United States
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Recent Trends in U.S. Services Trade:

2018 Annual Report

June 2018
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United States International Trade Commission

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Preface

This report is the 22nd in a series of annual reports on recent trends in U.S. services trade that the U.S. International Trade Commission (Commission or USITC) has published. The Commission also publishes an annual companion report on U.S. trade in goods, *Shifts in U.S. Merchandise Trade*. These recurring reports are the products of an investigation instituted by the Commission in 1993 under section 332(b) of the Tariff Act of 1930.[1] This report is one of the regular publications by the Commission that presents expert analysis of trade in services industries, drawing on fieldwork as well as published sources to apprise the Commission's customers and the public of global industry trends, regional developments, and competitiveness issues.[2]

[1] On August 27, 1993, acting on its own motion under section 332(b) of the Tariff Act of 1930 (19 U.S.C. 1332(b)), the USITC instituted investigation no. 332-345, *Annual Reports on U.S. Trade Shifts in Selected Industries*. On December 20, 1994, the USITC on its own motion expanded the scope of this report to include more detailed coverage of services industries. Under the expanded scope, the USITC publishes two annual reports, *Shifts in U.S. Merchandise Trade* and *Recent Trends in U.S. Services Trade*. The USITC's current report format provides a systematic means of examining and assessing major trade developments with leading U.S. trading partners in the services, agriculture, and manufacturing sectors. Beginning in 2013, *Recent Trends* has rotated its coverage between professional services, electronic services, distribution services, and financial services. The 2017 *Recent Trends* report focused on professional services. The previous report covering electronic services was published in 2014.

[2] Commissioner Jason E. Kearns did not participate in this annual report.

Abstract

Recent Trends in U.S. Services Trade: 2018 Annual Report focuses on U.S. exports and imports of electronic services, particularly audiovisual, computer and data processing, and telecommunications services, as well as sales of these services by foreign affiliates of U.S. firms and purchases from U.S. affiliates of foreign firms. In 2016, the United States exported $93.4 billion in cross-border electronic services and imported $54.3 billion, resulting in a trade surplus of $39.1 billion. In 2015, sales by foreign affiliates of U.S. electronic services firms totaled $270.1 billion, and purchases from U.S. affiliates of foreign electronic services firms totaled $132.7 billion. U.S. electronic services contributed $989.0 billion to U.S. gross domestic product (GDP) in 2016, or 6.9 percent of total U.S. private sector GDP. Electronic services employed over 3.7 million full-time equivalent employees in 2016, representing 3.3 percent of U.S. total private-sector employment. Electronic services workers earned an average wage of $106,052 in 2016 (compared to $59,485 in the private sector overall).

Electronic services are supplied on increasingly fast and pervasive telecommunications networks that give a rising number of people access to high-bandwidth internet connections. As a result, cloud-based application platforms can now offer cheaper data storage and processing power for a range of computer services. Consumers benefit from faster internet speeds and cloud storage to access data-intensive content on their smartphones as well as on their computers. Demand for electronic services is expected to grow steadily in the coming years as firms offer new services in new ways to a growing number of customers.

Acronyms and Abbreviations

Terms	Definitions
2G	second-generation cellular technology
3G	third-generation cellular technology
5G	fifth-generation cellular technology
BEA	Bureau of Economic Analysis
CAGR	compound annual growth rate
CDN	content delivery network
DSL	digital subscriber line
EIU	Economist Intelligence Unit
EU	European Union
FCC	Federal Communications Commission
FTE	full-time equivalent
GAAP	Generally Accepted Accounting Procedures (U.S.)
GATS	General Agreement on Trade in Services
Gbps	gigabits per second
GDP	gross domestic product
GPS	geographic positioning satellite
HS	Harmonized Commodity Description and Coding System
IaaS	infrastructure as a service
IFRS	International Financial Reporting Standards
IP-VPN	Internet Protocol virtual private network
IoT	internet of things
IT	information technology
ITU	International Telecommunications Union
LTE	long term evolution
ms	milliseconds
NAICS	North American Industry Classification System
NTMs	nontariff measures
OECD	Organisation for Economic Co-operation and Development
OTT	over-the-top
PaaS	platform as a service
SaaS	software as a service
SITC	Standard International Trade Classification
STRI	Services Trade Restrictiveness Index (OECD)
SVoD	subscription video on demand
U.S.	United States
UK	United Kingdom
UNESCO	United Nations Educational, Scientific, and Cultural Organization
USDOC	United States Department of Commerce
USITC	United States International Trade Commission
VoD	video on demand
VoIP	Voice over Internet Protocol
VR	virtual reality
WAN	wide area network
WTO	World Trade Organization

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Executive Summary

The United States remained the world's largest cross-border services exporter and importer in 2016.[3] U.S. cross-border services exports totaled $733.6 billion in 2016, and imports totaled $483.1 billion. Although U.S. cross-border services exports grew by only 0.2 percent in 2016, the United States remained highly competitive in the global services market; its share of global exports was more than double that of the United Kingdom (UK), the next-largest single-country exporter in 2016.

Preliminary data show that cross-border services exports grew by 3.8 percent to $761.7 billion in 2017, while imports grew by 6.8 percent, to $516.0 billion.

Sales by foreign affiliates of U.S. services firms totaled $1.4 trillion in 2015, while purchases from U.S. affiliates of foreign services firms totaled $952.5 billion.

Highlights by Sector

Audiovisual services are growing rapidly worldwide. The Chinese market is of growing interest to U.S. filmmakers, though state censorship and foreign film quotas limit market access.

In emerging markets, computer services are becoming widely available via mobile devices. Goods manufacturers are increasingly building computer-enabled services into their production processes.

U.S. telecommunications carriers are investing in network infrastructure, connecting a growing array of devices to the internet, and entering content and advertising markets.

[3] This report uses the latest available data. Industry-level analyses may cover slightly different years depending on the source, but U.S. services trade data will largely be consistent throughout the report. As of the date of publication, World Trade Organization data were available through 2016. Annual data on cross-border trade from the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce were available through 2016 (with preliminary data available for 2017), and BEA data on affiliate transactions were available through 2015. For details on the different modes of services trade, see box 1.1.

Key Findings

The United States Remained the Leading Global Exporter and Importer of Services in 2016

The top 10 exporting countries together accounted for 53.5 percent of global cross-border exports of private services[4] in 2016, with the United States accounting for the largest share (15.2 percent). U.S. cross-border services exports totaled $733.6 billion, while U.S. imports totaled $483.1 billion. This resulted in a trade surplus in services of $250.4 billion. Leading export markets were the UK, China, Canada, Ireland, and Japan, which together accounted for 35.8 percent of U.S. cross-border services exports in 2016. Similarly, the UK, Germany, Japan, Canada, and India supplied the largest single-country shares of U.S. services imports, and collectively accounted for 33.5 percent of such imports. As in previous years, travel services and passenger fares accounted for the largest sectoral share of U.S. cross-border services trade, together representing 33.4 percent of U.S. services exports ($244.7 billion) and 33.3 percent of imports ($160.8 billion).

Services supplied in foreign markets by local affiliates of U.S. multinational firms (i.e., U.S.-owned foreign affiliates) totaled $1.4 trillion in 2015.[5] The largest markets for sales of services by U.S.-owned foreign affiliates were the UK (15.8 percent), Canada (8.3 percent), and Ireland (7.9 percent). Purchases from affiliates of foreign firms located in the United States (i.e., foreign-owned U.S. affiliates) totaled $952.5 billion in 2015. The largest shares of purchases were from firms based in Japan (16.0 percent), the UK (14.1 percent), and Germany (13.9 percent).

Electronic Services Accounted for 12.7 Percent of U.S. Cross-border Services Exports and 11.2 Percent of Imports in 2016

Electronic services, the focus of this report, use computer-based technologies to develop, process, package, and deliver data and audiovisual content over telecommunications networks.

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[4] Exports and imports of private services exclude government transactions, which primarily consist of services supplied in support of operations by the U.S. military and embassies abroad.

[5] "Affiliate firms" includes both firms outside the United States that are owned by U.S. companies, and firms located in the United States that are owned by foreign companies. Publication of data on affiliate transactions lags publication of data on cross-border services trade by one year. This report compares affiliate transactions in 2015 with trends in such transactions from 2011 through 2014. Statistics on cross-border services trade are collected differently from statistics on services supplied through affiliates, so data on these two types of trade are not directly comparable (see chapter 1).

This report includes chapters on audiovisual services, computer services, and telecommunications services. Additional services, such as information services (including news agency services, database services, and internet search portals) and charges for the use of intellectual property related to software, are included in the overall definition of electronic services used to calculate industry-related statistics in this report.

In 2016, electronic services accounted for 12.7 percent ($93.4 billion) of total U.S. cross-border services exports and 11.2 percent ($54.3 billion) of imports, resulting in a surplus of $39.1 billion. The top markets for U.S. cross-border electronic services exports were the UK, Canada, and Germany for audiovisual services; the UK, Canada, and India for computer services; and Brazil, Argentina, and the UK for telecommunications services. The top sources for U.S. electronic services imports were the UK, Brazil, and Mexico for audiovisual services; India, Canada, and Ireland for computer services; and the UK, Mexico, and India for telecommunications services.

Foreign affiliates of U.S. electronic services firms represented 18.5 percent ($270.1 billion) of sales by U.S.-owned foreign affiliates in all industries in 2015, while U.S. affiliates of foreign electronic services firms represented 13.9 percent ($132.7 billion) of purchases from foreign-owned U.S. affiliates in all industries.

In 2016, value added contribution to private sector gross domestic product (GDP) by the U.S. electronic services sector grew by 6.0 percent to $989.0 billion, and the sector accounted for 6.9 percent of U.S GDP.[6] Broadcasting and telecommunications services accounted for $449.8 billion of value added, while data processing, internet publishing, and other information services registered rapid growth of 9.3 percent during 2015–16. Electronic services firms are making significant investments in artificial intelligence, a technology that attracted $39 billion in global investments in 2016.

Electronic services accounted for a small share of total U.S. private sector employment in 2016, with 3.7 million full-time equivalent employees (3.2 percent of total private sector employment). The computer systems design and related services industry accounted for 1.9 million of those employees.

Electronic services workers earned an average wage of $106,052 in 2016, well above wages in the services sector as a whole. However, wages varied from an average of $77,839 in motion picture and sound recording services to an average of $135,114 in data processing, internet

[6] Categories used in cross-border services trade statistics do not correspond exactly to categories used in GDP or employment statistics.

publishing, and other information services. Wage growth in electronic services was 2.4 percent in 2016, lower than the 3.5 percent average growth rate recorded in the sector during 2011–15.

Labor productivity in electronic services grew by 3.1 percent in 2016, and the sector had average output per worker of $265,717 in 2016. This indicator of labor productivity varied widely among industries, from $426,755 in broadcasting and television to $153,858 in computer systems design and related services.

The United States Was the World's Largest Market for Audiovisual Services in 2016

Audiovisual and related services include movies and television programming, books and sound recordings, and broadcasting and recording of live events. This report's focus is on the movie industry, which is heavily concentrated. The top two markets—the United States and China—together accounted for 47.9 percent of global box office revenues, which reached $38.6 billion in 2016. The United States was the largest market by box office revenue with $10.3 billion, though India and China produced more movies (1,903 and 944, respectively, compared to 789 in the United States) and had more cinema admissions (2 billion and 1.4 billion, respectively). The top seven U.S.-based movie studios accounted for 59 percent of global box office receipts.

Advances in digital technology are letting consumer's access content on a variety of devices, and streaming services are accounting for a growing share of audiovisual services revenue. China's rapid cinema construction and growing theater attendance has attracted attention from U.S. filmmakers, and major Chinese companies are investing in Hollywood studios and films. However, market access restrictions in China, including foreign film quotas and state censorship, remain substantial concerns for U.S. firms.

U.S. audiovisual services exports continued to exceed imports in 2016. However, cross-border exports fell by 5 percent to $20.4 billion, and cross-border imports rose by 25 percent to $10.0 billion. The UK remained the largest market for U.S. exports, though the Asia-Pacific region increased its share. The UK, Brazil, and Mexico were the largest sources of U.S. audiovisual services imports.

Most of the World's Leading Computer and Data Processing Services Firms Are U.S.-based

The global computer and data processing services industry grew rapidly during the past decade, and most of the industry's leading firms are headquartered in the United States. In 2016, information technology services earned $585.3 billion in worldwide revenue, while the global

cloud services market earned $89.3 billion and the global software market earned $335.2 billion. Mobile phone-based software provides services to growing numbers of customers in emerging markets who do not have broadband subscriptions, and goods manufacturers are incorporating increasing amounts of computer-enabled services in their production processes.

U.S. cross-border exports of computer and data processing services totaled $17.3 billion in 2016 (a 9.2 percent increase over 2015), while imports were $29.0 billion (a 5.4 percent increase). The United States had a trade deficit in computer and data processing services since 2011 to 2016, but U.S. exports of computer and data processing services grew more quickly than imports from 2011 to 2015. The UK and Canada were the largest markets for U.S. computer and data processing services exports, and India accounted for almost half of U.S. imports.

Computer and data processing services sales through foreign affiliates of U.S. firms tend to be larger than U.S. cross-border exports: such sales totaled $111.0 billion in 2015, a 6.7 percent decrease from 2014. Purchases from foreign-owned U.S. affiliates in the computer and data processing services industry totaled $29.4 billion in 2015, roughly the same level as in 2014.

The United States Was the World's Largest Market for Telecommunications Services in 2016

In 2016, the U.S. telecommunications (telecom) services market was valued at roughly $338.0 billion, or 22.8 percent of the global market, making it the largest national market for such services. The top U.S. telecom carriers were AT&T and Verizon, which earned $147 billion and $132 billion in 2016 revenues, respectively. U.S. telecom carriers are investing heavily in network infrastructure, connecting a growing array of devices to the internet, entering complementary content and advertising markets, and placing more emphasis on offering wide area networking services to enterprises.

In 2016, U.S. cross-border exports of telecom services totaled $12.2 billion, while imports totaled $5.5 billion, yielding a trade surplus of $6.7 billion. U.S. exports of telecom services experienced essentially no growth during 2011–15 and fell by 3 percent in 2016, while imports fell by 11 percent from 2011 through 2015, and by another 13 percent in 2016. U.S. carriers primarily offer telecom services to customers in foreign countries through local affiliates, and 2015 sales by such affiliates in the wired and wireless carrier segments were $26.5 billion and $5.5 billion, respectively (roughly 5 percent lower than in 2014). Telecom services purchased from U.S.-based affiliates of foreign telecom services companies totaled $75.6 billion, 13 percent higher than in 2014. A large portion of U.S. carrier sales abroad are enterprise services sold to multinational corporations.

USITC Services Roundtable

The Commission hosted its 11th annual Services Roundtable on October 25, 2017, with Commissioner Meredith Broadbent chairing the first session and Chairman Rhonda Schmidtlein chairing the second session. These roundtable discussions are held regularly to encourage dialogue among individuals from government, industry, and academia about issues affecting trade in services. This year's event focused on two themes: the relationship between goods and services trade, and recent developments in the tradability of services. The roundtable also discussed current trade data limitations and considered whether including services as manufacturing inputs could be a new approach to calculating services trade.

Chapter 1
Introduction

Services continue to be a large and growing sector of the U.S. economy. The United States remains the world's top exporter and importer of private services, and services accounted for over three-fourths of U.S. private sector gross domestic product (GDP) and employment in 2016.[7] The United States posted the world's largest services trade surplus in 2016 ($250.6 billion), followed by the United Kingdom (UK) ($129.1 billion). In 2016, electronic services employed 3.7 million people (a 6.0 percent increase in employment from 2015) and accounted for 6.9 percent of U.S. GDP. By contrast, professional services, the largest services category, employed 29.7 million people and accounted for 18.6 percent of U.S. GDP.

The *Recent Trends* report by the U.S. International Trade Commission (Commission or USITC) annually examines U.S. services trade (both in the aggregate and in selected industries), identifies important U.S. trading partners, and analyzes global market conditions in selected industries. This year, *Recent Trends* covers electronic services, a category created for the purpose of these reports, which includes information and communications technology (ICT) services as well as charges for the use of intellectual property related to audiovisual services and computer software. Chapter 2 discusses electronic services in detail, while later chapters focus on three specific industries: audiovisual services, computer and data processing services, and telecommunications services. Two other data categories in the electronic services industry[8]—information services and charges for the use of software-related intellectual property—are included in the statistics for the total "electronic services" category as presented in this report.[9]

Electronic services are supplied on increasingly fast and pervasive telecommunications networks that give a rising number of people access to high-bandwidth internet connections. As a result, cloud-based application platforms can now offer cheaper data storage and processing power for a range of computer services. Consumers benefit from faster internet speeds and cloud storage to access data-intensive content on their smartphones as well as on their

[7] WTO, Statistics Database, Time Series on International Trade, "Trade in Commercial Services, 2005–onward" (accessed November 12, 2017).
[8] See Chapter 2 for an additional discussion of these data.
[9] Since 2013, *Recent Trends in Services Trade* has rotated every four years between professional services, electronic services, distribution services, and financial services. For more on information services, see USITC, *Global Digital Trade 1.*

computers. Demand for electronic services is expected to grow steadily in the coming years as firms offer new services in new ways to a growing number of customers.

Data and Organization

Most of the services trade data used in this report are from the Bureau of Economic Analysis (BEA) at the U.S. Department of Commerce (USDOC). The BEA collects services trade data through surveys that generally require respondents with more than $2 million in exports or $1 million in imports to report their international services transactions. The BEA estimates trade flows using these survey results.[10]

This chapter examines the U.S. overall services sector, global trade in services, and U.S. trade in services. It reviews cross-border trade in services during 2011–16, as well as sales by foreign affiliates of U.S. services firms abroad and purchases from U.S.-located affiliates of foreign services firms during 2011–15, comparing services trade flows in recent years with earlier data.[11] Chapter 2 gives an overview of electronic services; identifies key trends affecting the sector; and examines the sector's contribution to U.S. economic output, employment, labor productivity, and trade. Chapters 3, 4, and 5 focus respectively on audiovisual services, computer and data processing services, and telecommunications services. These chapters provide an overview of market conditions, emerging demand and supply factors, and recent trends in U.S. cross-border trade and affiliate transactions in these industries.

Chapter 6 summarizes the information presented and the views expressed at the 11th annual USITC services trade roundtable, hosted by the Commission on October 25, 2017. Appendix A gives a snapshot of recent services research conducted by Commission staff. Appendix B includes data tables that correspond to the pie charts presented in this report. This report is

[10] For more information on the BEA's data collection methodology, see USDOC, BEA, *Survey of Current Business*, October 2015, 26. In this report, the USITC supplements the BEA data with information from other sources, including individual firms, trade associations, academic journals, industry reports, international organizations, and other government agencies. The BEA updates its international trade statistics for prior years when additional data become available, and occasionally revises the methodology and presentation of its statistics in order to improve their quality and comply with new international standards. For these reasons, care should be taken when comparing statistics in previous *Recent Trends in Services Trade* reports to current statistics. For more information, see USDOC, BEA, "The Comprehensive Restructuring," March 2014; USDOC, BEA, "Comprehensive Restructuring and Annual Revision," July 2014, 1–3.

[11] "Affiliate firms" includes both firms outside the United States that are owned by U.S. companies, and firms located within the United States that are owned by foreign companies. Publication of data on affiliate transactions lags publication of data on cross-border services trade. This report compares affiliate transactions in 2015 with trends from 2011 through 2014.

also accompanied by web-based interactive charts, which allow users to explore trends in U.S. services exports and imports over time and for selected industries and countries.[12]

The U.S. Services Sector

Services industries account for the majority of U.S. production and employment. In 2016, U.S. services industries accounted for 78.6 percent (or $11.3 trillion) of U.S. private sector GDP and 82.0 percent (or 93.7 million) of U.S. private sector full-time equivalent employees, compared to 21.4 percent and 18.0 percent, respectively, for the goods-producing sector.[13] Growth in services employment and wage rates slightly outpaced growth in employment and wage rates in the goods sector during 2011–15. Both sectors saw similar growth in value added over that period, and labor productivity was unchanged.[14]

Global Services Trade

The United States remains highly competitive in the global services market. As the world's top exporter of services, the United States accounted for $732.6 billion, or 15.2 percent, of global cross-border commercial services exports in 2016 (figure 1.1).[15] Other top exporters included the UK ($323.7 billion; 6.7 percent), Germany ($267.8 billion; 5.6 percent), France ($235.6 billion; 4.9 percent), and China ($207.3 billion; 4.3 percent). As in the past years, most of the world's top 10 services exporters were developed countries. However, two developing countries have ranked among the top 10 for several years: China (currently the 5th-largest services exporter) has been in the top 10 since at least 2005, and India (currently the 8th-largest services exporter) entered the top 10 in 2006. Overall, the top 10 exporting countries

[12] See : https://www.usitc.gov/publications/industry_econ_analysis_332/2018/recent_trends_us_services_trade_2018_annual_report.htm.

[13] The goods-producing sector includes agriculture, construction, fishing, forestry, and manufacturing. Some aspects of mining are also included in the goods-producing sector, although drilling, exploration, and other related services are included in the services sector. USDOC, BEA, "Frequently Asked Questions," March 10, 2006; USDOC, BEA representative, email message to USITC staff, March 7, 2017.

[14] USDOC, BEA, "Real Value Added by Industry," November 2, 2017; USDOC, BEA, "Full-Time Equivalent Employees by Industry," August 3, 2017; USDOC, BEA, "Wages and Salaries by Industry," August 3, 2017. "Value added" is a measure of an industry's contribution to gross domestic product (GDP); it is the difference between the value of an industry's gross output and the cost of its inputs. Full-time equivalent employees (FTEs) are the number of employees on full-time schedules plus the number of employees on part-time schedules converted to a full-time basis. The number of FTEs in each industry is the product of the total number of employees and the ratio of average weekly hours per employee to average weekly hours per employee on full-time schedules. Labor productivity is calculated as a sector's value-added GDP divided by number of employees, so this measure fluctuates with changes in both output and employment.

[15] This discussion draws on WTO trade data. The term "commercial services," used by the WTO, is roughly equivalent to the term "private services" used by the BEA.

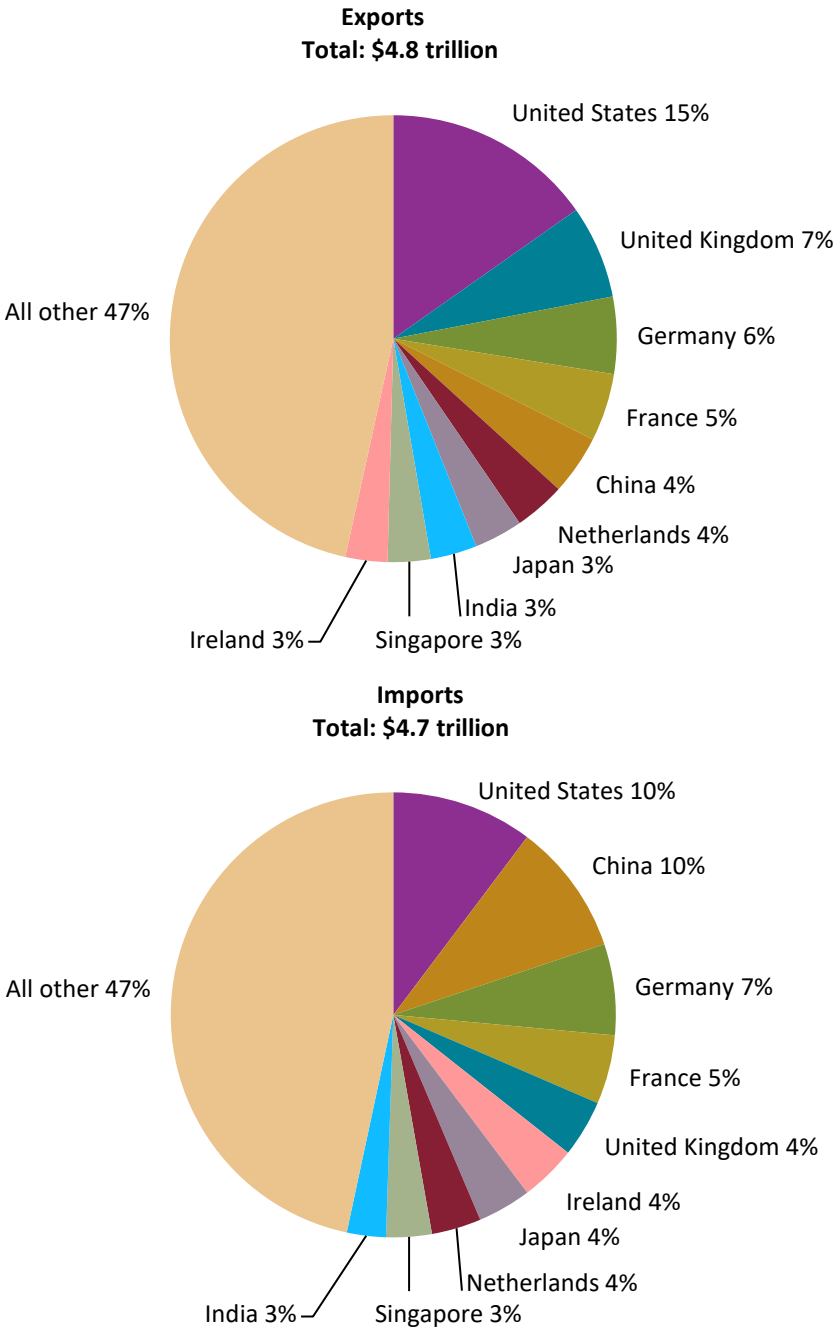
together accounted for 53.5 percent of global cross-border services exports in 2016.[16] The United States also remains the world's largest importer of services ($482.0 billion; 10.3 percent), followed by China ($449.8 billion; 9.6 percent), Germany ($310.6 billion; 6.6 percent), France ($235.7 billion; 5.0 percent), and the UK ($194.6 billion; 4.1 percent).[17]

The BEA publishes annual data on both U.S. cross-border trade and affiliate transactions in services, which together account for a substantial portion of the services provided through all four "modes of supply" specified in the General Agreement on Trade in Services (GATS) of the World Trade Organization (WTO) (box 1.1). The BEA publishes these data broken down by country and by industry, at the highest level of detail that its surveys and confidentiality policies allow. The BEA also publishes quarterly cross-border trade data in highly aggregated form.[18]

According to the BEA, "cross-border trade" occurs when suppliers in one country sell services to consumers in another country, with people, information, or money crossing national borders.[19] Such transactions appear as exports and imports in a country's balance of payments. Firms also provide services to foreign consumers through affiliates established in host (i.e., foreign) countries. The income generated through "affiliate transactions" may appear as direct investment income in the balance of payments.[20] Note that BEA statistics on cross-border services trade are collected and published by type of service, while statistics on services supplied through affiliates are collected and published based on the affiliate's primary industry.[21]

[16] WTO, Statistics Database, Time Series on International Trade, "Trade in Commercial Services, 2005–onward" (accessed November 12, 2017).
[17] WTO, Statistics Database, Time Series on International Trade, "Trade in Commercial Services, 2005–onward" (accessed November 12, 2017).
[18] Quarterly data on U.S. services trade can be found at USDOC, BEA, table 1.1, "U.S. International Transactions." (accessed March 21, 2018). The BEA will suppress data for certain countries or sectors in its publications if that data could potentially reveal confidential information about individual respondents.
[19] This definition is generally consistent with the WTO's GATS definitions of mode 1, mode 2, and part of mode 4, as described in box 1.1.
[20] Income generated through affiliate transactions appears as direct investment income in the balance of payments once it has been repatriated to the United States.
[21] See chapter 2 for a further discussion of services trade data classification.

Figure 1.1: Global services: Cross-border exports and imports of commercial services, 2016



Source: WTO, Statistics Database, Time Series on International Trade, "Trade in Commercial Services, 2005–onward" (accessed November 12, 2017).
Notes: The value of global exports and the value of global imports differ due to several factors, including time lags, differences in collection methodology, and other measurement errors. Excludes public-sector transactions (see appendix table B.1).

Box 1.1: Services Trade "Modes of Supply" under the World Trade Organization's General Agreement on Trade in Services (GATS)

The GATS identifies four "modes of supply" for services trade, or four ways that services can be traded:

Mode 1 is cross-border supply. In this mode, a service is supplied by an individual or firm in one country to an individual or firm in another (i.e., the service crosses national borders). An example would be a digital file of an architecture design emailed (i.e., exported) to a foreign client. Mode 1 is not identical to the cross-border trade category used by BEA in classifying its data (see explanation below).

Mode 2 is consumption abroad. In this mode, an individual from one country travels to another country and consumes a service in that country. An example of a U.S. export of travel services via mode 2 would be a foreign tourist staying in hotels and eating at restaurants while vacationing in the United States.

Mode 3 is commercial presence. In this mode, a firm based in one country establishes a local affiliate in another country and supplies services through that affiliate. An example would be a U.S.-based law firm providing legal services in a foreign country from an affiliated office located in that country.

Mode 4 is the temporary presence of natural persons. In this mode, an individual service supplier from one country travels to another country on a short-term basis to supply a service—for instance, as a consultant, contract employee, or intracompany transferee at an affiliate.[a] An example would be a U.S.-based engineer traveling to a foreign country to help local staff on a construction project.

The Bureau of Economic Analysis (BEA) categories for services trade—cross-border trade and affiliate transactions—do not correspond exactly to the channels of service delivery described in GATS.[b] Mode 1 and mode 2 transactions, as well as some mode 4 transactions, generally are grouped together in the BEA's data on cross-border trade, while mode 3 transactions are included, with some exceptions, in the BEA's affiliate transactions data.[c]

[a] USDOC, BEA, *Survey of Current Business*, October 2009, 40–43, tables 1 and 2. For more information on the four modes of supply under the GATS, see WTO, "Basic Purpose and Concepts" (accessed July 19, 2016).

[b] The BEA includes only affiliate transactions between residents and nonresidents, while certain transactions that fall under mode 3 of the GATS could involve only residents of the host country. Some statistics on services supplied through mode 4 may also be commingled with statistics on compensation of employees. USDOC, BEA, *U.S. International Economic Accounts: Concepts and Methods*, September 2014.

[c] The channel of delivery that service providers use is primarily determined by the nature of the service. For example, legal and accounting services are generally supplied through affiliates, while audiovisual services are generally supplied across borders. Sales of services by foreign affiliates of U.S. firms tend to exceed U.S. cross-border exports in value.

