U.S. Department of Commerce
Economics and Statistics Administration

Digital Economy and Cross-Border Trade: The Value of Digitally-Deliverable Services

Executive Summary

By
Jessica R. Nicholson
and
Ryan Noonan

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The digital, or Internet, economy has transformed many aspects of our lives over the past two decades. How we communicate, entertain ourselves, make decisions, and do business continues to evolve as the digital economy grows in size and importance. Given this transformation, it is becoming even more important for policymakers to consider how the Internet affects our lives and the economy as a whole.

The Department of Commerce has played an instrumental role in developing policies that facilitate the digital economy. The Department's Internet Policy Task Force identifies leading public policy and operational challenges in the Internet environment. The Task Force is committed to maintaining the global free flow of information online. This report provides a framework for understanding the size and nature of some cross border data flows. We do not forecast how data flows would change in response to any given policy decision.

Our analysis uses digitally-enabled services categories identified in previous research as a starting point for identifying "digitally-deliverable" services—i.e., services that may be, but are not necessarily, delivered digitally. These service categories are the ones in which digital technologies present the greatest opportunity to transform the relationship between buyer and seller from the traditional in-person delivery mode to a digital one. The aggregate trade data used in this report capture a mix of transactions that are entirely digital, somewhat digital, or entirely non-digital; our estimates focus on those transactions that are most likely to be done digitally. Because we do not have a direct measure of services that are digitally traded within each service category, it is difficult to precisely estimate how much this percentage has increased over time. Instead, this paper presents an upper-bound estimate of the percentage of services exports that are digitally-deliverable.

We also know that there is a great deal of interest in understanding the economic value related to digitally-enabled data and services delivered to users at no price. An exact number of bytes associated with these data flows may not be known, but the number is large and growing. Data flows related to subscribers' use of Facebook, Google, Twitter, and other free online services are not covered in this report because they are not captured as monetary transactions in Federal cross-border trade statistics. However, traditional services trade related to the operation of these free services—such as

advertising services, Internet access services, and legal services—are included in our analysis if they are exported to other countries from the United States.

Our analysis reveals that in 2011:

- The United States exported $357.4 billion in digitally-deliverable services. This represented over 60 percent of U.S. services exports and about 17 percent of total U.S. goods and services exports.[1]
- The United States imported $221.9 billion in digitally-deliverable services. This represented 56 percent of U.S. services imports and about 8 percent of total U.S. goods and services imports.
- The United States had a digitally-deliverable services trade surplus of $135.5 billion.
- The total value of digitally-deliverable services in the supply chain of total U.S. goods and services exports was $627.8 billion, or about 34 percent of total export value.
- The majority of U.S. digitally-deliverable services exports went to Europe and to the Asia and Pacific region.
- Specifically, the United States exported the highest value of digitally-deliverable services to the United Kingdom, Canada, Ireland, and Japan. The highest values of digitally-deliverable imports came from the United Kingdom, Bermuda, Switzerland, and Canada.

[1] For consistency with the input-output tables, Table 1 in this report excludes re-exports and presents a larger number (20 percent) for the digitally-deliverable share of total exports. In contrast, official statistics include re-exports.

Introduction

The digital, or Internet, economy has transformed many aspects of our lives the past two decades. How we communicate, entertain ourselves, make decisions, and do business continues to evolve as the digital economy grows in size and importance. Given this transformation, it is becoming more important for policymakers to consider how the Internet affects our lives and the economy as a whole.

The Department of Commerce has played an instrumental role in developing policies that facilitate the digital economy. The Department's Internet Policy Task Force identifies leading public policy and operational challenges in the Internet environment. The Task Force is committed to maintaining the global free flow of information online. This report provides a framework for understanding the size and nature of some cross border data flows. We do not forecast how data flows would change in response to any given policy decision.

A portion of cross-border data flows are associated with transactions that are captured in traditional services trade statistics. For example, an engineering firm or a financial services firm exporting their services likely transmits data across the U.S. border in the course of day-to-day-activities. While the number of bytes of data associated with these cross-border transactions is not measured like tons of coal at the border, the dollar value associated with cross-border services transactions is collected and published by the Bureau of Economic Analysis (BEA).

