy's improvement reflects efforts by the national government to improve regulation and digital infrastructure, the country's performance is not uniform across the areas of networked readiness. Some areas, for instance, show an increase in the government's use of digital technology, while others show signs of deterioration. It seems the political and regulatory environment — for which Italy ranks 96th — still represents one of the country's Achilles heels.[17]

Moreover, overall Europe underperforms on its digital potential relative to the United States. The European digital frontier, represented by the ICT sector and its digitization of assets, uses, and labor, is only 60% as digitized as the U.S. frontier. Some large sectors, such as professional services, wholesale trade, and real estate, are further behind the digital frontier in Europe than they are in the United States. There are also large differences among Europe's countries. The United Kingdom, for instance, operates at 17% of its digital potential, France at the EU average of 12%, and Germany at only 10%.[18]

In sum, McKinsey estimates that, due to the digital gap between leading and lagging sectors and countries, Europe's economy operates at only 12% of the digital potential exhibited by companies at the digital frontier in the United States. If the European economy were to move towards digital maturity, there would be tremendous economic benefits for Europe. The situation is similar in the United States, where the largest economic sectors are also digital laggards. According to McKinsey, the U.S. economy is operating at only an estimated 18% of the potential shown by the digital frontier.

TABLE 3.5.3: SHARE OF DIGITIZATION POTENTIAL REALIZED COMPARED TO THE DIGITAL FRONTIER

United States	18%
United Kingdom	17%
Netherlands	15%
Sweden	15%
Europe*	12%
France	12%
Germany	10%
Italy	10%

**Weighted average of six countries that make up 60% of Europe's population and 72% of GDP*
Source: McKinsey Global Institute.[19]

Transatlantic Digital Interdependencies

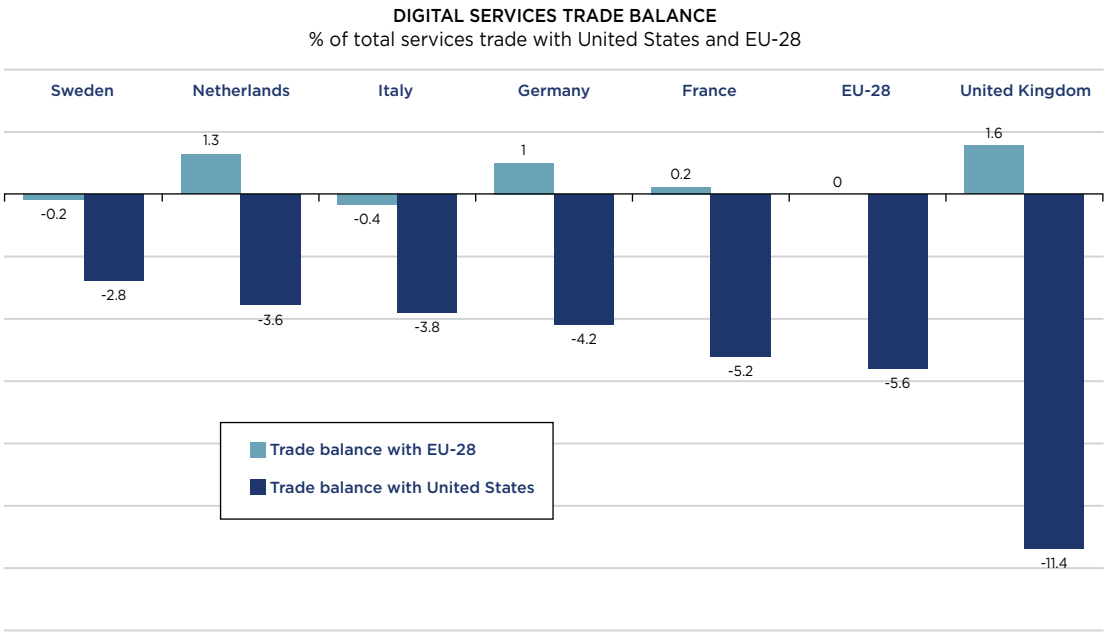
As we discussed in Section 2, Europe is a net importer of U.S. digital services, running a digital trade deficit amounting to nearly 5.6% of total U.S.-EU services trade. McKinsey finds that much of Europe relies on imports of U.S. technology for its own digital development. Ultimately, Europe does not rival the United States as a producer of global content, a creator of major platforms, or an incubator of successful internet companies. Measured by market capitalization, for instance, there are no European firms among the 20 largest digital companies. The proliferation of digital "unicorns" — start-ups with billion-dollar valuation — has not occurred in Europe as broadly and to the same extent as it has in the United States. Venture capital and growth investments are four times as high in the United States as in Sweden, and ten times as high as in Germany.[20]

Although many European countries rank relatively high on digitization overall compared with the United States, the United States is the dominant supplier of digital technologies to the world, including Europe. Among all publicly listed companies in the global ICT sector, U.S.-based firms account for nearly half of worldwide sales and two-thirds of post-tax profits. European firms generate only 17% of global revenue and 14% of worldwide profits. Of the 250 largest ICT firms in the world, 75 are from the United States and 50 from Japan; EU-15 countries together account for only 45 firms on the list.[21]

Nevertheless, some European firms have been highly successful, becoming digital giants. Among the world's largest ICT firms, the smaller number of European companies account for 22% of global sales, only slightly less than U.S. firms' 30% share. European firms are also showing promise in the new wave of industrial digitization, for instance accounting for a 21% share globally in Internet of Things companies, compared to only a 5% share by Chinese and Japanese companies (U.S. companies command a 74% share), and a 32% share of big data companies, compared to only a 6% share by Chinese and Indian companies and a 2% share by Japanese and Korean companies (U.S. companies command a 60% share).[22]

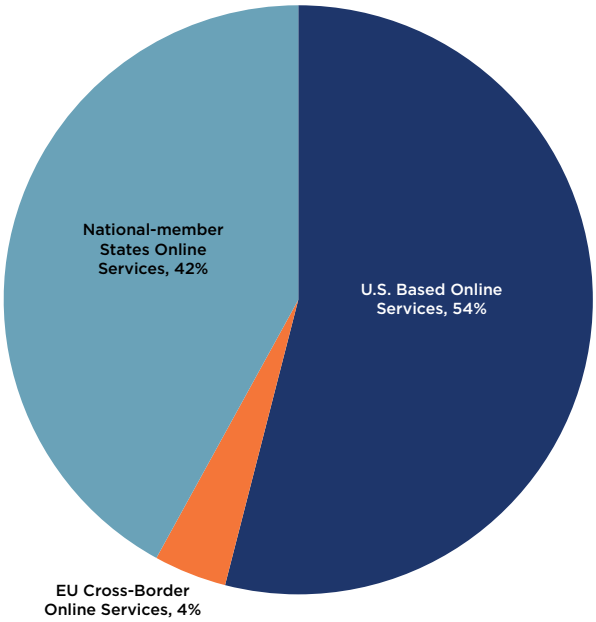
Domestic consumption is the primary driver of digitization in the European economy. However, the overall contribution of digital to GDP is reduced by the

TABLE 3.5.4: EUROPE IS DEPENDENT ON THE UNITED STATES FOR THE SUPPLY OF DIGITAL ASSETS



Source: Jacques Bughin, Eric Hazan, Eric Labaye, James Manyika, Peter Dahlström, Sree Ramaswamy, and Caroline Cochin de Billy, Digital Europe: Realizing the continent's potential, McKinsey Global Institute, June 2016, http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/digital-europe-realizing-the-continents-potential.

TABLE 3.5.5: THE DIGITAL MARKET IN EUROPE



Source: World Development Report 2016: Digital Dividends. Data as of: January 2016.

fact that Europe imports a significiant amount of its digital capability. There are two broad types of such imports: digital hardware, primarily from Asia; and digital platforms, largely from the United States. The U.S digital economy also relies on hardware imports from Asia. Its homegrown digital platforms mean that the United States ranks high as a supplier of digital capabilities to the global and European economies. One study notes that the share of online services imported from the United States is "very substantial" but that 32% of U.S. online service providers export, and that these exports account for nearly twice as much as domestic demand.[23] The World Bank notes that around 42% of all online services trade volume in the EU is domestic and that 54% comes from the United States. Moreover, about two-thirds of all EU online services suppliers do not operate in more than four countries.[24]

Endnotes

1. U.S. Council of Economic Advisers, "Mapping the digital divide," Issue brief, July 2015, https://www.scribd.com/document/271665456/Mapping-the-Digital-Divide; Brian Fung, "37 million Americans don't use the Web. Here's why you should care," *The Washington Post*, The Switch blog, July 29, 2015; James Manyika, Sree Ramaswamy, Somesh Khanna, Hugo Sarrazin, Gary Pinkus, Guru Sethupathy, and Andrew Yaffe, *Digital America: A tale of the haves and have-mores*. San Francisco. McKinsey Global Institute, December 2015,http://www.mckinsey.com/industries/high-tech/our-insights/digital-america-a-tale-of-the-haves-and-have-mores.
2. For more on digital disparities across U.S. states, counties and cities, see the various surveys conducted by the Center for Digital Government at http://www.govtech.com/cdg/.
3. Ibid; David Author and David Dorn, "The growth of low-skill service jobs and the polarization of the US labor market," American Economic Review, volume 103, number 5, August 2013.
4. Manyika, et. al, op. cit.
5. Jacques Bughin, Eric Hazan, Eric Labaye, James Manyika, Peter Dahlström, Sree Ramaswamy, and Caroline Cochin de Billy, *Digital Europe: Realizing the continent's potential*, McKinsey Global Institute, June 2016, http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/digital-europe-realizing-the-continents-potential.
6. http://digital-agenda-data.eu/charts/desi-composite/embedded#chart={"indicator":"DESI_SLIDERS","breakdown":{"DESI_1_CONN":5,"DESI_2_HC":5,"DESI_3_UI":3,"DESI_4_IDT":4,"DESI_5_DPS":3},"unit-measure":"pc_DESI_SLIDERS","time-period":"2017"}.
7. Ibid. Strategy&, *The 2012 Industry Digitization Index*, http://www.strategyand.pwc.com/media/file/The-2012-industry-digitization-index.pdf.
8. Ibid;
9. Manyika, et. al, op. cit; World Economic Forum, "Networked Readiness Index 2016," http://reports.weforum.org/global-information-technology-report-2016/networked-readiness-index/; OECD.
10. World Economic Forum, op. cit.; also World Economic Forum, "Global Information Technology Report 2016, Executive Summary, http://reports.weforum.org/global-information-technology-report-2016/executive-summary/.
11. World Economic Forum, "Country and regional trends from the NRI," http://reports.weforum.org/global-information-technology-report-2016/country-and-regional-trends-from-the-nri/#view/fn-24.
12. Bughin, op. cit; Manyika, op. cit.; World Economic Forum, "Networked Readiness Index 2016," op. cit.
13. Ibid.
14. Ibid.
15. J. Manyika, S. Lund, J. Bughin, J. Woetzel, K. Stamenov, and D. Dhringra, *Digital Globalization: The New Era of Global Flow*s. McKinsey Global Institute, March 2016, http://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/digital-globalization-the-new-era-of-global-flows.
16. World Economic Forum, "Country and regional trends from the NRI," op. cit.
17. Antonio Vetrò, "Italy is giving itself a digital makeover. Here's how," World Economic Forum, September 30, 2016, https://www.weforum.org/agenda/2016/09/italy-global-information-technology-report-2016.
18. Bughin, et. al, op. cit.
19. Ibid.
20. Ibid.
21. Ibid.
22. Ibid; Statista.com; J.P. Morgan.
23. Georgios Alaveras and Bertin Martens, "International Trade in Online Services," European Commission Joint Research Centre, Institute for Prospective Technological Studies, 2015, https://ec.europa.eu/jrc/sites/jrcsh/files/JRC97233.pdf.
24. World Bank, *World Development Report 2016: Digital Dividends*, http://documents.worldbank.org/curated/en/896971468194972881/pdf/102725-PUB-Replacement-PUBLIC.pdf.