Cross-border Services Trade, 2016–17

U.S. cross-border exports of private services totaled $733.6 billion in 2016 (the latest year for which detailed data are available), while U.S. imports totaled $483.1 billion, resulting in a trade surplus of $250.4 billion (figure 1.2).[22] As in previous years, travel services and passenger fares accounted for the largest share of U.S. services trade, representing 33.4 percent of U.S. services exports and 33.3 percent of imports, while professional services were the second-largest category. Electronic services accounted for 12.7 percent and 11.2 percent of U.S. services exports and imports, respectively. Cross-border trade in electronic services resulted in a surplus of $39.1 billion in 2016 (figure 1.3).

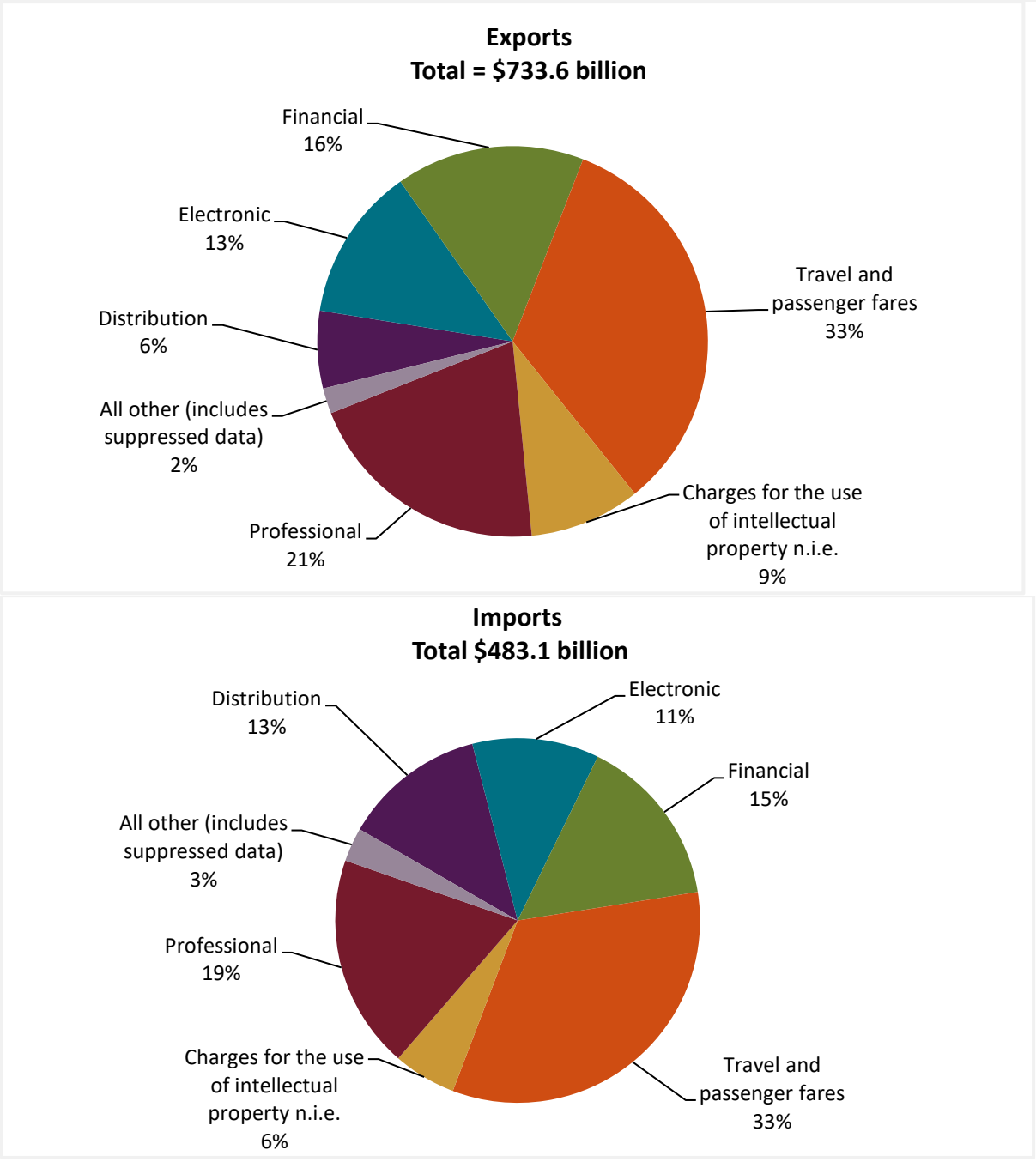
In 2016, U.S. cross-border services exports grew by only 0.2 percent, significantly below the 4.9 percent average annual growth rate during 2011–15. This slow growth stemmed from declines in several industries, including travel services, financial services, electronic services, and distribution services. However, growth in professional services such as business and management consulting services was strong: total professional services exports rose by 7.1 percent in 2016 compared to an average annual growth rate of 6.1 percent during 2011–15.[23] Additionally, charges for the use of intellectual property rose by 1.8 percent in 2016 after declining in 2015.[24] U.S. services imports grew by 2.8 percent to $483.1 billion in 2016, a slightly slower pace than the 3.8 percent growth recorded during 2011–15. In 2016, import growth was highest for charges for intellectual property (7.5 percent), followed by travel services (7.1 percent) and electronic services (6.3 percent). Imports of distribution services declined in 2016, reflecting decreases in imports of air freight services.

[22] Cross-border services trade, as reported by the BEA, includes both private and public sector transactions. The latter principally reflect operations of the U.S. military and embassies abroad. However, because public sector transactions are not considered to reflect U.S. services industries' competitiveness and may introduce anomalies resulting from events like international peacekeeping missions, this report focuses solely on private sector transactions, except as noted.

[23] For more information on U.S. trade in professional services, see USITC, *Recent Trends in U.S. Services Trade*, May 2017. In this study, all multiyear growth rates are calculated as compound annual growth rates (CAGRs) unless otherwise specified.

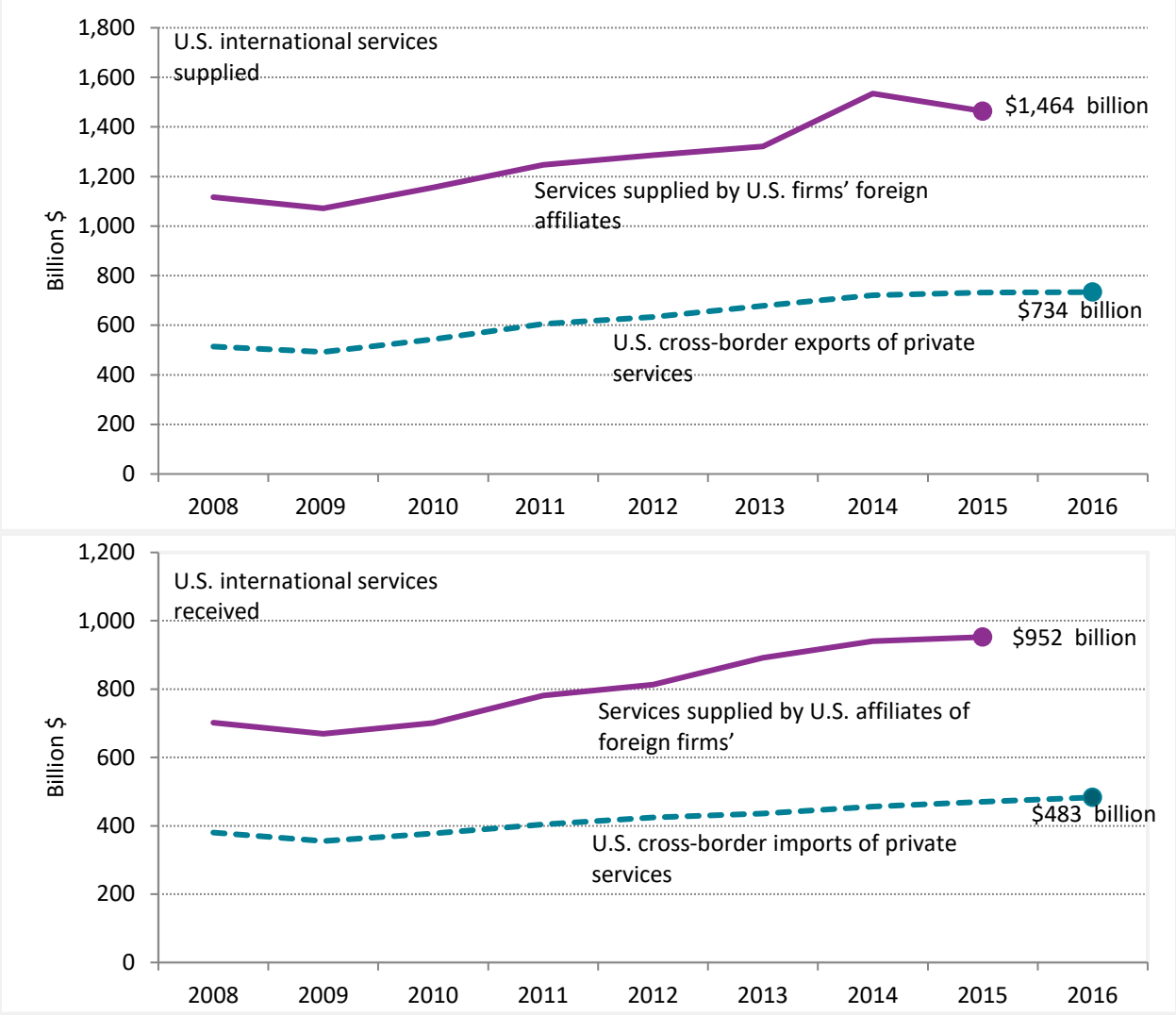
[24] Charges for the use of intellectual property fell by 0.6 percent during 2011–15, the only sector highlighted in figure 1.2 to experience a decrease in exports over the period. USDOC, BEA, table 2.2, "U.S. International Trade in Services," October 24, 2017.

Figure 1.2: U.S. services: Cross-border trade by services industry, 2016



Source: USDOC, BEA, table 2.1, "U.S. Trade in Services, by Type of Service," October 24, 2017. (See appendix table B.2.)
Notes: Excludes public-sector transactions. Total exports and imports by sector are based on the latest BEA data for which all sectors are available. N.i.e= not included elsewhere.

Figure 1.3: U.S. services: Cross-border services trade and sales and purchases of services through affiliates, 2008—16



Sources: USDOC, BEA, table 2.1, "U.S. Trade in Services, by Type of Service," October 24, 2017; table 4.1: "Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliate," October 24, 2017; table 5.1, "Services Supplied to U.S. Persons by Foreign MNEs through Their MOUSA, by Industry of Affiliate and by Country of UBO," Interactive tables: International Data, International Services, October 24, 2017. (See appendix table B.3.)
Note: The difference between foreign affiliate transactions recorded in 2014 and those in both 2013 and 2015 is largely attributable to an increased number of reporting enterprises on the BEA's 2014 Benchmark Survey of U.S. Direct Investment Abroad. As a result, these figures do not necessarily reflect an actual increase in the amount of services supplied. For more information see USDOC, BEA, U.S. International Services, December 2016, 21.

As in previous years, most U.S. services industries registered cross-border trade surpluses in 2016. The largest trade surplus was in travel services ($83.9 billion), followed by professional services ($59.3 billion), financial services ($40.8 billion), and charges for the use of intellectual property ($40.5 billion). Distribution services was the only category to register a cross-border trade deficit in 2016 ($14.1 billion), although several individual industries also recorded trade

deficits, including insurance services ($31.7 billion), sea transport services ($17.0 billion), and computer services ($11.7 billion).[25]

The deficits in these areas occurred for diverse reasons. The deficit in distribution services reflects a deficit in transport services—specifically, the deficit in U.S. merchandise trade and the payments of freight and port fees to transport goods to the United States.[26] The deficit in insurance services was principally the result of U.S. primary insurers' payments to European and Bermudian reinsurers in return for assuming a portion of primary insurers' risks.[27] Reinsurance imports from these countries totaled $35.6 billion in 2016, 85 percent of total reinsurance imports. Finally, the deficit in computer services is largely due to U.S. firms offshoring back-office processing and other information technology services to foreign providers, particularly those in India. U.S. imports of computer services from India were $13.7 billion in 2016, over four times greater than those from Canada (the next-largest source).[28]

A small number of countries continued to account for a substantial portion of U.S. cross-border services trade. The UK, China, Canada, Ireland, and Japan collectively accounted for 35.8 percent of U.S. cross-border private services exports in 2016. In the same year, the countries supplying the largest shares of U.S. private services imports were the UK (10.5 percent), Canada (6.1 percent), Germany (5.9 percent), Japan (5.7 percent), and India (5.3 percent). As a region, the European Union (EU) accounted for 31.4 percent of U.S. private services exports and 34.8 percent of U.S. private services imports in 2016.

Preliminary data for 2017, which are only available for broad categories of U.S. services trade, suggest a large increase in total U.S. services exports, while imports rose at an even faster rate. Annual private services exports were reported to be $761.7 billion in 2017, up 3.8 percent from $733.6 billion in 2016 (table 1.1).[29] However, some individual industries grew substantially. Exports of research and development services and insurance services rose by 15.0 and 9.0 percent, respectively, from 2016 to 2017. In contrast, travel services exports fell 0.8 percent

[25] USDOC, BEA, table 2.2, "U.S. International Trade in Services," October 24, 2017.
[26] For example, Chinese shipments of manufactured goods to the United States exceed U.S. shipments of goods to China. Payments to Chinese or other foreign shippers for transporting U.S. merchandise imports are recorded by the BEA as U.S. imports of transportation services. As a result, the United States has a $29.0 billion deficit in sea freight services but maintains a surplus in both port services and air transport services.
[27] Reinsurance refers to insurance companies buying insurance contracts from specialized insurers (reinsurers) to protect themselves from large unexpected claims.
[28] USDOC, BEA, table 2.2, "U.S. International Trade in Services," October 24, 2017.
[29] The data regarding exports and imports for 2017 discussed in this section are preliminary; the data do not contain breakdowns for all countries and certain industries or affiliate transactions, which are included in the data reported for 2016 referenced in the previous section. Data reported in table 1.1 for 2016 have also been revised slightly from the figures published in the BEA's 2017 Survey of Current Business. The BEA is scheduled to publish its full report covering international trade in services in October 2018.

over the same period. Exports of telecommunications, computer, and information services (a broad category used by the BEA for these preliminary data) rose 6.8 percent in 2017, somewhat slower than growth in imports of these services (9.1 percent).

Overall, total services imports in 2017 exceeded those in 2016 by 6.8 percent, or $32.9 billion. As a result, the United States recorded a services trade surplus of $245.7 billion, though this represents a decline of $4.7 billion from the previous year.[30] Initial data indicate that the UK, Canada, and China were the largest recipients of U.S. cross-border services exports in 2017, while the UK, Germany, and Canada were the largest sources of U.S. services imports.[31]

Table 1.1: U.S. private services exports and imports to the world, by category, 2016–17

Service industry	2016 (billion $)	2017 (billion $)	% change, 2016–17
Exports			
Travel and passenger fares	244.7	242.8	-0.8
Charges for the use of intellectual property n.i.e.[a]	124.5	127.9	2.8
Financial services	98.2	106.4	8.4
Professional and management consulting services	74.0	78.7	6.4
Research and development services	37.2	42.8	15.0
Telecommunications, computer, and information services	36.5	38.9	6.8
Technical, trade-related, and other business services[b]	31.0	33.0	6.2
Maintenance and repair services, n.i.e.	25.6	25.9	1.1
Air transport (excludes passenger fares)	22.8	24.1	5.6
Insurance services	16.3	17.8	9.0
Other	22.8	23.4	2.7
Total	733.6	761.7	3.8
Imports			
Travel and passenger fares	160.8	173.8	8.1
Insurance services	48.1	49.7	3.4
Charges for the use of intellectual property n.i.e.[a]	44.4	48.4	8.9
Professional and management consulting services	40.2	42.9	6.8
Telecommunications, computer, and information services	36.9	40.2	9.1
Sea transport	35.1	37.1	5.7
Research and development services	34.2	34.9	2.0
Computer services	29.0	31.6	9.2
Financial services	25.6	28.0	9.2
Technical, trade-related and other business services[b]	24.5	26.9	9.9
Other	4.4	2.4	-44.5
Total	483.1	516.0	6.8

Source: USDOC, BEA, International Transactions table 3.1, "U.S. International Trade in Services," March 21, 2018.
Notes: Data for 2017 are preliminary. N.i.e. = not included elsewhere. Excludes public-sector transactions.
[a] Charges for the use of intellectual property, n.i.e. (formally classified as royalties and licenses fees), includes industrial processes, computer software, trademarks, franchise fees, audiovisual and related products, and other intellectual property.
[b] The category of technical, trade-related, and other business services includes construction, architecture and engineering services, waste treatment, operational leasing, trade-related, and other business services.

[30] USDOC, BEA, table 3.1, "U.S. International Trade in Services," March 21, 2018.
[31] Ibid.

Affiliate Transactions, 2015

In addition to cross-border trade, services are also supplied through the foreign affiliates of multinational enterprises (MNEs). Sales of services in foreign markets by the local affiliates of U.S. firms totaled $1,463.5 billion in 2015 (the latest year available), compared to $1,534.8 billion in 2014.[32] Distribution services represented the largest share of these sales, accounting for 28.4 percent of total services provided by U.S.-owned foreign affiliates (figure 1.4). Financial services ranked second, accounting for 19.5 percent of such sales.[33] The largest foreign purchasers of services from U.S.-owned affiliates were the UK (15.8 percent), Canada (8.3 percent), and Ireland (7.9 percent). In 2015, sales to the EU represented 44.5 percent of total services supplied by U.S.-owned foreign affiliates.[34]

The value of services purchased from foreign-owned affiliates in the United States grew by 1.3 percent in 2015 to $952.5 billion, slower than the 6.4 percent average annual growth rate during 2011–14. Distribution services remained the largest category in 2015, accounting for 30.0 percent of services purchased from foreign-owned affiliates in the United States, and financial services ranked second at 18.6 percent. By country, Japan accounted for the largest share of services purchased from foreign-owned affiliates in 2015 (16.0 percent), followed by the UK (14.1 percent) and Germany (13.9 percent). Overall, affiliates of EU-based companies supplied 50.9 percent of such purchases in the United States.[35]

For U.S. firms, the preferred mode of delivery of many services in foreign markets is through the establishment of a commercial presence (mode 3 trade). From 1986, when the U.S. Department of Commerce began collecting statistics on U.S. services trade, through 1995, U.S. cross-border exports of services exceeded sales by U.S. majority-owned foreign affiliates of U.S. firms. Since 1996, however, sales by U.S. firms' foreign affiliates have exceeded exports of

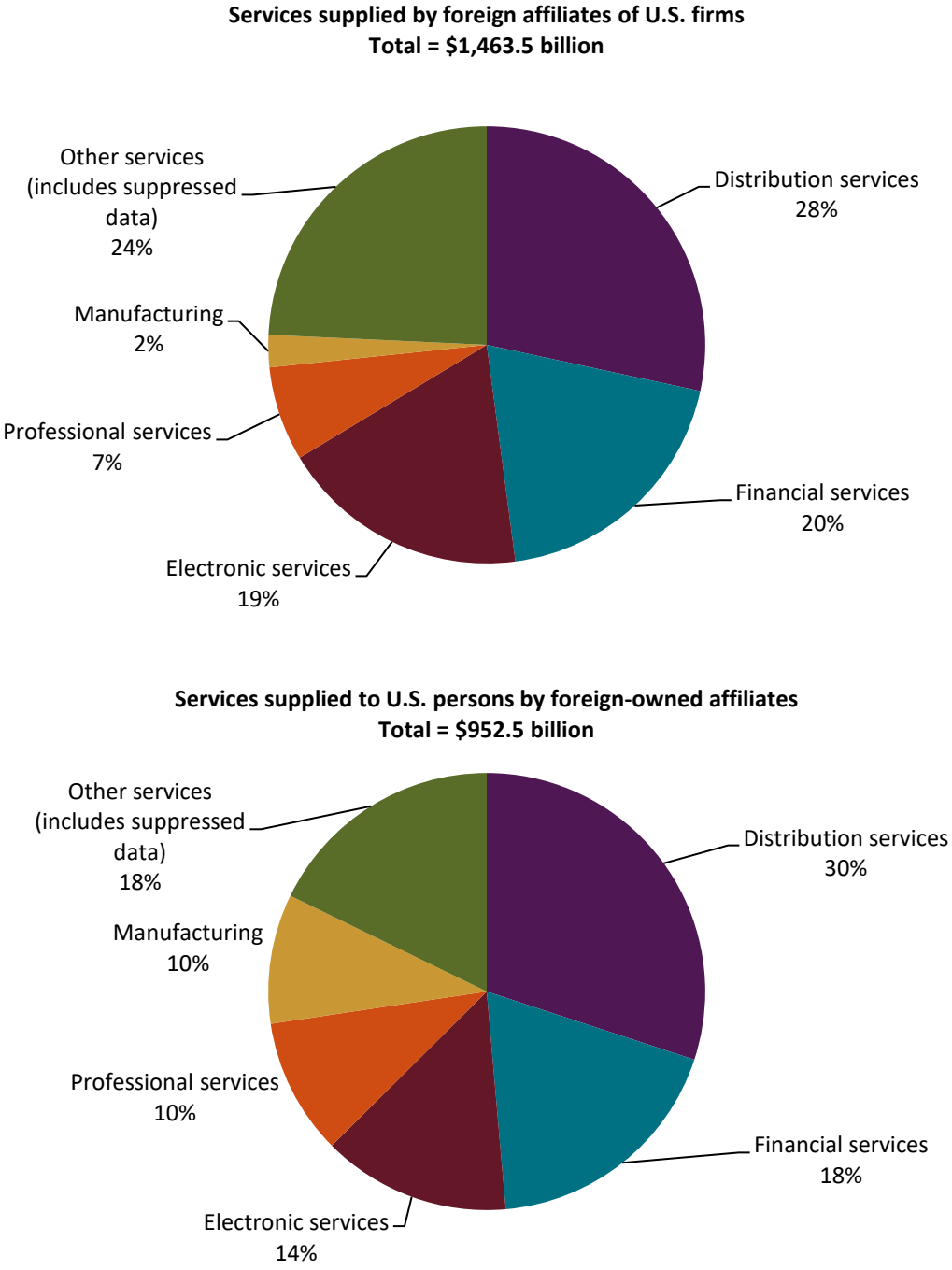
[32] In 2014, the BEA conducted a benchmark survey that recorded many more reporting enterprises than the regular annual surveys, which could account for the larger value of foreign affiliate sales that year compared to other years. Therefore, comparisons between foreign affiliate transactions in 2014 and other years should be treated with caution However, the overall trend is positive, with foreign affiliate sales rising 4.1 percent in 2011–15. For more information see USDOC, BEA, *U.S. International Services*, December 2016, 21.
[33] USDOC, BEA, table 4.1, "Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliate," October 24, 2017. "Other services"—a catchall category that includes services industries ranging from agricultural services to publishing—accounted for 33.5 percent of total services sold through U.S.-owned affiliates in 2015.
[34] USDOC, BEA, table 4.1, "Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliate," October 24, 2017.
[35] USDOC, BEA, table 5.2, "Services Supplied to U.S. Persons by Foreign MNEs through Their MOUSAs, by Country of UBO," October 24, 2017.

cross-border services.[36] However, in certain industries, such as transportation or charges for the use of intellectual property, the majority of trade continues to occur through cross-border supply (mode 1). Other countries may exhibit different patterns of trade: around 80 percent of New Zealand's services exports to the world occurred via mode 3, compared to only 14 percent of India's services exports.[37]

[36] USDOC, BEA, table 4.1, "Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliate," October 24, 2017; USDOC, BEA, table 5.2, "Services Supplied to U.S. Persons by Foreign MNEs through Their MOUSAs, by Country of UBO," October 24, 2017.

[37] Some U.S. services industries supply a substantial portion of their exports through mode 4 (presence of natural persons): about half of computer services exports are delivered in this way, while one-third of both architecture and engineering services exports and professional and management consulting services exports are via mode 4. Mann, "Exploratory Estimates of U.S. International Services by Mode of Supply," May 8, 2017.

Figure 1.4: U.S. services: Affiliate sales and affiliate purchases by industry, 2015



Source: USDOC, BEA, table 4.1, "Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliate," and "Table 5.1. Services Supplied to U.S. Persons by Foreign MNEs through Their MOUSAs, by Industry of Affiliate and by Country of UBO," October 24, 2017. (See appendix table B.4.)
Note: Software publishing was reallocated from "Other Services" to "Electronic Services" in this year's report to better reflect the industry composition; therefore, comparisons to data on electronic services found in reports from previous years should take that into consideration. Data for portions of electronic services (telecommunications services and broadcasting services) supplied by U.S.-owned foreign affiliates are suppressed for 2015.

GDP, Employment, Labor Productivity, and Salaries

In 2016, U.S. private services accounted for 78.6 percent of U.S. private sector GDP, and the value added by services grew by 2.0 percent to $11.3 trillion. By comparison, the value added by the production of goods declined by 0.2 percent, to $3.1 trillion in 2016 (table 1.2).[38] Within the category, professional services was the largest sector (accounting for 23.7 percent of value added by private services, or $2.7 trillion). At the same time, the electronic services sector registered the fastest growth during 2015–16: it grew by 6.0 percent, slightly faster than the 5.4 percent average annual growth from 2011–15.

Private services also represented a large majority (82.0 percent) of total U.S. private sector employment in 2016, with 93.7 million full-time equivalent (FTE) employees compared to 20.5 million FTEs in goods. Distribution services accounted for just over a quarter (25.9 percent) of private services employment, while electronic services had the fastest employment growth during 2015–16. Average wages and labor productivity in the services sector were both slightly below the average in the private sector overall. On the other hand, electronic services had the highest average wages and labor productivity of any sector—goods or services—followed by financial services.

Table 1.2 United States: GDP, FTEs, wage and salary accruals, and labor productivity, by industry (goods and services), 2011, 2015–16

	2011	2015	2016	CAGR 2011–15	% change 2015–16
GDP[a] (billion $)					
Private sector	12,872	14,202	14,420	2.5	1.5
Goods	2,796	3,085	3,079	2.5	-0.2
Manufacturing	1,823	1,910	1,920	1.2	0.5
Nonmanufacturing	973	1,175	1,159	4.8	-1.3
Services	10,076	11,117	11,341	2.5	2.0
Distribution services	2,170	2,411	2,456	2.7	1.9
Electronic services	757	933	989	5.4	6.0
Financial services	1,143	1,269	1,258	2.7	-0.9
Professional services	2,392	2,633	2,685	2.4	2.0
Other services	3,614	3,871	3,953	1.7	2.1

[38] Private sector GDP excludes the value of goods and services produced by the government at the federal, state, and local levels (such as defense and government enterprises). This is similar to exports and imports of private services, a category that excludes international government transactions involving foreign military bases and U.S. embassies abroad. The share of electronic services in total services contribution to GDP (8.7 percent) is similar to the sector's share of total services exports (7.7 percent). This similarity indicates that the export intensity of electronic services is in line with its overall level of production, while other sectors—such as distribution services—are more domestically focused.

	2011	2015	2016	CAGR 2011–15	% change 2015–16
FTEs (thousands)					
Private sector	101,851	112,335	114,221	2.5	1.7
Goods	18,688	20,422	20,522	2.2	0.5
Manufacturing	11,451	12,075	12,046	1.3	-0.2
Nonmanufacturing	7,237	8,347	8,476	3.6	1.5
Services	83,164	91,913	93,699	2.5	1.9
Distribution services	22,040	23,945	24,246	2.1	1.3
Electronic services	3,226	3,620	3,722	2.9	2.8
Financial services	6,071	6,424	6,509	1.4	1.3
Professional services	26,080	28,988	29,674	2.7	2.4
Other services	25,746	28,936	29,548	3.0	2.1
Wages and salary accruals ($ per FTE)[b]					
Private sector	53,475	58,708	59,458	2.4	1.3
Goods	58,905	64,080	64,869	2.1	1.2
Manufacturing	61,716	66,819	67,609	2.0	1.2
Nonmanufacturing	54,457	60,118	60,975	2.5	1.4
Services	52,254	57,515	58,272	2.4	1.3
Distribution services	45,076	49,279	49,776	2.3	1.0
Electronic services	90,188	103,560	106,052	3.5	2.4
Financial services	88,634	99,733	100,687	3.0	1.0
Professional services	60,455	65,758	66,302	2.1	0.8
Other services	36,762	40,939	41,820	2.7	2.2
Labor productivity ($ per FTE)[c]					
Private sector	126,381	126,425	126,246	0.0	-0.1
Goods	149,615	151,063	150,034	0.2	-0.7
Manufacturing	159,200	158,178	159,389	-0.2	0.8
Nonmanufacturing	134,448	140,769	136,739	1.2	-2.9
Services	121,158	120,951	121,037	0.0	0.1
Distribution services	98,457	100,689	101,295	0.6	0.6
Electronic services	234,656	257,735	265,717	2.4	3.1
Financial services	188,272	197,540	193,271	1.2	-2.2
Professional services	91,718	90,831	90,483	-0.2	-0.4
Other services	140,371	133,778	133,782	-1.2	0.0

Source: USITC staff calculations, USDOC, BEA, "Real Value Added by Industry," November 2, 2017; USDOC, BEA, table 6.5D, "Full-Time Equivalent Employees by Industry," August 3, 2017; USDOC, BEA, table 6.3D, "Wage and Salary Accruals per Full Time Equivalent Employee by Industry," August 3, 2017.
Note: CAGR = compound annual growth rate.
[a] Real valued added by industry using 2009 chained dollars (a method of adjusting real dollar amounts for inflation over time, to facilitate comparison of values from different years).
[b] Average wages are calculated by industry group, not by occupation. Wage and employment data presented in table 2.1 for the goods sector cover all workers employed in that sector, including those in both production and services work. USDOC, BEA representative, email message to USITC staff, May 3, 2017.
[c] Labor productivity, as calculated by USITC, is value added by industry divided by the number of FTEs.

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Chapter 2
Electronic Services

Overview

For the purposes of this report, "electronic services" data comprise audiovisual, computer and data processing, information services, and telecommunications services, as well as computer software. These components of electronic services, as well as their sub-components, are highly interdependent: for example, computer services are essential parts of the telecommunications sector, while telecommunications networks enable trade in audiovisual content. Electronic services also increase productivity and enable trade in other industries, such as education, finance, healthcare, and logistics. But they are traded electronically themselves as well—for example, when data processing services are offered by a supplier in one country to a consumer in another. U.S. electronic services industries are highly competitive, and U.S. firms are among the global leaders in technology adoption and in research and development. By facilitating data and information flows, electronic services firms provide critical infrastructure to the U.S. and global economies.