This paper estimates the economic value associated with cross-border data flows by first determining which services trade categories most likely represent transactions that take place online rather than by other means, such as people crossing a border to perform the service. Previous research has identified a number of service categories as digitally-enabled—i.e., those services for which information and communications technologies (ICT) demonstrably play an important role in facilitating cross-border trade.

Services that are not primarily delivered online are excluded from our analysis. For example, education is a category for which the primary mode of delivery is in-person rather than digital and is therefore not included in digital trade. An exception is distance learning, which is primarily delivered online. Distance learning is not part of the education services trade category and is captured in official statistics as training, a component of business, professional, and technical services.

It is important to note that these digitally-deliverable services are not new trade categories. Rather, estimates of digitally-deliverable services trade are based on an approximation of *how* trade in an existing category of services likely took place. The aggregate trade data capture a mix of transactions that are entirely digital, somewhat digital, or entirely non-digital; our estimates focus on those transactions that are most likely to be done digitally. The degree of "digital-ness" of transactions in the various services categories is also likely changing over time as businesses respond to changes in their markets and to new technology.

Because we do not have a direct measure of services that are digitally traded within each service category, it is difficult to precisely estimate how much this percentage has increased over time. Instead, this paper presents an upper-bound estimate of the percentage of services exports that are digitally-deliverable.

What are Cross-Border Data Flows?

Data cross country borders in a variety of ways. They are constantly flowing from the United States to other countries, and vice versa. Data flows can be measured in bytes of digital traffic per second, hour, year, or any other amount of time. Data flows can also be categorized in different ways—for example, by the commercial characteristics of the contents. Below, we define four categories of data flows:

1. Purely non-commercial traffic, such as government or military communications.
2. Commercial data and services exchanged between businesses or other related-parties, such as supply chain information, personnel data, or design information, at a $0 market price.
3. Flows of data that are traded between a seller and buyer at a market price. This may include royalty payments associated with movies, TV, or music sales; online banking services; advertising; or other transactions.
4. Digitally-enabled data and services delivered to or from end-users at a $0 market price. Examples include free email services, search engine services, map and direction services, and social media services.

For the purpose of this report, we focus on providing an estimate of the potential size of the third category, digital trade in services. Federal economic statistics collected by the Bureau of Economic Analysis (BEA) provide estimates of the dollar values associated with trade in services, but BEA data are unable to quantify the size of information flows in terms of bytes. The remaining three categories require a non-financial understanding of data flows, and Federal economic statistics do not provide a sound basis for estimating the size of the flows associated with those transactions.

We know that there is a great deal of interest in understanding the economic value related to the fourth category above – digitally-enabled data and services delivered at no price. An exact number of bytes associated with these data flows may not be known, but the number is large and growing. Data flows related to subscribers' use of Facebook, Google, Twitter, and other free online services are not covered in this report because they are not captured as monetary transactions in Federal cross-border trade statistics. However, traditional services trade related to the operation of these free services—such as advertising services, Internet access services, and legal services—are included in our analysis if they are exported to other countries from the United States.

Finally, there is one caution to keep in mind. The default way of thinking about digital trade in books, movies or music tends to be in terms of transactions that an individual might make in purchasing an e-book, movie, or sound recording from an online store or in subscribing to a service that provides on-demand access to a catalog of movies or music. However, those types of transactions do not typically take place across borders. In fact, in most cases, they are specifically blocked because of the geographically-specific legal regimes that govern intellectual property associated with such content. The correct way of thinking about the dollars exchanged in these categories is, for example, the exchange of money from a firm in one country to a firm in another country for the right to sell content that is protected by intellectual property laws in a given geographical area. [2]

[2] BEA will introduce new trade in services categories based on new international standards with their June 2014 revision. The new standards require differentiation of licenses to use from licenses to reproduce and distribute. The two manuals that give guidance on trade in services are published by the International Monetary Fund (http://www.imf.org/external/pubs/ft/bop/2007/bopman6.htm) and the United Nations Statistical Division (http://unstats.un.org/unsd/tradeserv/tfsits/msits2010.htm).