SECTION FOUR

Challenges

Challenges

Just as digitization's advance faces various barriers in both Europe and the United States, it also confronts societies on each side of the Atlantic with a host of legal, economic, societal and normative questions. Let's look at these challenges.

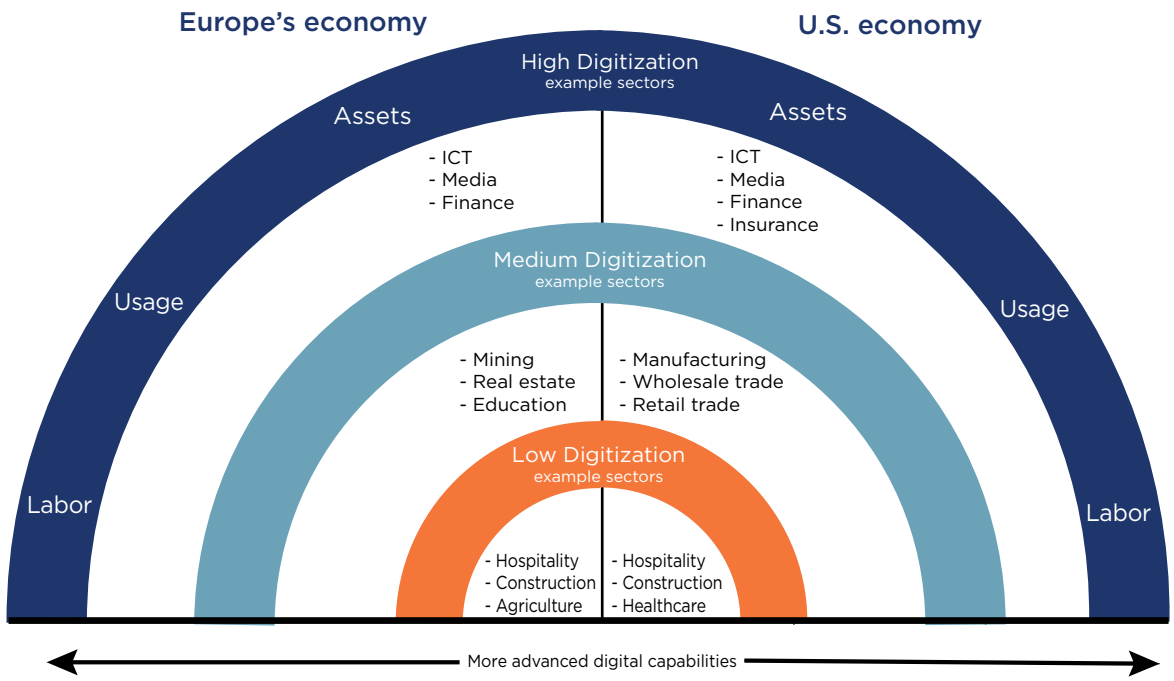
Despite the remarkable advance of the transatlantic digital economy, various hurdles challenge the ability of the United States and Europe to take fuller advantage of digitalization.

Digital Divides

Each side of the Atlantic faces a divide between economic sectors pushing towards the digital frontier and those lagging behind. Table 4.1 illustrates this divide, and also highlights the fact that the same industries tend to be at the frontier — and lag behind — on both sides of the Atlantic. The fact that this sectoral divide is similar in Europe and the United States offers a basis for more concerted transatlantic efforts to exchange good practice to accelerate digitization of lagging sectors of the economy.

This sectoral division also highlights a second common challenge: the digital divide between large and small firms. Since large firms tend to be more digitized than small ones, countries whose average firm size tends to be smaller may be further away from capturing the full potential of digitization. This can be significant for a country like Italy, where large firms account for only about 30% of

TABLE 4.1: DIGITAL LEADERS AND LAGGARDS IN EUROPE AND THE UNITED STATES



Source: McKinsey Global Institute.[1]

employment, compared to countries like the United States and the United Kingdom, where large firms account for more than half of overall employment. Prioritizing efforts to encourage small-firm digitization could be particularly significant not only for Italy, but also for Europe, since microenterprises with fewer than ten employees make up 18% of employment in Europe, compared to only 8% in the United States.[2]

Fragmented Markets

Europe's fragmented markets and regulatory heterogeneity not only hamper Europe's digital potential, they hold back the full promise of the transatlantic digital economy.

In and of themselves, platforms favor no one, they offer a level digital field of potentially global reach. Companies can prosper to the extent they are able to take advantage of such scale and related network effects. American and Chinese platform companies have been successful in part because their large domestic markets and relatively homogenous regulatory frameworks enable them to gain size and strength at home before venturing abroad. European companies, in contrast, have struggled to achieve scale and network effects, despite efforts such as the European Single Market and the Digital Single Market.

As we showed in chapter 2.2, e-commerce within individual European markets is growing exponentially, yet cross-border e-commerce across European borders still accounts for only a small fraction of the total. Different national regulatory environments have fractured European service markets in an era in which scale and seamless commercial flows are essential components of competitiveness. E-merchants seeking to conduct cross-border commerce in Europe cite fragmented legal, taxation, logistics and distribution systems, as well as the complexity of offering alternative payment methods, as among the most difficult barriers they must overcome.[3] Just the cost of legal fees required to comply with different national regulations are estimated at 9,000 euros per country, so that an e-commerce retailer might face a total of a quarter of a million euros in additional costs simply to be present in all EU member state markets. This is prohibitive for small- and medium-sized companies, which stand to be among the greatest beneficiaries of the digital economy.[4]

Localization requirements are another prominent hurdle. Such barriers include policies that require the in-country location of data servers; policies that require local content or technologies; and government procurement preferences and standards that favor local companies. Such barriers can reduce market access, increase costs to firms, result in less efficient business processes,[5] and present consumers with fewer choices at higher prices. Geo-blocking, which encompasses the blocking or modification of digital content (including offers of physical goods and services) based on a customer's nationality or place of residence, is a glaring example of how national laws restrict businesses from serving customers across European borders.[6]

Just within the EU alone, the Belgian think tank ECIPE has identified 22 data localization measures where EU member states impose restrictions on the transfer of data to other member states, and another 35 restrictions on data usage that could indirectly localize data within an individual member state.[7] One result is that two-thirds of all demand for ICT-related services is sourced locally within each member state, while only 18% is sourced from the rest of the EU and only about 13% sourced from outside the EU. ECIPE estimates that if these localization measures were removed, EU GDP would increase by €8 billion a year (up to 0.06% of GDP), which is on par with the gains of recent free trade agreements (FTAs) concluded by the EU.[8]

These challenges are not limited to Europe. In 2015, a European Commission survey found that only 37% of websites, including those in the United States, actually allowed cross-border customers to reach the final step before completing the purchase by entering payment details.[9] Nevertheless, the hurdles seem highest in Europe.

The result of this fragmentation is visible in Europe's low 10% worldwide share of "unicorn" technology companies with a valuation of $1 billion or more; the fact that more than half of European unicorns are now owned by American corporations; and that the EU's largest technology unicorn, music-streaming service Spotify, has repeatedly signaled that it is prepared to move operations from Stockholm to the United States should the regulatory and business environment in the EU and Sweden stay unchanged.[10]

These challenges, in turn, are accentuated by Europe's varied reactions to the platform economy.[11] For instance, Barcelona fined Airbnb for breaking local property rental laws, while Amsterdam passed legislation to encourage more local sharing services. Berlin banned short-term rental services like Airbnb, while Paris has allowed home owners to use apartment-sharing services to rent out their flats as long as they fulfill certain safety requirements. Uber had been outlawed in Germany until Frankfurt overturned a ban in September 2016. Portugal has come to the sharing economy regulation game later and has seemingly benefited from other countries' missteps, on both ends of the spectrum. Recently, the country drafted a new rental law that will not only help Airbnb

and similar businesses grow, but also encourage home owners to register their property and — more importantly — pay taxes.[12]

Once again, Europe is not alone in this hodgepodge reaction; a number of U.S. cities and states have responded to platforms in a variety of ways. Nonetheless, due to Europe's fragmented markets, such efforts add another level of complexity and uncertainty to cross-border digital commerce on the continent.

Challenges to the Digital Single Market

The EU has sought to address these issues with its Digital Single Market (DSM) initiative, which encompasses an ambitious regulatory overhaul made up of 16 initiatives in three areas. The first area tackles barriers to consumer and business access to digital goods and services across Europe. The second seeks establish a technical framework that can facilitate greater cross-border digital commerce and boost the EU's network environment. The third seeks to improve growth opportunities for start-ups and other companies that are either challenged by, or in a position to benefit from, digital transformation and the need for improved digital skills. A set of additional initiatives have also been passed, including the General Data Protection Regulation (GDPR), new regulations on net neutrality, abolishing of roaming charges, and efforts to tackle geo-blocking.[13]

While these efforts show promise and generally point in the right direction, critics have identified three major concerns with the DSM strategy.