Individual chapters in this report focus on audiovisual services (chapter 3), computer and data processing services (chapter 4), and telecommunications services (chapter 5). When calculating statistics for total electronic services, this chapter uses data for the above industries combined with data for two additional categories: information services and computer software.[39] Two important issues affect these industry statistics. The first is that cross-border services trade data are classified by the type of service, while services supplied through foreign affiliate transactions and data on domestic services industries[40] are classified by industry, using the North American Industry Classification System (NAICS) and this can affect the comparability of services data. The second issue is that in a number of cases, the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce suppresses certain statistics to avoid disclosing proprietary information of individual companies.

[39] Computer software and audiovisual services are both sub-components of the BEA category "Charges for the use of intellectual property" while telecommunications services, computer and data processing services, and information services are all part of the "Telecommunications, computer, and information services" category.
[40] This report highlights the services components of gross domestic product, full-time equivalent employees, wages, and labor productivity data.

Data Sources

Data on cross-border trade in electronic services include five BEA categories: audiovisual services, computer and data processing services, telecommunications services, computer software, and information services. Audiovisual services[41] are receipts and payments for rights to display, reproduce, distribute, or broadcast copyrighted material and other intellectual property related to movies and television programming, books, and sound recordings. Computer and data processing services are hardware- and software-related services, including software downloaded or provided through the cloud.[42] Telecommunications services are the broadcast or transmission of sound, images, data, or other information by electronic means (including traditional telephone calls as well as internet access services).[43] Computer software is defined as receipts and payments for rights to distribute and reproduce general use software. Information services are news agency services, database services, and internet search portals.[44]

Data on affiliate transactions by electronic services firms include seven BEA categories: motion picture and sound recording industries; computer systems design and related services; data processing, hosting, and related services; telecommunications; broadcasting; other information services; and software publishing. The services industry categories used by the BEA in statistics on value added GDP, full-time equivalent (FTE) employees, wages, and labor productivity[45] are slightly different in that they exclude "other information services" and "software publishing" from those data but include five industries: motion picture and sound recording; telecommunications; broadcasting; data processing, hosting, and related services; and computer systems design and related services.[46]

Shifts in Electronic Services

These services are increasingly supplied through a fast and pervasive internet. The percentage of the global population with internet access almost doubled from 2013 to 2016, increasing

[41] Audiovisual services, as defined by the BEA, include three subsectors: movies and television programming; books and sound recording; and broadcasting and recording of live events.
[42] USDOC, BEA, "Form BE-125," November, 2016. For computer software products, licenses for use are included in computer services, while licenses for reproduction and distribution are included in the computer software category.
[43] USDOC, BEA, "U.S. International Economic Accounts: Concepts and Methods," June 30, 2014.
[44] USDOC, BEA, "U.S. International Economic Accounts: Concepts and Methods," June 30, 2014.
[45] Wages and labor productivity are calculated by USITC staff using BEA data.
[46] NAICS category 51919 (other information services) is not broken out separately in the datasets used for the presentation of domestic services statistics; for this reason it is excluded from the calculation of value added, FTEs, wages and labor productivity. Broadcasting and telecommunications categories are combined into a single category for BEA statistics on value added, FTE employees, wages, and labor productivity. Software publishing is also not broken out separately for this data.

from 27.3 percent to 49.4 percent.[47] And global average connection speeds more than doubled during this time, from 3.1 megabits per second (mbps) in 2013 to 6.3 mbps in 2016.[48] Growing internet bandwidth enables more data to be stored and processed in cloud-based platforms instead of local computers, which facilitates applications like artificial intelligence (box 2.1) and the streaming of audiovisual content.[49]

From 2013 to 2016, the computing resources of traditional data centers fell by almost one-quarter, from 58.3 million workloads to 45.1 million, while the computing resources of cloud data centers grew by 118 percent, from 108.0 million workloads to 234.9 million.[50] The growth in cloud resources has given consumers quicker and cheaper access to cloud data centers and facilitated the streaming of audiovisual content. This enabled video-on-demand services such as YouTube, Netflix, and Amazon Prime to earn revenues totaling $10 billion in 2016 through streaming services, outearning earlier formats such as downloads ($3 billion) and pay-per-view ($3 billion).[51]

Box 2.1: Artificial Intelligence in Electronic Services

In 2016, firms invested up to $39 billion worldwide in artificial intelligence (AI) technology, which allows computers to perform tasks that normally require human intelligence.[a] AI has developed with the rise of larger datasets that can be compiled through faster computers and higher-bandwidth internet connections.[b] AI algorithms' ability to perform tasks such as speech recognition and object identification increases the productivity of firms in industries like health care and retail.[c]

Telecom companies deliver AI applications through high-capacity internet networks that connect consumers to the cloud.[d] Network expansion has fueled advances in AI applications, as AI requires large amounts of processing power, which are increasingly available on the cloud at significantly lower costs.[e] In turn, cloud-based firms are investing in AI algorithms to improve customer service with chatbots or electronic personal assistants.[f]

AI is also helping audiovisual companies deliver their content more efficiently and analyze the viewing habits of their customers. For example, Netflix has used AI to improve its search results. By one estimate, customers are only willing to spend 90 seconds searching for a movie before giving up. By helping people find movies more quickly, AI increases customers' willingness to use and pay for the service, saving Netflix an estimated $1 billion annually in lapsed subscriptions.[g]

AI can also help firms reduce waste in business design processes, as well as improve marketing precision. One transportation firm reported saving $300 million by using AI to better predict repair

[47] UN, ITU, "ICT Facts and Figures 2016," June 2016.
[48] Akamai, *State of the Internet, Q1, 2013*, 2013, 5; and Akamai, *State of the Internet, Q1, 2016*, 2016, 3.
[49] Cloud computing services include software as a service, infrastructure as a service, and platforms as a service; see chapter 4.
[50] Cisco, "Cisco Global Cloud Index," 2016; Cisco, "Cisco Global Cloud Index," 2012. "Workloads" reflect the computing resources, including storage, that are available for requests made and applications run by a system's users.
[51] Statista, "Digital Media," 2016.

needs for its fleet.[h] Additionally, some retail firms are using AI to predict customer demand and reduce errors when automating operations.[i]

While U.S. firms are global leaders in developing and adopting AI, Chinese firms are catching up quickly through both private and public sector investments. In 2017, China's Ministry of Finance invested $1 billion in applying AI to a range of projects, from oil to microchip production,[j] while the e-commerce firm Alibaba—the world's sixth-largest company by revenue—is developing AI algorithms to improve its forecasts of customer purchases.[k] Additionally, Baidu's Institute of Deep Learning is researching the use of AI in driverless cars, search engine technology, and speech and voice recognition.[l]

[a] Bughin et al., *Artificial Intelligence*, June 2017, 9.
[b] Bughin et al., *Artificial Intelligence*, June 2017, 9.
[c] Otto, a German retailer, has reached 90 percent accuracy in its sales forecasts for a 30-day period; Toyota expects to invest $1 billion in a research institute to develop robotics and driverless cars; and Google's open source TensorFlow can help customers with their online purchases or target specific ads to them. Bughin et al., *Artificial Intelligence*, June 2017; Metz, "Google Is Already Late to China's AI Revolution," June 2, 2017.
[d] Giokas, "How Telecom Operators Could Capture Business," 2016; Gurnaney, "Why Telcos Will Soon Be Betting on Artificial Intelligence," 2017.
[e] Linthicum, "The Cloud Is Finally Making Machine Learning Practical," 2015.
[f] Janakiram, "5 Ways Machine Learning Has Influenced the Modern Cloud," 2017.
[g] McAlone, "Why Netflix Thinks Its Personalized Recommendation Engine," June 14, 2016.
[h] Bughin et al., *Artificial Intelligence*, June 2017, 28.
[i] Bughin et al., *Artificial Intelligence*, June 2017.
[j] Wang, "Will the Future of Artificial Intelligence Look Chinese?" November 6, 2017.
[k] Dasgupta, "Big Data Gives China's Top 3 Internet Firms Big Leverage," June 14, 2017.
[l] Metz, "Google Is Already Late to China's AI Revolution," June 2, 2017.

U.S. Trade in Electronic Services

Electronic services accounted for 12.7 percent of total U.S. cross-border services exports and 11.2 percent of U.S. cross-border services imports in 2016.[52] That year, the United States exported $93.4 billion and imported $54.3 billion in electronic services, resulting in a surplus of $39.1 billion. Between 2011 and 2015, exports of electronic services grew at an annual rate of 2.1 percent, compared to a slight decline of 0.4 percent in 2015–16.[53] Exports of audiovisual services have made up the largest share of electronic services exports since 2007. In 2016, audiovisual services accounted for 21.8 percent of total electronic services exports, followed by computer services (18.5 percent) and telecommunications services (13.1 percent) (figure 2.1). By contrast, computer services represented the majority (53.4 percent) of total electronic services imports in 2016, with imports of $29.0 billion.

In 2016, the UK was the largest destination for U.S. exports of both audiovisual services (21.9 percent) and computer services (13.1 percent). Canada and Germany were the second- and third-largest export markets for audiovisual services, whereas Canada and Switzerland were the second- and third-largest export markets for computer services. U.S.

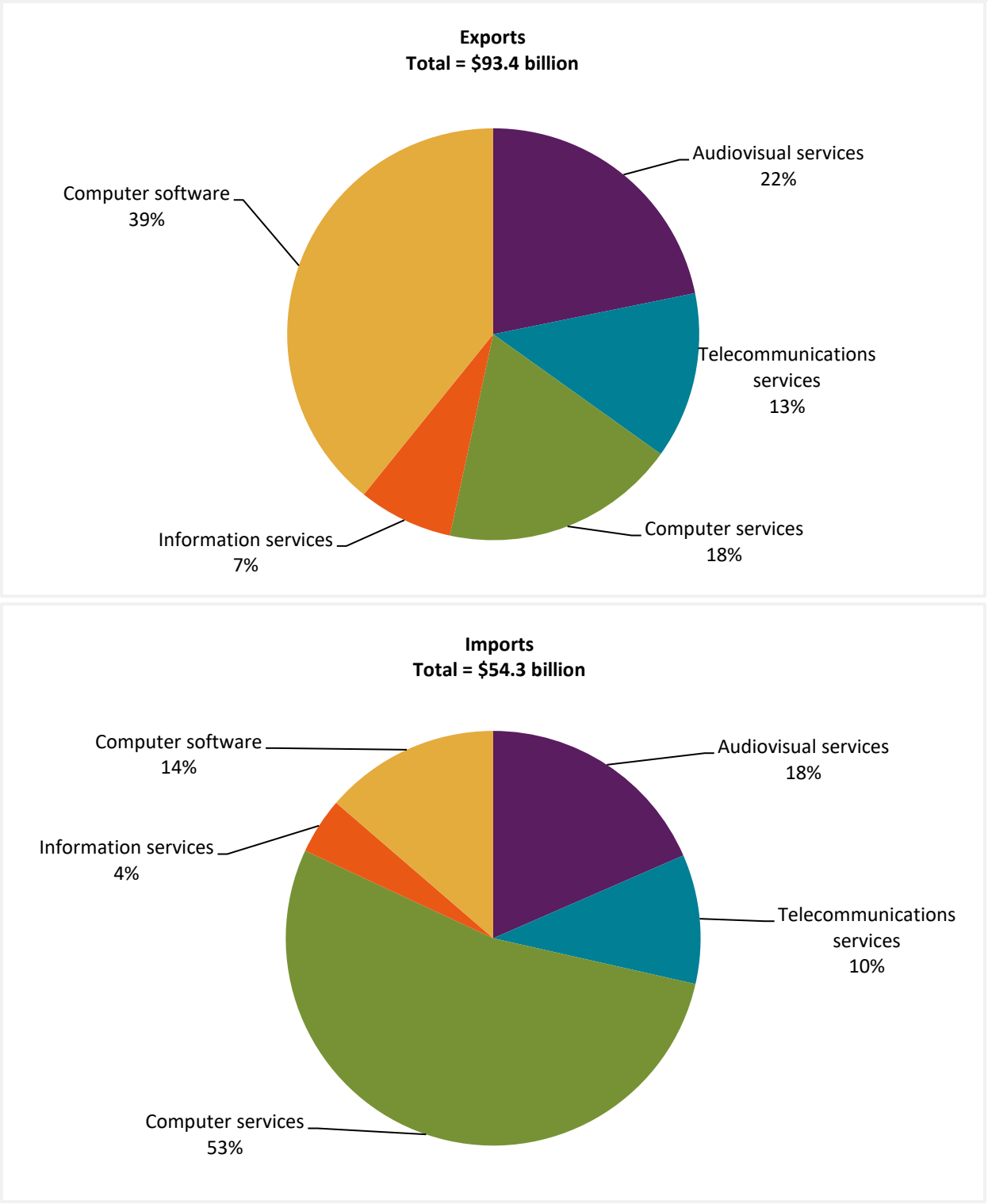
[52] USDOC, BEA, table 2.1, "U.S. Trade in Services, by Type of Service," October 24, 2017.
[53] USDOC, BEA, table 2.1, "U.S. Trade in Services, by Type of Service," October 24, 2017.

telecommunications services exports in 2016 primarily went to Central and South America, with Brazil accounting for the largest share (27.2 percent or $3.3 billion), followed by Argentina (11.8 percent or $1.5 billion).[54] Ireland was the largest export market for services involving the use of intellectual property related to computer software (24.5 percent).

Most U.S. trade in electronic services occurs through affiliates (GATS mode 3; see box 1.1). In 2015, electronic services accounted for 18.5 percent, or $270.1 billion, of total services supplied by U.S.-owned foreign affiliates abroad. This value was down slightly from 2014. Sales by foreign affiliates of U.S. computer system design firms represented 34.7 percent ($93.8 billion) of this total, followed by sales by foreign affiliates of software publishing firms, which represented 26.6 percent ($71.8 billion) (figure 2.2).[55] The same year, the value of electronic services purchased from foreign-owned U.S. affiliates totaled $132.7 billion, an increase of 6.4 percent over the previous year. Telecommunications services firms accounted for most of these purchases (57.0 percent), followed by computer system design firms (21.4 percent).[56]

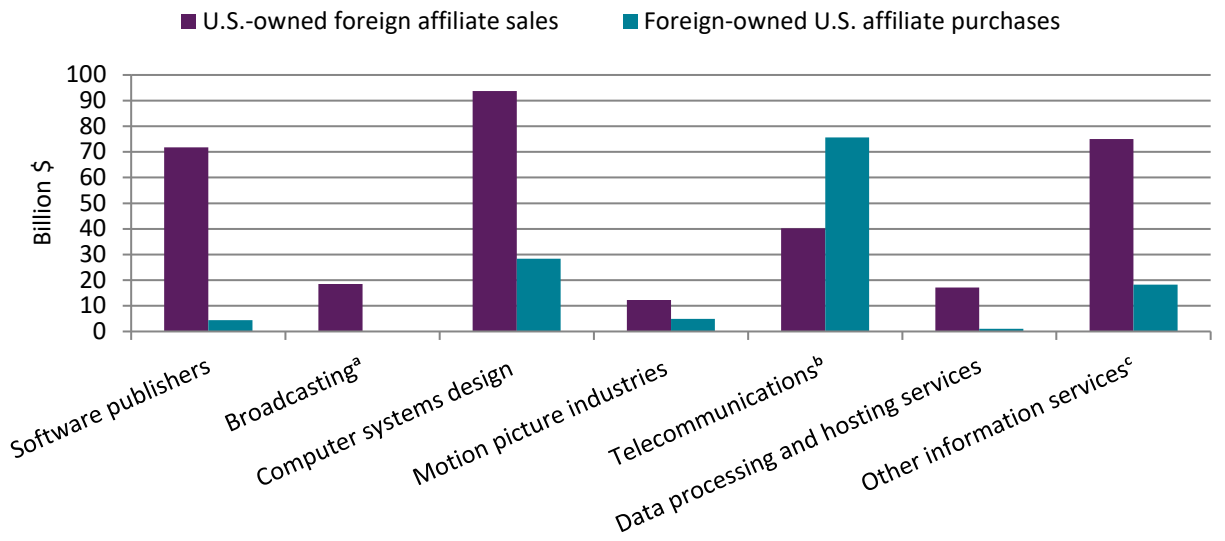
[54] USDOC, BEA, table 2.2, "U.S. Trade in Services, by Country and Affiliation," October 24, 2017.
[55] Data for telecommunications services and broadcasting services supplied by U.S.-owned foreign affiliates are unavailable for 2015. Data on telecommunications services data have been suppressed since 2012, and data on broadcasting services (except internet) have been suppressed since 2014.
[56] USDOC, BEA, table 4.1, "Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliate," October 24, 2017.

Figure 2.1: U.S. electronic services: Exports and imports by industry, 2016



Source: USDOC, BEA, table 2.1, "U.S. Trade in Services, by Type of Service," October 24, 2017. (See appendix table B.5.)
Notes: Excludes public-sector transactions.

Figure 2.2: U.S. electronic services: Affiliate sales and affiliate purchases by industry, 2015



Sources: USDOC, BEA, table 4.1, "Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliate," and table 5.1, "Services Supplied to U.S. Persons by Foreign MNEs through Their MOUSAs, by Industry of Affiliate and by Country of UBO," October 24, 2017. (See appendix table B.6.)

[a] The total value of services supplied by foreign affiliates of U.S. telecommunications firms and broadcasting firms is not available due to suppression of data for Africa. However, services supplied by U.S. firms to all other regions of the world totaled $40.2 billion for telecommunications services and $18.5 billion for broadcasting services.

[b] Establishments that broadcast exclusively on the Internet are included in subsector 519, "other information services."

[c] Other information services corresponds to NAICS code 5191 (which includes internet entertainment, game and sports sites, internet publishing and/or broadcasting, and web search portals and additional internet services).

GDP, Employment, Labor Productivity, and Salaries in Electronic Services

Value added in the U.S. electronic services sector grew from $933 billion in 2015 to $989 billion in 2016 (an increase of 6.0 percent), and the sector accounted for 6.9 percent of the total U.S. private sector GDP in 2016 (table 2.1).[57] Within that category, broadcasting and telecommunications was the largest contributor (accounting for 45.5 percent of value added in the electronic services sector, or $450 billion). However, during 2015–16, data processing, internet publishing, and other information services registered the fastest growth at 9.3 percent, slightly slower than the 12.5 percent average annual growth recorded in this segment for 2011–15. Value added in the computer systems design and related services segment rose 6.4 percent

[57] Private sector GDP excludes the value of goods and services produced by the government at the federal, state, and local levels (such as defense and government enterprises). This is similar to exports and imports of private services, a category that excludes international government transactions involving foreign military bases and U.S. embassies abroad. The share of electronic services in total services' contribution to GDP (8.7 percent) is similar to the sector's share of total services exports (7.7 percent). The similarity indicates that the export intensity of electronic services is in line with its overall level of production, while other sectors such as distribution services are more domestically focused.

in 2016, while motion picture and sound recording industries' value added increased by only 1.8 percent.

In 2016, electronic services accounted for a small share of total U.S. private sector employment, with 3.7 million FTE employees (or around 3.2 percent of total private sector employment).[58] That year, FTEs in electronic services grew by 2.8 percent, in line with the 2.9 percent compounded annual growth recorded in this segment during 2011–15. The computer systems design and related services industry accounted for just over half (50.8 percent) of electronic services employment, followed by broadcasting and telecommunications (28.3 percent). Broadcasting and telecommunications was the only electronic services industry to see a decrease in employment in 2016, falling 0.9 percent from 2015.

Electronic services workers earned an average wage of $106,052.[59] Average wages in electronic services were far above those of the services sector as a whole ($58,272), but varied substantially by industry, ranging from an average of $77,839 in motion picture and sound recording services to an average of $135,114 in data processing, internet publishing, and other information services. In 2016, wage growth in the electronic services industry was 2.4 percent, lower than the 3.5 percent average growth rate recorded during 2011–15.

Labor productivity in electronic services (measured as output in dollars per FTE) grew by 3.1 percent in 2016, as the value of output rose slightly faster than employment. This was greater than during 2011–15, when productivity rose 2.4 percent. Electronic services had an average output per worker of $265,717 in 2016, substantially higher than the average for the services sector as a whole ($121,037). Labor productivity varied widely among electronic services industries, from $426,755 per worker in broadcasting and telecommunications to $153,858 in computer systems design and related services. Broadcasting and telecommunications saw the fastest growth in labor productivity in 2016, rising 6.9 percent, while motion picture and sound recording was the only industry to see a fall in labor productivity (-6.2 percent).

[58] The BEA defines full-time equivalent employees as the number of employees on full-time schedules, plus the number of part-time employees that would have been needed to complete all the hours of full-time work reported in a given dataset.

[59] Wages are defined as monetary remuneration for employees, including tips, commissions, overtime, bonuses, and subsidies (such as for housing). Wages do not include benefits such as employer-sponsored health insurance or retirement contributions. USDOC, BEA, "Concepts and Methods," February 2014.

Table 2.1: United States: GDP, FTEs, wage and salary accruals, and labor productivity, by electronic services industry, 2011, 2015–16

	2011	2015	2016	CAGR 2011–15	% change 2015–16
Value added[a] (billion $)					
Electronic services	757	933	989	5.4	6.0
Motion picture and sound recording industries	106	116	118	2.2	1.8
Broadcasting and telecommunications	366	425	450	3.8	5.9
Data processing, internet publishing, and other information services	75	119	131	12.5	9.3
Computer systems design and related services	211	274	291	6.8	6.4
FTEs (thousands)					
Electronic services	3,226	3,620	3,722	2.9	2.8
Motion picture and sound recording industries	319	350	380	2.3	8.6
Broadcasting and telecommunications	1,141	1,064	1,054	-1.7	-0.9
Data processing, internet publishing, and other information services	300	384	396	6.4	3.1
Computer systems design and related services	1,466	1,822	1,892	5.6	3.8
Wages and salary accruals ($ per FTE)[b]					
Electronic services	90,188	103,560	106,052	3.5	2.4
Motion picture and sound recording industries	74,254	80,700	77,839	2.1	-3.5
Broadcasting and telecommunications	77,348	86,107	88,560	2.7	2.8
Data processing, internet publishing, and other information services	95,157	126,503	135,114	7.4	6.8
Computer systems design and related services	102,633	113,307	115,381	2.5	1.8
Labor productivity ($ per FTE)[C]					
Electronic services	234,656	257,735	265,717	2.4	3.1
Motion picture and sound recording industries	331,661	330,000	309,474	-0.1	-6.2
Broadcasting and telecommunications	320,596	399,342	426,755	5.6	6.9
Data processing, internet publishing, and other information services	248,333	310,938	329,545	5.8	6.0
Computer systems design and related services	143,588	150,165	153,858	1.1	2.5

Source: USDOC, BEA, "Real Value Added by Industry," November 2, 2017; USDOC, BEA, table 6.5D, "Full-Time Equivalent Employees by Industry," August 3, 2017; USDOC, BEA, table 6.3D, "Wage and Salary Accruals per Full Time Equivalent Employee by Industry," August 3, 2017.

Notes: CAGR = compound annual growth rate. Average wages are calculated by industry group, not by occupation.

[a] Real valued added by industry using 2009 chained dollars ("chaining" is a method of adjusting real dollar amounts for inflation over time, to facilitate comparison of values from different years).

[b] Wages and salary accruals per FTE, calculated by USITC, are total wages and salaries by industry divided by the number of FTEs.

[c] Labor productivity, calculated by USITC, is GDP by industry divided by the number of FTEs.

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Chapter 3
Audiovisual Services

Summary

Audiovisual services include movies and television programs, books and sound recordings, and broadcasts and recordings of live events.[60] The following discussions of market conditions and supply and demand factors focus on the motion picture and television industries, while the trade trends section covers the broader audiovisual services sector.[61]

Motion picture and television services are distributed to consumers through projection in theaters, commercial airline flights, and other public venues; rental or sale of prerecorded works as DVDs and Blu-ray discs; and dissemination via broadcast, cable, and satellite television (including video on demand) and, increasingly, via streaming and on-demand services. The sector remains heavily concentrated, with a few countries accounting for the majority of box office revenues and film/television productions worldwide. Global box office revenues have climbed steadily in recent years as consumers have shifted a growing share of their audiovisual expenditures to streaming services. Major U.S.-based film studios continue to account for the majority of global revenues; they tend to attract larger audiences and to offer more downstream revenue opportunities (such as streaming and television licensing rights) than overseas competitors.

Overseas box office revenues, particularly in developing markets like China, are growing rapidly and becoming even more crucial for U.S. studios and films than before. Streaming and video on demand (VoD) channels are increasingly important to consumers in these markets, who can

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[60] USDOC, BEA, International Data, International Services, "Table 2.2. U.S. Trade in Services, by Type of Services and Country or Affiliation" (accessed November 17, 2017).

[61] See box 3.1 for the definition of audiovisual services and a discussion of U.S. cross-border and affiliate trade in these services. In terms of trade data, while the "books and sound recordings" and the "broadcasting and recording of live events" industries also fall under the audiovisual services category (as defined by BEA), they have been excluded from this year's market conditions and supply and demand factors discussions, since most of their official trade data have previously been either unavailable or have been suppressed to avoid disclosing the data of individual companies. Audiovisual services was last covered in the 2014 *Recent Trends* report where the latest trade data was from 2012 (when much of the previously noted audiovisual services trade data categories were not available). Since trade data availability has changed significantly from this chapter's last iteration, the market analysis in this chapter focuses on "movies and television programming" for the sake of consistency. Overall, the value of U.S. exports of "movies and television programming" is seven to eight times greater than the value of U.S. exports of "books and sound recordings" or the "broadcasting and recording of live events." Video games are also excluded from the discussion due to lack of official trade data. However, the lines between the motion picture/television and gaming industries are increasingly blurring.

access vast amounts of audiovisual content on a variety of digital devices, including internet-connected TVs, smartphones, and tablets. Further, China's rapid cinema construction and growing theater attendance has been attracting more attention from U.S. filmmakers, while major Chinese companies have been investing in Hollywood studios and films. Nonetheless, China's persistent foreign film quota system and growing state censorship continue to challenge U.S. firms.

U.S. audiovisual services exports continued to exceed imports in 2016. While cross-border exports fell slightly to $20.4 billion, cross-border imports rose significantly to $10.0 billion. The United Kingdom (UK) remained the largest market for U.S. exports, though the Asia-Pacific region increased its share. The UK, Brazil, and Mexico were the largest sources of U.S. audiovisual services imports.

Introduction

Producers of audiovisual services collect receipts and payments for rights associated with movies and television programming, books and sound recordings, and broadcasting and recording of live events. The U.S. motion picture industry is the leading global producer of videos, television programs, and movies, and the United States is home to the world's leading providers of streaming content, such as Netflix, Amazon Prime Video, and YouTube.[62]

Internationally, the movie industry is heavily regulated. Some governments censor or limit the distribution of certain audiovisual products, impede foreign productions or co-productions, or require local content. The goals of such regulations can include curtailing the dissemination of disfavored cultural values, restricting illicit content, protecting intellectual property rights, and bolstering national identity and pride. Governments also provide investment and tax incentives for their domestic audiovisual companies.[63] The largest developed-country producers of audiovisual services have made some market access commitments under the World Trade Organization (WTO) in this sector, though commitments more typically apply to movie-related services than to TV- and radio-related services. Moreover, audiovisual services are among the services sectors with the fewest WTO commitments.[64]

Digital technology is changing audiovisual services by lowering the costs of production and distribution, and its widespread use is one of the most important trends affecting film and TV

[62] The estimated global combined streaming revenue for Netflix, Amazon Prime Video, and YouTube was about $8.7 billion in 2016 (by comparison, U.S. exports of electronic services in 2016 were $56.8 billion). Arthofer et al., "The Future of Television," September 20, 2016.
[63] WTO, "Audiovisual Services: Background Note," January 12, 2010, 1.
[64] There are 30 total country commitments in audiovisual sectors according to the WTO. WTO, "Audiovisual Services" January 12, 2010, 17-18.

markets.[65] Online streaming services now provide vast amounts of audiovisual content, competing with traditional providers such as movie theater owners, television and cable broadcasters, and DVD and Blu-ray sellers.[66] Faster internet speeds and accessibility, and lower costs of cloud computing and storage, have promoted the shift in consumption from traditional cinemas to a variety of fixed and mobile devices (see chapters 4 and 5). This has also created new opportunities for audiovisual content producers, who benefit from lower input costs and more outlets for content delivery. To compete with VoD and online options, traditional theaters have invested heavily in enhanced amenities such as 3D screens, improved seating (including power reclining seats and stadium seating), and a greater variety of higher-quality concessions.[67] Digital technologies, however, also facilitate copyright infringement. In particular, infringement is enabled by devices preloaded with software that allows users to stream movies and television programs, as well as camcording in theatres (with digital copies uploaded to the internet for global distribution), and websites and other digital tools.[68]

Market Conditions

Global box office revenue for films was $38.6 billion in 2016, up modestly from $34.6 billion in 2012; growth was 11.6 percent during 2012–16. Growth of box office revenue in the United States was relatively stable during the same period, averaging about 5 percent annually, with a 2 percent increase from 2015 to 2016.[69] Several reasons underlie this increase, including rising ticket prices from 3D movies. Growth was tempered, however, by lower theater attendance as consumers took advantage of increasing content streaming options and less expensive online leisure options available from home. The exception was China, which has shown exponential growth in box-office revenue over the last few years.

The industry remained concentrated, with the leading 10 markets accounting for 78 percent of global box office revenues (table 3.1). In 2016, the United States was the largest market, by revenue, with $10.3 billion, although its 27 percent share of the global market was down slightly from 2012. China's box office revenue was second at $8.2 billion—a 300 percent increase from 2012—and accounted for 21 percent of the global market, up from 8 percent in 2012. By one estimate, China is projected to surpass U.S. box office revenue by 2020: its

[65] Precise cost savings are difficult to gauge, since they vary greatly by production budget/studio. However, general opinion points to the rise of digital technology and the subsequent increase in the number of independent or smaller budget studios/creators being able to produce better content and distribute it to wider audiences as a clear sign that production and distribution costs, once nearly prohibitive, have fallen. Leigh, "Celluloid Is Strictly for Nostalgists," July 7, 2016.
[66] SNL Kagan, "U.S. Availability of Film and TV Titles," March 2016.
[67] IBISWorld, *Global Movie Production and Distribution*, August 2017.
[68] IBISWorld, *Global Movie Production and Distribution*, August 2017, 6; USITC, Digital Trade in the U.S. and Global Economies, July 2013, 5-15; and USITC, Global Digital Trade 1, August 2017, 293–94.
[69] Statistics in this sentence include Canada; MPAA, "Theatrical Statistics, 2016," 2016.

anticipated annual growth for 2015–20 is 18.9 percent, compared to 1.2 percent in the United States.[70] China was building 15 new movie screens per day in 2016, many featuring digital and 3D theater technologies.[71] In contrast, the United States and other mature markets are focusing on improving the cinema experience. In most other top 10 markets, including Japan, the UK, France, and Germany, revenues have flattened or declined since 2012, reflecting increased competition from other sources of entertainment.