If the copyrighted works were supplied to foreign consumers from a U.S. business through a U.S. affiliate located in the country of the purchaser, the transaction would be captured by BEA as services supplied through affiliates rather than as cross-border trade.[3]

Digitally-Deliverable Services Defined

To understand how the digital economy contributes to cross-border trade in services, one approach is to identify or estimate those services that are delivered to end-users digitally. In a recent study, BEA uses the term "digitally-enabled services" to refer to those services that are principally or largely enabled by information and communication technologies (ICT).[4,5] To measure the size of digitally-enabled trade, BEA follows the definition used by the United Nations Conference on Trade and Development (UNCTAD). In 2007, UNCTAD defined seven categories in the International Monetary Fund balance of payments accounts as ICT-enabled: communications services; insurance; financial services; computer and information services; royalties and license fees; other business services; and personal, cultural, and recreational services.

These categories correspond to five categories in BEA's cross-border trade statistics:

- Business, professional, and technical services (except construction);
- Royalties and license fees;
- Insurance services;
- Financial services; and
- Telecommunications.

It is important to note that there is no way to determine an exact percentage of the trade in each of these categories that was actually delivered digitally, as the international trade statistics do not capture how services are provided. There are also other types of services that may be traded digitally, but the UN and BEA have chosen to exclude these services from analysis because their primary mode of delivery is not digital. We discuss these limitations in the Technical Appendix of this report.

This report uses the term "digitally-deliverable" rather than "digitally-enabled" to describe these five service categories. Because there are no data available that indicate whether these services were actually delivered digitally or by some other means, the term "digitally-deliverable" is intended to convey that these services *may* be delivered digitally. In particular, these service categories are the ones in which digital technologies present the most opportunity to transform the relationship between buyer and seller from the traditional in-person delivery mode to a digital one.

[3] Services supplied through affiliates cover the delivery of services to international markets through establishment of a commercial presence. While an important mode of delivery, a discussion of services supplied through affiliates is beyond the scope of this report. Data on services supplied through affiliates are available from BEA at: http://www.bea.gov/international/international_services.htm#detailedstatisticsfor1.

[4] http://www.bea.gov/international/pdf/trends_in_digitally_enabled_services.pdf

[5] This paper's approach excludes services that are not primarily delivered online. For example, education is a services trade category for which the primary mode of delivery is in-person rather than digital; therefore, the education services category is not included in digital trade. Distance learning, which is primarily delivered online, is not part of the education services trade category and is captured in official statistics as training, a component of business, professional, and technical services.

Which Services are Included?

The cross-border trade in services categories discussed in this report and defined as digitally-deliverable include a wide array of services. To make these concepts more concrete, here are some examples of the kinds of services included in these categories.

Business, professional, and technical services: The largest category of digitally-deliverable services includes a large number of activities. Some of these activities, such as computer and information services, are inherently digital, although some computer products provided on a physical medium are classified as goods . Others, such as legal services or architectural services, are known to make intensive use of digital resources. Legal briefs and documents, consulting reports, and architectural or engineering designs can easily be digitized and transmitted over the Internet to customers located anywhere in the world. Advertising services are used throughout the digital world, whether by department stores, sports teams, or high-tech companies like Facebook and Google.