The first concern is the speed of law vs. speed of light problem: legislative implementation lags woefully behind fast-moving digital developments. This is not a problem exclusive to the EU, but the need to harmonize legislation not only within EU member states but among them adds an additional layer of complexity and a great deal more time to the legislative process.[14] It also costs money. A European Parliament study noted that a number of rather substantial barriers within the EU could reduce the value of potential increased use to up to €18 billion in the shorter-term and up to €134 billion in the medium and longer term, depending on the scale of regulatory obstacles.[15] EU-wide directives continue to face challenges of uneven implementation. For instance, despite the European Commission's efforts to ban geo-blocking, online stores across the continent keep refusing customers from other countries, charging higher prices to foreign customers or creating virtual boundaries in some other way.[16] The Commission has launched investigations to assess if certain online sales practices prevent, in breach of EU antitrust rules, consumers from enjoying cross-border choice and being able to buy consumer electronics, video games and hotel accommodation at competitive prices.[17]

The second concern is that the DSM strategy is focused almost exclusively on tackling digital barriers, whereas the main obstacles to the EU's digital future are its non-digital barriers. Creating a genuine non-digital European Single Market is arguably the most fundamental precondition to facilitate structural economic change and to create a true cross-national DSM.[18]

The Single Market is both the bedrock of European integration and the EU's most potent instrument to address the challenges and opportunities of the digital age. Yet in many ways it remains a dream unfulfilled. Regulatory barriers persist all across the Union, while subsidies, tax schemes and other arrangements protect relatively unproductive companies from competition. A more complete and vibrant Single Market would provide countries and companies with a stronger geoeconomic base in a world of continental-sized players. It would give EU countries greater opportunities to exploit their full comparative advantage, and would give EU companies new possibilities to restructure their activities on a pan-European scale.[19]

Third, the narrow focus on digital also forgoes the opportunity to use the current digital transformation to open up EU services markets. The services economy is the EU's biggest untapped source of jobs, economic growth, and digital transformation. While the EU-wide Services Directive has helped to forge a more coherent approach to services within the EU, it is not fully implemented, and excludes such critical areas of potential innovation and productivity growth as financial services, health, employment and social services. One study found that if the Services Directive were fully implemented, it could deliver more than 600,000 new jobs and boost GDP growth in the EU by up to 1.5%. And if services competition in the eurozone was raised to U.S. levels, the European Central Bank estimated that services sector output could be increased by 12%. Since the digital economy is integrally linked to the services economy, a Services Single Market would accelerate the Digital Single Market as well. Moreover, a true Single Market in Services would also position the EU well internationally, since the EU is a world-class leader in services trade and investment.[20]

From Cold War to Code War

Every day, millions of cyberattacks are launched against targets in Europe and the United States, as well as in

many other countries. The Pentagon alone reports more than 10 million efforts at intrusion each day.[21] Germany's army was targeted 284,000 times by cyber attacks in the first three months of 2017.[22] Each side of the Atlantic is challenged by cyberthreats and what Alec Ross has dubbed "the weaponization of code." The pervasive nature of the internet, together with the proliferation and democratization of digital technologies, has created a breathtaking set of vulnerabilities.[23] Cyberattacks can be directed from one country to another, from a country to a company or a company to a country. Digitally-empowered individuals or crowd-sourced hackers, often with no return address, can cause as much damage as conventional military forces. 10 years ago, malicious digital activities did not register at all on the list of major threats to U.S. national security compiled by the Director of National Intelligence. In 2015, they ranked first.[24]

Russian cyber-hacking of the Democratic National Committee in the United States is a recent and emblematic example of such attacks. But Russian hackers have also attacked the German Bundestag, France's TV5 Monde and Poland's Warsaw stock exchange. In 2007 Estonia was subjected to distributed denial-of-service attacks for weeks following a dispute with Russia about moving a World War II memorial to Soviet soldiers, and its Baltic neighbors Lithuania and Latvia have also been targeted by escalating cyberattacks. Georgia and Ukraine were attacked in similar fashion during Russia's 2008 and 2014 invasions of these two countries. In many ways, Ukraine has in fact become a training laboratory for novel attack techniques on critical infrastructures that could be used in other countries; since 2015 the country's power facilities, its national railway system and the Ministry of Finance have all been subject of attacks. [25]

"The world has left the Cold War behind only to enter into a Code War,"[26] notes Ross. NATO allies have determined that cyber defense is integral to the Alliance's core task of collective defense, have recognized cyberspace as a domain of operations in which NATO must defend itself as effectively as it does in the air, on land and at sea, and have initiated collaboration with the European Union and with industry. The United States and a number of European nations have established their own cyber commands, and the United States and the EU have each adopted cybersecurity strategies to address these challenges.[27] These efforts, however, are still proving insufficient to the challenges. After Russia's interference with the 2016 U.S. election, for instance, President Barack Obama felt the need to reclassify American elections as a 'critical infrastructure' warranting protection under U.S. Homeland Security guidelines. Yet government weather forecasting and GPS satellites, which are crucial to protect and enable critical infrastructure, are not yet included. NATO nations have agreed to prioritize seven baseline requirements for greater resilience, including to digital threats, yet they are being addressed on a country-by-country basis, thus ignoring the deep connections binding European national infrastructures to one another and the reality that resilience efforts, to be effective, must be shared — not only by public authorities, but also in partnership with the private sector, which owns much of the West's critical infrastructure.[28]

Public-private resilience partnerships are especially urgent because U.S. and European companies are the world's leading targets of cyberattacks by states, terrorists and criminals.[29] Malware is becoming ubiquitous, and ransomware attacks, where companies are forced to pay ransoms to avoid losing data or having systems shut down, have become mainstream. In recent years hackers have compromised more than 500 million Yahoo accounts, 117 million LinkedIn user emails and passwords, and 85 million accounts from the video sharing platform Daily Motion.[30] Ninety percent of Citibank's networks across North America were taken down by a disgruntled employee.[31] The list goes on. According to Gemalto's Breach Level Index (BLI), of the 1.4 billion data records lost or stolen from corporations worldwide in 2016, over 82% occurred in the United States and in Europe.[32]

U.S.-EU Differences: Privacy, Hate Speech, and Intellectual Property

These examples underscore that the United States and Europe face a number of common challenges in the digital world. Yet the transatlantic digital economy is also held back by basic EU-U.S. differences on a range of issues, including privacy and personal data, rules regarding hate speech and fake news, and intellectual property protection.

Privacy. While the EU and the United States each protect privacy and personal data, their approaches in how to safeguard these rights differ in some respects. The EU's revised General Data Protection Regulation, which will come into force in 2018, replaces 28 different national laws with one single set of rules for data protection, sharing and privacy in Europe's Digital Single Market. The United States, in contrast, has no single, comprehensive federal (national) law regulating the collection and use of personal data. Instead, a collection of federal and state laws and regulations reigns, supplemented by an additional thicket of self-regulatory guidelines and frameworks by governmental agencies and industry groups that are considered "best practices" and that are increasingly being used as tools for regulatory enforcement.[33] These differing legal frameworks can

cause transatlantic frictions, even though each party is committed to protecting privacy and personal data.

In recent years the United States and the European Union have struggled to craft agreed procedures that protect national security in ways that respect basic human rights. In January 2014, in the wake of the Snowden leaks and with the U.S. intelligence community under intense pressure from critics at home and abroad, President Obama issued Presidential Policy Directive 28 (PPD 28), which extends privacy protections to non-U.S. citizens should their personal data be obtained incidentally as part of U.S. surveillance targeting other individuals.[34]

Despite this promise, in 2015, the European Court of Justice (ECJ) invalidated a basic U.S.-EU agreement known Safe Harbor, which at the time was one of the primary ways that U.S. and EU companies could legally transfer commercial data on EU citizens outside of the EU. The ECJ's invalidation of the agreement caused significant uncertainty for U.S. businesses operating in Europe, particularly small businesses that could not readily afford to build alternative legal channels for transferring data.

To address this, the United States and the EU negotiated a new agreement with the EU, known as the Privacy Shield, to replace the Safe Harbor agreement. The Privacy Shield is currently in effect, and thousands of U.S. and EU companies have signed up to it. The main points of the agreement include stronger obligations on companies in the United States to protect the personal data of EU citizens and stronger monitoring and enforcement by the U.S. Department of Commerce and Federal Trade Commission; clearer conditions, limitations and oversight regarding personal data transfers; several redress possibilities to ensure effective protection of EU citizens' rights; and an annual joint review mechanism.[35]

The European Commission has committed to defending the Privacy Shield before the ECJ, but both its ability and willingness to do so depend on the U.S. maintaining its privacy commitments, most of which are currently contained in U.S. law, particularly the USA Freedom Act and the Judicial Redress Act. Both are important foundations for the new Privacy Shield, as is PPD 28.

A related agreement is the U.S.-EU Umbrella Agreement protecting personal information exchanged as part of law enforcement cooperation. This includes information on suspects and convicted persons, but also innocent victims and witnesses. The Umbrella Agreement, which came into force on February 1, 2017, represents a common transatlantic privacy framework based on high standards.[36]

Another foundational element is Title VII, Section 702 of the U.S. Foreign Intelligence Surveillance Act (FISA) Amendments Act, which will expire on December 31, 2017 unless Congress acts to extend the law. Section 702 allows warrantless surveillance of non-U.S. citizens believed to be outside of the U.S., and has provided the authority for the PRISM and UPSTREAM surveillance programs that enable interception of high volumes of internet data and telephone traffic, which have become so controversial in U.S.-EU relations. Surveillance under Section 702 was at the heart of the ECJ's decision to strike down the Safe Harbor arrangement.[37]

Various stakeholders, particularly in Europe, have been critical of the oversight mechanisms for privacy violations and what they believe to be inadequacies in the limitation on collection, access and use of personal data.[38] They argue that the U.S. is not fully compliant with all of its commitments under Privacy Shield, including not having a permanent independent ombudsperson in place.[39] They also argue that there are many ways the U.S. could reform Section 702 to better protect human rights without undermining the security of U.S. citizens or others around the world. Others, particularly in the United States, are concerned that such limitations could endanger national security. As of this writing, the balance is holding. Yet if these foundational elements fall away, the tortuous issues that have plagued U.S.-EU relations will be back on the table, chilling the transatlantic digital economy as well as overall transatlantic commerce.[40]

Hate speech, fake news, and consumer protection. Both the United States and Europe are challenged by online hate speech, illegal content, and digital fraud, yet each side of the Atlantic has different laws and tools to tackle these challenges.

Many EU countries, for instance, have specific laws that criminalize certain types of speech, whereas the First Amendment to the U.S. Constitution guaranteeing free speech has been interpreted by U.S. courts in ways that permit a broader range of speech, although also with some narrow exceptions. As a result, U.S. platforms have come under fire in a number of European countries for alleged failures to remove such content promptly from their sites. Germany has been the most vociferous critic, and has presented a draft law that would fine social networks up to €50 million for failing to remove slanderous or threatening online postings.