Table 3.1: Audiovisual services: Top 10 countries by estimated global box office revenue and market share, 2016

Country	Estimated revenue (billion $)	Estimated market share (%)
United States	10.3	26.7
China	8.2	21.2
Japan	2.1	5.4
India	1.9	4.9
UK	1.8	4.5
South Korea	1.6	4.1
France	1.5	4.0
Germany	1.2	3.0
Australia	0.9	2.4
Mexico	0.9	2.3
Total top 10	30.3	78.4
All others	8.3	21.6
Grand total	38.6	100

Source: Statista, "IHS Screen Digest and MPAA Data," 2017, 7.

Nearly 8 billion moviegoers were admitted to cinemas worldwide in 2017, up from 7 billion in 2012. India, China, and the United States (and Canada)[72] had the most admissions worldwide in 2016, and together accounted for 4.7 billion admissions in 2016, representing 60 percent of the global total (table 3.2). India remained the leading market with over 2 billion admissions. China's cinema admissions, however, nearly tripled from 470 million in 2012 to 1.4 billion in 2016, overtaking the United States to become the second-largest global market by admissions. The growth of China's admissions corresponds to the surge in the number of screens in China, especially in smaller cities.[73] Other countries in the top 10 have large populations and stable or growing disposable income, such as Mexico, South Korea, Brazil, Japan, France, and the UK.

[70] PwC, "China Challenges the US for Global Box Office Leadership," 2016.
[71] PwC, "China Challenges the US for Global Box Office Leadership," 2016.
[72] The European Audiovisual Observatory (EAO) uses statistics for "number of admissions" that combine the United States and Canada as one market.
[73] Oxford Economics, *The Economic Contribution of Film and Television in China*, December 2017.

Table 3.2: Audiovisual services: Top 10 markets by estimated cinema admissions and global share, 2016

Country	Number of admissions (million)	Global share (%)
India	2,015	25.5
China	1,370	17.3
United States and Canada	1,320	16.7
Mexico	321	4.1
South Korea	217	2.7
France	213	2.7
Russia	195	2.5
Brazil	184	2.3
Japan	180	2.3
UK	168	2.1
Total top 10	6,183	78.1
All others	1,730	21.9
Grand total	7,913	100

Source: EAO, *Focus: World Film Market Trends*, 2017, 11.

The worldwide volume of film production was 7,070 films in 2016, up 12 percent from 6,334 films in 2012.[74] Film production was highly concentrated, with the leading 10 countries producing 82 percent of the global volume of films in 2016 (table 3.3). India, China, and the United States accounted for 51 percent of output during 2016, increasing their combined global market share modestly from 49 percent in 2012. India, home of "Bollywood" film producers, continued to lead worldwide feature film production[75] with 1,903 films in 2016, accounting for 27 percent of global film production.[76] China, which produced 944 films in 2016, more than doubled its production during the last decade; it surpassed the United States (which produced 789 films in 2016) to become the world's second leading film producer.[77]

The picture was mixed in smaller markets. Among other leading Asian markets, Japan (which is known for animated features) modestly increased its output to 610 films, while South Korean film volume increased by 66 percent, in part owing to government incentives that spurred domestic production.[78] France, the leading European film producer, ranked sixth globally with 282 films, reflecting a drop in international co-productions that was partly countered by a slight increase in domestically produced films.[79]

[74] EAO, *Focus: World Film Market Trends*, 2017, 13.
[75] Bollywood refers to the Hindi-language film industry centered in Mumbai, India
[76]. Bollywood films are consumed globally, particularly throughout Asia and regions with large Indian diaspora populations.
[77] The number of U.S. films held steady in 2016. EAO, *Focus: World Film Market Trends*, 2017, 43, 51.
[78] EAO, *Focus: World Film Market Trends*, 2017, 57.
[79] EAO, *Focus: World Film Market Trends*, 2017, 23.

Table 3.3: Audiovisual services: Top 10 countries, by estimated global feature film production and global share, 2016

Country	Number of films	Global share (%)
India	1,903	26.9
China	944	13.4
United States	789	11.2
Japan	610	8.6
South Korea	339	4.8
France	283	4.0
Germany	256	3.6
Spain	254	3.6
Italy	224	3.1
UK	200	2.8
Total top 10	5,802	82.1
All other	1,268	17.9
Grand total	7,070	100

Source: EAO, *Focus: World Film Market Trends*, 2017, 13.

U.S.-headquartered movie studios continued to lead the U.S. and global film markets during 2017. The top 10 U.S. movie studios accounted for 93.4 percent of U.S. movie revenue (table 3.4), and the top 7 U.S.-based movie studios accounted for 59 percent of global box office receipts.[80] Even in the European Union (EU), which has a well-established film industry, 67 percent of film admissions were for U.S. movies in 2016, and another 4 percent were for U.S.-EU co-produced films.[81] U.S. movies also account for a substantial share of the film market in developing countries. In these markets, the construction of digital-ready multiplex theaters (which cater to U.S. films) has increased consumer interest in and access to U.S. films. Since the United States is a mature market, U.S. movie producers rely heavily on international audiences for box office revenue: in 2017, 59 percent of the revenue for the top 10 U.S. movies came from foreign moviegoers (table 3.5).

In general, U.S. films tend to earn high global revenues because of their large budgets, which can be used to pay for high-quality talent and physical materials (such as props, special effects, and use of various locations), and vertically integrated production and distribution. The largest U.S. studios are responsible for not just the production of the movies, but also the financing, contract negotiations, and advertising and marketing needed (these costs are usually incorporated in total film budgets). Total film production expenditures by major Hollywood movie studios reached an estimated $7 billion in 2015, or 65 percent of the global total, followed by the UK ($1.5 billion, 14 percent) and Canada ($969 million, 9 percent).[82]

[80] Tartaglione, "Worldwide Box Office 2017 Studio Rankings," January 4, 2018.
[81] EAO, *Focus: World Film Market Trends*, 2017, 14.
[82] Doty, "U.S. Film Production Spending Increased 11 Percent," June 15, 2016.

Table 3.4: Audiovisual services: Leading movie studios by estimated U.S. revenue, 2017

Producer/distributor	Country	U.S. revenue (million$)	Share (%)
Walt Disney	United States	2,410	21.8
Warner Brothers	United States	2,035	18.4
Universal	United States	1,529	13.8
20th Century Fox	Australia/United States	1,425	12.9
Sony/Columbia	Japan/United States	1,090	9.9
Lionsgate	United States	855	7.7
Paramount	United States	534	4.8
STX Entertainment	United States	207	1.9
Focus Features	United States	130	1.2
Weinstein Company	United States	125	1.1
Total top 10		10,340	93.4
All other		725	6.6
Grand total		11,065.4	100

Source: BoxOfficeMojo.com, "Studio Market Share," n.d. (accessed January 22, 2018).

Table 3.5: Audiovisual services: Top 10 films by estimated North American (NA) and international (INT) box office (BO) revenue, 2016

Title (original)	Country of origin	Studio	NA BO revenue (million $)	NA share (%)	INT BO revenue (million $)	INT share (%)
Captain America: Civil War	United States	Walt Disney	408	36.6	707	63.4
Finding Dory	United States	Walt Disney	486	47.6	533	52.3
Zootopia	United States	Walt Disney	341	34.0	661	66.0
The Jungle Book	United States/GB	Walt Disney	364	38.4	583	61.6
The Secret Life of Pets	United States/JP	Universal Pictures	368	42.5	496	57.3
Batman v Superman: Dawn of Justice	United States	Warner Bros.	330	39.7	502	60.3
Rogue One	United States	Walt Disney	408	52.6	368	47.4
Deadpool	United States	20th Century Fox	363	47.6	399	52.4
Fantastic Beasts and Where to Find Them	United States/GB	Warner Bros.	223	29.8	525	70.2
Suicide Squad	United States	Warner Bros.	325	46.2	378	53.8
Total top 10			3,616	41.2	5,152	58.7
All other			7,784	26.1	22,048	73.9
Grand total			11,400	29.5	27,200	70.5

Sources: EAO, "Top 20 Films by Gross Box Office Worldwide," 2016, 13; USITC calculations.

Supply and Demand Factors

Growth of Streaming Services

Advances in digital technology, including broadband proliferation, are joining with declining prices for cloud computing and the adoption of smartphones and tablets to transform the audiovisual services industry by making it easier to consume film and television content online.[83] According to one report, consumers of audiovisual services are "increasingly agnostic as to the size of the screen on which they view films."[84] Streaming services providers, such as U.S.-based Netflix and Amazon Prime Video, are making vast libraries of content available through video on demand (VoD) and subscription video on demand (SVoD) services. This both creates opportunities and increases competition for established U.S. content producers, as streaming service providers are producing more original content.[85] Streaming video consumption is also causing the sales of physical DVDs and Blu-ray discs to decline rapidly.

In response, many U.S. studios are releasing films through VoD and streaming services sooner after theatrical screening than in the past.[86] U.S. studios are also licensing more of their content to streaming providers, and are forming their own streaming services ventures.

Video streaming services are the fastest-growing segment of the global audiovisual services industry. SVoD penetration is projected to increase from 1.6 percent of global households in 2010 to 13.4 percent in 2020, while global SVoD revenues are projected to grow from $11.0 billion in 2016 to $18.7 billion by 2022.[87] The global footprint of Netflix, the largest provider, is projected to grow from less than 20 million households in 2010 to 115 million by 2020. Amazon Prime Video, the second-largest global supplier, is projected to increase its subscriptions outside the United States from 9.3 million in 2017 to 17.8 million in 2020, with much of this growth coming from Europe and Asia.[88] The U.S. market for SVoD is relatively mature; as a result, firms that provide SVoD increasingly rely on foreign markets for subscriber

[83] Global average connection speeds were 3.1 megabits per second (Mbps) at the beginning of 2013 and reached 7.2 Mbps in the first quarter of 2017. Akamai, *Akamai's State of the Internet,* 2013 and 2017. Internet access increased from 36.9 percent of the global population in 2013 to 45.9 percent in 2016; World Bank, DataBank (accessed January 20, 2017). Cloud data center workloads increased by nearly 800 percent during 2011–16, from 21.3 million workloads to 189.8 million in 2016. USITC, *Global Digital Trade 1*, 2017, appendix table G.1.
[84] PWC, "Perspectives from the Global Entertainment and Media Outlook on Business Models," 2017, 22.
[85] USITC, *Global Digital Trade 1*, 2017.
[86] PwC, "Perspectives from the Global Entertainment and Media Outlook," 2017.
[87] Statista, "Number of Subscription Video on Demand (SVoD) Households Worldwide from 2018 to 2022 (in millions)," 2018; Statista, "Digital Markets Outlook, 2016," 2018.
[88] Statista, "Number of Amazon Prime Video Subscribers Worldwide," 2018.

and revenue growth. In 2016, Netflix earned $3.2 billion in revenue from international sources, which accounted for 60 percent of the firm's total revenue that year.[89]

Although Netflix and Amazon Prime Video hold large worldwide market shares, they face strong competition from an expanding number of local service providers.[90] For example, while the leading provider to India's market of 160 million digital video viewers is Amazon Prime Video, which streams content in Hindi, Tamil, Telugu, and other local languages (as well as English), Indian firms like Hotstar are drawing customers by providing original and local content.[91] In Europe, Netflix and Amazon Prime Video compete with two types of providers. Pan-European SVoD providers such as the UK's Sky Now TV and Sky Online/Ticket offer services in the UK, Germany, Italy, and Austria, while some national providers are owned and operated by domestic broadcasters, telecom providers, or internet service providers, such as the UK's BBC iPlayer.[92]

China's Film Market and Its Growing Ties with Hollywood

The Chinese film industry is increasingly prolific, in terms of both production (see table 3.3) and consumption, and it is estimated that China will soon overtake the United States as the world's biggest film market in terms of revenue.[93] Several factors have contributed to the industry's accelerated growth, including rapid cinema construction, a growing middle class eager to consume more audiovisual content, and increasing investments by Chinese companies in U.S. movie/TV studios and films. However, continuing issues such as intellectual property infringement, film quotas, redistribution of box office earnings, and state censorship continue to dampen the expansion of the Chinese market for U.S. movies.[94]

China had 1.4 billion cinema admissions in 2016, a 600 percent increase over 2009.[95] The number of cinema screens in China is estimated to reach 50,000 by 2020 (there were 41,179 screens in 2016), and much of this expanded capacity will be in rural areas where demand is growing. In comparison, there are about 40,000 cinema screens in the United States today, a number that has remained steady over the past five years.[96] While more mature markets like

[89] According to the Netflix 10-K filing, 40 percent of its revenue came from U.S. sources. Netflix, "Form 10-K," December 31, 2016.
[90] Mishra and Sharma, "The Race Is On," November 22, 2017.
[91] Baxi, "India's Video Streaming Market Is Bigger Than Ever," September 30, 2017.
[92] USITC, *Global Digital Trade 1*, 2017, 425.
[93] PwC, *Global Entertainment and Media Outlook 2016–2020: Cinema*, 2016.
[94] PwC, *Global Entertainment and Media Outlook 2016–2020: Cinema*, 2016.
[95] Oxford Economics, *The Economic Contribution of Film and Television in China*, December 2017, 9.
[96] PwC, *Global Entertainment and Media Outlook 2016–2020: Cinema*, 2016.

the United States are relying to a greater extent on rising ticket prices (particularly for 3D films) for revenue growth, China also benefits from its rapidly growing rate of admissions.[97]Although China's box office growth slowed in 2016, increasing by only about 4 percent from the previous year—likely due to a general economic slowdown in the country, among other factors—total private movie consumption has risen by 90 percent since 2009.[98]

Chinese films continue to account for the majority of the country's film market: about 58 percent of Chinese box office receipts in 2016 went to domestically produced movies.[99] But U.S. movie studios increasingly rely on the Chinese market to bolster their own film revenues. For instance, the movie adaptation of the video game *Warcraft* (2016), which underperformed in the U.S. market by earning less than $25 million on its opening weekend, earned $156 million in its first five days in Chinese theaters, due in part to the popularity of video gaming in China.[100] In many cases, China's box office size is affecting the kind of films Hollywood produces; according to some observers, U.S. movies are incorporating more of the action plotlines that draw Chinese audiences[101] and including more Chinese actors and locations.[102]

Chinese companies are also increasingly investing in Hollywood. At the end of 2016, the Chinese real estate and entertainment conglomerate Dalian Wanda Group announced that it would acquire Legendary Entertainment—a U.S. studio that produced blockbusters such as *Jurassic World* (2015)—for $3.5 billion.[103] Wanda's founder Wang Jianlin, China's wealthiest person as of 2017, also made deals with Sony Pictures to finance films, and acquired Dick Clark Productions, a major U.S. TV production company that produces awards shows and music entertainment programs, for $1 billion.[104] (Sony Pictures is a U.S. subsidiary of Sony Entertainment, which is itself a subsidiary of Japan's Sony Corporation.) Moreover, Chinese e-

[97] PwC, *Global Entertainment and Media Outlook 2016–2020: Cinema*, 2016.
[98] Oxford Economics, *The Economic Contribution of Film and Television in China*, December 2017, 9; EAO, *Focus: World Film Market Trends*, 2017, 51; Beech, "How China Is Remaking the Global Film Industry," January 26, 2017.
[99] EAO, *Focus: World Film Market Trends*, 2017, 51.
[100] Beech, "How China Is Remaking the Global Film Industry," January 26, 2017. With the recent slowdown in Chinese box office revenues, there has been an increased push to produce more domestic blockbuster movie franchises. For example, the Chinese action thriller *Wolf Warrior II* (2017) grossed $810 million in box office revenue in its first five weeks of release (dwarfing the $88 million total made by the movie's first installment in 2015). It became China's highest-grossing movie of all time and the second highest earning title in history for a single region (behind *Rogue One: A Star Wars Story* (2016) for North America). This level of box office earnings for a largely domestically made movie (with some Western consultants) indicates how well-crafted Chinese movie productions have become, and how attuned they are to Chinese movie going audiences. *Wolf Warrior II* has sparked interest as a guideline for Hollywood studios seeking to attract Chinese viewers. Frater, "Wolf Warrior II's' Massive Success Forces Studios to Rethink," August 31, 2017.
[101] Comedic taste and romantic boundaries often vary more across cultures than simpler action-themed plotlines. Follows, "How Important Is International Box Office?" May 15, 2017.
[102] Beech, "How China Is Remaking the Global Film Industry," January 26, 2017.
[103] Beech, "How China Is Remaking the Global Film Industry," January 26, 2017.
[104] Beech, "How China Is Remaking the Global Film Industry," January 26, 2017.

commerce leader Alibaba and online gaming company Tencent have invested in smaller Hollywood studios and provided funding for major U.S. films such as *Mission: Impossible—Rogue Nation* (2015) and *Star Trek Beyond* (2016). Further, in 2016 Alibaba and director Steven Spielberg announced a partnership to produce, distribute, and finance films globally.[105]

However, China's longstanding import quota for films and its increasingly stringent state censorship pose challenges for the growing ties between U.S. and Chinese investors and filmmakers. The Chinese government has long maintained an import quota of 34 big-budget feature films per year for the United States, though the quota rose in 2016 to 39 movies in an effort to offset the box office slowdown and to meet the terms of a 2012 memorandum of understanding to import and distribute more foreign films in the Chinese market.[106] (Some analysts expect the quota to be maintained at this level going forward.)[107] Furthermore, only 25 percent of Chinese box office revenues are shared with U.S. movie distributors (compared to the international average of 40 percent),[108] and many U.S. distributors report lengthy payment delays.[109] China reportedly has become more restrictive in censoring content, as China's President Xi Jinping has expressed an intention to refocus on "core socialist values" and avoid "overt admiration for Western lifestyles."[110]

Trade Trends

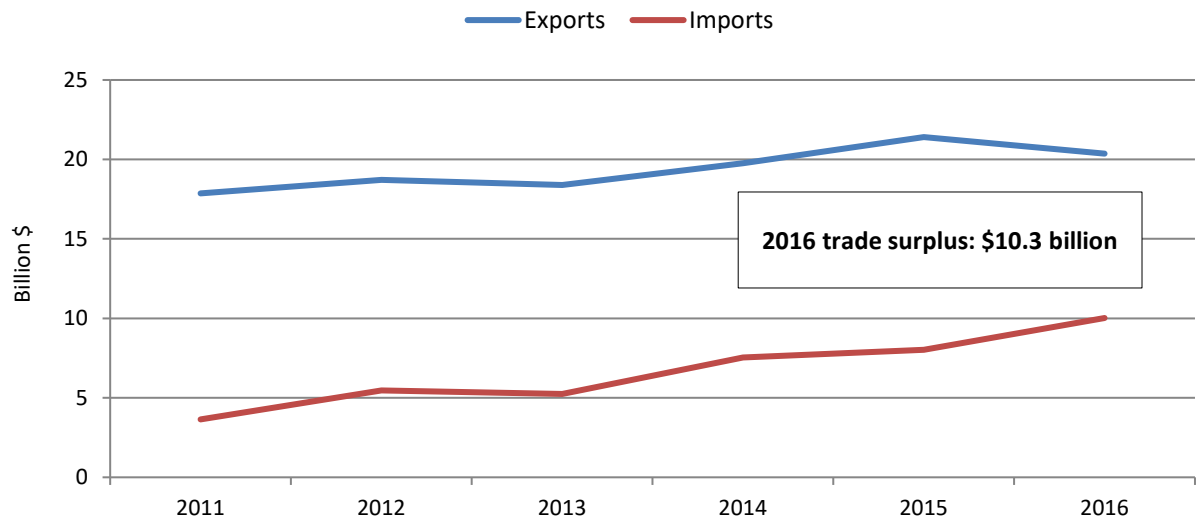
Cross-border Trade

The Bureau of Economic Analysis (BEA) publishes data on audiovisual services, which is defined to include movies and television programming, books and sound recordings, and broadcasting and recording of live events.[111] According to these data, U.S. exports continue to exceed imports of audiovisual services (box 3.1) (figure 3.1). In 2016, U.S. cross-border exports of audiovisual services were $20.4 billion, a slight decline from $21.4 billion in 2015, following average annual growth of 4.6 percent from 2011 to 2015. The UK remained the largest single U.S. export market for audiovisual services, accounting for $4.5 billion (22 percent). Other

[105] Beech, "How China Is Remaking the Global Film Industry," January 26, 2017.
[106] USTR, 2018 National Trade Estimate Report on Foreign Trade Barriers, 2018, 101–2.
[107] Brzeski, "China's Quota on Hollywood Film Imports," February 9, 2017.
[108] Brzeski, "China's Quota on Hollywood Film Imports," February 9, 2017.
[109] EAO, *Focus: World Film Market Trends*, 2017, 51.
[110] Beech, "How China Is Remaking the Global Film Industry," January 26, 2017. For example, one draft film law demands "excellence in both professional skills and moral integrity" from those in the Chinese movie business. Beech, "China's Morality Censors Take Aim," August 30, 2016.
[111] USDOC, BEA, table 2.1, "U.S. Trade in Services, by Type of Service," October 24, 2017.

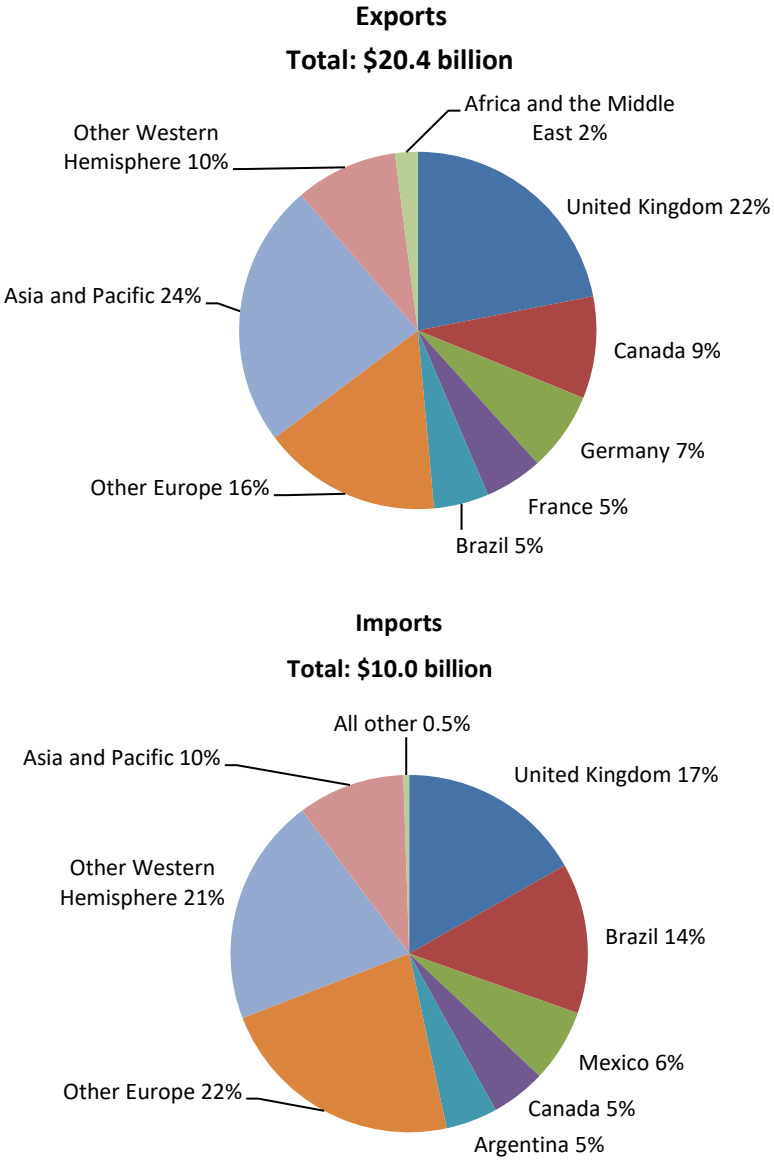
important export markets included Canada ($1.9 billion, 9 percent); Germany ($1.5 billion, 7 percent); France ($1.1 billion, 5 percent); and Brazil ($1.0 billion, 5 percent) (figure 3.2).

Figure 3.1: Audiovisual services: U.S. cross-border trade, 2011–16



Source: USDOC, BEA, International Data, International Services, "Table 2.2. U.S. Trade in Services, by Type of Services and Country or Affiliation" (accessed November 17, 2017). (See appendix table B.7).

Figure 3.2: Audiovisual services: U.S. cross-border exports and imports by country, 2016



Source: USDOC, BEA, International Data, International Services, "Table 2.2. U.S. Trade in Services, by Type of Services and Country or Affiliation" (accessed November 17, 2017). (See appendix table B.8).

Europe remained the largest regional consumer of U.S. audiovisual services exports, accounting for 50 percent of the total in 2016 (28 percent excluding the UK). However, Europe's share of exports was 59 percent in 2012, so this represents both a relative decline and a slight absolute decline, from $11.0 billion in 2012 to $10.3 billion in 2016. In contrast, the share of U.S. audiovisual exports going to the Asia-Pacific region increased from 19 percent in 2012 to 24 percent in 2016 ($3.6 billion to $4.9 billion). This growth was driven by China and India: U.S. audiovisual exports to China grew from $185 million to $963 million, and those to India grew from $110 million to $878 million over the period.

U.S. cross-border imports of audiovisual services in 2016 totaled $10.0 billion, a 25 percent increase from the previous year. This was a slight increase from the steady 22 percent growth rate for imports from 2011 to 2015. The UK was the largest source of U.S. audiovisual imports in 2016, accounting for $1.7 billion (or 17 percent of total imports). The UK was followed by Brazil ($1.4 billion, or 14 percent), Mexico ($661 million, or 7 percent), Canada ($498 million, or 5 percent), and Argentina ($468 million, or 5 percent).

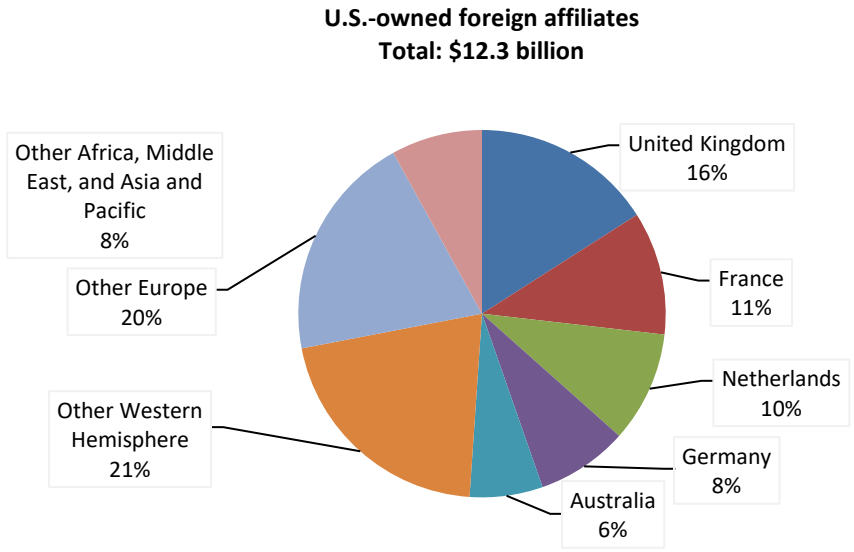
Latin America continues to supply a large amount (46 percent) of U.S. audiovisual imports, and Brazil accounts for the largest country share within Latin America. The United States imported $1.4 billion in audiovisual services from Brazil in 2016, almost all either movies or television programming. Brazil's Globo is the world's second-largest commercial TV network by revenue and the world's largest producer of telenovelas.[112] At the same time, the Asia-Pacific region accounts for a growing share of U.S. audiovisual imports—5 percent in 2012 and 10 percent in 2016. However, imports from Europe recorded the largest increase, from 31 percent in 2012 to 39 percent in 2016 ($1.7 billion to $3.9 billion). Countries other than the UK accounted for a substantial share of this increase: imports from non-UK Europe increased from $722 million in 2012 to $2.3 billion in 2016. Imports of movies and television programming from Europe grew from $504 million to $1.2 billion, while imports of books and sound recordings grew from $982 million to $2.2 billion.

Affiliate Transactions

Sales by foreign affiliates of U.S. audiovisual firms (including firms in the motion picture, video, and sound recording industries) totaled $12.3 billion in 2015. This was a 14 percent decrease from 2014, and a 27 percent decrease from its peak in 2008. The largest markets for such sales were the UK ($2.0 billion), France ($1.3 billion), and the Netherlands ($1.2 billion) (figure 3.3). Purchases from U.S. affiliates of foreign audiovisual firms were $4.9 billion in 2015, a 7 percent increase from 2014. The BEA suppresses most country-specific data on these purchases (box 3.1).

[112] Telenovelas (which originated in Latin America), are melodramatic television series with a limited number of episodes that are performed in Spanish or Portuguese, typically shown during prime time on multiple days of the week over the course of several months. There are telenovelas aimed at children, teenagers, or mature audiences. Telenovela Studies, "What is a Telenovela," n.d. (accessed March 27, 2018).

Figure 3.3: Audiovisual services: Affiliate sales by country, 2015



Source: USDOC, BEA, table 3.1, "Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliate" (accessed November 15, 2017). (See appendix table B.9).

Box 3.1: Understanding Data on Cross-Border Trade and Affiliate Transactions in Audiovisual Services

The Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce (USDOC) captures cross-border trade in audiovisual services with the quarterly BE-125 survey on U.S. international transactions in intellectual property.[a] This survey asks respondents to report receipts from foreign persons, and payments to foreign persons, for rights related to intellectual property. There are three broad audiovisual categories: rights related to television programs and motion pictures; books and sound recordings; and rights related to broadcast and recordings of live events. The survey is mailed to about 2,000 U.S. persons and has an average response rate of 90 percent, with a reporting threshold of $6 million for receipts and $4 million for payments.[b]

The BEA's affiliate transaction data captures sales by foreign affiliates of U.S. motion picture and sound recording firms, and purchases from U.S. affiliates of foreign firms. Many numbers are suppressed to avoid disclosing the data of individual companies.[c]

The Institute for Statistics of the UN Educational, Scientific and Cultural Organization (UNESCO) conducts a biennial survey of feature film and cinema statistics.[d] It maintains data on film consumption (such as attendance) and infrastructure (such as the number of indoor cinemas) in different countries. Industry groups like the MPAA also track box office revenues in different regions.