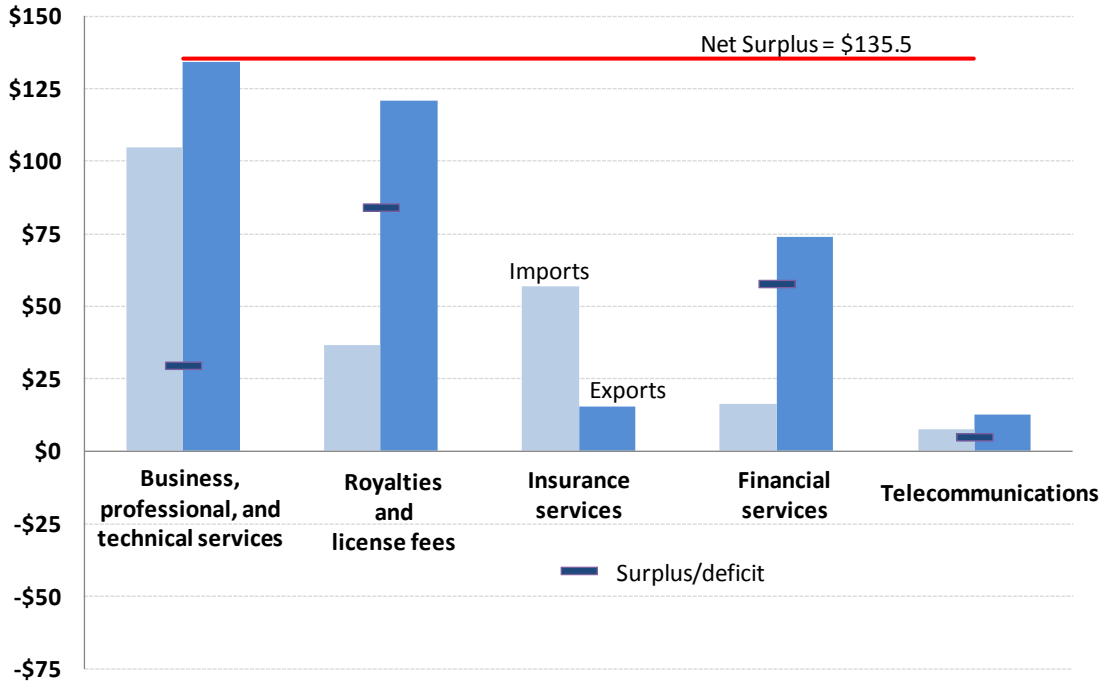
Royalties and license fees: This category covers charges for the use of intellectual property, such as patents, trademarks, copyrights, industrial processes and designs, and franchises. Two-thirds of royalties and license fees are for industrial processes and for general use computer software. Improvements in digital communications have enabled easier sharing of schematics and designs across borders. The value associated with reproducing and disseminating copyrighted materials in digital form (including e-books, music, movies, and software) is included here if a U.S. company directly supplies the content to a foreign consumer or business, or vice versa.

Financial services: Banking is an increasingly digital activity. Whether customers are accessing information, managing their accounts, paying bills, or transferring funds, they are doing it online far more often. Investment activities, whether they are market research, financial planning tools, or buying and selling shares in the stock market or a mutual fund, are also increasingly being performed online and across borders.

Insurance services: Insurers are increasingly turning to digital networks for communication and the delivery of products. Digitized paper documents and e-delivery are growing in importance throughout the industry. As with banking services, customers are turning more and more to the digital transmission of premiums, and they are receiving payments for claims in the same manner. In addition, reinsurance—the purchase of insurance policies by another insurance company as a strategy for mitigating risk—involves transfers of funds and documents that may be conducted digitally.

Telecommunications: The telecommunications service category is arguably the most digital of the service categories studied in this report. Telephone calls, video conferences, e-mail, and voice mail are highly digitized activities. Internet access services are also included in this category.

Figure 1. U.S. Trade in Digitally-Deliverable Services, 2011
(billions of dollars)



Source: Economics and Statistics Administration analysis using data from the Bureau of Economic Analysis.

United States Cross-Border Trade Data

Using these five service categories, we find that digitally-deliverable services accounted for over 60 percent of U.S. service exports in 2011, and about 17 percent of overall U.S. goods and services exports.[6] In dollar terms, U.S. exports of digitally-deliverable services totaled $357.4 billion, while imports totaled $221.9 billion, resulting in a trade surplus of $135.5 billion.[7]

Business, professional, and technical services accounted for the largest share of digitally-deliverable services exports (38 percent), followed by royalties and license fees (34 percent), financial services (21 percent), insurance services (4 percent), and telecommunications (4 percent) (see Figure 1). In 2011, 47 percent of digitally-deliverable services imports were business, professional, and technical services, followed by insurance services (26 percent), royalties and license fees (17 percent), financial services (7 percent), and telecommunications (3 percent).

Overall, the United States saw a $135.5 billion digitally-deliverable trade surplus in 2011. The only individual category that registered a deficit was insurance services.

[6] For consistency with the input-output tables, Table 1 in this report excludes re-exports and presents a larger number (20 percent) for the digitally-deliverable share of total exports. Official statistics include re-exports and should be used wherever possible.