In May 2016 a number of U.S. companies agreed with the European Commission on a code of conduct that committed them to review and remove illegal hate speech from their

respective platforms within 24 hours. Germany's new draft rules would turn those commitments into legal obligations.[41]

There is also growing concern on both sides of the Atlantic about fake news being circulated on social media platforms. In December 2016 Facebook began rolling out new tools in the United States to prevent the spread of misinformation, working with a number of fact-checking partners.[42] In January 2017 the company announced it would start filtering fake news for users in Germany.[43] The German government, however, has charged that some companies have been less effective than others.[44]

In addition, the European Commission in March 2017 launched an initiative to ensure that social media platforms' terms of services are brought into conformity with European consumer law. The Commission has challenged companies to ensure that EU consumers have judicial redress in their own country, not just before courts in the United States; that consumers have the right to withdraw from online purchases; that terms of service cannot limit social media networks from liability when it comes to performance of services; that sponsored content be identified as such; and that digital scams and fraud be removed from digital sites.[45]

Intellectual property challenges. Copyright law has struggled to adapt to the digital world. Content providers are concerned about internet piracy and inadequate compensation by digital service providers. Platform companies, in turn, are concerned that they could be held liable for infringements or illegal conduct of users of their systems, whose actions they do not control, due to unclear or excessively broad legal frameworks.[46]

In the United States, fair-use exceptions for copyright and intermediary liability protection have been key to enabling the growth in platform companies and the digital economy.[47]

In Europe, however, debates rage. The European Commission has presented a legislative package to modernize EU copyright rules, including a new directive on copyright in the Digital Single Market, that could require digital service providers to monitor user-uploaded content and license the use of short digital excerpts from publishers. Some EU member states, such as Germany and Spain, require search engines and news aggregators to pay copyright fees to publishers when they display short excerpts from their articles. In Spain, Google closed the Spanish version of Google in response. In Germany, major publishers decided to waive their rights so they would still be indexed by such search engines.[48]

Data and Trade

Digital flows have become the lifeblood of world trade and the global economy. Recent estimates suggest that the potential economic growth to be realized from liberalizing barriers to internet access and digital trade across the G20 could be as much as $4.2 trillion. Realizing this opportunity, however, will depend heavily on removing constraints that inhibit universal internet access and preventing the emergence of new barriers to digital trade.[49]

Some of the most important hurdles to digital commerce are conventional barriers rooted in the analog economy. These include onerous customs procedures and duties. In a recent survey, 44% of European e-commerce businesses reported that logistics and distribution are the most difficult barriers to cross-border digital trade.[50] Basic differences among postal regimes can also confound small- and medium-sized companies engaged in e-commerce. Traditional barriers to services trade are also major impediments to digital commerce.[51] Simplifying and harmonizing such standard regulations could go far to enhance the efficiency of global digital trade.[52]

Beyond these traditional barriers, a range of novel impediments to digital trade have arisen. Those include widely differing approaches to data privacy and protection, data localization requirements, shortcomings in achieving a balanced intellectual property regime for the digital environment, legacy financial services regulations, and increasing instances of online censorship.[53]

Protection of personal data has become a major issue in global trade.[54] Over 100 countries either have in place or are developing personal data protection regulations, many of which differ considerably from country to country.

Some restrictions are designed to protect individual privacy rights or enhance national security. Others are protectionist measures designed to shield domestic services, content and production from outside competition. They may sound appealing to local politicians, but they can serve to limit domestic economies from leveraging the economic and social benefits of data flows and find themselves unable to access cloud services, internet-connected machines, or content produced through online collaborations with trading partners.[55]

The EU and U.S. can play a role in guiding the international community towards harnessing the potential — and navigating the challenges — associated with data flows for economies and for global trade in an inclusive and open manner.[56]

For example, negotiations for a Trade in Services Agreement (TiSA), under way since April 2013, aim to establish global minimum requirements for trade in sectors such as financial, digital and transport services. Participants include the United States, the EU, and 21 other WTO members, who together account for 70% of global trade in services. The TiSA is expected to establish new market access commitments and universal rules that reflect 21st century trade, and agreement between the United States and the EU is likely to be decisive.

Unfortunately, the two sides have failed to unite behind common principles. Since the EU considers data protection to be a non-negotiable fundamental right, not a trade barrier to be used as a bargaining chip in a trade negotiation, the European Commission prefers to deal with countries bilaterally, agreeing to cross-border data transfers only after officials scrutinize the partner country's privacy laws and determine that they are equivalent to those in place within the EU. This makes it difficult for the EU to negotiate a plurilateral deal like TiSA.

Meanwhile, the EU's General Data Protection Regulation, set to go into effect in 2018, expands the number of options deemed acceptable by EU authorities when it comes to legitimizing international data transfers, but still maintains that data is prohibited from being transferred outside the EU without approval from an EU supervisory authority.[57]

The United States and others who want to move ahead with a TiSA provision on free flow of data argue that if the European Commission doesn't come along, there will be a chill to digital trade with the EU. Similar challenges await the EU in other trade deals it is negotiating.[58]

The Changing Nature of Work

Perhaps the most significant challenge facing the UnitedStates and Europe is the potential impact of the digital economy on jobs and the nature of work. Forecasts vary widely. Some see boundless opportunities in previously unimagined job categories, enhanced productivity and liberation from mundane routines. Others project massive dislocation and unemployment, widening skills gaps and growing income disparities.

Isolating digitization's particular influence on labor markets is no easy task. The European and North American economies are in a continuous state of flux. Every hour, hundreds and even thousands of jobs appear and disappear for many reasons: technological progress, changing consumer tastes, demographic changes, migration flows, energy and raw materials costs, cyclical fluctuations, government policy changes, uneven productivity performances, and many other powerful factors that shape the competitive clash of companies. Many different factors simultaneously affect the demand for labor, the labor supply, the level and cost of wages across each continent.[59]

Given the economy's churn, it is exceedingly difficult to differentiate between job losses or job gains caused by digitization and those caused by these other factors. Each affects the others in many different ways. These factors are tied up with one another in one great knot. Untangling that knot, and pulling out the digitization strand cleanly, is exceedingly difficult. Nevertheless, as digital technologies automate many human tasks, it is clear that the nature of work will change profoundly.[60]

Debate has been fueled by a variety of studies. In 2013, researchers at Oxford University estimated that around 47% of total U.S. employment had a "high risk of computerisation" by the early 2030s.[61] This finding was largely corroborated by McKinsey, which estimated in 2015 that some 45% of U.S. employees' work time was spent on tasks that could be automated with existing technologies.[62]

Others aren't so sure. In 2016 a team of OECD researchers drew on an extensive new OECD data set to review the Oxford University study, and arrived at much lower estimate that only around 10% of jobs were under "high risk of computerisation".[63] They argued that predictions of job automation should focus more on specific tasks related to particular jobs rather than on whole occupations.[64]

A 2017 study by PriceWaterhouseCoopers, in turn, drawing on previous research, estimates that around 38% of existing U.S. jobs, 35% of German jobs, and 30% of UK jobs could be at potential risk of automation by the early 2030s. They conclude that the most exposed sectors in the UK include wholesale and retail trade, manufacturing, administrative and support services, and transport and storage. They estimate that in the United States, three of the same four sectors are exposed (administrative and support services being the exception), with the finance, accommodation and food service, and information and communications sectors also most exposed than in the UK. In Germany, construction is the most exposed sector, along with transport and storage, manufacturing, and finance and insurance.[65]

While these studies arrive at different conclusions, each focuses narrowly on the technical feasibility of automation displacing jobs, while a host of additional factors are likely to be equally relevant.

Just because it is technically feasible to replace a human worker with a robot does not necessarily mean that it makes economic sense to do so. The marginal cost of replacing a worker with a robot system in manufacturing, for instance, is approximately $130,000 today, whereas the marginal cost of applying AI software to a radiology or financial services task may be quite low and the productivity gains quite high.[66] Autonomous cars raise a host of safety, liability and regulatory concerns that range far beyond pure technical feasibility. Such factors suggest that digitization's impact on jobs is likely to be quite uneven sector-by-sector and country-by-country, and in many instances over longer time horizons than envisaged by some.[67]

Projections such as those cited above also tend to ignore the economy's churn, and in particular the fact that digitization is also creating new jobs, occupations and even sectors of the economy. By bringing supply and demand together in real time, the platform economy is making many markets more efficient, is matching labor to employment needs more effectively, and is enabling workers to better map out their education and career pathways.[68] In many industries and countries, the most in-demand occupations or specialties did not exist ten or even five years ago, and the pace of change is set to accelerate. By one popular estimate, 65% of children entering primary school today will ultimately end up working in completely new job types that don't yet exist.[69] Unfortunately, it is much more difficult to quantify the effects of future jobs and professions that today do not even exist. One study estimated that in 2013 around 6% of all UK jobs, and 10% of all London jobs, were of a kind that did not exist in 1990, and that by 2030 at least 5% of UK jobs may be in areas related to new robotics/AI of a kind that do not even exist now. Some studies project that digitization could lead to entirely new employment structures in which some percentage of workers shift between various forms of employment and will at times have multiple, simultaneous workplaces. This is already becoming apparent, as more and more workers exist simultaneously in multiple worker categories. Once again, official statistics have not yet caught up with these changing realities.[70]

Furthermore, digitization should generate productivity gains that cause additional higher average real income levels and spending that will support additional jobs, particularly in sectors that are less easy to automate, such as healthcare and other personal services, where robots are more likely to complement and enhance, rather than replace workers.[71] This digitally-enabled productivity surge has, however, not yet come to pass. In fact, over the past decade productivity growth in advanced economies has slowed significantly. Various explanations have been given for this, for instance, the shift from generally higher-productivity manufacturing economies to lower-productivity services economies; a slower rate through which digital innovations radiate through the economy; that businesses lag in harnessing the full potential of digitization; and that such technological advances boost productivity only after a gestation period.[72] Whatever the causes, projections of employment effects become difficult.

Widening Skills Gaps

What the debate on digitization's impact on jobs makes clear, however, is that skills and continuous learning matter more than ever.[73] The World Economic Forum estimates that by 2020, more than a third of the desired core skill sets of most occupations will be comprised of skills that are not yet considered crucial to the job today. They also underscore that social skills such as persuasion, emotional intelligence and teaching others will be in higher demand across industries than narrow technical skills, such as programming or equipment operation and control.[74] Individuals who are able and disposed to adapt and reskill throughout their working lifetimes are more likely to ride the digital wave than those who are not.[75]

For all the talk of job losses due to digitization, and despite relatively high unemployment in a number of European countries, especially among the young, the European Commission is concerned that the EU could actually face a shortage of up to 900,000 skilled ICT workers by 2020, due to mismatches between demand and skills. The Commission estimates that around 40% of people in the EU workforce do not have adequate digital skills and that 14% have no digital skills at all.[76] Skills gaps are also apparent in the United States, where there were 353,000 open jobs per month in the manufacturing industry through August 2016.[77]

A related concern is that digitization could accelerate income disparities. Income inequality is greater in the United States than in any other democracy in the developed world, and it is growing in Europe. By eliminating some routine jobs while requiring new skills in others, digitization rewards those who can adapt successfully, while those with less education and skills fall behind. Automation and digital technologies have reduced the need for many production, sales, administrative and clerical jobs, while demand has increased or low-skilled jobs that are harder to automate. The result is what MIT economist David Autor calls a "barbell-shaped" economy with strong demand at the high and low ends and a "hollowing out" of the middle.[78] Between 2000 and 2015, the United States created eight million net new full-time equivalent positions; 5.36 million of those were in low-skill interactive work and the remaining 2.64 million in high-skill interactive work.