The UN's Comtrade database has data on trade in "developed cinematographic film" (Standard International Trade Classification) and "cinematographic film exposed or developed" (Harmonized Commodity Description and Coding Systems), categorized as a commodity rather than a service. Additionally, the WTO maintains a database that records different countries' audiovisual services exports to the world and imports from the world (though not bilateral transactions), but the database understates audiovisual trade, since many WTO members do not report such statistics.[e]

[a] BEA describes this sector as "film and television tape distribution." USDOC, BEA, *Survey of Current Business*, October 2013, 26–28, 32.
[b] USDOC, BEA, *Survey of Current Business*, October 2013, 26–28, 32.
[c] Hanson and Xiang, "International Trade in Motion Picture Services," January 2008, 3–9.
[d] UNESCO, Institute for Statistics, Feature Films and Cinema Data (accessed December 21, 2017).
[e] WTO, "Audiovisual Services: Background Note," January 12, 2010, 4.

Outlook

Global box office revenues are expected to be modest in the coming years, but they will vary by region. Revenues are expected to shift from mature markets like the United States and Europe to the Asia-Pacific region, particularly China, where disposable incomes are expected to rise.[113] By 2020, the Asia-Pacific region is expected to account for about half of global box office revenue.[114] Although China will likely surpass the United States in box office revenue within the next few years (and has already surpassed total annual U.S. cinema admissions), it remains unclear how U.S.-China audiovisual services trade will develop due to import quota, remuneration, and censorship issues.[115]

Consumers worldwide are expected to continue to shift consumption to streaming services and other online formats because of the convenience and wide selection of online content. This global expansion of streaming services will benefit U.S. firms as the leading global providers.[116] Such services will likely further erode film studios' revenues from theatrical screening and physical home video products (such as DVDs and Blu-ray discs), though box office revenues will likely continue to grow as ticket prices rise worldwide.

The growth of streaming services will also bolster licensing revenues from streaming platforms.[117] The online distribution of audiovisual content will likely continue to pose challenges to the enforcement of intellectual property rights.[118]

[113] PwC, "Perspectives from the Global Entertainment and Media Outlook," 2017.
[114] PwC, "China Challenges the US," 2016, 2.
[115] Dresden, "What Does the Chinese Film Industry Get?" December 11, 2017; IBISWorld, Global Movie Production and Distribution, August 2017, 6-7.
[116] IBISWorld, *Global Movie Production and Distribution*, August 2017, 7.
[117] PwC, "Perspectives from the Global Entertainment and Media Outlook," 2017.
[118] IBISWorld, *Global Movie Production and Distribution*, August 2017, 7. Intellectual property rights issues traditionally have included transferring digital files and selling bootleg DVDs. However, in some recent cases people have gained access to pre-release films or television programs, and demanded ransoms from Hollywood studios in exchange for not releasing digital copies of the films or programs before their official release dates. *Economist*, "Film Piracy Is Changing. Pirates Now Want Ransoms," June 1, 2017.

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Chapter 4
Computer and Data Processing Services

Summary

The global computer and data processing services industry—encompassing information technology (IT) services, cloud computing, and software—grew rapidly during the past decade, and this strong growth will likely continue in the coming years. Computer services increasingly enable the integration of services and manufactured goods, with more and more services embedded in manufactured products.[119]

Demand remained highest in North America, where most of the industry's leading firms are headquartered. At the same time, Indian computer service companies have begun supplying higher-value services, while Chinese firms have become prominent players in the sector. In emerging markets, computer services firms have used mobile applications reach new consumers. The growth in mobile phone subscriptions and cloud-based application hosting platforms has increased access to computer services in these markets.

The U.S. trade deficit in computer and data processing services grew during 2011–16, totaling $11.7 billion at the end of the period.[120] India remained the largest supplier of U.S. imports of computer and data processing services, accounting for 47 percent of such imports in 2016. Sales by U.S.-owned foreign affiliates whose primary industry was computer and data processing services totaled $111 billion in 2015. These sales were more than five times the value of U.S. cross-border exports of such services in that year and far exceeded purchases from U.S. affiliates of foreign computer and data processing services firms, which totaled

[119] As an example, one forecast predicts that by 2021, 98 percent of new cars sold in the United States and Europe will be electronically connected to the car manufacturer. Firms report that they will use the data to better understand buyers, improve production and performance, and enhance vehicle safety. Holley, "Big Brother on Wheels," January 17, 2018, 17.

[120] U.S. exports of computer services grew more quickly than imports from 2011 to 2015.

$29.4 billion that year. Countries have increasingly introduced non-tariff measures to digital trade, such as data localization requirements, which may undermine global provisions of computer services.

Introduction

The computer and data processing services industry can be divided into two broad categories: IT services and software services. While IT services tend to be sold to businesses, software targets both businesses (with offerings like marketing software) and consumers (through mobile phone applications). A third category of computer services, cloud computing, overlaps with both of these categories but is often discussed separately.

IT services range widely. They include hardware and software consultancy, installation, and maintenance services, including installation of mainframes and central computing units; data recovery services; analysis, design, and programming of ready-to-use systems (including webpage development and design); data processing and hosting services (cloud services), such as data entry, tabulation, and processing on a time-sharing basis; webpage hosting services; and provision of applications, hosting clients' applications, and computer facilities management services.[121] IT services also encompass software-dependent services such as financial statement preparation, payroll preparation, tax return preparation, industrial design, and interior design.[122]

Software services are likewise diverse and include different categories of services depending on whether the software is mass produced (like Microsoft Office), or created for a specific client (custom software). For mass produced software, computer services include software downloaded or otherwise electronically delivered (including applications downloaded to smartphones), and can be purchased through a single payment, subscription, or through licensing agreements. Custom software includes development, production, supply, documentation, and sale of software, including operating systems, made to order for specific

[121] These activities fall under the "computer and data processing services" category of the BEA survey of cross-border services trade and correspond to codes 5415 and 5182 of the North American Industry Classification System (NAICS). USDOC, BEA, Quarterly Survey of Transactions in Selected Services and Intellectual Property with Foreign Persons, Form BE-125, September 2016.

[122] These services are additional categories that fall under NAICS code 5415, which includes "Businesses engaged in providing services in the field of information technologies through one or more of the following activities: (1) writing, modifying, testing, and supporting software to meet the needs of a particular customer; (2) planning and designing computer systems that integrate computer hardware, software, and communication technologies; (3) on-site management and operation of clients' computer systems and/or data processing facilities; and (4) other professional and technical computer-related advice and services." USDOC, BEA, *Guide to Industry Classifications for International Surveys,* 2012, 43.

users (however delivered). Additionally, sales of original copies and ownership rights of software are included in this category. However, this definition excludes non-customized computer software on physical media (considered goods trade) and licenses to reproduce or distribute software (considered intellectual property).[123]

A third segment of the market—cloud computing—allows firms to host computer-based services on networks of servers accessed via the internet.[124] Cloud services are frequently embedded in IT and software services, but are often reported as a separate segment of the industry. Cloud computing offers users "ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage applications, and services);" and quick access to the resources, via the internet, requires little effort from either the resource manager or the service provider.[125] Cloud computing has three basic service models. Software as a service (SaaS) offers software and applications that are hosted on cloud datacenter networks and accessed by customers via the internet. Platform as a service (PaaS) offers tools for development, testing, hosting and maintenance of software and applications. Infrastructure as a service (IaaS) provides data processing and storage services for both firms and individuals.[126]

This chapter considers all of the services described above. In recent years, the computer and data processing services industry has continued to grow in many countries, including in the United States. Between 2011 and 2016, the share of U.S. economic output accounted for by computer and data processing services rose from 1.8 percent to 2.2 percent.[127]

[123] Again, these services correspond to NAICS codes 5415 and 5182. USDOC, BEA, *Guide to Industry Classifications for International Surveys*, 2012, 39, 43.
[124] In the BEA definition of computer services, cloud computing falls under "data processing and hosting services." USDOC, BEA, Quarterly Survey of Transactions in Selected Services and Intellectual Property with Foreign Persons, Form BE-125, September 2016.
[125] USDOC, NIST, *The NIST Definition of Cloud Computing,* September 2011, 2–3.
[126] USITC, Global Digital Trade 1, August 2017, 58.
[127] USDOC, BEA, "Value Added by Industry," November 2, 2017. The shares of output correspond to value added as a percentage of gross domestic product (GDP).

Market Conditions

The size of the global computer and data processing services industry depends on how such services are defined. The BEA considers software to be a computer service only when it is delivered over the internet (physical copies of software are classified as goods). However, industry reports do not typically make this distinction.[128] As a result, it is difficult to construct a consistent estimate of the share of all software sales that fall into the category of computer and data processing services. It is also difficult to estimate the size of the market without double-counting cloud services, because they are both a separate segment of the computer services market and embedded in the IT and software segments of computer services. For example, a company that offers cloud-based business processing software can be considered both an IT service provider and a cloud-based SaaS provider. This means that the same firm's revenue could be counted in estimates of the size of the IT market and in estimates of the size of the cloud services market. Because of the difficulty in measuring the size of the total computer and data processing sector, this section presents IT services, software, and cloud services separately, rather than aggregating estimates for the individual segments of the sector.

In 2016, the global market for IT services—including business processing services, application development services, application hosting and data center services, desktop support and management, security, and storage services—had $585.3 billion in revenue.[129] In the same year, the global cloud services market had revenue of $89.3 billion, while the global software market had revenue of $335.2 billion (including physical delivery of non-customized software).[130] Table 4.1 provides a breakdown of revenues in each of these segments of the computer services market by region. The markets for IT and software services are fairly evenly divided between the United States and Europe, while the United States has 57 percent of the cloud services market.

Table 4.1: Computer and data processing services: Total global revenue of computer services by type of service and region, 2016 (billion $)

	IT services	Cloud services	Software
United States	201.7	50.8	109.3
Europe	195.5	18.9	105.7
Asia-Pacific	151.5	13.5	80.5
Middle East	1.7	0.7	13.6

[128] Under the NAICS definition of computer and data processing services, only non-customized software that is delivered over the internet is considered a service, while physical copies of the same software are considered goods. USDOC, BEA, *Guide to Industry Classifications for International Surveys*, 2012.
[129] *MarketLine*, "Global IT Services," March 2017, 1.
[130] *MarketLine*, "Global Cloud Computing," December 2016, 1; *MarketLine*, "Global Software," June 2017, 7.

	IT services	Cloud services	Software
Rest of the world	34.9	5.4	26.2
Total	585.3	89.3	335.3

Source: MarketLine, "Global IT Services," March 2017, 1, 10; MarketLine, "Global Cloud Computing," December 2016, 1, 10; MarketLine, "Global Software," June 2017, 1, 10.

Table 4.2 lists the 2016 revenues of the 20 largest global companies that identify themselves as primarily computer and data processing firms.[131] While U.S. companies dominate these lists, there are also large computer services companies in India, China, and the European Union (EU). In India, these large companies tend to be leading global providers of IT services, and have moved into higher-value-added services, such as data analytics and consulting, in recent years.[132]

Table 4.2: Computer and data processing services: Top computer services providers by revenue, 2016

Company name	Country	Operating revenue (billion $), 2016
IBM	United States	79.9
Legend Holdings (Lenovo)	Hong Kong	44.5
Accenture	United States	34.8
Google	United States	27.7
Tata Consultancy Services	India	18.5
NTT Data Corporation	Japan	15.5
CDW	United States	14.0
Cognizant Technology Solutions	United States	13.5
Facebook	United States	13.3
Capgemini	France	13.2
Appsense	United Kingdom	13.0
ATOS	France	12.9
Cisco	United States	12.7
Ericsson	Sweden	12.1
First Data Corporation	United States	11.6
Xerox	United States	10.8
Infosys	India	10.2
Wipro	India	8.5

Note: Includes firms (or segments of firms) that classify themselves under NAICS codes 5182 and 5415.
Source: Bureau van Dijk, Orbis database (accessed April 11, 2018).

Major technology companies like Amazon, HPE, Microsoft, and Apple also provide computer services, but they are not captured in this list because of their primary industry classifications. For example, Amazon is considered a retail service provider rather than a computer service

[131] Includes firms whose primary reported NAICS codes are 5182 and 5415. Since cloud services are frequently embedded in other computer services and firms do not consistently report revenue by segment, it is difficult to rank top cloud service providers. See the "Cloud Services" chapter of USITC, *Global Digital Trade I*, August 2017, for more information.
[132] Analytics refers to the development of predictions based on applying statistical and mathematical techniques to large volumes of data. MarketLine, "IT Services in India," March 2017, 7.

provider, though 9 percent of its net sales in 2016 ($12.2 billion) came from its cloud services arm AWS.[133]

On the demand side, total global spending on IT services (including both cloud and non-cloud services) was an estimated $935 billion in 2016. Table 4.3 shows spending by type of service. Globally, the largest segment of IT services is business process outsourcing (BPO) services, a key "horizontal" (i.e., firm-to-firm) service that includes services used by firms in all industries, such as human resources.[134]

Table 4.3: Computer and data processing services: Spending by type of service, 2016

Type of service	Total spending (billion $)	Share of spending (%)
Key horizontal business process outsourcing (BPO)	180.4	19.3
Systems integration	122.9	13.1
Business consulting	104.5	11.2
IT outsourcing	100.3	10.7
Software deployment and support	70.2	7.5
Hardware deployment and support	61.3	6.6
Application management	60.0	6.4
Network and endpoint outsourcing services	45.7	4.9
Hosting infrastructure services	44.9	4.8
Custom application development	41.5	4.4
Network consulting and integration	39.5	4.2
IT consulting	34.7	3.7
IT education and training	16.9	1.8
Hosted application management	12.1	1.3
Total	935.0	

Source: Huston, "Worldwide Services Forecast Update, 2017–2021," November 2017.

Global spending on public cloud services was an estimated $99.2 billion in 2016.[135] Table 4.4 presents this spending according to the type of cloud service. Software hosted on cloud servers (software as a service or SaaS) represented the largest segment of cloud services in 2016. The cloud-based computer and data processing services segment is one of the fastest-growing segments of the industry due, in part, to other computer service firms' expanding use of these

[133] Amazon, "Annual Report-2016," April 12, 2017, 30.
[134] IDC defines Key Horizontal BPO as "processes that enable any business to engage in the fundamental activities required to run the business. These activities are relevant to all categories and sizes of business, regardless of geographic region or vertical industry. Activities in this category often focus around hiring and managing employees, managing daily operations and finances, servicing customers, and delivering goods and services to customers." IDC, "IDC's Worldwide Services Taxonomy, 2017," March 2017.
[135] Public cloud refers to a cloud network that gives both firms and the general public access to a provider's computing infrastructure through the internet. In contrast, a private cloud refers to cloud servers owned or operated by a single firm. Estimates of the size of the cloud services market tend to include only spending on public cloud services. USITC, *Global Digital Trade I,* August 2017, 64.

technologies.[136] As a result, some of this spending on SaaS is likely captured in figures on demand for IT services as IT service providers shift to cloud-based offerings. Additionally, since software hosted on the internet is considered SaaS, spending on SaaS also represents a share of total spending on software.[137]

Table 4.4: Computer and data processing services: Public cloud spending by segment, 2016

Category	Total spending (billion $)	Share of spending (%)
Infrastructure as a service (IaaS)	18.7	18.9
Platform as a service (PaaS)	12.5	12.6
Software as a service (SaaS)	68.0	68.6
Total	99.2	

Source: IDC, "Cloud Services," February 2017.
Note: IaaS refers to cloud-based data hosting services, PaaS refers to cloud-based application hosting services, and SaaS refers to cloud-based software.

Demand for SaaS continues to grow as firms strengthen their cloud-based software offerings to enable product differentiation and adaptability and to enhance customer experiences and outcomes. Firms are also increasingly embedding cloud-based software in physical goods to connect products, customers, and suppliers via the Internet of Things (IoT) and cloud-based data storage. A survey of global leading IT firm reports a 65 percent increase in research and development spending on software offerings between 2010 and 2015.[138]

Supply and Demand Factors

Computer services cover a broad range of products and customers. Two developments that are shaping the computer services market are mobile phone-based software, which provides computer services to customers in emerging markets without broadband subscriptions, and the digitization of manufacturing, in which computer services enable manufacturers to incorporate services throughout the value chain and production process.[139] Additionally, content delivery networks have decreased latency (box 4.1) and improved the performance of firms that provide computer services via the internet.

[136] The U.S. cloud computing industry generated revenues of $50.8 billion in 2016, representing a compound annual growth rate (CAGR) of 35 percent between 2012 and 2016. The European and Asia-Pacific industries had CAGRs that were almost as high—33.3 percent and 30.3 percent—over the same period, but with much lower total values of $18.9 billion and $13.5 billion, respectively, in 2016. MarketLine, "Cloud Computing," 2017.
[137] IDC, "IDC's Worldwide Services Taxonomy, 2017," March 2017, 12.
[138] Jaruzelski, "Software-as-a-Catalyst," October 25, 2016, 2–3.
[139] A "value chain" refers to distinct steps in the production of a final good that firms use to develop, produce, market, and deliver the good. Economist, "Value Chain," November 19, 2009.

Box 4.1: Latency and Demand for Computer Services

Latency is the gap in time between the point when a data request is made and the point when the requested information is provided to a user. Latency is a key determinant of demand for computer services, particularly services that are delivered over the internet. Latency and bandwidth are often used together to describe the capacity of an internet connection. Bandwidth refers to the amount of data that can be transferred over an internet connection, while latency refers to the speed at which those data can travel.[a]

The latency of internet-based computer services depends on the proximity of the user to data centers; when data centers are closer, internet-based services are delivered faster. The Federal Communications Commission (FCC) tests the latency of U.S.-based internet service providers annually by measuring the time it takes data to travel roundtrip from a consumer's home to the FCC's testing server. Average latency in the United States has improved in recent years: in 2011, the latency of land-based internet service providers ranged from 14 to 75 milliseconds (ms), and by 2016, it had fallen to 12–58 ms.[b]

Computer services delivered over the internet can vary in terms of the speed they require to function as intended. Basic applications like email can function with higher latency (over 160 ms) than more data-intensive applications such as video streaming, which requires latency of less than 100 ms.[c] High-frequency trading in the financial sector represents (or used to represent) an extreme example of the importance of latency. Financial and commodity trading firms pay to co-locate with stock exchange servers, because traders with servers that are closer to the stock exchange servers are able to make trades microseconds before their competitors.[d] This competitive edge has, however, become less lucrative than it once was, given that U.S. aggregate revenue from high-frequency stock trading has dropped; it was less than $1 billion in 2017, compared to $7.2 billion in 2009.[e] This development has led financial firms to cooperate rather than compete in developing new latency-reducing networks, such as the "Go West" network that will connect Chicago and Tokyo starting in 2018.[f]

Content delivery networks (CDNs) are an innovative type of cloud service that reduces the latency of internet-based content. CDN providers create copies of websites in a geographically dispersed network of servers and route traffic to the closest copy of the website, so that users can access nearby data instead of accessing websites directly from the original hosts.[g] CDN provider Cloudflare estimates that their services shorten latency by roughly 70 percent.[h] Prominent CDN providers by revenue in 2016 included Akamai ($8.2 billion), Level 3 Communications ($2.3 billion), and Cloudflare ($17.5 million).[i] Akamai and Level 3 CDN revenues grew at an average annual rate of 6.8 and 14.4 percent during 2012–16, respectively.[j] Increased data consumption over the internet is expected to further drive growth of CDN services, and the industry is projected to grow from $7.47 billion in 2017 to $30.9 billion in 2022.[k]

[a] Arsenault, "Understanding Network Bandwidth vs Latency," August 3, 2017.
[b] FCC, *Measuring Broadband America*, 2011, 6; FCC, *Measuring Broadband America*, 2016, section 2-D.
[c] Cisco, "Cisco Global Cloud Index: Forecast and Methodology," 2016, 18–20.
[d] Stafford, "Data Centres Help London Retain Cachet," February 23, 2017.
[e] Meyer, Bullock, and Rennison, "How High-Frequency Trading Hit a Speed Bump," January 1, 2018.
[f] Meyer, Bullock, and Rennison, "How High-Frequency Trading Hit a Speed Bump," January 1, 2018.
[g] USITC, *Global Digital Trade I,* August 2017, 67.
[h] USITC estimate using data from Cloudflare, "CDN," https://www.cloudflare.com/cdn/ (accessed January 11, 2018).
i Since Cloudflare is not a publicly traded company, revenue for 2016 is an estimate provided by Orbis. Bureau van Dijk, Orbis database (accessed January 12, 2018).
j USITC staff calculations using data from Bureau van Dijk, Orbis database (accessed January 12, 2018); Darrow, "New $100 Million Fund Backs Cloudflare-Related Startups," June 27, 2017.
k Markets and Markets, "Content Delivery Network Market Worth 30.89 Billion," December 2017.

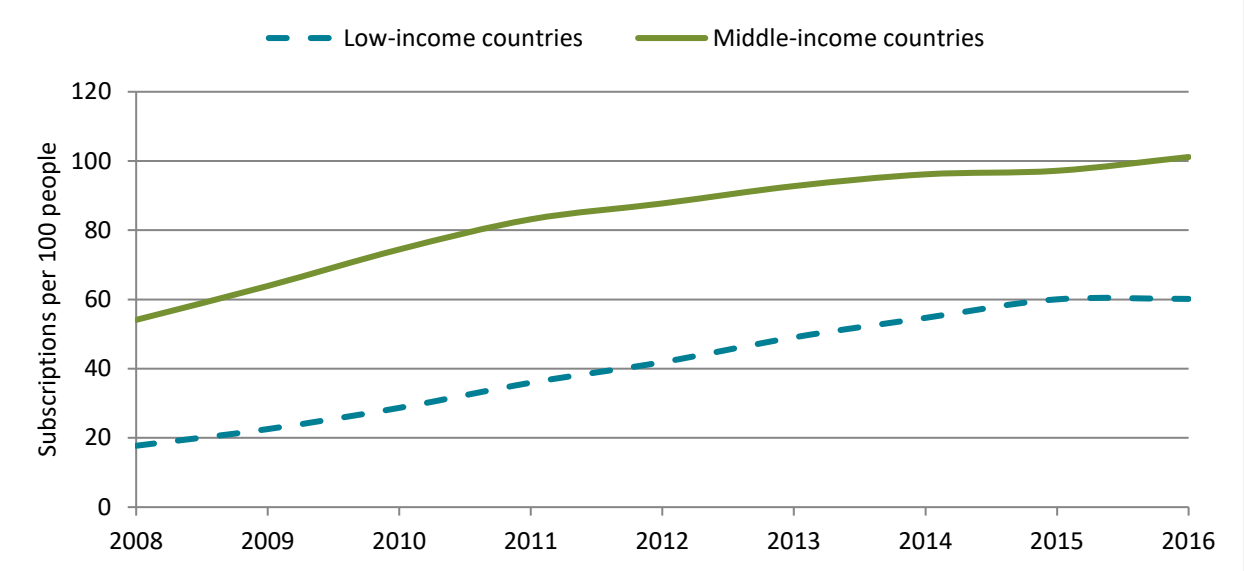
Software Services and "Leapfrogging" in Emerging Markets

Telecommunications infrastructure has enabled consumers in emerging markets to access the internet via mobile phones without ever having used computers or fixed broadband subscriptions, a trend referred to as technology "leapfrogging."[140] The shift from physical software to software delivered over the internet (i.e., cloud-based software) has facilitated this transition, as consumers can access software (such as crop monitoring applications) without purchasing physical infrastructure other than mobile phones.[141] This shift to internet-based software has also made leapfrogging possible in other sectors. In the financial sector, consumers in emerging markets have bypassed traditional cashless payment systems, such as credit cards, in favor of mobile payment applications.

Figure 4.1 illustrates the growth in cellular phone subscriptions in low- and middle-income countries.[142] In both groups, the number of cellphone subscriptions per 100 people has increased by about 40 percentage points since 2008; in middle-income countries, penetration has actually exceeded 100 percent.

[140] *Economist*, "The Limits of Leapfrogging," February 7, 2008. For more information on telecommunications services, see chapter 5.
[141] This chapter includes a discussion of smartphones because they are essentially handheld computers; like desktop and laptop computers, they contain a central processing unit (CPU), memory, and display functionality, and use an operating system that provides computer services via cloud-hosted program applications (apps).
[142] Low-income countries were defined as having a gross national income (GNI) per capita of less than $1,025 in 2015. Middle-income countries were defined as having a GNI per capita of $1,026–12,475 in 2015. World Bank, World Development Indicators (accessed January 12, 2018).

Figure 4.1: Computer and data processing services: Mobile phone subscriptions per 100 people, 2008–16



Source: World Bank World Development Indicators, "Mobile Cellular Subscriptions (per 100 people)" (accessed January 12, 2018).
Note: As defined by the World Bank, low-income countries had a gross national income (GNI) per capita of less than $1,025 in 2015. Middle-income countries were defined as having a GNI per capita of $1,026–12,475 in 2015. (See appendix table B.10).

Currently, Apple's iOS and Google's Android operating system are the major interfaces that support mobile phone-based software, commonly referred to as mobile applications (or apps).[143] Developers build applications using cloud-based platform as a service (PaaS) providers, which host applications on their server networks. Such services are typically priced based on use of the application, and sometimes include free-service tiers for minimally used applications.[144] This allows small application developers to provide software over the internet without purchasing physical infrastructure, thereby reducing startup costs. Application developer fees to PaaS providers only increase after applications attract large numbers of users, so those developers can target specific markets. Or segments of consumers that may otherwise be overlooked in industries where startup costs are high.

Two examples of this in agriculture are Virtual City's "Colateral Management" software in Kenya and applications by Jayalaxmi Agro Tech in India. Colateral Management is a mobile application that facilitates commodity sales and gives farmers and buyers access to data on

[143] World Bank, *Mobile Applications for Agriculture and Rural Development*, May 2012, 2.
[144] For example, the AppSync service from Amazon Web Services (AWS) offers free service for up to 250,000 query or data modification operations, 250,000 real-time updates, and 600,000 connection minutes per month for the first 12 months. AWS, "AWS AppSync Pricing," https://aws.amazon.com/appsync/pricing/ (accessed January 11, 2018).

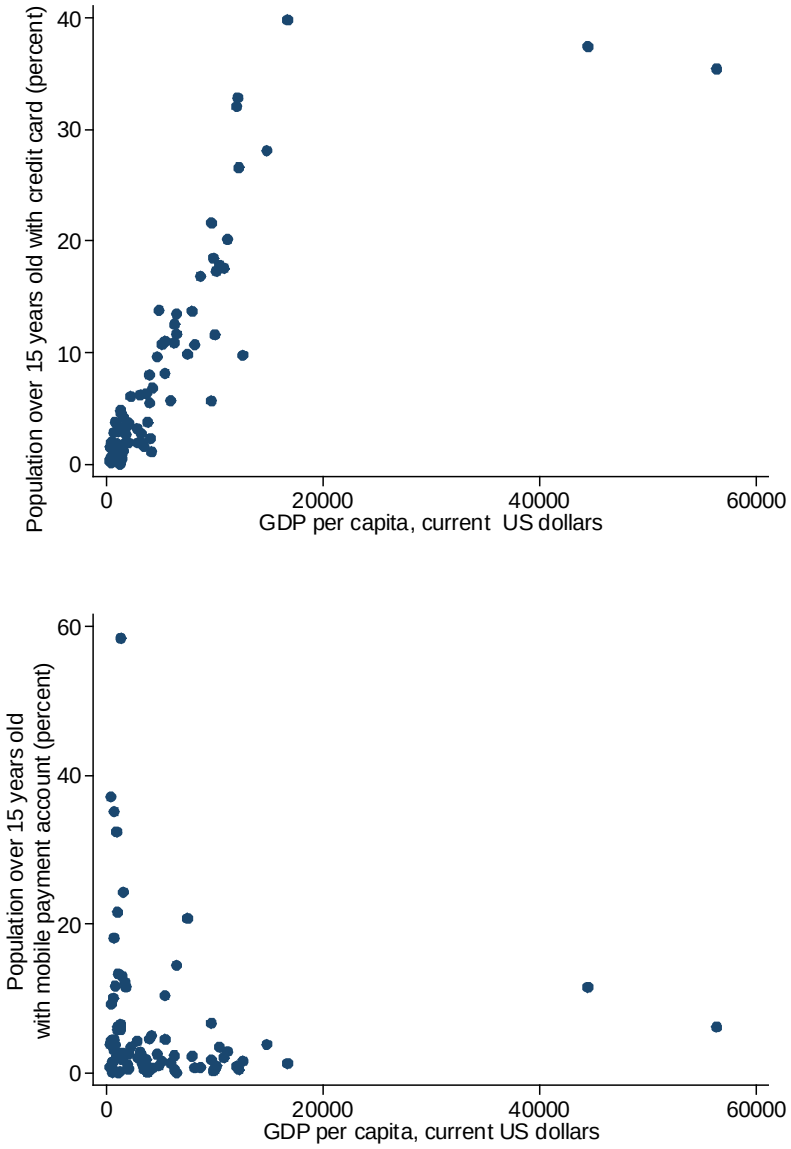
production and prices, thereby increasing market transparency.[145] The World Bank estimates that use of Virtual City's software cut farmers' average transaction time at the Kenya Tea Production Authority from 3 minutes to 22 seconds, generating an additional $300 in income per year for the average tea farmer.[146] In India, Jayalaxmi Agro Tech makes a number of applications providing market information on specific crops. Their audiovisual instructions and picture-based interface make the apps usable by illiterate farmers.[147] By targeting small farmers, Jayalaxmi's products can increase the efficiency of farming and crop sales in places where mobile phones are used instead of traditional computer infrastructure.

The ubiquity of mobile phone subscriptions in emerging markets, along with the well-developed mobile application infrastructure in many places, also lets consumers bypass credit cards in favor of mobile phone-based payment applications. According to previous USITC research, 79 percent of sub-Saharan African countries have at least one mobile phone-based payment service provider, and there are roughly 200 million registered mobile payment accounts in the region.[148] In China, Alibaba's mobile payment application Alipay alone has 520 million users.[149]

Figure 4.2 illustrates this leapfrogging by comparing both the share of the adult population that has a credit card and the share of the adult population that uses mobile payment systems to GDP per capita, using a sample of 84 developing countries in 2014. In the case of credit cards (upper graph), there is a strong correlation between countries with higher GDP per capita and their share of credit card users.[150] In contrast, in 2014 the share of the population that had a mobile payment account was not correlated with GDP per capita (lower graph).[151] This suggests that people in countries with lower average incomes are able to access cashless payment systems sooner using mobile applications than through the traditional banking sector.