[7] Cross-border trade data for 2012 were available at the time this report was written. However, to be consistent with the input-output data available, we opted to use 2011 data.

Data Flows and Trade Policy

The Internet is a key platform for commerce between buyers and sellers located in different countries. As the Internet enables cross-border data flows, it also underpins much of global economic integration and international trade. For instance, cross-border data flows are now very common in business, from Internet-based communications like email and platforms such as eBay and Facebook that bring buyers and sellers together, to financial transactions to complete product purchases across borders, to the downloading of digital products and services.

Major concerns for U.S. policymakers regarding the digital economy include protecting privacy and security (i.e., protection of personal and business data), promoting the free flow of information, and avoiding localization requirements. Strong privacy and security safeguards protect the integrity of financial transactions and reassure consumers that their personal information will not be misused if they participate in digital commerce. Furthermore, well-conceived online security measures can help businesses protect the privacy of their employees, safeguard their assets , and maintain their competitive edge. In short, online commerce can thrive only if all users, whether buyers or sellers and regardless of nationality, trust that the system provides robust security and privacy protections.

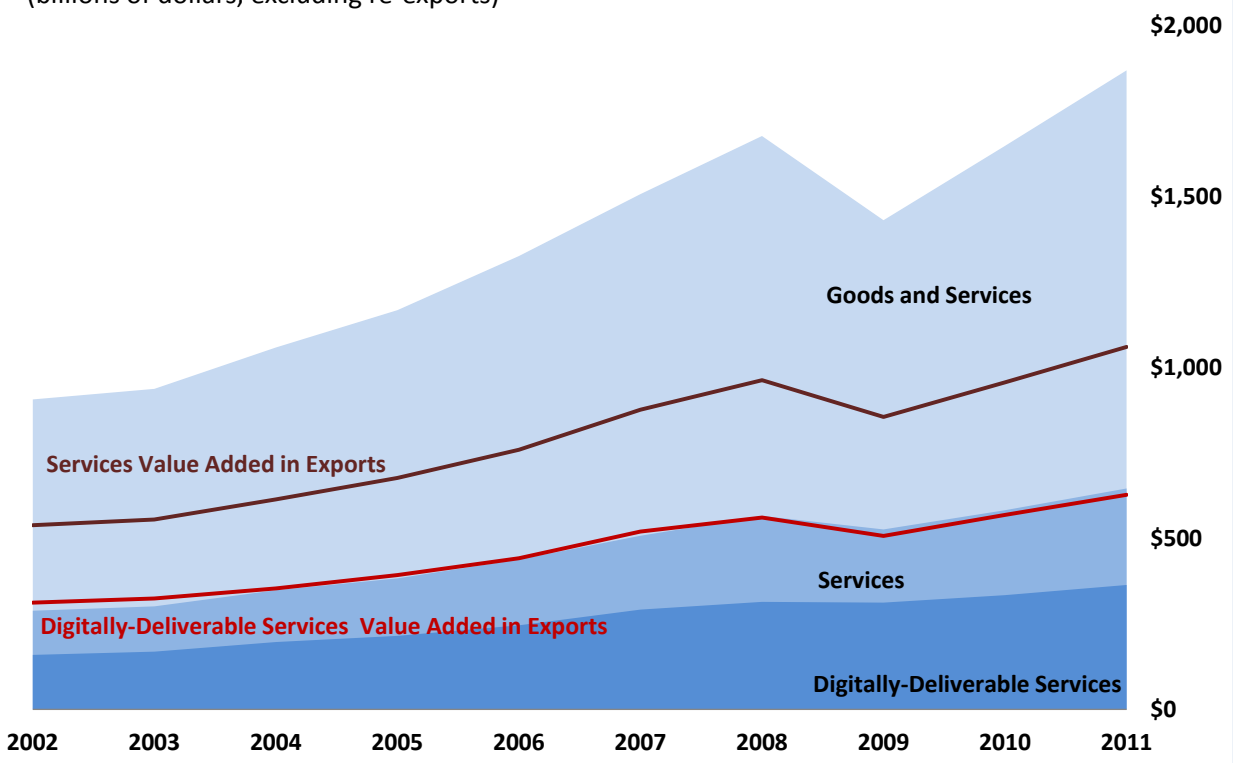
Conversely, Internet-based trade is hindered by restrictions on data flows, such as limitations on data flows across national borders or other artificial restrictions. While some countries cite important privacy concerns as a basis for restricting data flows, such restrictions may be economically harmful and damage the free exchange of ideas, goods, and services online. While balanced and clear intellectual property policies promote the free flow of information as well as the rights of innovators, restrictions on the flow of information may be implemented in an unfair or nontransparent manner or may be more expansive than necessary.