But during this period, some 2.5 million net medium-skill jobs were lost.[79] McKinsey finds that automation could displace anywhere from 10-15% of middle-skill jobs in the decade ahead.[80]

Conclusion

In short, the net long-term effect of digitization on total employment in the United States and Europe could be either positive or negative.[81] Yet digitization has clear implications for skills development, and offers a cautionary note regarding income disparities.[82] Opportunities for lifelong vocational education and training to help people adapt to increased automation is becoming an imperative to success in the digital economy.[83] Workers will need to adapt to changing employment possibilities and be prepared for many jobs during their working life. Yet it is even more important to ensure that labor flexibility does not lead to precarious living standards. Both public and private leaders must address the need for economic security as workers adapt to changing circumstances.[84]

Endnotes

1. Jacques Bughin, Eric Hazan, Eric Labaye, James Manyika, Peter Dahlström, Sree Ramaswamy, and Caroline Cochin de Billy, *Digital Europe: Realizing the continent's potential*, McKinsey Global Institute, June 2016, http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/digital-europe-realizing-the-continents-potential; James Manyika, Sree Ramaswamy, Somesh Khanna, Hugo Sarrazin, Gary Pinkus, Guru Sethupathy, and Andrew Yaffe, *Digital America: A tale of the haves and have-mores*. San Francisco. McKinsey Global Institute, December 2015,http://www.mckinsey.com/industries/high-tech/our-insights/digital-america-a-tale-of-the-haves-and-have-mores.
2. Ibid; Jacques Bughin and James Manyika, "The mobile Internet's consumer dividend," McKinsey Quarterly. February 2014.
3. "European ecommerce players still have trouble selling abroad," E-Commerce News, May 25, 2016, https://ecommercenews.eu/european-ecommerce-players-still-trouble-selling-abroad/#more-6945;Keira McDermott, "Key Business Drivers and Opportunities in Cross-Border Commerce," Payvision, 2016, http://www.payvision.com/downloads/key-business-drivers-and-opportunities-2016.pdf.
4. Hendrik Enderlein, Paul-Jasper Dittrich, David Rinaldi, "#DigitalAmitié. A Franco-German Axis to Drive Digital Growth and Integration," Jacques Delors Institute, March 2017, footnote 11, http://www.delorsinstitut.de/2015/wp-content/uploads/2017/03/20170310_DigitalEconomicSchengen-DittrichEnderleinRinaldi-EN-JDIB-7.pdf.
5. U.S. International Trade Commission, "Digital Trade in the U.S. and Global Economies, Part 1." Investigation No. 332-531. USITC Publication 4415. July 2013. p. xxi.
6. Matthias Bauer, Right Direction, *Wrong Territory. Why the EU's Digital Single Market Raises Wrong Expectations*. Washington, DC: American Enterprise Institute, 2017; U.S. International Trade Commission, op. cit.; "Consumers still face restrictions while shopping online in Europe," E-Commerce News, December 14, 2016, https://ecommercenews.eu/consumers-still-face-restrictions-shopping-online-europe/#more-8225; Kati Suominen, "Silver bullet for helping small businesses trade: Plurilateral agreement on de minimis," E15 Initiative, March 2016, http://e15initiative.org/blogs/silver-bullet-for-helping-small-businesses-trade-plurilateral-agreement-on-de-minimis; Usman Ahmed and Grant Aldonas, "Addressing Barriers to Digital Trade," E15 Initiative, December 2015, http://e15initiative.org/wp-content/uploads/2015/09/E15-Digital-Economy-Ahmed-and-Aldonas-FINAL-2.pdf.
7. Matthias Bauer, Martina F. Ferracane, Hosuk Lee-Makiyama, Erik van der Marel, "Unleashing Internal Data Flows in the EU: An Economic Assessment of Data Localisation Measures in the EU Member States," ECIPE, December 2016, http://ecipe.org/publications/unleashing-internal-data-flows-in-the-eu/.
8. Ibid.
9. McDermott, op. cit.
10. Enderlein, et. al, op. cit, footnote 1.
11. Amit Peri, "The sharing economy: shaking up Europe, unifying the U.S.," Geektime, September 28, 2014, http://www.geektime.com/2014/09/28/the-sharing-economy-shaking-up-europe-while-unifying-the-u-s/
12. Ibid.
13. Bauer, op. cit.
14. Enderlein, et. al, op. cit.; Pierre Goudin, *The Cost of Non-Europe in the Sharing Economy*, European Parliamentary Research Service, January 2016, http://www.europarl.europa.eu/RegData/etudes/STUD/2016/558777/EPRS_STU(2016)558777_EN.pdf.
15. Ibid.; Robert Vaughan, "Disruption in unexpected sectors and corporates adapting their business models; find out what's next for the sharing economy in our 2017 predictions," PriceWaterHouseCoopers, February 8, 2017, http://pwc.blogs.com/megatrend_matters/2017/02/disruption-in-unexpected-sectors-and-corporates-adapting-their-business-models-find-out-whats-next-f.html.
16. "Consumers still face,..." op. cit.
17. European Commission, "Antitrust: Commission opens three investigations into suspected anticompetitive practices in e-commerce," February 2, 2017, http://europa.eu/rapid/press-release_IP-17-201_en.htm.
18. Bauer, op. cit.
19. Ibid.
20. For a review of various studies and policy conclusions, see Daniel S. Hamilton, *Europe 2020: Competitive or Complacent?* (Washington, DC: Center for Transatlantic Relations, 2011), Chapters 2 and 19.
21. Joseph S. Nye, Jr., "Deterrence and Dissuasion in Cyberspace," *International Security*, Vol. 41, No. 3, Winter 2016/17, p. 47; Brian Fung, "How Many Cyberattacks Hit the United States Last Year? Nextgov, March 8, 2013, http://www.nextgov.com/cybersecurity/2013/03.
22. http://www.euractiv.com/section/cybersecurity/news/germany-rolls-out-new-cyber-defence-team/
23. Alec Ross, *The Industries of the Future*, New York: Simon & Shuster, 2016, p. 134.
24. Nye, op. cit., pp. 44-71; James Clapper, "Statement for the Record: Worldwide Threat Assessment of he U.S. Intelligence Community," Senate Armed Services Committee, 114th Congress, 2nd session, February 9, 2016; Greg Allen, "America's plan for stopping cyberattacks is dangerously weak," Vox, March 27, 2017.
25. Franklin D. Kramer, Robert Butler, and Catherine Lotrionte, "How to Stop Russia's Hacking, U.S. News and World Report, August 12, 2016, https://www.usnews.com/opinion/articles/2016-08-12/how-the-us-can-fight-back-against-russias-cyberattacks; Janosch Delcker, " Germany fears Russia stole information to disrupt election," *Politico*, March 20, 2017, http://www.politico.eu/article/hacked-information-bomb-under-germanys-election/; Charley Snyder and Michael Sulmeyer, "The Department of Justice Makes the Next Move in the U.S.-Russia Espionage Drama," Lawfare, March 16, 2017, https://lawfareblog.com/department-justice-makes-next-move-us-russia-espionage-drama; Kim Zetter, "The Ukrainian Power Grid was Hacked Again," Motherboard, January 10, 2017, http://motherboard.vice.com/read/ukrainian-power-station-hacking-december-2016-report; Allen, op. cit.; Dmitri Alperovitch, "Bears in the Midst: Intrusion into the Democratic National Committee," Crowdstrike, June 15, 2016, https://www.crowdstrike.com/blog/bears-midst-intrusion-democratic-national-committee/; John Leyden, " Russia's to blame for pro-ISIS megahack on French TV network," The A Register, June 10, 2015, https://www.theregister.co.uk/2015/06/10/russian_trolls_staged_tv5monde_megahack_shocker/.
26. Ross, op. cit., p. 121.
27. U.S. Department of Defense, "The DOD Cyberstrategy 2015,"https://www.defense.gov/Portals/1/features/2015/0415_cyber-strategy/Final_2015_DoD_CYBER_STRATEGY_for_web.pdf
28. Daniel S. Hamilton, ed., *Forward Resilience: Protecting Society in an Interconnected World*. Washington, DC: Center for Transatlantic Relations, 2016; Kaveh Waddell, " Why Elections Are Now Classified as 'Critical Infrastructure'," *The Atlantic*, January 13, 2017, https://www.theatlantic.com/technology/archive/2017/01/why-the-government-classified-elections-as-critical-infrastructure/513122/; Mackenzie Eaglen, "Rebuild our Defenses for the Information age," *Wall Street Journal*, March 21, 2017, https://www.wsj.com/articles/rebuild-our-defenses-for-the-information-age-1490138210.