[145] Virtual City, "Colateral Management," http://www.virtualcity.co.ke/solutions/colateral-management/ (accessed January 12, 2018).
[146] World Bank, *Mobile Applications for Agriculture and Rural Development*, May 2012, 16.
[147] Jayalaxmi Agro Tech, "Our Products," http://www.jayalaxmiagrotech.com/ (accessed January 12, 2018).
[148] Powell, *Sub-Saharan African Services Economy*, July 2017, 67.
[149] Alipay, https://intl.alipay.com/ (accessed November 30, 2017).
[150] The correlation between credit card usage and GDP per capita is significant at the 99 percent level.
[151] USITC calculations using data from World Bank, World Development Indicators (accessed November 15, 2017); World Bank, Global Financial Inclusion database (accessed November 15, 2017).

Figure 4.2: Computer and data processing services: Credit card use, mobile payment use, and GDP per capita in emerging markets, 2014



Source: USITC staff calculations using data from World Bank, World Development Indicators, and World Bank, Financial Inclusion database (accessed November 15, 2017).

The use of mobile payment systems varies by country. In Kenya, the service M-Pesa is primarily a peer-to-peer money transfer system.[152] In contrast, China's mobile money service Alipay is used for commercial payments, including for goods sold on Alibaba's e-commerce site.[153] Many Chinese customers of Alipay and similar services use their mobile phones as a replacement for

[152] Powell, *Sub-Saharan African Services Economy*, July 2017, 68.
[153] Alipay, https://intl.alipay.com/ (accessed November 30, 2017).

cash or credit cards.[154] These mobile payment systems connect consumers who do not have easy access to traditional computer hardware or brick-and-mortar banks to the formal financial sector, and give computer services firms access to new consumers.

The Digitization of Manufacturing

Computer and data processing services are increasingly necessary for, and complementary to, manufacturing and other industry processes. Computer and data processing technologies such as big data analytics, cloud computing, and the Internet of Things (IoT) have been incorporated into and facilitated global value chains, improved production efficiency, reduced costs, and increased innovation. They have also yielded additive (3-D) manufacturing and artificial intelligence, which are further driving up manufacturing productivity.[155] For example, Joy Global, a manufacturer of mining machinery, began using IBM's advanced predictive analytics software and optimization solutions in 2014 to improve machine performance, minimize downtime, and reduce operating costs.[156] Ford Motor Company reports that one of the reasons it is investing more than $200 million in a new data center in Flat Rock, Michigan, is to address the data deluge it anticipates with the growth of connected autonomous vehicles.[157]

Manufacturers are increasingly bundling computer and data processing services with traditional consumer goods and with industrial goods. Smartphones, for example, not only transmit voices between two distant parties, but let users create, view, and distribute photos and videos; tap real-time translation services; track fitness; and access Global Positioning System (GPS) satellite navigation from nearly anywhere on earth.[158] Manufacturers in heavy industry are also bundling digital services. GE Aviation, an operating unit of General Electric Company, bundles sensors and software in commercial and military jet engines in partnership with Tableau Software. The software analyzes sensor-captured data ranging from engine diagnostics and maintenance requirements to flight patterns and fuel usage. Airlines use Tableau's visual analytics platform to further analyze data from a variety of industry sources, as well as GE

[154] Industry representative, interview by USITC staff, March 28, 2017.
[155] For example, General Electric changed its business model from being a product and component supplier to being a power and propulsion provider, which leases equipment on a "power by the hour" basis. Industry representative, interview by USITC staff, January 4, 2018.
[156] Lee, "Does Implementation of Big Data Analytics Improve?" 2017, 9. In April 2017, Komatsu America Corp., a subsidiary of Komatsu Ltd., acquired Joy Global, Inc., and renamed it Komatsu Mining Corp.
[157] Donoghue, "Supercomputers in the Cloud," October 26, 2017.
[158] Apple's iPod is a well-known example of a manufactured good for which the majority of the value added comes from services produced in the United States.

Aviation's fleet of 35,000 engines—which produces more than 100 million flight records each year—in order to increase safety and efficiency. [159]

As computer and data processing services have become more integrated with manufacturing, the boundaries between services and manufacturing have blurred.[160] For example, search engines and cloud computing are energy-intensive activities which, like factories, require high levels of fixed assets, such as server farms and cooling systems.[161] In 2015, Amazon, Microsoft, and Alphabet (Google) together had nearly $26 billion in capital expenditures.[162] The workforce composition of manufacturing firms and services firms is also becoming increasingly similar, with growing proportions of full time service workers in manufacturing firms. From 2002 to 2012, services occupations in two fields—apparel, leather, and associated products, and computer and electronic products—increased 8.4 percent and 7.7 percent, respectively.[163] In 2016, for example, Google hired approximately 2,000 phone engineers from Taiwan-based HTC to create Pixel smartphones, speakers, headphones, cameras, and high-end laptops.[164]

The digitization of manufacturing and the bundling of services with products have strengthened demand for computer and data processing services. Increasingly sophisticated information and communication technologies, such as big data, cloud computing, and the IoT, have become integral to the development, production, and after-sale use of goods.[165] Indeed, the boundaries between the manufacturing and services sectors have blurred and the processes of both have fragmented.[166] Cyber-physical systems which can constantly communicate with each other, the goods they produce, and the people who operate them, are likely to drive further demand for computer and data processing services.

[159] GE Press Center, "GE Aviation and Tableau Partner," November 8, 2017.
[160] IBM adapted its products to users' needs and, although it produces IT infrastructure, it is now predominantly a service supplier. Lanz and Maurer, "Services and Global Value Chains," March 2, 2015, 13.
[161] Computer and data processing services firms have always used some physical inputs, but the proportion is rapidly growing; Bernard and Teresa, "Factoryless Goods Producers in the U.S.," May 10, 2016.
[162] The entire sum did not go to data center build-out, but all three companies have described the cloud as a major area of current and future investment. Gallagher, "Why Cloud Scale Is Worth the Price," March 15, 2016.
[163] USDOL, BLS, Occupational Employment Statistics (accessed June 20, 2013); USITC calculations.
[164] Bohn, "Google Hardware Is No Longer a Hobby," October 4, 2017.
[165] Computer and data processing services add value to manufacturing global value chains.
[166] Both manufacturing and computer and data processing are increasingly fragmented, with frequent outsourcing and offshoring of discrete tasks through global value chains. In 1995, domestic services accounted for 23.1 percent of value added in manufactured exports, while foreign services accounted for 10.8 percent; by 2011, the share of domestic services had dropped to 20.5 percent, while that of foreign services had risen to 14.5 percent. Bamber et al., *Global Value Chains and Economic Development*, September 2017, 30.

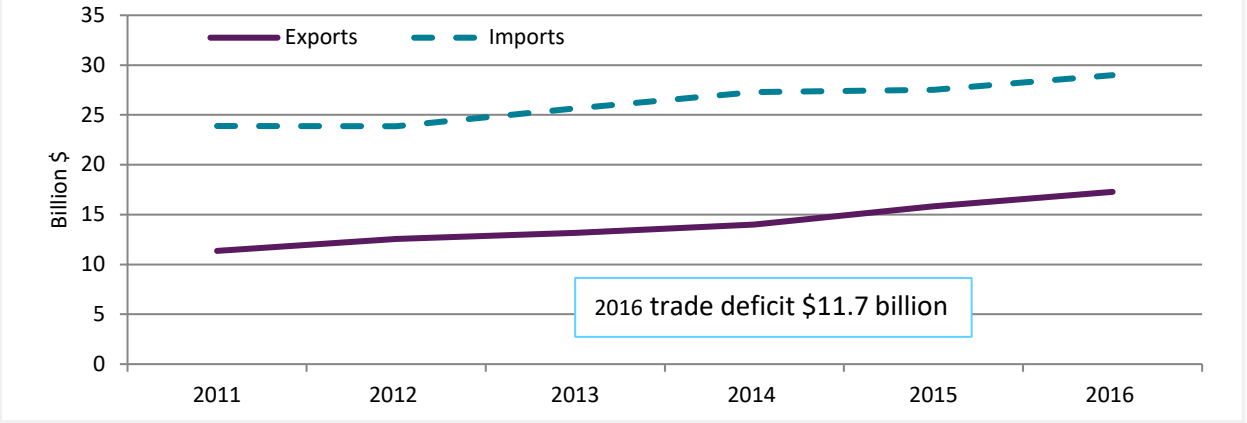
Trade Trends

Cross-border Trade

U.S. cross-border exports of computer services (which encompass all U.S. firms that report selling computer services across borders, regardless of their primary industry) totaled $17.3 billion in 2016, a 9.2 percent increase from 2015. U.S. cross-border imports of computer services were $29.0 billion in 2016, a 5.4 percent increase from 2015. The United States has had a trade deficit in computer services since 1999 and recorded a deficit of $11.7 billion in 2016. However, U.S. exports of computer services grew more quickly than imports from 2011 to 2015: U.S. cross-border computer service exports grew at an average annual rate of 8.8 percent, while imports grew at an average annual rate of 4.0 percent.

Figure 4.3 shows U.S. cross-border exports and imports of computer services during 2011–16. U.S. computer services exports represented roughly 4 percent of total U.S. gross output in the sector in 2016.[167]

Figure 4.3: Computer and data processing services: U.S. cross-border trade, 2011–16



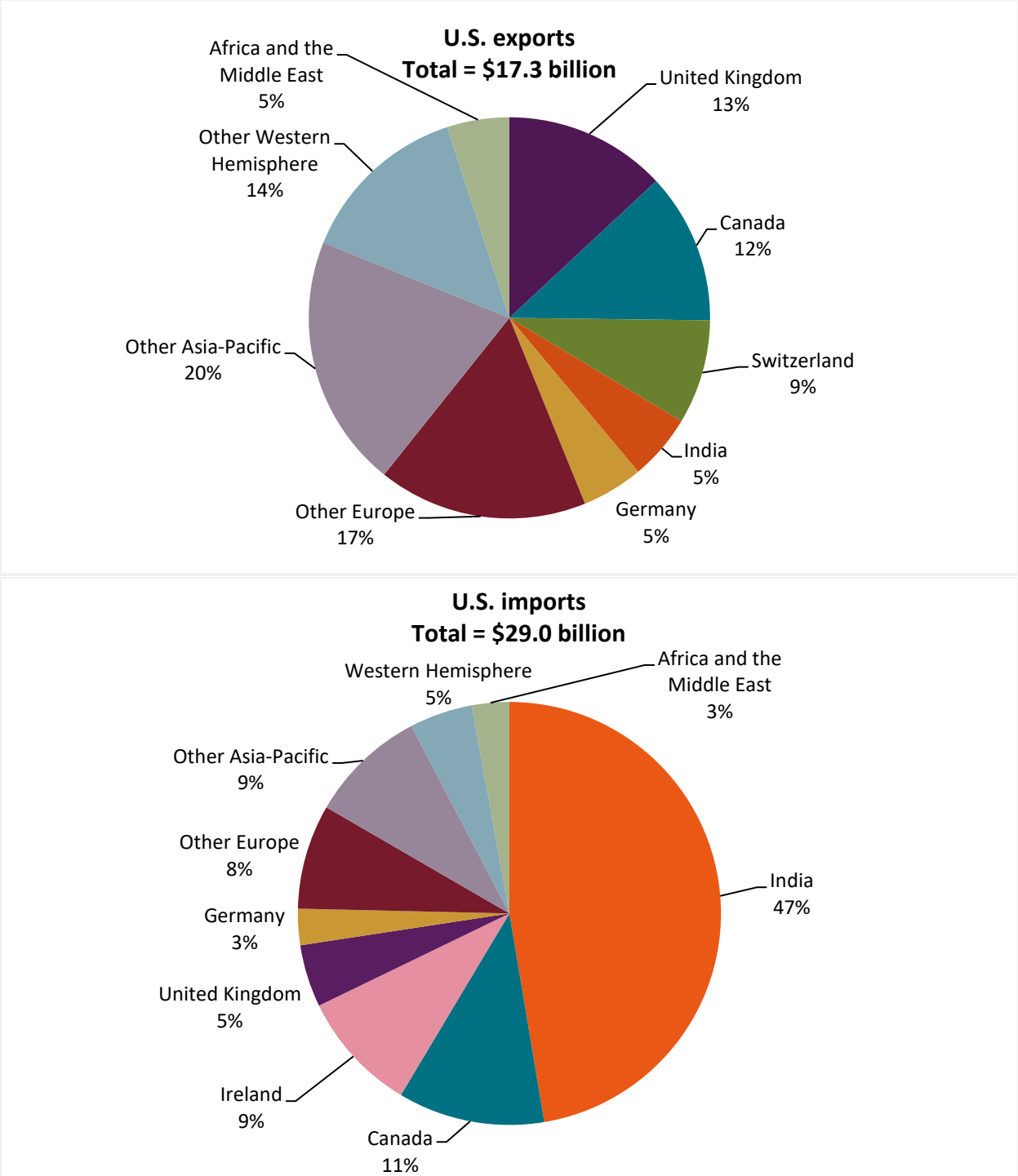
Source: USDOC, BEA, International Data, International Services, "Table 2.2. U.S. Trade in Services, by Type of Services and Country or Affiliation" (accessed November 17, 2017). (See appendix table B.11).

Figure 4.4 shows U.S. cross-border computer services imports and exports by country in 2016. The United Kingdom (UK) and Canada were the largest markets for U.S. computer services exports, accounting for 13 and 12 percent of exports, respectively. Other top destinations were Switzerland, India, and Germany. India accounted for almost half (47 percent) of U.S. imports of

[167] Author's calculation based on BEA, Gross-Domestic-Product (GDP)-by-Industry Data: Gross Output (accessed January 8, 2018).

computer services in 2016, followed by Canada (11 percent), Ireland (9 percent), and the UK (5 percent).

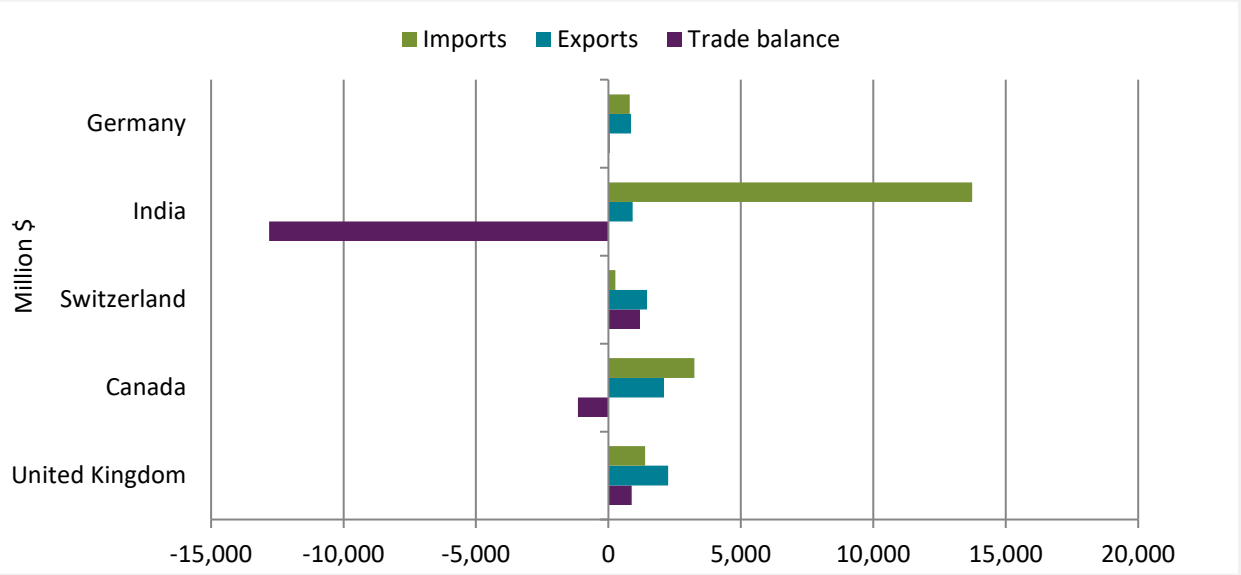
Figure 4.4: Computer and data processing services: Cross-border trade by country, 2016



Source: USDOC, BEA, International Data, International Services, "Table 2.2. U.S. Trade in Services, by Type of Services and Country or Affiliation" (accessed November 17, 2017). (See appendix table B.12).

Figure 4.5 shows the U.S. cross-border trade balance for computer services by partner country in 2016. The United States recorded its highest trade deficit that year with India, which exports large amounts of IT services, such as business process outsourcing and data analytics, to the United States. This deficit has existed since 2006, and it reflects the strength of India's computer services sector. In 2016, the top four Indian IT firms—HCL, Infosys, Tata Consultancy Services, and Wipro—had combined revenues of $38 billion.[168]

Figure 4.5: Computer and data processing services: Net U.S. cross-border trade by country, 2016



Source: USDOC, BEA, International Data, International Services, "Table 2.2. U.S. Trade in Services, by Type of Services and Country or Affiliation" (accessed November 17, 2017).

Affiliate Transactions

For affiliate transactions, U.S. computer and data processing services includes services supplied by U.S. firms listed under NAICS codes 5415 (computer systems design and related services) and 5182 (data processing, hosting, and related services). Beginning in 2014, the BEA started reporting affiliate transactions by data processing services firms (including web hosting, streaming services, and application hosting firms). Combining this data with affiliate data on computer services firms provides more coverage of affiliate transactions in the computer and data processing services sector, and makes affiliate transaction data more consistent with the cross-border data on computer services (see box 4.2 below).

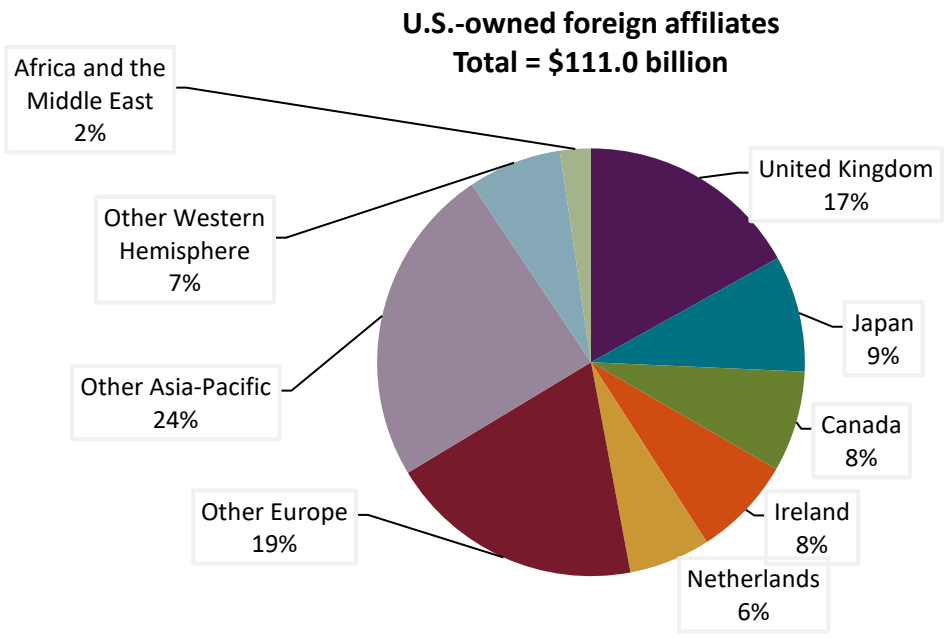
The value of U.S. computer and data processing services firms' sales through foreign affiliates tends to be consistently larger than that of U.S. cross-border exports of such services, reflecting

[168] MarketLine, "IT Services in India," March 2017, 7, 14, 20.

the importance of having a local presence when delivering these services.[169] Sales by U.S.-owned foreign affiliates whose primary industry was computer and data processing services totaled $111 billion in 2015, more than five times the value of U.S. cross-border exports of such services in that year. This is a 6.7 percent drop from $117 billion in 2014, which primarily reflects a decrease in new sales of large software systems in Europe and the Asia-Pacific region.

In 2015, the UK accounted for the largest share (17 percent) of sales by U.S.-owned foreign affiliates in the computer and data processing industry, followed by Japan (9 percent), Canada (8 percent), and Ireland (8 percent) (figure 4.6). Eight of the top 10 country markets for U.S. cross-border exports of computer and data processing services (2016) also ranked among the top 10 county markets for U.S. affiliate sales in this industry (2015). Cross-border trade and affiliate sales of computer and data processing services are often complementary, which may explain why the leading destinations for exports and affiliate sales were similar.[170]

Figure 4.6: Computer and data processing services: U.S. affiliate sales by country, 2015



Source: USDOC, BEA, table 3.1, "Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliate" (accessed November 15, 2017). (See appendix table B.14).

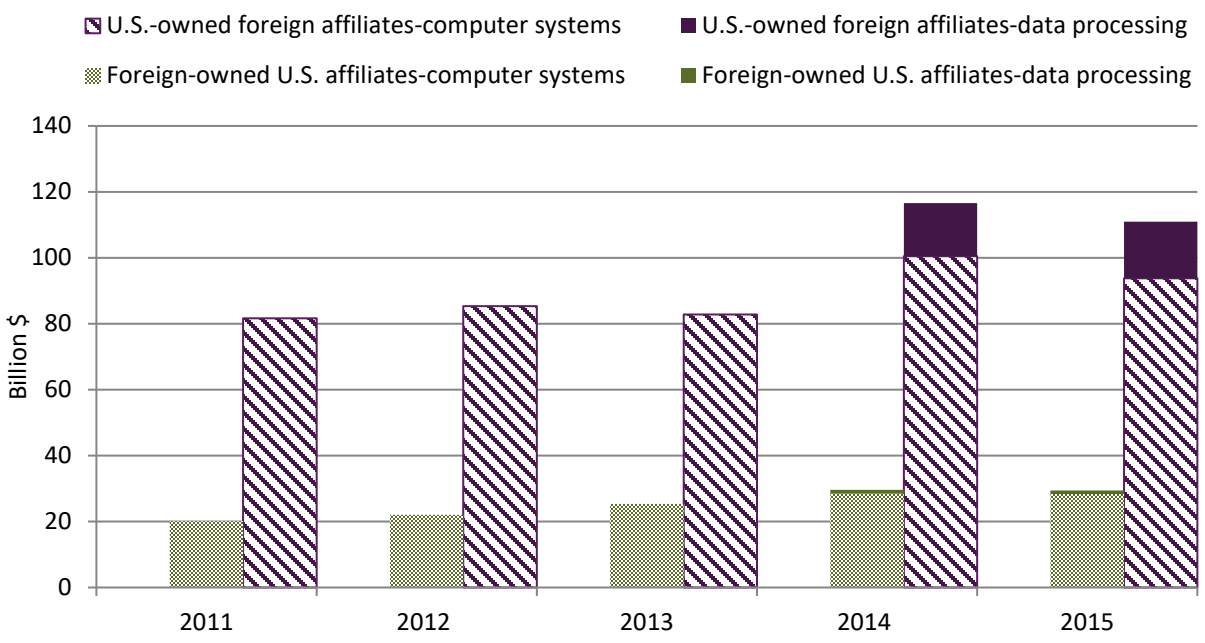
As noted, the BEA started reporting affiliate transactions by data processing services firms (including web hosting, streaming services, and application hosting firms) in 2014. For 2014 and

[169] BEA reports "services supplied" by foreign affiliates. In the affiliate statistics for the computer and data processing services industry, services supplied correspond to sales. Thus, the terms "sales" and "services supplied" are used interchangeably in this section. USDOC, BEA, "Where Can I Find Information?" November 28, 2017.
[170] See, for example, Nordås, "Trade and Regulation," June 24, 2008, 23–24.

2015, figure 4.7 shows foreign affiliate transactions by data processing services firms as darker-colored sections of the bars representing affiliate sales and purchases (box 4.2).

Purchases from foreign-owned U.S. affiliates in the computer and data processing services industry totaled $29.4 billion in 2015, roughly the same level as in 2014 (figure 4.7). Top sources for purchases from foreign-owned U.S. affiliates in 2015 were the UK ($2.6 billion), Canada ($1.6 billion), and Japan ($1.3 billion).[171]

Figure 4.7: Computer and data processing services: U.S. affiliate sales and purchases, 2011–15



Source: USDOC, BEA, table 3.1, "Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliate," and table 4.1, "Services Supplied to U.S. Persons by Foreign MNEs through Their MOUSA, by Industry of Affiliate and by Country of UBO" (accessed November 15, 2017).
Note: Data processing services firms are shown as darker-colored sections of the bars. (See appendix table B.15).

Box 4.2: Understanding Data on Cross-border Trade and Affiliate Transactions in Computer Services

The Bureau of Economic Analysis (BEA) at the U.S. Department of Commerce (USDOC) measures both cross-border trade and foreign affiliate transactions for computer services. The BEA collects data through two surveys that differ in their methodologies. First, the BEA's cross-border surveys ask companies to report sales by type of activity. Computer services activities include electronically delivered software, hardware and software installation, computer maintenance, data processing and hosting services, and webpage development and hosting. As noted, they do not include physical shipments of packaged computer software. The analysis presented in this chapter excludes cross-border

[171] USDOC, BEA, table 4.1, "Services Supplied to U.S. Persons by Foreign MNEs through Their MOUSA, by Industry of Affiliate and by Country of UBO" (accessed November 15, 2017).

trade in the intellectual property associated with these services, which the BEA considers separately, as a subset of the "intellectual property not included elsewhere" category.[a]

The BEA categorizes data on affiliate transactions according to the industry classification of the parent or affiliate under the North American Industry Classification System (NAICS), rather than the type of service provided. Since this measure focuses on the industry of the firm, rather than the types of services provided, figures for foreign affiliate sales are not necessarily comparable with those for cross-border trade. For computer and data processing services, foreign affiliate transactions data include two NAICS codes: 5415 (computer systems design and related services) and 5182 (data processing, hosting, and related services). Computer systems design includes developing customized software, designing and maintaining computer systems, and providing technical and professional computer-related advice. Data processing includes providing infrastructure for hosting or data processing (such as web hosting, streaming services, or application hosting), and data processing services.[b] This chapter does not include software licensing as part of the "affiliate transactions" computer services aggregate.

Previous *Recent Trends* reports have covered only affiliate trade in computer systems design. However, in 2014, the BEA started reporting statistics for affiliate transactions by data processing services firms.[c] Since cross-border trade in computer services includes data processing services, this addition makes the two types of data more comparable.

[a] USDOC, BEA, Quarterly Survey of Transactions in Selected Services and Intellectual Property with Foreign Persons, Form BE-125, September 2016, 3, 19–20.

[b] A third NAICS code, 5191 (other information services), includes computer services such as web searches, but also includes non-computer services such as libraries, and as a result is not included in the computer services aggregate. USDOC, BEA, *Guide to Industry Classifications for International Surveys*, 2012, 39, 43.

[c] When the BEA conducted its benchmark survey for affiliate transaction data in 2014, it increased the number of firms responding to the survey. This change partially contributed to an apparent 24 percent rise in total U.S. services supplied through foreign affiliates. For more information, see USDOC, BEA, "U.S. International Services: Trade in Services in 2015 and Services Supplied through Affiliates in 2014," December 2016, 24; BEA representative, email message to USITC staff, November 29, 2016, and telephone interview by USITC staff, December 2, 2016. However, this aggregate is still incomplete, as companies like Google fall under NAICS code 5191 (other information services) rather than 5415 or 5182. See previous note.

Outlook

Demand for computer and data processing services is expected to continue to grow in the coming years. One source forecasts an annual growth rate in worldwide computer services spending from 2016 to 2020 of approximately 3.8 percent.[172] Another predicts that the size of the public cloud services market will grow by 19 percent annually from 2015 to 2020, due to increasing interest from business consumers, a sharp rise in supply, more offerings, and lower prices.[173]

Data protection and data localization measures, such as the European Union's General Data Protection Regulation and China's Cybersecurity Law, may affect growth in the global computer services sector if they raise the costs of complying with different standards in different

[172] IDC, "Worldwide Services Spending Snapshot, 2017," March 2017.

[173] Gartner, Inc., "Worldwide Public Cloud Services Revenue Forecast," January 25, 2016.

markets.[174] Firms may respond to the higher costs of doing business in these markets by reducing their offerings or by investing in other, less regulated markets. The 2017 Services Trade Restrictiveness Index (STRI) finds that 13 countries have become more restrictive in their computer services regulations since 2014, while 12 have become more liberal and 19 were unchanged.[175] Several of the major U.S. export markets for computer services are becoming more open. For example, the UK (which is the largest U.S. export market) reduced its trade restrictiveness score by two basis points, from 0.22 to 0.20—more than any other leading market for U.S. exports of computer services. Canada, Switzerland, India, and Germany also reduced their restrictiveness, though to a lesser degree.[176]

[174] USITC, *Global Digital Trade I,* August 2017, 277.
[175] The STRI index uses values between zero and 1, 1 being the most restrictive; the 2017 computer services scores range between 0.10 and 0.46, with an average of 0.24. OECD, "STRI Sector Brief: Computer Services," December 2017, 1.
[176] Compiled by the Organisation for Economic Co-operation and Development (OECD), the STRI considers five policy areas that affect computer services—restrictions on foreign investing, restrictions on movement of people, barriers to cross-border trade, regulatory transparency, and other discriminatory measures—for the 35 OECD countries as well as Brazil, China, Colombia, Costa Rica, India, Indonesia, Lithuania, Russia, and South Africa. OECD, *STRI Sector Brief*, 2017.

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Chapter 5
Telecommunications Services

Summary

Telecommunications (telecom) services comprise the transmission of voice, data, text, sound, and video using wired and wireless telecommunications networks. Over the last five years, the global telecom market has expanded at an average annual rate of less than 2 percent. Globally, the United States is the largest telecom services market, with other large markets including China, Japan, Brazil, and the United Kingdom (UK). The top companies in the U.S. market are well-known telecom carriers and cable television companies, although a growing number of firms that provide over-the-top (OTT) software applications are competing successfully in the voice and messaging markets.

The core telecom services segments—fixed-line voice, mobile services, and internet services—have evolved into mature markets. In an effort to address flat or declining revenue growth, U.S. telecom carriers are bolstering network infrastructure, connecting a growing array of Internet of Things (IoT) devices, entering content and advertising markets, and refocusing business services on wide area networking services for data centers. With only a few exceptions, U.S. telecom carriers do not offer telecom services to consumers in foreign markets, preferring instead to focus on offering business services to large, multinational companies.

In 2016, U.S. cross-border exports of telecom services exceeded imports by a wide margin: exports totaled $12.2 billion, while imports totaled $5.5 billion. The leading export markets were Brazil, Argentina, and the UK, and the top sources of imports were the UK, Mexico, and India. Affiliate transactions remained the predominant mode of trade in telecom services, with the value of services supplied by U.S.-owned foreign affiliates estimated to be more than twice that of U.S. cross-border exports.