While localization requirements may serve some national goals, they can serve as disguised trade barriers when they unreasonably differentiate between domestic and foreign products or services. For example, as technologies increasingly rely on remote servers for data storage, access, and transfer, requirements that data must reside on local servers can increase costs by reducing economies of scale. Policies that discriminate against foreign technologies or require use of country-specific technology standards may reduce data security, interoperability, and the stability of the digital service. Localization requirements carry great risk of limiting the Internet's global character, making cross-border trade difficult for large companies and practically impossible for small businesses that cannot afford to implement separate systems and standards in every country in which they do business.

A New Understanding of Trade in Services

Trade in all services accounts for nearly 30 percent of U.S. exports. On its own, this is a fairly large number, contributing over $600 billion to U.S. gross domestic product in 2011. One thing this simple valuation overlooks, however, is the value of services as inputs throughout the production process. Virtually any good that is exported requires services somewhere in its supply chain, whether those services are legal or business services, royalties or license fees, or even education or health care for production workers. Because such services are intermediate inputs, their value is absorbed into the final value of the good that is produced after the services are consumed. Simply adding up the services exported by the U.S. underestimates the true value of services to the

Figure 2. U.S. Exports, 2002-2011
(billions of dollars, excluding re-exports)



Source: Economics and Statistics Administration analysis using data from the Bureau of Economic Analysis

U.S. export economy.

One way to estimate the true value of services to U.S. exports is by using input-output (I-O) tables, which show the interdependencies between industries and commodities throughout the economy and the production process. Using I-O tables, the Organisation for Economic Cooperation and Development (OECD) and the World Trade Organization (WTO) have conducted a study of Trade in Value Added (TiVA). According to their study, services as intermediate inputs accounted for nearly 50 percent of the value of exports from the U.S. in 2009, a number that is substantially higher than the 30 percent accounted for by final service exports.[8]

To put this number into context, while final service exports are valued at over $600 billion, services may account for $1.1 *trillion* of export value throughout the entire production process.

To check the OECD and WTO numbers, we conducted a similar analysis using the I-O tables produced by BEA. In the end, we found that services as intermediate inputs accounted for a similar but slightly larger amount—57 percent—of the value of exports in 2011 (see Figure 2).

[8] See http://stats.oecd.org/Index.aspx?DataSetCode=TIVA_OECD_WTO. The indicator SERV_VAGR—"Services value added embodied in gross exports by source country, as % of gross exports"—displays the relevant statistic.

Table 1. Digitally-Deliverable Services		
Year	As a Percentage of Products in Exports†	As a Percentage of Value Added in Exports
2002	17.6%	34.5%
2003	18.0%	34.6%
2004	18.6%	33.5%
2005	18.5%	33.7%
2006	18.5%	33.4%
2007	19.4%	34.5%
2008	18.8%	33.5%
2009	21.8%	35.5%
2010	20.3%	34.5%
2011	19.5%	33.6%

Source: Economics and Statistics Administration analysis using data from the Bureau of Economic Analysis
†For consistency with the input-output tables, these percentages exclude re-exports.

The Value of Digitally-Deliverable Services as Intermediate Inputs

The TiVA project makes clear that simply measuring trade in services does not necessarily provide a clear picture of the value of services as intermediate inputs in the production of goods or even other services. Combining the methodology used by the TiVA project with our categories of digitally-deliverable services, we can take our understanding of digitally-deliverable services one step further. BEA's I-O tables can be used to calculate the percentage of export value contributed by these services throughout the production process. The I-O tables use a different classification system than the cross-border trade in services data. Please refer to the Technical Appendix for the detailed industry concordance and a description of the methodology used for this calculation.