29. Frédérick Douzet and Sébastien Héon, "Companies at risk from political cyberattacks," *Europe's World*, June 7, 2016, http://europesworld.org/2016/06/07/companies-risk-political-cyberattacks/#.WN_Ka0Z1rX4.
30. Ross, op. cit., pp. 142-143; Nye, op. cit., p. 48; Jason Healey, ed., *A Fierce Domain: Conflict in Cyberspace*, 1986 to 2012. Washington, DC: Atlantic Council, 2013; Kenneth Geers, ed., *Cyber War in Perspective: Russian Aggression against Ukraine*. Talinn: NATO, 2015.; Lorenzo Franceschi-Bicchierai, "Another Day, Another Hack: 117 Million LinkedIn Emails and Passwords," Motherboard, May 18, 2016, http://motherboard.vice.com/read/another-day-another-hack-117-million-linkedin-emails-and-password; Robert McMillan, "Yahoo Says Information on at Least 500 Million User Accounts Was Stolen," *The Wall Street Journal*, September 22, 2016, http://www.wsj.com/articles/yahoo-says-information-on-at-least-500-million-user-accounts-is-stolen-1474569637; Riley Walters, "Cyber Attacks on U.S. Companies in 2016," Heritage Foundation, December 2, 2016, http://www.heritage.org/defense/report/cyber-attacks-us-companies-2016#_ftn20.
31. News release, "Former Citibank Employee Sentenced to 21 Months in Federal Prison for Causing Intentional Damage to a Protected Computer," U.S. Department of Justice, U.S. Attorney's Office, Northern District of Texas, July 25, 2016, https://www.justice.gov/usao-ndtx/pr/former-citibank-employee-sentenced-21-months-federal-prison-causing-intentional-damage.
32. Gemalto, "Mining for Database Gold. Findings from the 2016 Breach Level Index," http://breachlevelindex.com/assets/Breach-Level-Index-Report-2016-Gemalto.pdf.
33. See Ieuan Jolly, "Data protection in the United States: overview," Thomsen Reuters Practical Law, https://content.next.westlaw.com/6-502-0467?__lrTS=20170402131916664&transitionType=Default&contextData=(sc.Default)&firstPage=true&bhcp=1.
34. The key passage in PPD-28 is "All persons should be treated with dignity and respect, regardless of their nationality or wherever they might reside, and all persons have legitimate privacy interests in the handling of their personal information. U.S. signals intelligence activities must, therefore, include appropriate safeguards for the personal information of all individuals, regardless of the nationality of the individual to whom the information pertains or where that individual resides."
35. Tracey Stretton and Lauren Grest, "How will the new EU-US privacy shield fit with the upcoming General Data Protection Regulation?" SC Magazine, April 22, 2016, https://www.scmagazineuk.com/how-will-the-new-eu-us-privacy-shield-fit-with-the-upcoming-general-data-protection-regulation/article/531527/#_ftn1.
36. "Speech of Commissioner Jourova at event organized by the Center for Strategic and International Studies," March 31, 2017, https://ec.europa.eu/commission/commissioners/2014-2019/jourova/announcements/speech-commissioner-jourova-event-organized-center-strategic-and-international-studies_en.
37. https://www.accessnow.org/new-call-u-s-surveillance-reform/2http://curia.europa.eu/juris/document/document.jsf;jsessionid=9ea7d2dc30d5852f28e96d934651aa32917a242c53e3.e34KaxiLc3qMb40Rch0SaxyKch10?text=&docid=169195&pageIndex=0&doclang=EN&mode=lst&dir=&occ=first&part=1&cid=633385
38. Amie Stepanovich, "Written Remarks for the German Parliament Committee of Inquiry, September 8, 2016," https://www.accessnow.org/cms/assets/uploads/2016/09/StepanovichWrittenTestimony-GermanBundestag1stCoI.pdf; Amie Stepanovich, "A New Call for U.S. Surveillance Reform," Access Now, December 13, 2016, https://www.accessnow.org/new-call-u-s-surveillance-reform/; https://www.accessnow.org/cms/assets/uploads/2016/03/Priv-Shield-Coalition-LtrMar2016.pdf; https://www.accessnow.org/cms/assets/uploads/2017/02/Letter-to-Jourova.pdf.
39. "Speech of Commissioner Jourova..." op. cit.
40. Letter from Congressman James Sensenbrenner to President-elect Donald Trump, December 20, 2016, http://sensenbrenner.house.gov/uploadedfiles/privacy_shield_letter.pdf; Natalia Drozdiak and Sam Schechner, "Concerns Loom Over a Data-Sharing Pact to Protect Privacy of Europeans; Tech firms, officials say they don't know how President Trump will deal with Privacy Shield agreement," Wall Street Journal (Online), February 8, 2017.
41. Caroline Copley and Eric Auchard, "Facebook moves to head off tighter regulation in Germany," Reuters, January 17, 2017, http://www.reuters.com/article/us-germany-facebook-idUSKBN1502CA; Jeremy Malcolm, " Upload Filtering Mandate Would Shred European Copyright Safe Harbor," Electronic Frontier Foundation, October 12, 2016, https://www.eff.org/deeplinks/2016/10/upload-filtering-mandate-would-shred-european-copyright-safe-harbor.
42. Sam Shead, "Facebook exec says they haven't figured out how to delete fake news content that could trigger €50 million fines in Germany," Business Insider, March 15, 2017, http://www.businessinsider.com/facebook-fake-news-50-million-fine-not-simple-2017-3
43. Kif Leswing, "Facebook will filter 'fake news' in Germany," Business Insider, January 15, 2017, http://www.businessinsider.com/facebook-tests-fake-news-filtering-in-germany-2017-1?r=DE&IR=T.
44. Natasha Lomas, "Facebook, Twitter still failing on hate speech in Germany as new law proposed," Tech Crunch, March 14, 2017, https://techcrunch.com/2017/03/14/facebook-twitter-still-failing-on-hate-speech-in-germany/.
45. European Commission, "The European Commission and Member States consumer authorities ask social media companies to comply with EU consumer rules," March 17, 2017, http://europa.eu/rapid/press-release_IP-17-631_en.htm.
46. U.S. International Trade Commission, op. cit.
47. https://investor.twitterinc.com/secfiling.cfm?filingID=1564590-17-2584&CIK=1418091
48. Ibid; Goudin, op. cit.; Chris Spillane, "Publishers to get power to sue internet platforms," *Politico*, March 8, 2017, http://www.politico.eu/pro/publishers-spar-with-internet-platforms-over-copyright-fight-yahoo-google; Jasper Jackson, "New EU copyright rules could boost media groups," *The Guardian*, September 14, 2016, https://www.theguardian.com/media/2016/sep/14/eu-copyright-rules-media-youtube-google-news-facebook; Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, "Online Platforms and the Digital Single Market. Opportunities and Challenges for Europe," May 25, 2016, http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1466514160026&uri=CELEX:52016DC0288.
49. Ahmed and Aldonas, op. cit.; D. Dean, S. DiGrande, D. Field, A. Lundmark, J. O'Day, J. Pineda, and P. Zwillenberg, "The Internet Economy in the G-20: The $4.2 Trillion Growth Opportunity," Boston Consulting Group, 2012, March 2012, https://www.bcg.com/ documents/file100409.pdf.
50. Ahmed and Aldonas, op. cit.; "Ecommerce Europe wants to improve parcel delivery market," E-Commerce News, April 23, 2015.
51. Joshua P. Meltzer, "The Internet and international data flows in the global economy, " E16 Initiative, Mary 27, 2016, http://www.ictsd.org/opinion/the-internet-and-international-data-flows-in-the-global-economy.
52. Ahmed and Aldonas, op. cit.
53. Ahmed and Aldonas, op. cit.; U.S. International Trade Commission, op. cit.
54. Swedish Board of Trade, No Transfer, *No Trade — the Importance of Cross-Border Data Transfers for Companies Based in Sweden*, January 2014, http://www.kommers.se/Documents/dokumentarkiv/publikationer/2014/No_Transfer_No_Trade_webb.pdf.

55. Michael I. Roth, "How Data Restrictions Hurt the Global Economy," *Information Week*, March 3, 2015, http://www.informationweek.com/strategic-cio/executive-insights-and-innovation/how-data-restrictions-hurt-the-global-economy-/a/d-id/1319301.
56. Meltzer, op. cit.
57. These options include binding corporate rules, standard contractual clauses adopted by the Commission, an approved code of conduct, an approved certification mecchanism, and other contractual clauses authorized by a data protection authority. See Stretton and Grest, op. cit.; "Amidst political uncertainty, new updated secret documents on the "Trade in Services Agreement (TISA)" are leaked," Bilaterals.org, January 30, 2017, http://www.bilaterals.org/?amidst-political-uncertainty-new.
58. Catherine Stupp, "European Commission paralysed over data flows in TiSA trade deal," Euractiv, October 11, 2016, https://www.euractiv.com/section/trade-society/news/european-commission-paralysed-over-data-flows-in-tisa-trade-deal/.
59. See Walter Nonnemann, "European Immigration and the Labor Market," Migration Policy Institute/Bertelsmann Foundation, July 2007; Daniel S. Hamilton and Joseph P. Quinlan, "Globalization's Impact on Employment and Wages in Europe," chapter 10 in Daniel S. Hamilton and Joseph P. Quinlan, *Globalization and Europe. Prospering in the New Whirled Order*. Washington DC Center for Transatlantic Relations, 2008.
60. Manyika, et. al, op. cit.
61. C.B. Frey and M.A. Osborne, "The Future of Employment: How Susceptible are Jobs to Computerisation?" University of Oxford, 2013, http://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf.
62. Michael Chui, James Manyika, and Mehdi Miremadi, "Four fundamentals of workplace automation," McKinsey Global Institute, November 2015.
63. M. Arntz, T. Gregory and U. Zierahn, 'The risk of automation for jobs in OECD countries: a comparative analysis', OECD Social, Employment and Migration Working Papers No 189, 2016.
64. D.H. Autor, "Why are there still so many jobs? The history and future of workplace automation," *Journal of Economic Perspectives*, 29(3), 2015, pp.3-30.
65. PriceWaterhouseCoopers, "UK Economic Outlook," March 2017, http://www.pwc.co.uk/economic-services/ukeo/pwc-uk-economic-outlook-full-report-march-2017-v2.pdf.
66. Roger Burkhardt and Colin Bradford, "Addressing the Accelerating Labor Market Dislocation from Digitalization," Brookings, March, 2017, https://www.brookings.edu/wp-content/uploads/2017/03/global_20170320_accelerating-labor-market-dislocation.pdf.
67. PriceWaterhouseCoopers, "UK Economic Outlook," op. cit.
68. JManyika, et. al, op. cit;
69. World Economic Forum, The Future of Jobs...", op. cit.
70. Ursula Huws, Neil H. Spencer and Simon Joyce, Crowd Work in Europe, FEPS Studies, December 2016, http://www.uni-europa.org/wp-content/uploads/2016/12/2016-12-Crowd-work-in-Europe.pdf.
71. Manyika, et. al, Digital America, op. cit.; PriceWaterhouseCoopers, "UK Economic Outlook," op. cit.
72. Andrew Haldane, "Productivity puzzles," Speech to the London School of Economics, March 20, 2017, Bank of England, http://www.bankofengland.co.uk/publications/Documents/speeches/2017/speech968.pdf; OECD Compendium of Productivity Indicators 2016, http://www.keepeek.com/Digital-Asset-Management/oecd/industry-and-services/oecd-compendium-of-productivity-indicators-2016_pdtvy-2016-en#page20; "Technology isn't working," *The Economist*, October 4, 2014, http://www.economist.com/news/special-report/21621237-digital-revolution-has-yet-fulfil-its-promise-higher-productivity-and-better.
73. Manyika, et. al, Digital America, op. cit.
74. World Economic Forum, "The Future of Jobs...," op. cit.
75. PriceWaterhouseCoopers, "UK Economic Outlook," op. cit.
76. Andrus Ansip, "Digital skills, jobs and the need to get more Europeans online," March 23, 2015, https://ec.europa.eu/commission/commissioners/2014-2019/ansip/blog/digital-skills-jobs-and-need-get-more-europeans-online_en.
77. Anna Louie Sussman, "As Skills Requirements Increase, More Manufacturing Jobs go Unfilled," Wall Street Journal, September 1, 2016; John Arensmeyer, " Closing The Skills Gap: Small Businesses Get Creative To Address Worker Training Shortfalls," The Huffington Post, December 14, 2016, http://www.huffingtonpost.com/john-arensmeyer/closing-the-skills-gap-sm_b_13635204.html.
78. Cited in David Rotman, "Technology and Inequality," *MIT Technology Review*, March 21, 2014, https://www.technologyreview.com/s/531726/technology-and-inequality/.
79. Manyika, et. al, *Digital America*, op. cit.
80. Ibid.
81. PriceWaterhouseCoopers, "UK Economic Outlook," op. cit.
82. See Diana Farrell and Fiona Greig, "Paychecks, Paydays and the Online Platform Economy," J.P. Morgan Chase Institute, February 2016, https://www.jpmorganchase.com/corporate/institute/document/jpmc-institute-volatility-2-report.pdf.
83. PriceWaterhouseCoopers, "UK Economic Outlook," op. cit.
84. Richard Baldwin, *The Great Convergence*. Cambridge, MA: Harvard University Press, 2016, p. 237; PriceWaterhouseCoopers, "UK Economic Outlook," op. cit.; Manyika, et. al, *Digital America*, op. cit.