Introduction

Telecom services encompass both basic and value-added services. Basic services involve the end-to-end transmission of voice or data information from senders to receivers. The most widely used basic services are traditional telephone calls (both landline and mobile), short message services (i.e., text messaging services), and internet access services. Other basic

services include Voice-over-Internet Protocol (VoIP)[177] services, fax services, and business services.[178] Value-added telecom services, by contrast, typically complement or supplement basic services, with examples including voice mail, email, and data storage and processing services.[179] Value-added services are increasingly important, as operators are moving into data storage and cloud computing services, internet advertising and content, and television services. Operators are also moving into "smart home" and IoT services, providing internet connectivity for a growing array of devices, and processing and analyzing the data they collect.

Market Conditions

The global telecom services market, measured by spending on voice and data services (both fixed and mobile),[180] was estimated to be $1.5 trillion in 2016. Overall, the global market grew by 1.8 percent during 2016, slightly faster than the 1.2 percent compound annual growth rate (CAGR) recorded during 2012–15. Slowing global revenue growth is attributed to contraction in both the fixed voice and wireless voice markets, which declined by 5 percent and 3 percent, respectively, in 2016. The fixed and wireless voice services segment is a mature market in many countries, and is subject to increasing competition from voice and text message applications (see "Trade Trends" later in this chapter). In 2016, the U.S. telecom services market was valued at roughly $338.0 billion, or 22.8 percent of the global market, making it the largest country market for such services. Other large markets included China ($228.5 billion; 15.4 percent), Japan ($95.2 billion; 6.4 percent), Brazil ($66.3 billion; 4.5 percent), and the UK ($48.3 billion; 3.3 percent).[181]

The top U.S. telecom carriers, measured by 2016 revenues, are AT&T and Verizon, both of which offer a full suite of fixed-line and mobile services (including voice, internet access, data, and pay-TV) (table 5.1). Other leading providers include CenturyLink and Frontier (which focus mainly on fixed-line services), as well as Sprint and T-Mobile (which focus mainly on mobile services). Over the past decade, cable TV providers have also started to offer telecom services,

[177] VoIP technologies enable telephone calls to be transmitted over the Internet, rather than traditional circuit-switched networks, by breaking the conversation into Internet Protocol packets.
[178] Business services encompass not only landline and mobile voice services, text messaging, and internet access services but also wide area network services like Internet Protocol-virtual private network (IP-VPN), business Ethernet, data center, cloud computing, and network security.
[179] WTO, "Coverage of Basic Telecommunications and Value-added Services," n.d. (accessed December 27, 2017).
[180] The global market is defined as spending by both consumers and businesses on fixed-voice services (both traditional fixed-line and IP-based services, including line and access costs), fixed data services (including broadband services based on digital subscriber line [DSL], cable, and fiber), IP-VPN services, Ethernet line and Ethernet local area network services, frame relay and asynchronous transfer mode services, leased-line services, and internet access services. IDC, Worldwide Telecom Services Database (accessed January 30, 2018).
[181] IDC, Worldwide Telecom Services Database (accessed January 30, 2018).

mainly internet access and VoIP services. The leading companies in this category are Comcast, Cox Communications, Altice USA, and Charter Communications.[182]

Table 5.1: Telecommunications services: Top 10 global telecommunications services firms by revenue, 2015

Rank	Company	Headquarters country	Revenues, million $ (2014–15 change, percent)	Profit before tax, million $ (percent of revenue)	Employees
1	AT&T	United States	146,801 (10.8)	20,692 (14.1)	281,450
2	Verizon	United States	131,620 (3.6)	28,240 (21.5)	177,700
3	China Mobile	China	106,542 (0.6)	22,913 (21.5)	438,645
4	NTT	Japan	96,106(-4.8)	11,070 (11.5)	241,448
5	Deutsche Telekom	Germany	76,816 (-7.6)	5,302 (6.9)	226,332
6	Softbank	Japan	76,225 (-1.5)	8,375 (11.0)	63,591
7	Vodafone	United Kingdom	61,744 (-9.2)	-677 (-1.1)	107,667
8	América Móvil	Mexico	56,367 (-11.6)	3,539 (6.3)	195,475
9	China Telecom	China	52,798 (0.1)	4,255 (8.1)	291,526
10	Telefónica	Spain	52,395 (-9.1)	345 (0.7)	129,890

Source: Statista, "Top 100 Telecommunications Companies (Global)," March 14, 2017.
Notes: The end of the fiscal year was March 31, 2016, for NTT and Vodafone. For all other companies on the list, the end of the fiscal year was December 31, 2015. Constant exchange rates from the last fiscal yearend were used to calculate U.S. dollar values. AT&T, NTT, and Verizon prepared their financial statements according to U.S. Generally Accepted Accounting Principles; all other companies prepared their financial statements according to International Financial Reporting Standards.

For more than a century, the primary telecom service in the United States was the traditional fixed-line telephone call. The broad-based adoption of mobile phones starting in the mid-1990s, however, led to a decline in fixed-line telephony as consumers slowly but steadily canceled fixed-line subscriptions in favor of mobile services. In recent years, competition from VoIP and, increasingly, messaging apps has also reduced demand for fixed-line telephony. As a result, the number of fixed-line subscriptions peaked in the United States in 2000, and has declined at an annual rate of 3 percent ever since,[183] almost exactly on pace with the decline of fixed-line subscriptions around the world.[184]

Broadband internet access services, particularly digital subscriber line (DSL) services, which are delivered over the same copper-wire local networks as fixed-line voice services, have mitigated the decline of fixed-line subscriptions because such services are frequently bundled together. In addition, business customers are slower to cancel fixed-line voice services because such

[182] BMI, *United States Telecommunications Report*, June 2017, 32.
[183] International Telecommunications Union (ITU), ITU World Telecommunications/ICT Indicators database (accessed January 3, 2018).
[184] Calculated by Commission staff using data from International Telecommunications Union (ITU), World Telecommunications/ICT Indicators database (accessed January 30, 2018). Between 2010 and 2015, the number of global fixed-line subscriptions declined at an annual rate of 3.1 percent, from 1.1 billion to 921 million.

services are more reliable and secure than mobile voice services.[185] Nonetheless, fixed-line subscriptions in the United States are forecast to decline at an average annual rate of 1.7 percent during 2018–20.[186] Revenues in the fixed-line segment fell at an annual rate of 5.9 percent from 2012 to 2017, and are forecast to decline at annual rate of 4.1 percent during 2018–22.[187]

Mobile services, which first emerged as a commercially viable service in the mid-1990s, have grown rapidly over the past 20 years. From 1996 through 2016, the number of mobile subscribers in the United States grew at an average annual rate of 12 percent, from 44 million to 417 million, resulting in a mobile penetration rate[188] of 127 percent.[189] In 2017, the number of mobile subscriptions is expected to have increased to 433 million, representing a penetration rate of 133 percent.[190] Despite the high mobile penetration rate in the United States—which stems from the fact that many people own more than one phone—the market is expected to continue to grow during the next three years, albeit at a lower annual rate of 2.7 percent due to market saturation.[191] Globally, more than 120 countries have mobile penetration rates that exceed 100 percent.[192]

Until 2000, telephone calls were the sole mobile service. After the rollout of second-generation cellular technology (2G) networks in the early 2000s, text messaging surged in popularity. In 2007, the simultaneous rollout of the first third-generation cellular technology (3G) network (by AT&T) and Apple's iPhone (available only through AT&T for the first few years) revolutionized the mobile services industry. The subsequent demand for smartphones and data has greatly benefited the industry, with wireless revenues among the four largest providers—AT&T, Sprint, T-Mobile, and Verizon—growing in every year between 2007 and 2015. In 2016, however, the revenue of these providers contracted, largely due to the ongoing shift to contract-free service plans and phone-leasing programs. In 2017, too, revenue growth is expected to stagnate.[193]

Internet access service was widely adopted in the United States starting in the late 1990s and has grown steadily ever since. Fixed broadband services like cable modem, DSL, and fiber optic services represent the vast majority of internet access subscriptions. Between 2006 and 2016, the number of fixed broadband subscriptions in the United States grew at an average annual

[185] Longo, *Wired Telecommunications Carriers in the United States*, April 2017, 7.
[186] Economist Intelligence Unit (EIU), *Telecommunications: United States of America, Q4 2017*, 2.
[187] Zino, *Industry Surveys: Telecommunications*, January 2017, 13.
[188] The mobile penetration rate is defined as the number of mobile subscribers per 100 people.
[189] ITU, ITU World Telecommunications/ICT Indicators (WTI) database (accessed January 3, 2018).
[190] EIU, *Telecommunications: United States of America, Q4 2017*, 2.
[191] EIU, *Telecommunications: United States of America, Q4 2017*, 2.
[192] ITU, World Telecommunications/ICT Indicators Database (accessed January 30, 2018).
[193] Zino, *Industry Surveys: Telecommunications*, January 2017, 13.

rate of 4.4 percent, from 60.2 million to 106.1 million, resulting in a broadband internet penetration rate of 32.3 percent.[194] In 2016, there were roughly 247 million internet users in the United States, or approximately 76 percent of the population.[195] Over the past 10 years, cable modem service has consistently gained market share in the United States, whereas fiber optic broadband has grown more slowly. In 2016, fiber subscriptions accounted for only 11 percent of broadband subscriptions in the United States, significantly lower than the Organization for Economic Co-operation and Development average of 21 percent. By contrast, fiber subscriptions in Japan and South Korea represented 75 percent and 74 percent of the market, respectively.[196] In 2015, spending on fixed broadband internet services in the United States totaled $51 billion, an increase of 11.8 percent from the previous year.[197]

Supply and Demand Factors

In an effort to address flat or declining revenues, U.S. telecom carriers are focusing on opportunities that make use of their existing network infrastructure and core connectivity services, which represent more than 90 percent of total revenues for many companies. Such strategies include bolstering network infrastructure, connecting a growing array of devices, entering complementary markets, and reconfiguring their business services offerings.

Network Infrastructure and New Devices

Smartphones are becoming the primary means by which many consumers access the internet. The spread of unlimited data plans and the growth of video content (including an increasing amount of high-definition video) are causing demand for mobile data to surge, making network congestion an ongoing issue for mobile carriers in the United States and requiring them to continually invest in network upgrades.[198] Over the next few years, network construction efforts will also be driven by the rollout of fifth-generation cellular technology (5G) networks. These networks will connect a host of new devices (ranging from watches to home thermostats to cars) to the internet, a market that is increasingly referred to as the Internet of Things (IoT).

Driven by such factors, U.S. carriers are frequently announcing the completion of network upgrades as well as future network plans. For example, in November 2017, T-Mobile

[194] ITU, ITU World Telecommunications/ICT Indicators (WTI) database (accessed January 5, 2018).
[195] EIU, *Telecommunications: United States of America, Q4 2017*, 6.
[196] Ibid.
[197] Statista, "Fixed Broadband Revenue in Selected Countries," 2016.
[198] Chatterjee, "Top 3 Mobile Data Trends to Watch For in 2018," January 26, 2018.

announced the activation of LTE-Advanced[199] networks—an upgrade of its Long-Term Evolution (LTE) networks—in more than 920 markets around the United States. In 430 of those markets, it has activated even higher-speed networks based on Gigabit Class LTE technologies. Going forward, T-Mobile plans to launch networks using LTE-Licensed Enabled Access technologies, which boost network capacity by deploying small cells operating on unlicensed spectrum.[200]

Further, AT&T plans to activate networks based on the new 5G New Radio guidelines in a dozen U.S. markets by the end of 2018. In addition, AT&T plans to expand its current LTE network, including its upgraded 4G LTE network, dubbed 5G Evolution (despite offering sub-5G speeds). Verizon is planning to launch 5G service in five cities by the end of 2018, Sprint intends to activate a 5G network in 2019, and T-Mobile has announced plans to roll out nationwide 5G network coverage by the end of 2020.[201] Such network construction requires enormous amounts of capital. T-Mobile, for example, is expected to spend roughly $5 billion on its mobile network infrastructure in 2017.[202] Over the next seven years, U.S. carriers are expected to spend an estimated $275 billion on 5G infrastructure, including more than $100 billion on the construction of new 5G antenna sites.[203]

At the same time, U.S. carriers have been making efforts to increase the number of devices connected to their networks. In March 2017, Verizon launched its Cat M1 IoT infrastructure, a specialized low-power wide area network designed for IoT devices. Verizon is also developing ThingSpace, a web-based platform for managing IoT deployments. So far, Verizon has 14,000 developers registered on the ThingSpace platform.[204] In Columbus, Ohio, Verizon Share software (which connects to ThingSpace) lets taxi drivers use an app to locate, reserve, and rent the closest YellowCab car for the purpose of offering taxi services. In Sacramento, California, Verizon offers free Wi-Fi in public parks via 15 kiosks around city, and is installing intelligent software and systems in more than a dozen stoplights in an effort to help the city better manage traffic flows.[205]

[199] Long Term Evolution-Advanced technologies offer higher transmission capacity than previous LTE network configurations.
[200] TeleGeography, "T-Mobile US Extends LTE-A to 920 Markets," November 10, 2017. Unlicensed spectrum is a frequency band allocated for use by the public and, therefore, does not require a license.
[201] Gartenburg, "AT&T Announces Plans to Roll Out a True 5G Network," January 4, 2018; Gartenburg, "AT&T Announces It Will Build a Fake 5G Network," April 25, 2017.
[202] Smith, "What Are T-Mobile's Capex Plans for 2017?" September 28, 2017.
[203] Rayner, "The Cost of Rising Data Consumption," January 23, 2018.
[204] Sibley, "What's the IoT Plan, Verizon?" September 11, 2017.
[205] Sibley, "What's the IoT Plan, Verizon?" September 11, 2017.

Verizon is also moving into the connected car and fleet management markets. In June 2016, Verizon Telematics announced plans to acquire Telogis, a California-based developer of telematics and fleet logistics software used by Ford, Volvo, GM, and other automobile manufacturers.[206] In August 2016, Verizon also announced plans to spend $2.4 billion in cash to buy Fleetmatics Group, a fleet management company that develops software and uses GPS technologies to track vehicle location, fuel usage, speed, mileage, and driver behavior.[207] AT&T has also been building a connected-car business and now has more than a dozen car companies as customers.[208]

Smart home services are another growing IoT market. AT&T has launched a smart home service known as Digital Life, which offers home security as well as automated thermostats, lighting control, and water-leak detection.[209] By the end of 2016, AT&T had roughly 308,000 subscribers, making it the third-largest provider of such services in the United States.[210] Similarly, CenturyLink offers a smart home service that includes home security, fire and carbon monoxide monitoring, and home automation services.[211]

Outside of the United States, telecom carrier involvement in the IoT market is also in the early stages, but growing rapidly. Spain's Telefónica announced that roughly 15 million machine-to-machine subscriber identification modules were connected to its network at the end of June 2017, up 15 percent from the same period in 2016, while revenues for such services were up 25.5 percent to $82 million.[212] In 2017, Telefónica also launched "The Thinx," a facility/platform that allows customers to launch new applications or devices.[213] In South Korea, mobile carrier SK Telecom signed agreements with home automation companies Commax and Hyundai Telecom in 2015 and smart home equipment provider Kocom in 2016, with the goal of controlling 50 percent of South Korea's smart home market by 2020.[214] Going forward,

[206] PRNewswire, "Verizon to Enhance Significantly Its Connected Vehicle Business," June 21, 201; Lunden, "Verizon Buys Telogis to Drive Deeper Into the Connected Vehicle Market," June 21, 2016.
[207] Nayak, "Verizon to Buy Vehicle Management Company Fleetmatics for $2.4 Billion," August 1, 2016.
[208] Newcomb, "Verizon's Acquisition of Telogis Expands Company's Connected-Car Footprint," June 30, 2016.
[209] AT&T, "AT&T Digital Life Home," https://my-digitallife.att.com/learn/home-security-and-automation (accessed January 5, 2018).
[210] Engebretson, "Report: AT&T Third in Smart Home Market Share," January 2017. In 2016, the top two companies in the U.S. smart home market were Vivint and ADT Pulse.
[211] Century Link, http://www.centurylink.com/home/help/products/smart-home-frequently-asked-questions.html (accessed January 5, 2018).
[212] TeleGeography, "IoT Time," July 27, 2017.
[213] Telecompaper, "Telefonica Launches 'The Thinx' Project," November 2, 2017.
[214] Iglauer, "SK Telecom to Dominate Smart Home Services Market by 2020," March 31, 2016.

theglobal IoT market is expected to grow to $457 billion during 2016–20, representing a CAGR of 28.5 percent.[215]

Carriers Enter Complementary Content and Advertising Markets

Some telecom carriers are responding to flat or declining revenues in their core service markets by entering complementary markets. In October 2016, AT&T announced plans to purchase Time Warner, which owns the Warner Brothers movie studio as well as CNN, HBO, and TBS, for $85 billion (plus $22 billion in assumed debt).[216] The deal, which would merge AT&T's distribution network with Time Warner's movie and television content, is predicated on locking customers into internet and wireless services by offering packages that include Time Warner content. The deal would also allow AT&T to better manage its content costs, while simultaneously earning revenues by offering content to other pay-TV services providers.[217] In a setback to AT&T, the U.S. Department of Justice filed a civil antitrust lawsuit in November 2017 to block the acquisition, saying that the combined company would hinder competitors by forcing them to pay hundreds of millions of dollars more per year for Time Warner's content.[218]

Verizon has also undertaken several large acquisitions in recent years to complement its existing network and services. In 2015, Verizon purchased AOL for $4.4 billion in cash.[219] Although AOL's digital content development business was largely unprofitable, it had developed a set of valuable ad-buying and targeting tools, particularly for videos. Also, in June 2017, Verizon completed its purchase of Yahoo for roughly $4.8 billion. Yahoo, too, had failed to generate profits from its content operations, but had developed advertising technologies and had a customer base of more than one billion users. Over the past few years, Verizon has also purchased Microsoft's ad-technology operations as well as the ad-technology company Millennial Media.[220]

The combination of these companies gives Verizon both a variety of content and data on the online activities of more than a billion users, which it can use to target its own ads, as well as the ads of other companies.[221] Verizon hopes that its collection of digital advertising assets will allow it to compete against Facebook and Google. In 2016, most of the internet's ad-referral

[215] Columbus, "2017 Roundup of Internet of Things Forecasts," December 10, 2017.
[216] Downes, "Why Mergers Like the AT&T Time Warner Deal Should Go Through," November 2017; Pressman, "AT&T's Time Warner Deal Makes Strategic Sense," October 22, 2016.
[217] Pressman, "AT&T's Time Warner Deal Makes Strategic Sense," October 22, 2016.
[218] USDOJ, "Justice Department Challenges AT&T/DirecTV's Acquisition of Time Warner," November 20, 2017.
[219] DiChristopher, "Verizon Closes AOL Acquisition," June 23, 2015.
[220] Ingram, "Here's Why Verizon Wants to Buy Yahoo So Badly," April 19, 2016.
[221] Ingram, "Here's Why Verizon Wants to Buy Yahoo So Badly," April 19, 2016.

traffic went to Google (which accounted for 31 percent of global digital ad revenues) and Facebook (with 12 percent), whereas the combined ad revenue of Yahoo and Verizon was less than 3 percent.[222]

Data Centers and Interconnection Capacity

In recent years, U.S. telecom carriers have responded to the growth of cloud computing and surging demand for data by investing significant capital in a geographically diverse set of data centers,[223] either by expanding existing data centers or buying data centers from other companies. Now, however, many have decided to sell their data centers, largely due to the effort of operating and managing data centers as well as the high costs of providing power and air conditioning. In 2015, for example, AT&T sold several data centers for $2 billion, and is reportedly trying to sell several others. Similarly, in 2016, Verizon sold 29 data centers to data-center operator Equinix for $3.6 billion.[224] In May 2017, Verizon also sold its cloud and managed hosting business to IBM,[225] while CenturyLink sold its data center and colocation[226] business for $2.3 billion to a consortium led by BC Partners.[227]

Instead of operating data centers, many U.S. carriers decided to focus on their core competency by offering wide area networking (WAN) services to data center operators. WANs are high-speed networks that connect companies' offices and facilities in different locations to form a single network. These networks can connect distinct offices within a single city or two or more offices anywhere in the world. WAN technologies have also become increasingly important for connecting data centers and cloud computing facilities.

Although leased lines and Internet Protocol virtual private network (IP-VPN) services are used to connect data centers, business Ethernet is now the dominant data center interconnection service. The primary benefit of business Ethernet is faster data transmission: connection speeds of 2.5 gigabits per second (Gbps), 5 Gpbs, and 10 Gbps are now largely standard products, and 40 Gbps and 100 Gbps products are becoming increasingly common. Business Ethernet is increasingly the service of choice for companies that have large data transmission needs and/or require high-bandwidth connections to (or between) data centers and cloud computing

[222] Udland, "Yahoo Is the Latest Piece of Verizon's $10 Billion Plan," July 25, 2016.
[223] Data centers are large, warehouse-like facilities that offer space for companies to install servers and other computer equipment. The core services provided by data centers are telecom network connectivity, space rental, physical security, air conditioning and electricity services, and emergency backup systems.
[224] EIU, "The Great Datacentre Sell-Off," May 5, 2017; Buckley, "How AT&T, Verizon, and CenturyLink Are Exiting Data Centers," May 22, 2017.
[225] Lardinois, "Verizon Sells Its Private Cloud," May 3, 2017.
[226] Colocation services involve the leasing of space for telecom networking equipment and computer hardware.
[227] Moss, "CenturyLink Completes Sale of Its Data Center Business," May 2, 2017.

facilities. In 2015, the U.S. business Ethernet market grew by 29.4 percent to $6.6 billion, faster than the average annual rate of 26.4 percent recorded during 2010–14. This expansion was driven by ongoing growth in cloud computing services, falling product prices, and growing demand for high-speed network facilities.[228]

Trade Trends

Telecom services are traded between countries in two main ways: through cross-border trade between countries—most commonly payments for connecting international telephone calls and for roaming on foreign networks—and through affiliate sales, or the local sales of telecom services in one country by an affiliate of a telecom services company headquartered in another country.

Cross-Border Trade

In 2016, U.S. cross-border exports of telecom services (box 5.1) totaled $12.2 billion, while imports totaled $5.5 billion, yielding a trade surplus of $6.7 billion (figure 5.1).[229] Exports of telecom services experienced essentially no growth during 2011–15 and fell by 3 percent in 2016. This trend likely reflected a decline in demand for traditional voice services in favor of smartphone-based communications apps, often referred to as over-the-top (OTT) services; examples of OTT services include WhatsApp, Facebook Messenger, and FaceTime.[230] Imports of telecom services also decreased during the period, falling by 11 percent from 2011 through 2015 and by another 13 percent in 2016. The decline in U.S. telecom imports also likely reflects the impact of smartphone-based communications apps.[231]

Box 5.1: Understanding BEA Data on Cross-Border Trade and Affiliate Transactions in Telecommunications Services

BEA data on cross-border trade in telecommunications services cover the following services: telephone message services, telex, telegram, and other jointly provided basic services; private leased channel services; value-added services; support services; and reciprocal exchanges.[a] These figures are collected quarterly by the BEA (using Form BE-125).[b] Companies are instructed to report data for these categories in the aggregate, so data by specific service type are not available.[c] In addition, the BEA periodically conducts benchmark surveys (using Form BE-120). The latest such survey occurred in 2011.

In 2006, the BEA started collecting and reporting data for both affiliated and unaffiliated telecommunication transactions (earlier, the BEA had collected only unaffiliated data).[d] Affiliated

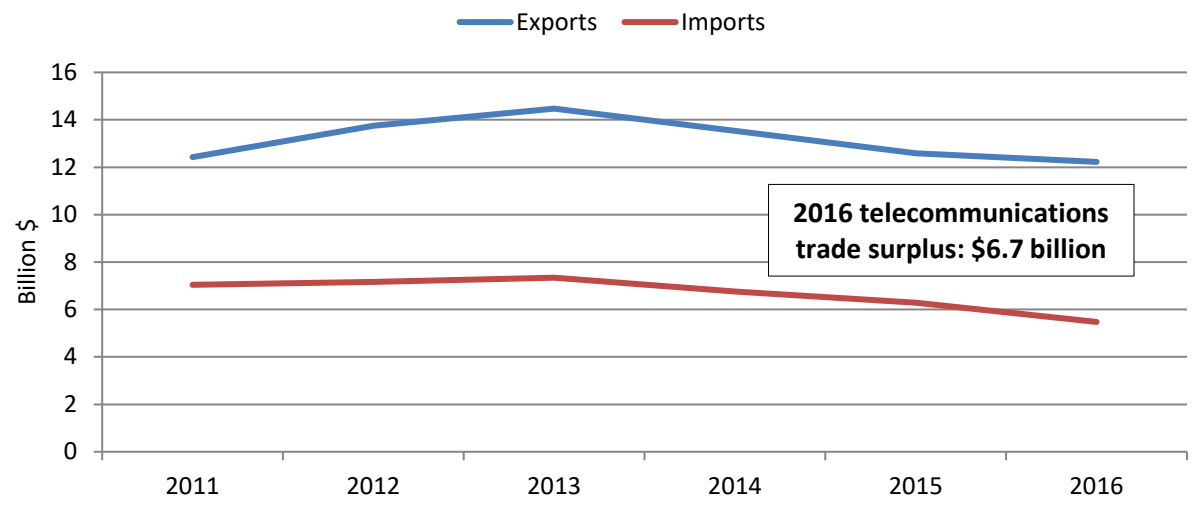
[228] TIA, *TIA's 2016–2020 ICT Market Review and Forecast*, 2016, 2–8.
[229] USDOC, BEA, *U.S. International Services*, 12.
[230] Christian, "Market Sees First Decline in International Carrier Voice," January 26, 2017.
[231] Ibid.

transactions reflect trade within multinational telecommunications services companies—i.e., trade between U.S. parent companies and their foreign affiliates, and vice versa. By contrast, unaffiliated transactions reflect trade with foreign partners that neither own nor are owned by the U.S. provider or consumer of the service.[e]

The BEA collects data on sales by foreign affiliates of U.S. firms using forms BE-10 (a benchmark survey) and BE-11 (an annual survey). For purchases from U.S. affiliates of foreign companies, it collects data using forms BE-12 (a benchmark survey) and BE-15 (an annual survey). While cross-border data are collected based on the type of service traded, affiliate data are collected based on the primary industry of the firm.[e] The BEA reports on services traded by three types of telecom affiliates: wireline telecommunication carriers, wireless telecommunication carriers (except satellite), and other telecommunications services firms.[f]

[a] USDOC, BEA, Form BE-125 (1-2010), 17.
[b] BEA representative, email message to USITC staff, March 23, 2010. For example, if Company A (in the United States) owes Company B (in France) $100 million, and Company B owes Company A $20 million, Company A would report a receipt (export) of $20 million and a payment (import) of $100 million.
[c] BEA representative, email messages to USITC staff, March 12–23, 2010. For more information on affiliated/unaffiliated trade in telecommunications services, see DOC, BEA, *Survey of Current Business*, October 2009, 41, table 1, "Trade in Services, 1998–2009," footnote 7.
[d] USDOC, BEA, *Survey of Current Business*, October 2009, 29; USDOC, BEA, Form BE-125 (1-2010), 17.
[e] BEA representative, email message to USITC staff, March 12, 2010.
[f] USDOC, BEA, *Survey of Current Business*, October 2009, 22–64.

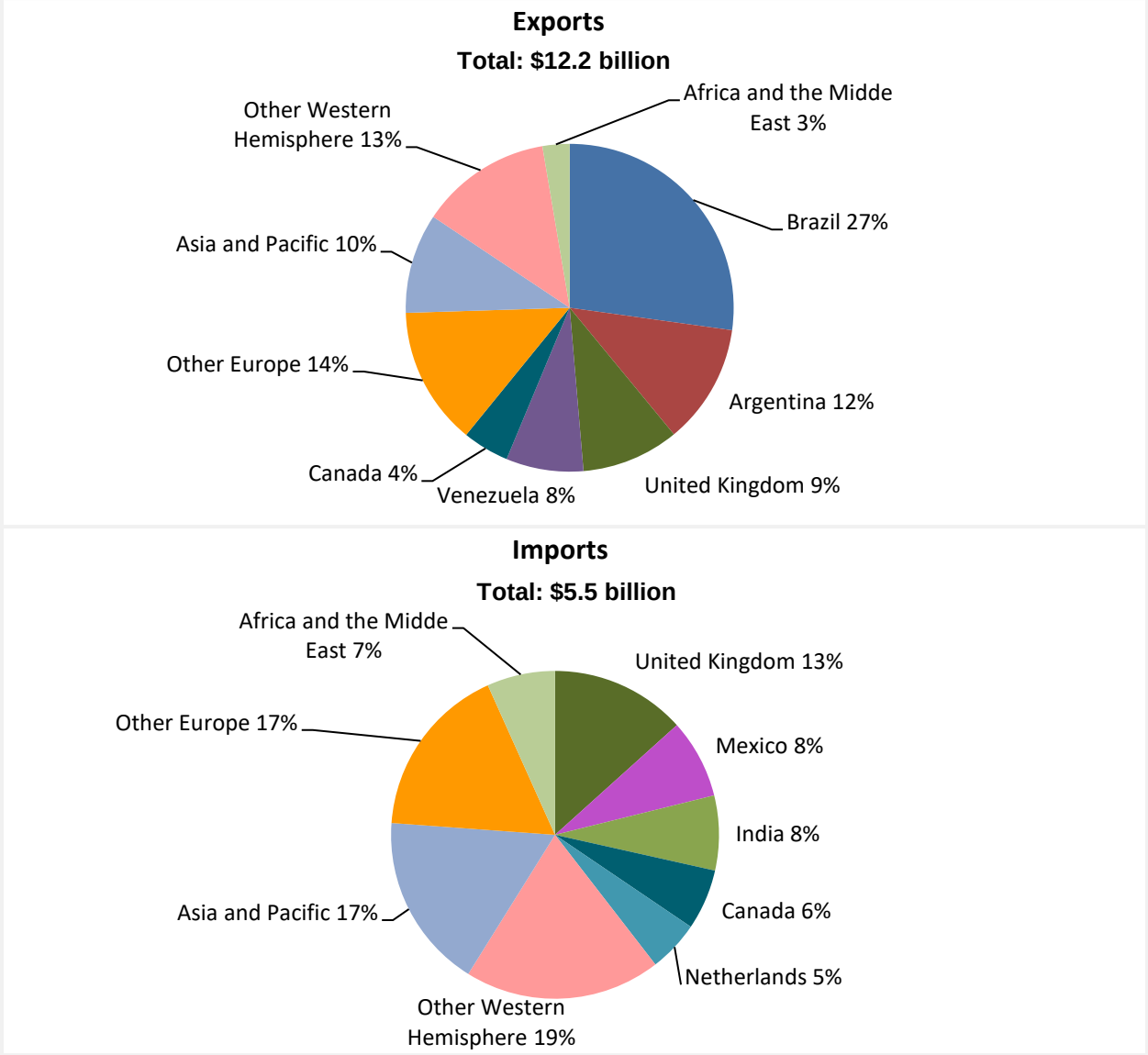
Figure 5.1: Telecommunications services: U.S. cross-border trade, 2011–16



Source: USDOC, BEA, International Data, International Services, table 2.2, "U.S. Trade in Services, by Type of Services and Country or Affiliation" (accessed November 17, 2017). (See appendix table B.16).