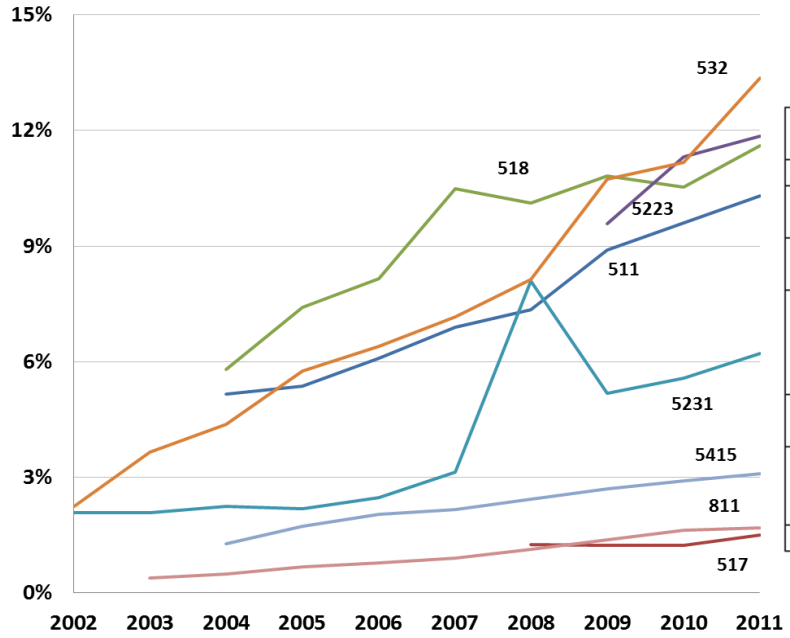
Our findings are displayed in Table 1 and Figure 2.[9] Recall that digitally-deliverable services account for about one-fifth of total U.S. exports When considered as inputs in the production process, we find that the contribution of digitally-deliverable services jumps to more than one-third of the total value of U.S. exports.

Because we are unable to determine exactly what portion of output in each of these industries is actually delivered digitally, it is difficult to draw more specific conclusions about trends over time. For instance, the production and delivery processes in the newspaper publishing industry may be substantially or primarily digital today but were less so a decade ago. Our analysis, however, cannot distinguish between the newspaper industry of today and the newspaper industry of ten years ago.

To provide some context about the increasing digitization of the industries in our study, we looked at data on revenues in some of the service industries and trends in the percentage of revenues attributed to e-commerce (see Figure 3). E-commerce sales are not a comprehensive measure of the digitization of these industries. Some services may not be purchased digitally, but may be delivered

[9] We also performed a more fine-grained analysis using the 2002 benchmark I-O tables, which present industries at a much more detailed level than the annual tables. Our result—39.5 percent—was similar to the result of the annual analysis. BEA will release new benchmark I-O tables for 2007 and new annual tables for 2012 in December 2013, at which point it will be possible to update this analysis.

Figure 3. Percentage of Revenues Contributed by E-Commerce, 2002-2011
(selected industries)



511	Publishing industries (except Internet)
517	Telecommunications
518	Data processing, hosting, and related services
5223	Activities related to credit intermediation
5231	Securities and commodity contracts intermediation and brokerage
532	Rental and leasing services
5415	Computer systems design and related services
811	Repair and maintenance

Note: Data are not available for all industries for all years.
Source: Economics and Statistics Administration analysis using data from the U.S. Census Bureau

digitally, and therefore, would not necessarily be captured here.[10] Data on e-commerce revenues, although limited, do support the claim that these services are becoming increasingly digitized.[11]