SECTION FIVE

Opportunities

Opportunities

The transatlantic economy is undergoing an unprecedented digital transformation. It is reshaping how we buy, sell, learn, work and play. Its potential is enormous. The digital transformation is becoming the single most important means by which both sides of the Atlantic can reinforce their bonds and position themselves for a world of more diffuse power and intensified competition.[1]

Europe and North America are bound in many ways. Geopolitics focuses on alliances and states. But we should also think of networks and webs. The transatlantic digital economy is a vibrant mesh binding the two sides of the Atlantic together in ways that are critical to our prosperity, our security, and our democracy. It is time "to integrate statecraft with webcraft, the art of designing, building, and managing networks," Anne-Marie Slaughter says, and to "think in terms of translating chessboard alliances into hubs of connectedness and capability."[2]

The best place to start is with the transatlantic community. Each side of the Atlantic is committed to basic human rights grounded in the rule of law and underpinned by open societies, open economies, and open digital links. Together North America and Europe have tremendous opportunity to pioneer strong international governance standards for an open internet that safeguard those rights at a time when countries like China and Russia are pushing very different, closed visions.

U.S. and European policymakers are more likely to advance these goals together if they are better able to understand the stake each side of the Atlantic has in a vibrant transatlantic digital economy.

The digital economy is both strengthening the transatlantic economy and transforming it. It is lowering marginal production and distribution costs, reducing the cost of participating in cross-border trade, helping to match supply and demand in real time, sparking innovation, and offering consumers more choices at lower prices. Individuals are participating in the transatlantic digital economy directly, using platforms to learn, build personal networks, find and offer work, showcase their talent, and make more effective use of unused or underutilized assets such as spare bedrooms, cars or tools. Digital transformation is expanding the potential of many traditional jobs and creating new jobs that were unimaginable only a few years ago. Digital marketplaces for services are creating flexible work opportunities that could boost labor force participation.[3]

The digital economy offers opportunity to independent creators to compete with large businesses in producing content such as music, films, and books. It can help farmers track machinery, soil and weather conditions, and crop growth to improve yields and farm efficiency. It makes it easier for small and medium-sized enterprises to export and to connect with customers and suppliers globally. Telemedicine, molecular nanotechnology and synthetic biology are poised to change the future of agriculture, manufacturing, medicine, and human health. In the United States alone, big data analytics in health care and government could produce some $150 billion to $300 billion in cost savings—and even bigger returns in the form of better health, more effective public services, and improved quality of life.[4]

McKinsey points to advances in analytics, automation, and the Internet of Things, along with innovations in areas such as materials science, that are already showing great promise at reducing resource consumption. Examples include smart lighting and intuitive thermostats that are significantly reducing electricity consumption in homes and businesses; algorithms that optimize robotic movements in ways that can reduce a manufacturing plant's energy consumption by as much as 30%; and cement-grinding plants that can cut energy consumption by 5% or more with customized controls that predict peak demand.[5]

Digital transformation is at the heart of a transatlantic economy that is stronger, faster, and more dynamic. Digital transformation is evident all across the Atlantic space. The EU's Digital Agenda seeks to connect all residences

to broadband (at least 30 mbps) and 50% of all households to superfast broadband (100 mbps or greater) by 2020. Siemen's Digital Factory is providing digitally integrated hardware, software and technology-based services to U.S. manufacturing companies all across the United States. General Electric is opening "digital foundries" across Europe to incubate startups, improve collaboration and drive digital ecosystem growth. Cisco has joined with the Government of France to promote a digital transformation of the entire country. Germany's *Industrie 4.0* promises to infuse digital innovation into the powerful German manufacturing sector and beyond. The UK is expanding innovation centers to promote digital advances in energy, transport, health care and education. Cities and rural areas across both continents are embracing digitization with projects that are generating billions of dollars in value in terms of reduced costs, productivity gains, and increased revenues.[6]

Digitization's impact is only likely to accelerate. Cross-border digital flows are of particular relevance to Europe, which has the largest share of intraregional data flows among all regions. The EU's Digital Single Market promises to improve digital cross-border flows, capitalize on Europe's inherent strengths in intraregional trade, and provide European firms with the opportunity to build scale commensurate with that of the United States.

McKinsey estimates that by 2025, digitization could boost EU GDP by up to $2.5 trillion and U.S. GDP by up to $2.2 trillion through changes in the labor market, improved capital efficiency, and greater multifactor productivity.[7]

That's just the beginning. When other economic sectors are taken into account, the possibilities are likely to be much greater, and consumer benefits much bigger, even though they are difficult to quantify.

Mandel and Hofheinz conclude that if France, Germany, Italy and Spain had the same level of digital density (defined as the amount of data used per capita) as the United Kingdom, their level of intangible investment, in terms of patents, copyrights, trademarks, and technology, would rise by roughly €200 billion per year, equivalent to a 2% improvement in overall national output. And if those six countries could reach the level of digital density of the United States, their economies could see roughly €460 billion of additional economic output per year — an amazing 4% increase.[8]

Achieving the Potential

To achieve this potential, individuals, companies and policymakers all have a role to play.

TABLE 5.1: ESTIMATED INCREASE IN INTANGIBLE INVESTMENT IF DIGITAL DENSITY LEVEL ROSE TO:

Level of UK (€ billions)

	€ BILLIONS	AS PERCENT OF NATIONAL GDP
Italy	73.2	4.5
Spain	45.7	4.3
Germany	69.5	2.4
France	20.9	1.0
Total for six countries*	**209.0**	**2.0**

Level of U.S. (€ billions)

	€ BILLIONS	AS PERCENT OF NATIONAL GDP
Italy	112.0	6.9
Spain	71.0	6.7
Germany	139.0	4.8
France	72.0	3.4
UK	54.0	2.4
Sweden	10.0	2.3
Total for six countries	**459.0**	**4.4**

**including UK and Sweden, whose digital density is higher than UK*
Source: Hofheinz and Mandel.[9]

Individuals need to develop their skills and embrace the flexibility and new opportunities that digitization offers them. Science, technology, engineering and mathematics (STEM), entrepreneurial and creative skills are fundamental in enabling digital innovation. Individual chances of success will be higher if governments and companies also embrace the need to help those who are affected and to build the institutions and training pathways needed for a more digital economy. That means paying attention to continuous skills development and re-skilling programs, and using the huge amount of data now available on educational outcomes, skills, and career paths to design more effective and responsive systems for education and training. It means enhancing digital literacy, increasing awareness of digital tools, and encouraging their adoption by consumers and workers. It means facilitating a culture of enterprise in which young innovators have access to early-stage investments and opportunity for their ideas, rather than be forced to wait for decades before given real authority or access to capital. It also means clarifying how digital freelancers and on-demand service workers are treated under the law and how benefits systems may be modernized for the digital economy. Germany and Sweden, for example, have a "dependent contractor" category that grants some additional protections to workers who fall somewhere between employees and independent contractors and are dependent on a single employer.[10]

Denser digital connections, as well as their potential abuse, underscore the need for new means of building trust among citizens, companies and governments. "Is there an algorithm for trust?" asks Alec Ross. One trust-building example might be a pan-European Trustmark, governed by one European set of rules, which is being advanced by Ecommerce Europe in close cooperation with national consumer organizations.[11]

Companies must adapt their business models, digitize their operations, promote open innovation, and help their employees skill and reskill along the way. Digital laggards will need to accelerate their digital transformation. In Europe that includes asset-heavy sectors such as manufacturing and logistics, quasi-public sectors such as health care and education, and local, fragmented sectors such as hospitality and construction. In the United States that also includes construction, leisure, hospitality, retail, and health care.

Citizens and companies on each side of the Atlantic need to encourage governments not only to digitize their own operations to improve transparency, accountability and responsiveness,[12] but to create an ecosystem that encourages and rewards digital innovation, adaptability, productivity and competitiveness in ways that generates the greatest value for the greatest number of people, builds scale, and reduces fragmentation.[13]

This ecosystem needs to be grounded in several essential elements: a highly educated and skilled workforce; robust public investment in research and development; world-class digital-age infrastructure; "smart government" policies, including how agencies procure and implement technology in their own operations, and how government spurs adoption of emerging information technologies more broadly (e.g., Internet of Things, smart cities, etc.); tax and regulatory policies that encourage firms to invest in technology; and strong connections to the global marketplace through an open, rules-based trading system.[14]

Governments should be active on three fronts. They can unlock investment in R&D and access to capital by facilitating the flow of venture capital funding and strengthening interactions among entrepreneurs, investors and universities. They can open data flows by tackling data localization and geo-blocking. And they can address issues surrounding skills and the labor market by making digital skills a core part of education curricula; developing targeted programs to fill critical talent shortages; and developing targeted retraining programs for workers affected by the digital transition and mitigating its impact on job displacement.[15]

Building an Ecosystem at EU level

In the digital world, scale matters; countries with a large installed digital base and uniform culture, language and regulations have a competitive edge.[16] In Europe, that means creating a more seamless digital market. It means promoting the standardization of telecom networks, regulation standards, and the logistics of e-commerce to create a digital market comparable to that of the United States.[17] But is also means paying attention to non-digital barriers and to the services sector. That is why the EU must advance its triumvirate of the European Single Market, the European Services Directive, and the Digital Single Market.

Building an Ecosystem via Coalitions Of the Willing

As the EU evolves, variable geometry or "multi-speed" Europe is likely to become the norm. While EU-wide efforts at digital transformation are optimal, they can be underpinned by both regional and national efforts.