In 2016, the leading markets for U.S. cross-border exports of telecom services were Brazil ($3.3 billion), Argentina ($1.4 billion), the UK ($1.2 billion), Venezuela ($933 million), and Canada ($561 million) (figure 5.2). The top sources of U.S. telecom services imports were the UK ($730 million), Mexico ($427 million), India ($404 million), Canada ($327 million), and the Netherlands ($276 million).

Figure 5.2: Telecommunications services: U.S. cross-border trade by country, 2016



Source: USDOC, BEA, International Data, International Services, table 2.2, "U.S. Trade in Services, by Type of Services and Country or Affiliation" (accessed November 17, 2017). (See appendix table B.17).

Affiliate Transactions

U.S. carriers primarily offer telecom services to customers in foreign countries—including the foreign affiliates of U.S.-based multinational firms—through in-country affiliates (box 5.2). In 2015, data on the total sales of U.S. telecom carriers through their foreign affiliates were suppressed by the BEA to protect the confidential data of individual firms, but sales by affiliates in the wired and wireless carrier segments were $26.5 billion and $5.5 billion, respectively. These figures were roughly 5 percent lower than in 2014.[232] By contrast, telecom services purchased from U.S.-based affiliates of foreign telecom services companies totaled $75.6 billion—13 percent higher than in 2014. A large portion of the data pertaining to U.S. sales and purchases of telecom services through foreign affiliates—including virtually all country-level data—is suppressed. The suppression of such data, however, likely indicates that only one or two U.S. companies operate in most foreign countries, suggesting that the dollar amounts of such sales and purchases in individual countries are relatively small.

Box 5.2: U.S. Telecom Carriers in the Global Market

For more than a decade, U.S. telecom carriers have largely avoided making investments in consumer[a] telecom services markets abroad. In recent years, one of the few examples of a U.S. carrier entering a foreign consumer telecom services market is AT&T's acquisition of two companies in Mexico—Iusacell and Nextel Mexico—in 2015.[a] AT&T's acquisition of DirecTV in 2015 also included satellite-TV services in more than a dozen Latin American and Caribbean countries, as well as significant ownership positions in Sky Brazil and Sky Mexico.[b]

Instead, in foreign countries, U.S. carriers primarily offer business services to multinational corporations and government agencies that maintain offices in one or more countries. Common business services include fixed-line and mobile voice, private line, digital subscriber line, cable modem, dedicated internet access, managed router, managed security, infrastructure as a service, hosted cloud, carrier Ethernet, and Internet Protocol virtual private networks. Although more than 15 U.S. carriers offer business services, including several cable television companies, most focus on the U.S. market, leaving the global business services market to only a few companies—mainly AT&T, CenturyLink, GTT, Level 3, Sprint, Verizon, and XO Communications. For the two largest providers, AT&T and Verizon, domestic and international business services were a significant source of revenues, accounting in 2016 for 9.3 percent and 6.9 percent of total company revenues, respectively.[c]

In 2017, a number of mergers led to a decline in the number of companies offering such services. Verizon completed its $1.8 billion purchase of XO Communications in February 2017, mainly to acquire fiber-optic networks in key cities,[d] and CenturyLink closed its $25 billion purchase of Level 3 Communications in November 2017, a deal that increased its presence in the business services market outside the United States.[e]

[232] USDOC, BEA, "Table 4.1. Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliate," October 24, 2017.

In 2016, the global business services market was valued at $310 billion, up 3.5 percent from the previous year.[f] The largest 10 companies hold an out-sized share of the market and increased that market share, while the market shares of second- and third-tier companies contracted. Worldwide, the largest provider of business services in 2016 was Japan-based NTT, with 15.8 percent of the global market, followed by AT&T (United States; 8.3 percent), China Telecom (China; 6.0 percent), Verizon (United States; 4.4 percent), and Deutsche Telekom (Germany, 4.2 percent). All remaining companies, including British Telecom (United Kingdom), Orange (France), Telstra (Australia), China Unicom (China), and Telefónica (Spain), had a market share of less than 4 percent.

Revenue growth in the business networking market is increasingly driven by changing consumer and data usage patterns. Specifically, service demand and corresponding network traffic are being driven by the migration away from legacy networking technologies to hybrid wide area networks and cloud technologies, both of which, in turn, are driving emerging services like the Internet of Things, cognitive computing, collaboration, and video services.[g]

[a] AT&T, "AT&T Closes Acquisition of Mexican Wireless Provider," January 16, 2015; AT&T, "AT&T Completes Acquisition of Nextel Mexico," April 30, 2015.
[b] Sherman, "AT&T Is Weighing a Public Share Offering," October 12, 2017.
[c] Munroe, "Worldwide Telecommunications Wireline Business Market Shares, 2016," 2017.
[d] Buckley, "After Delay, Verizon Wraps $1.8 Billion XO Acquisition," February 1, 2017.
[e] CenturyLink, "CenturyLink Completes Acquisition of Level 3," November 1, 2017; Lind, "CenturyLink Announces Intent to Acquire Level 3," October 31, 2016.
[f] Munroe, "Worldwide Telecommunications Wireline Business Market Shares, 2016," 2017.
[g] Munroe, "Worldwide Telecommunications Wireline Business Market Shares, 2016," 2017.

Outlook

Over the next three years, the global telecom services industry is forecast to grow at a rate of 1.3 percent,[233] largely due to flat or declining revenues in the core fixed-line, mobile, and internet markets. Going forward, in an effort to offset anemic revenue growth, U.S. carriers are expected to continue upgrading and expanding their networks, particularly 5G networks. At the same time, they will likely focus on earning revenues from recent investments and acquisitions that they have made in new markets, including broadcasting content, IoT, online advertising, smart home, and WAN services. Carriers are also expected to continue cutting costs and reducing their exposure to unprofitable market segments.

[233] IDC, Worldwide Telecom Services Database (accessed January 30, 2018).

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Chapter 6
Services Roundtable

The Commission hosted its 11th annual Services Roundtable on October 25, 2017. These roundtable discussions are held regularly to encourage dialogue among individuals from government, industry, and academia about issues affecting trade in services. The 2017 event focused on two themes: the relationship between goods and services trade, and recent developments in the tradability of services.

The roundtable also discussed current trade data limitations and considered whether including services as manufacturing inputs could be a new approach to calculating services trade. Commissioner Meredith Broadbent moderated the first half of the discussion, and Chairman Rhonda Schmidtlein moderated the second half.

The Relationship between Goods and Services Trade

The first half of the roundtable focused on the relationship between goods and services trade. Participants discussed the ways that services facilitate merchandise trade, serve as a substitute for certain goods, and are part of the value added in some exported goods.

One participant cited the importance of financial and telecommunications services in the production and export of goods, while others pointed out that maintenance and educational services are bundled with certain goods. A participant noted that companies use social media for marketing, which increases domestic sales and exports, and another stressed that payment services enable trade in goods and services. Another participant noted that some companies use data analytics to inform consumers of the location and availability of products—such as gasoline—in real time, which facilitates purchases and increases efficiency. Finally, a participant stated that digital services are an important part of manufacturing and merchandise trade during both design and production, as well as in marketing, distribution, and exporting.

The participants discussed the contribution of services to trade in value added. Participants indicated that governments, multilateral agencies, and businesses have been trying to more accurately assess the value added by services in manufactured goods by using new approaches to trade statistics. They noted that the services incorporated into the value of a good can be sourced either in-house or from an outside supplier, and are indirectly exported when finished goods are provided to overseas customers. According to one participant, services components

of manufactured goods are increasingly sourced internationally, which extends manufacturing supply chains. Echoing statements made in the previous services roundtable, one participant suggested that defining a fifth mode of supply, "value-added services," to the four already defined by the General Agreement on Tariffs and Trade would increase awareness of services tradability and facilitate the collection of more comprehensive trade statistics.[234]

Several participants remarked that services can substantially increase the value of a good. One participant gave the example of bicycles, which can be bundled with valuable bike-sharing services. Another participant stated that complex products—such as aircraft engines, as well as heating, ventilation, and air conditioning systems—are increasingly integrated with digital services, which allow manufacturers or other service providers to manage their performance and provide diagnostic services remotely.

Services, especially digital services, can also substitute for certain goods. For example, one participant stated that some consumers are increasingly interested in using transport services, which connect passengers to local drivers, instead of buying their own vehicles. The participant pointed out that some ridesharing services operate across borders.

Developments in the Tradability of Services

The second half of the roundtable focused on developments in the tradability of services (i.e., when services are produced in one location and consumed in another). Participants described technological advances that enable services trade, noting that digital technology facilitates direct cross-border trade in some services that traditionally have been traded through mode 2 or mode 3. These include education (online distance learning) and medical consultation (telemedicine). Participants indicated that providers in these industries no longer need to share a physical space with a student, patient, or other type of customer.

One participant noted that certain digital services are difficult to capture in official trade statistics because they may cross multiple countries in a single transaction. The participant added that sometimes such services are provided to the end user free of charge, typically because the free service provides valuable data to the provider. A participant said that free services bundled with goods are not captured in trade data, and another gave the specific example of a free translation app for smartphones that allows individuals to translate conversations while traveling, with data being transferred between the user's smartphone and a data center in another country. Another participant stated that trade in certain services, such

[234] See chapter 1, box 1.1.

as cloud computing, can involve multiple modes of supply and may take place as an ongoing business relationship rather than a single distinct transaction.

Despite innovations in services trade, several participants noted that services trade restrictions still have significant effects, especially in large developing countries like India, China, and Brazil. One participant said that the presence of different licensing rules in different markets is an obstacle to trade in audiovisual services. A second participant identified foreign direct investment restrictions as a major barrier. A third participant noted that digital trade restrictions both limit exports of computer and information services and reduce manufacturing firms' access to logistics and financial services, which affects their goods' exports and supply chains.

One participant said that some trade restrictions have a limited effect because companies learn to bypass restrictions by providing their services through different modes of supply; for this reason, barriers are a greater impediment when they affect multiple modes of supply. Another participant noted that medical services are frequently affected by privacy regulations that prevent the transfer of patient data through mode 1, while licensing requirements may restrict the ability of healthcare professionals to provide services abroad through mode 4. Despite these challenges, the participant indicated that medical services are still tradable through mode 2. One participant expressed the view that facilitating the entry of foreign producers and consumers into the United States would increase access to medical services, boost employment, and facilitate mode 2 services trade in other industries like tourism.

Appendix A
Summary of Selected Services Research

Selected Services Research

This appendix provides summaries and links to recent U. S. International Trade Commission reports that feature topics in services trade, and lists several forthcoming Commission reports that include information on the services sector. Services-related reports and investigations were prepared under section 332(g) of the Tariff Act of 1930 (19 U.S.C. § 1332(g)) in response to requests from the U.S. Trade Representative, the U.S. House of Representatives Committee on Ways and Means, and/or the U.S. Senate Committee on Finance. Executive Briefings on Trade, articles in the *Journal of International Commerce and Economics*, and other staff publications and working papers reflect the opinions and research of individual authors and are not the views of the U.S. International Trade Commission or any of its Commissioners.

332 Investigations

Global Digital Trade I: Market Opportunities and Key Foreign Trade Restrictions

Investigation No. 332-561, September 2017

https://www.usitc.gov/sites/default/files/publications/332/pub4716_0.pdf

This report is the first of three on global digital trade to be prepared by the Commission during 2017–19, at the request of the U.S. Trade Representative (USTR). When the series is complete, the reports will describe developments in several areas—global business-to-business and business-to-consumer digital trade; the adoption of digital technology by different industries; and market conditions for U.S. companies in foreign markets, including regulations and policy measures related to digital trade that may impede those companies' ability to compete.

Articles in the *Journal of International Commerce and Economics*

"The Impact of Liberalizing International Trade in Professional Services"

Tamar Khachaturian (Office of Industries) and David Riker (Office of Economics), May 2017

https://www.usitc.gov/sites/default/files/publications/332/journals/the_impact_of_liberalizing_international_trade_in_professional_services_khachaturian_riker.pdf

The paper analyzes trade in services using an economic model which features multiple modes of supply and firm heterogeneity. The Commission authors calibrated the model to the U.S. markets for two types of professional services—architectural and engineering services, and legal services. They then estimated the economic impact of reducing fixed costs of supplying U.S. markets for these services through cross-border trade and, alternatively, through affiliate transactions. Among other results, the authors estimated that reducing the fixed costs of trade in these services by half would have large effects on the value of cross-border imports into the U.S. market and on foreign affiliate sales in the U.S. market. However, that reduction would have only small effects on the sales of domestic producers and on overall prices of the services in the U.S. market.

"The Impact of Trade and Technology on the U.S. Labor Market: Summary of USITC Roundtable Discussion"

Joann Peterson (Office of Industries), August 2017

https://www.usitc.gov/sites/default/files/publications/332/journals/jice_labor_roundtable_summary_peterson_commission_draft_508_compliant.pdf

The Commission hosted its second labor roundtable on March 29, 2017. The roundtable facilitated an exchange of ideas among 30 participants representing academic institutions, government agencies, industry associations, international organizations, think tanks, and nonprofit organizations. The 2017 event focused on the role that trade plays in U.S. labor markets and mechanisms, with the aim of assessing the connection between trade and labor. Within this framework, participants discussed three broad topics: the influence of trade and technology on the U.S. labor market; worker displacement and the efficacy of worker retraining programs (including the Trade Adjustment Assistance program); and the impact of labor provisions in trade agreements on U.S. and global labor standards.

"An Overview of Customs Reforms to Facilitate Trade"

Joann Peterson (Office of Industries), August 2017

https://www.usitc.gov/sites/default/files/publications/332/journals/jice_customsreformstofacilitatetradepeterson_508_compliant.pdf

The factors motivating customs reform in various countries are the focus of this article. In particular, it describes how certain customs practices have recently evolved in response to the globalization of manufacturing, just-in-time production processes, and the growth in e-commerce. Countries have undertaken several types of customs reform, including the use of online single-window systems to streamline customs paperwork and improve transparency; the adoption of "trusted trader" programs and risk assessment tools to speed customs clearance at border checkpoints; and efforts at harmonizing customs processing among regional trading partners. Guiding principles to improve customs efficiency were also agreed upon under the World Customs Organization's Kyoto Convention and the World Trade Organization's Trade Facilitation Agreement (TFA). This article outlines these developments and reviews work by the Organisation for Economic Co-operation and Development, the World Bank, and the World Economic Forum to benchmark countries' progress in achieving customs reform, including implementing policy recommendations under the TFA.

"Does Trade Promote State Capacity in Ghana? A Synthetic Control"

Jeremy Streatfeild (Office of Industries), March 2018

Can changes in trade volumes explain improvements in the capacity of African states to collect revenue and to provide public services? To study this relationship, the author argues that Ghana's state capacity is stronger than it would have been otherwise, thanks to its recent trade growth. This research represents a departure from most economics literature on trade, which focuses on improvements to economic performance. Instead, it discusses an oft-overlooked aspect of trade—its impact on a state's political economy. Identifying the roots of stronger African state capacity is an important objective, in light of a concern that African states, in their current form, may just limp along, hampered by their endowment of inhospitable geography. Improvements in a state's capacity for governance mean it can better provide public goods, combat corruption, and attract private investment.

The findings presented in this paper not only are consistent with the hypothesis that trade growth has had a measurable impact on Ghana's state capacity, but—using a synthetic

control—show just how quickly that impact has arisen. Although the weakness of African states has received much attention, the findings in this paper suggest that capacity levels can be directly bolstered through trade-promotion policies.

Staff Publications and Working Papers

"Do Non-Tariff Measures Make Domestic Firms More Profitable? Evidence from the Commercial Banking Sector"

Sarah Oliver (Office of Industries), December 2017

https://www.usitc.gov/sites/default/files/publications/332/working_papers/ntms_and_commercial_banking_id_047_508_compliant.pdf

Using firm-level data from 78 country markets in 2012, this paper analyzes the relationship between the severity of nontariff measures related to the entry and operation of foreign firms and firm profitability in the commercial banking sector. It also differentiates the impact of these nontariff measures on foreign-owned and domestic firms. It finds a nonlinear relationship between the level of restrictions and the profitability of firms. Banks in countries with low levels of restriction are significantly more profitable than banks in countries with no restrictions, while banks in countries with moderate levels of restriction are less profitable than banks in countries with no restrictions. Additionally, foreign-owned firms are significantly more profitable than domestic firms when there are no restrictions on the entry and operation of foreign firms, but less profitable than domestically owned firms at both low and moderate levels of restriction.

"The Sub-Saharan African Services Economy: Insights and Trends"

Jennifer Powell (Office of Industries), July 2017

https://www.usitc.gov/sites/default/files/publications/332/sub-saharan_african_id-17-046_final_071217sae.pdf

This staff report gives insights into the sub-Saharan African (SSA) services sector, describing its general characteristics and highlighting its distinctive qualities. This compilation of recent work does not present summary findings or a comprehensive overview of the region's services sector, although a few broad themes emerge. For example, overall services output and trade in SSA, while small, are growing rapidly: in many individual SSA countries, services account for

more than half of total GDP. Nonetheless, several factors—including poor infrastructure and a lack of skilled workers—inhibit services sector expansion in the region.

The report begins with a brief overview of SSA services output, employment, and trade. This is followed by a discussion of issues affecting the SSA services sector as a whole, including the growth in Chinese investment and foreign aid in the region, the role of the informal sector in the SSA services economy, and measures affecting the foreign provision of services in SSA. The second section of the report focuses on trends in particular services industries, including architecture, engineering, and construction services; financial services (in particular, microinsurance); telecommunications (with special attention to the recent expansion of submarine cable infrastructure and mobile money); tourism; and transportation services (with an emphasis on transit corridors). The final section of the report gives overviews of service sector developments in a subgroup of SSA countries, including Botswana, Ethiopia, Ghana, Kenya, Mauritius, Nigeria, Rwanda, Senegal, South Africa, Tanzania, Togo, Uganda, and Zambia.

Appendix B
Data Tables for Figures

Table B.1: Global services: Cross-border trade of exports and imports of commercial services, 2016

Country/region	Exports (billion $)	Imports (billion $)
United States	732.6	482.0
United Kingdom	323.7	449.8
Germany	267.8	310.6
France	235.6	235.7
China	207.3	194.6
Netherlands	177.4	191.9
Japan	168.7	182.7
India	161.3	169.2
Singapore	149.4	155.4
Ireland	146.2	133.0
All other	2,237.8	2,198.3
Total value	$4.8 trillion	$4.7 trillion

Source: WTO, Statistics database, Time Series on International Trade, Trade in Commercial services, 2005–onward (BPM6), (accessed November 12, 2017).
Notes: The value of global exports and the value of global imports differ due to several factors, including time lags, differences in collection methodology, and other measurement errors. Excludes public sector transactions (corresponds to figure 1.1).

Table B.2: U.S. services: Cross-border trade by services industry, 2016

Services Industry	Exports (billion $)	Imports (billion $)
Travel and passenger fares	244.7	160.8
Professional services	151.0	91.7
Financial services	114.5	73.7
Distribution services	147.1	61.2
Electronic services	93.4	54.3
Charges for the use of intellectual property n.i.e.	67.5	26.9
All other	15.4	14.5
Total value	$733.6 billion	$483.1 billion

Source: USDOC, BEA, table 2.1, "U.S. Trade in Services, by Type of Service," October 24, 2017.
Notes: Excludes public-sector transactions. Total exports and imports by sector are based on the latest BEA data for which all sectors are available. Corresponds to figure 1.2. N.i.e. = not included elsewhere.

Table B.3: U.S. services: Cross-border services trade and sales and purchases of services through affiliates, 2008–16

	U.S. international services supplied (billion $)		U.S. international services received (billion $)	
Year	Services supplied by U.S. firms' foreign affiliates[a]	U.S. cross-border exports of private services	Services supplied by U.S. affiliates of foreign firms[a]	U.S. cross-border imports of private services
2008[235]	1,117	514	702	380
2009	1,072	492	669	355
2010	1,155	544	701	377
2011	1,247	606	782	404
2012	1,286	634	813	424
2013	1,322	679	892	436
2014	1,535	721	940	457
2015	1,464	732	952	470
2016		734		483

[a] 2016 data not available. USDOC, BEA, table 2.1, "U.S. Trade in Services, by Type of Service," October 24, 2017; table 4.1, "Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliate," October 24, 2017; table 5.1, "Services Supplied to U.S. Persons by Foreign MNEs through Their MOUSA, by Industry of Affiliate and by Country of UBO," Interactive tables: International Data, International Services, October 24, 2017. Corresponds to figure 1.3.

Table B.4: U.S. services: Affiliate sales and affiliate purchases by sector, 2015

Services industry	Services supplied by foreign affiliates of U.S. firms (billion $)	Services purchased from U.S. affiliates of foreign firms (billion $)
Distribution services	416	286
Financial services	285	177
Electronic services[236]	270	133
Professional services[237]	102	96
Manufacturing	35	91
Other services (includes suppressed data)	355	169

Source: USDOC, BEA, table 4.1, "Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliate," and table 5.1, "Services Supplied to U.S. Persons by Foreign MNEs through Their MOUSAs, by Industry of Affiliate and by Country of UBO," October 24, 2017. Corresponds to figure 1.4.

Table B.5: U.S. electronic services: Cross-border trade by industry, 2016

Services industry	Exports (billion $)	Imports (billion $)
Audiovisual services	20.4	10.0
Telecommunications	12.2	5.5
Computer services	17.3	29.0
Information services	6.9	2.4
Computer software	36.6	7.4
Total value	$93.4 billion	$54.3 billion

[235] Data are underreported by the BEA to avoid disclosing individual companies' information.
[236] Data for foreign affiliate sales are underreported by the BEA to avoid disclosing individual companies' information.
[237] Data for foreign affiliate sales and purchases are underreported by the BEA to avoid disclosing individual companies' information.

Source: USDOC, BEA, table 2.1, "U.S. Trade in Services, by Type of Service," October 24, 2017.
Notes: Excludes public-sector transactions. Corresponds to figure 2.1.

Table B.6: U.S. electronic services: Affiliate sales and affiliate purchases by industry, 2015

Services industry	U.S.-owned foreign affiliate sales (billion $)	Foreign-owned U.S. affiliate purchases (billion $)
Motion picture and sound recording industries[238]	12.3	4.9
Telecommunications	40.2	75.6
Broadcasting (except internet)[239]	18.5	0.2
Data processing, hosting, and related services[240]	17.2	1.1
Computer systems design and related services[241]	93.8	28.3
Other information services	75.1	18.2
Software publishers	71.8	4.4

Source: USDOC, BEA, table 4.1, "Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliate," and table 5.1, "Services Supplied to U.S. Persons by Foreign MNEs through Their MOUSAs, by Industry of Affiliate and by Country of UBO," October 24, 2017. Corresponds to figure 2.2.

Table B.7: Audiovisual services: U.S. cross-border trade, 2011–16

Year	Exports (billion $)	Imports (billion $)
2011	17.9	3.6
2012	18.7	5.5
2013	18.4	5.2
2014	19.8	7.5
2015	21.4	9.0
2016	20.4	10.0

Source: USDOC, BEA, International Data, International Services, table 2.2, "U.S. Trade in Services, by Type of Services and Country or Affiliation" (accessed November 17, 2017). Corresponds to figure 3.1.

Table B.8: Audiovisual services: U.S. cross-border trade by country, 2016

Country/region	Exports (million $)	Country/region	Imports (million $)
United Kingdom	4,468	United Kingdom	1,683
Canada	1,879	Brazil	1,364
Germany	1,459	Mexico	661
France	1,070	Canada	498
Brazil	1,013	Argentina	468
Other Europe	3,299	Other Europe	2,255
Asia-Pacific	4,876	Other Western Hemisphere	2,070
Other Western Hemisphere	1,887	Asia-Pacific	971
Africa and the Middle East	418	All other	53
Total value	$20.4 billion		$10.0 billion

Source: USDOC, BEA, International Data, International Services, table 2.2, "U.S. Trade in Services, by Type of Services and Country or Affiliation" (accessed November 17, 2017). Corresponds to figure 3.2.

[238] Data are underreported by the BEA to avoid disclosing individual companies' information.
[239] Data are underreported by the BEA to avoid disclosing individual companies' information.
[240] Data are underreported by the BEA to avoid disclosing individual companies' information.
[241] Includes ancillary services provided by goods manufacturers, such as computer hardware services.

Table B.9: Audiovisual services: U.S. affiliate sales by country, 2015

Country/region	U.S. owned foreign affiliates (million $)
United Kingdom	1,963
France	1,336
Netherlands	1,201
Germany	993
Australia	791
Other Western Hemisphere	2,570
Other Europe	2,461
Other Africa, Middle East, and Asia-Pacific	987
Total value	$12.3 billion

Source: USDOC, BEA, table 3.1, "Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliate" (accessed November 15, 2017). Corresponds to figure 3.3.

Table B.10: Computer and data processing services: Mobile cellular subscriptions per 100 people, 2008–16

	Subscriptions per 100 people	
Year	Low-income countries	Middle-income countries
2008	17.7	54.1
2009	22.5	63.9
2010	28.7	74.5
2011	36.0	83.2
2012	41.9	87.7
2013	49.1	92.7
2014	54.7	96.2
2015	60.0	97.2
2016	60.2	101.1

Source: World Bank World Development Indicators, "Mobile Cellular Subscriptions (per 100 people)" (accessed January 12, 2018).
Note: As defined by the World Bank, low-income countries are those with a gross national income (GNI) per capita of less than $1,025 in 2015. Middle-income countries are defined as those that had a GNI per capita of $1,026-–12,475 in 2015. Corresponds to figure 4.1.

Table B.11: Computer and data processing services: U.S. cross-border trade, 2011–16

Year	Exports (billion $)	Imports (billion $)
2011	11.4	23.9
2012	12.6	23.9
2013	13.2	25.7
2014	14.0	27.3
2015	15.8	27.5
2016	17.3	29.0

Source: USDOC, BEA, International Data, International Services, table 2.2, "U.S. Trade in Services, by Type of Services and Country or Affiliation" (accessed November 17, 2017). Corresponds to figure 4.3.

Table B.12: Computer and data processing services: U.S. cross-border trade by country, 2016

Country/region	Exports (million $)	Country/region	Imports (million $)
United Kingdom	2,257	India	13,730
Canada	2,097	Canada	3,249
Switzerland	1,455	Ireland	2,682
India	916	United Kingdom	1,382
Germany	854	Germany	804
Other Europe	2,917	Other Europe	2,320
Other Asia-Pacific	3,524	Other Asia-Pacific	2,598
Other Western Hemisphere	2,396	Western Hemisphere	1,397
Africa and the Middle East	867	Africa and the Middle East	827
Total value	$17.3 billion		$29.0 billion

Source: USDOC, BEA, International Data, International Services, table 2.2, "U.S. Trade in Services, by Type of Services and Country or Affiliation" (accessed November 17, 2017). Corresponds to figure 4.4.

Table B.13: Computer and data processing services: net U.S. cross-border trade by country, 2016

Country/region	Imports (million $)	Exports (million $)	Trade balance (million $)
Germany	804	854	50
India	13,730	916	-12,814
Switzerland	259	1,455	1,196
Canada	3,249	2,097	-1,152
United Kingdom	1,382	2,257	875

Source: USDOC, BEA, International Data, International Services, table 2.2, "U.S. Trade in Services, by Type of Services and Country or Affiliation" (accessed November 17, 2017). Corresponds to figure 4.5.

Table B.14: Computer and data processing services: U.S. affiliate sales by country, 2015

Country/region	U.S.-owned foreign affiliates (billion $)
United Kingdom	18.7
Japan	9.8
Canada	8.5
Ireland	8.4
Netherlands	6.8
Other Europe	21.4
Other Asia-Pacific	26.9
Other Western Hemisphere	7.8
Africa and the Middle East	2.6
Total value	$111.0 billion

Source: USDOC, BEA, table 3.1, "Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliate" (accessed November 15, 2017). Corresponds to figure 4.6.

Table B.15: Computer and data processing services: Affiliate sales and purchases, 2011–15

Year	U.S.-owned foreign affiliates: computer systems (billion $)	U.S.-owned foreign affiliates: data processing (billion $)	Foreign-owned U.S. affiliates: computer systems (billion $)	Foreign-owned U.S. affiliates: data processing (billion $)
2011	81.6		20.1	
2012	85.3		22.1	
2013	82.8		25.4	
2014	100.5	16.1	28.5	1.1
2015	93.8	17.2	28.3	1.1

Source: USDOC, BEA, table 3.1, "Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliate," and table 4.1, "Services Supplied to U.S. Persons by Foreign MNEs through Their MOUSA, by Industry of Affiliate and by Country of UBO" (accessed November 15, 2017). Corresponds to figure 4.7.
Note: Data processing services firms are shown as darker-colored sections of the bars.

Table B.16: Telecommunications services: U.S. cross-border trade, 2011–16

Year	Exports (billion $)	Imports (billion $)
2011	12.4	7.0
2012	13.7	7.2
2013	14.5	7.3
2014	13.5	6.8
2015	12.6	6.3
2016	12.2	5.5

Source: USDOC, BEA, International Data, International Services, table 2.2, "U.S. Trade in Services, by Type of Services and Country or Affiliation" (accessed November 17, 2017). Corresponds to figure 5.1.

Table B.17: Telecommunications services: U.S. cross-border trade by country, 2016

Country/region	Exports (million $)	Country/region	Imports (million $)
Brazil	3,324	United Kingdom	730
Argentina	1,448	Mexico	427
United Kingdom	1,176	India	404
Venezuela	933	Canada	327
Canada	561	Netherlands	276
Other Europe	1,666	Other Western Hemisphere	1,060
Asia-Pacific	1,205	Asia-Pacific	946
Other Western Hemisphere	1,586	Other Europe	938
Africa and the Middle East	326	Africa and the Middle East	368
Total value	$12.2 billion		$5.5 billion

Source: USDOC, BEA, International Data, International Services, table 2.2, "U.S. Trade in Services, by Type of Services and Country or Affiliation" (accessed November 17, 2017). Corresponds to figure 5.2.