The Delors Institute, for example, has proposed inter-governmental cooperation among groups of member states, "coalitions of the willing" intent on moving towards regulatory convergence within varying geographic and sectoral settings. Franco-German efforts at what the Institute calls a "joint digital eco-system" would be an example of such efforts. Under such a scheme, France and Germany would identify emerging technologies as well as sectors and industries with a high chance for disruptive innovation and set up joint regulatory tools for opening them; design a common set of rules for upcoming spectrum allocations and for the regulation of the telecoms sector; introduce a joint "innovative company status" for their start-ups allowing them to apply their national regulation even when operating on the other market; and build a network of French-German coding schools.[18]

Building an Ecosystem at National Level

Given that each country's regulatory environment and "digital endowment" is different, digital transformation cannot occur only at EU level in some lock-step effort in which all member states move forward in the same direction at the same pace, or not at all. While some reforms must come from Brussels, national efforts are essential, and good practice exchange can help.[19] France, for instance, ranks relatively low in terms of internet access in schools, whereas the Netherlands and Finland rank high. Following good practice in these countries could point the way. Similarly, French firms lag in terms of the quality of their mobile connection to customers; good practice in leading countries such as Belgium or Austria could offer orientation.[20]

Conclusion

Whether through digitally deliverable services, e-commerce, the growing app and bot economy, data flows, social media, or submarine cables criss-crossing the Atlantic, the transatlantic digital economy has quickly become a major force in global commerce. Europe and North America are leaders when it comes to investments in information communications technology and intangible assets, the app economy and networked readiness. Yet we have seen only the tip of the digital iceberg. If policy makers can devise answers to common cybersecurity challenges and bridge their differences to find commonalities in and around rules and restrictions governing data, data privacy, intellectual property rights, and host of other items, tremendous synergies are possible.

The digital transformation of the transatlantic economy is akin to a transatlantic "Big Bang," a game-changing dynamic that would propel growth and competitiveness in the United States and Europe, improve societal outcomes in areas such as health care, education, and infrastructure, and further deepen linkages between the two parties while strengthening their ability to remain rule-makers, rather than become rule-takers, in the economy of the 21st century.

Endnotes

1. John Chambers, "How Digitizing Europe Will Create 850,000 New Jobs," Huffington Post, http://www.huffingtonpost.com/john-chambers/digitizing-europe-jobs_b_6873984.html.
2. Anne-Marie Slaughter, "How to Succeed in the Networked World. A Grand Strategy for the Digital Age," *Foreign Affairs*, November/December 2016, https://www.foreignaffairs.com/articles/world/2016-10-04/how-succeed-networked-world.
3. Chambers, op. cit.; Susan Lund and James Mankiya, "How Digital Trade is Transforming Globalisation," E15 Initiative, January 2016, http://e15initiative.org/wp-content/uploads/2015/09/E15-Digital-Economy-McKinsey-FINAL.pdf; Jacques Bughin, Eric Hazan, Eric Labaye, James Manyika, Peter Dahlström, Sree Ramaswamy, and Caroline Cochin de Billy, *Digital Europe: Realizing the continent's potential,* McKinsey Global Institute, June 2016, http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/digital-europe-realizing-the-continents-potential; U.S. International Trade Commission, *Digital Trade in the U.S. and Global Economies, Part 2*, Publication Number 4485, August 2014, https://www.usitc.gov/publications/332/pub4485.pdf; James Manyika, Sree Ramaswamy, Somesh Khanna, Hugo Sarrazin, Gary Pinkus, Guru Sethupathy, and Andrew Yaffe, *Digital America: A tale of the haves and have-mores*. San Francisco. McKinsey Global Institute, December 2015, http://www.mckinsey.com/industries/high-tech/our-insights/digital-america-a-tale-of-the-haves-and-have-mores.
4. U.S. International Trade Commission, op. cit; Gigi Kwik Gronvall, *Synthetic Biology. Safety, Security, Promise*. Baltimore, MD: UPMC Center for Health Security, 2016; Manyika et. al, op. cit.
5. Ezra Greenberg, Martin Hirt, and Sven Smit, "The global forces inspiring a new narrative of progress," McKinsey Quarterly, April 2017, http://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/the-global-forces-inspiring-a-new-narrative-of-progress.
6. Chambers, op. cit.; James Detar, "General Electric Opens Paris Digital Center; GE Stock Retakes Key Level," Investors.com, June 14, 2016, http://www.investors.com/news/ge-is-expanding-its-industrial-internet-footprint-in-europe/.
7. Manyika et. al, op. cit. Bughin, et. al, op. cit.
8. Paul Hofheinz and Michael Mandel, "Uncovering the Hidden Value of DigitalTrade: Towards a 21st Century Agenda of Transatlantic Prosperity," Lisbon Council/PPI institute, Issue 19, 2015, http://www.progressivepolicy.org/wp-content/uploads/2015/07/2015.07-Mandel-Hofeinz-Uncovering-the-Value-of-Digital-Trade_Towards-a-21st-Century-Agenda-of-Transatlantic-Prosperity.pdf.; http://useu.usmission.gov/remarks12215.html.
9. Ibid.
10. Alec Ross, *The Industries of the Future*. New York: Simon & Shuster, 2016, pp. 231-232; Bughin, op. cit.; Accenture, "Five Ways to Win with Digital Platforms," 2017, https://www.accenture.com/us-en/_acnmedia/PDF-29/Accenture-Five-Ways-To-Win-With-Digital-Platforms-Executive-Summary.pdf; Judy Fudge, Shae McCrystal, and Kamala Sankaran, eds., *Challenging the legal boundaries of work regulation*, Hart Publishing, 2012. See also Lauren Weber, "What if there were a new type of worker? Dependent contractor", *Wall Street Journal*, January 28, 2015; Manyika, et. al, op. cit.
11. Ross, op. cit.; The Ecommerce Europe Trustmark is non-profit and based upon self-regulation. Over 10,000 certified online shops in 11 countries can join the Ecommerce Europe Trustmark for free. See https://www.ecommerce-europe.eu/app/uploads/2016/07/European-B2C-E-commerce-Report-2016-Light-Version-FINAL.pdf.
12. Europe is already a world leader in e-government services. France is fourth in the latest UN global rankings for e-government, followed by the Netherlands in fifth, the United Kingdom in eighth, and Finland in tenth. But continent-wide, only 40% of EU citizens access government services online. Capabilities vary dramatically, not just at the regional and national levels, but particularly at the municipal level. See United Nations e-government survey 2014: E-government for the future we want, United Nations, 2014; "Europe's e-government opportunity", McKinsey.com, March 2015.] Bughin, op. cit.
13. Matthias Bauer, *Right Direction, Wrong Territory. Why the EU's Digital Single Market Raises Wrong Expectations*. Washington, DC: American Enterprise Institute, 2017; Geoffrey G. Parker, Marshall W. van Alstyne and Sangeet Paul Choudary, *Platform Revolution: How Networked Markets are Transforming the Economy—And How to Make Them Work for You*, New York: W.W. Norton, 2017.
14. See Peter L. Singer, "Investing in "Innovation Infrastructure" to Restore U.S. Growth," Information Technology and Innovation Foundation, January 3, 2017, https://itif.org/publications/2017/01/03/investing-innovation-infrastructure-restore-us-growth; John Wu, Adams Nager, and Joseph Chuzhin, High-Tech Nation: How Technological Innovation Shapes America's 435 Congressional Districts, Information Technology and Innovation Foundation, November 28, 2016, https://itif.org/publications/2016/11/28/technation.
15. Europe suffers from a private-sector R&D investment gap with the United States. A recent report from the European Investment Bank finds that for the European Union to match U.S. levels of venture capital financing as a share of GDP would require around €35 billion a year in additional venture capital activity. *Restoring EU competitiveness*, European Investment Bank, January 2016; Bughin, op. cit.
16. Accenture, op. cit.
17. Bughin, op. cit.
18. Hendrik Enderlein, Paul-Jasper Dittrich, David Renaldi, "#DigitalAmitié. A Franco-German Axis to Drive Digital Growth and Integration," Delors Institute, 2017, http://www.delorsinstitut.de/2015/wp-content/uploads/2017/03/20170310_DigitalEconomicSchengen-DittrichEnderleinRinaldi-EN-JDIB-7.pdf.
19. Erik Van der Marel, "The Importance of Complementary Policy for ICT in the EU." Brussels: ECIPE Occasional Paper No. 8, 2015; Bauer and Erixon, op. cit.
20. M. Macchi, B. Berthon and M. Robinson, M., "Digital density index: Guiding digital transformation," Accenture Strategy, 2015, https://www.accenture.com/us-en/insight-digital-density-index-guiding-digital-transformation.

Notes on Terms, Data and Sources

INVESTMENT, TRADE AND SERVICES FOR THE EU 28, NORWAY, SWITZERLAND, TURKEY AND THE U.S.

Investment data are from the Bureau of Economic Analysis. Data for the U.S. imports are from the Office of Trade and Industry Information of the International Trade Administration. Data on imports and exports were extracted from the IMF Direction of Trade Statistics database, among other sources. IMF exports are valued on a Free on Board (F.O.B) basis, while imports are reported at Cost Including Insurance and Freight (C.I.F). Free on Board indicates that the buyer bears all costs and risks of loss or damage to the goods from the point of shipment. C.I.F. means that the seller has to pay all costs and freight until the goods are delivered to the importing country. Therefore, import values, which include insurance and transportation charges, may differ from export values. Calculations for digital and digitally-enabled services drawn from UNCTAD, the U.S. Bureau of Economic Analysis, and the European Commission, among other sources. Further details and references are contained in endnotes to relevant chapters.

TERMS

Throughout this report, the term "EU" refers to all 28 member states of the European Union. The term EU15 refers to the older EU member states: the United Kingdom, Ireland, Belgium, Luxembourg, the Netherlands, Austria, Spain, Italy, Greece, France, Germany, Portugal, Sweden, Finland, and Denmark. The term EU12 refers to the newer EU member states: Estonia, Latvia, Lithuania, Poland, the Czech Republic, Slovakia, Hungary, Slovenia, Malta, Cyprus, Romania and Bulgaria. EU12 data does not include Croatia, which on July 1, 2013 became the 28th member state of the European Union. EU13 refers to the EU12 plus Croatia.

In addition to the above, unless otherwise indicated the term "Europe" in this report refers to the following: all 28 members of the European Union plus Russia, Turkey, Switzerland, Albania, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Gibraltar, Greenland, Iceland, Kazakhstan, Kyrgyzstan, Macedonia, Malta, Moldova, Monaco, Montenegro, Serbia, Tajikistan, Turkmenistan, Union of Soviet Socialist Republics, Uzbekistan. Europe includes Albania, Andorra, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Faeroe Islands, Georgia, Gibraltar, Iceland, Liechtenstein, Macedonia, Moldova, Monaco, Montenegro, Norway, Russia, San Marino, Serbia, Svalbard, Switzerland, Tajikistan, Turkey, Ukraine, Vatican City.

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Daniel S. Hamilton is an award-winning author on the transatlantic economy. He is the Austrian Marshall Plan Foundation Professor and Founding Director of the Center for Transatlantic Relations at Johns Hopkins University's School of Advanced International Studies.

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