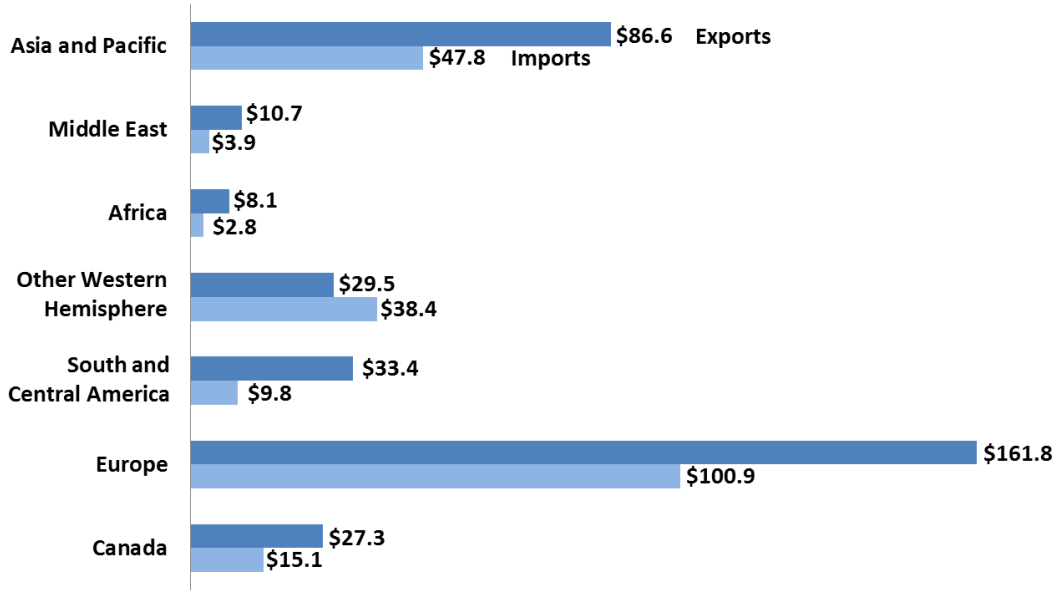
All of the industries for which data are available show positive trends in revenues attributed to e-commerce. These data are not conclusive evidence that all of the digitally-deliverable service industries included in our study are becoming increasingly digitally-delivered, nor are they a precise measure of the level of digitization in these service industries; however, these data do support the notion that the digital delivery of services is growing.

Even though data on the digitization of service exports are limited, there is no shortage of anecdotal evidence that an increased use of digitization is occurring in many of these industries. Media companies provide one example of this change. Newspapers (product of I-O industry 51110), book stores (product of I-O industry 511130), and music stores (product of I-O industry 512200) continue to shut down, while revenues from online media and entertainment continue to grow.

[10] The U.S. Census Bureau collects data on revenues in services industries in the Service Annual Survey. Data on e-commerce revenues are only available for limited years due to various factors, including changes in industry classification and changes to the scope of the survey. "E-commerce" describes on-line transactions whether over open networks such as the Internet or proprietary networks running systems such as Electronic Data Interchange (EDI). http://www.census.gov/econ/estats/2011/all2011tables.html and http://www.census.gov/econ/estats/about.html.

[11] For a detailed discussion of the increasing use of digital technologies in these services, see "Digital Trade in the U.S. and Global Economies, Part 1." United States International Trade Commission Publication 4415, July 2013. Pages 3-7 through 3-24. Accessed online September 9, 2013. http://usitc.gov/publications/332/pub4415.pdf.

Figure 4. U.S. Exports and Imports of Digitally-Deliverable Services, by region or country of destination or origin, 2011
(billions of dollars)



Source: Economics and Statistics Administration analysis using data from the Bureau of Economic Analysis (BEA).
Note: Region definitions can be found on the BEAwebsite at:
http://www.bea.gov/international/bp_web/geographic_area_definitions.cfm.

PricewaterhouseCoopers estimates that revenues for these online services will increase by approximately 13 percent a year for the next five years. IFPI, a trade group, reports that global music industry revenues-including both digital and non-digital revenues—grew by 0.3 percent in 2012—the best result since 1998—due to the growth of digital music including download sales, subscription services, music video streaming, digital radio, performance rights, and sychronization.[12]

Advertising and related services (I-O industry 541800) provides another example of increased digitization. According to *The Economist*, firms that depended on print advertising have been the worst hit by digitization of these services, while advertising on the web grows in leaps and bounds.[13] In 2012, online ads were worth $88 billion, or 18 percent of global advertising spending, up from 2006, when online ads composed just 7 percent of global spending.[14] This share is expected to continue growing.

Cross-Border Trade by Region and Service Category

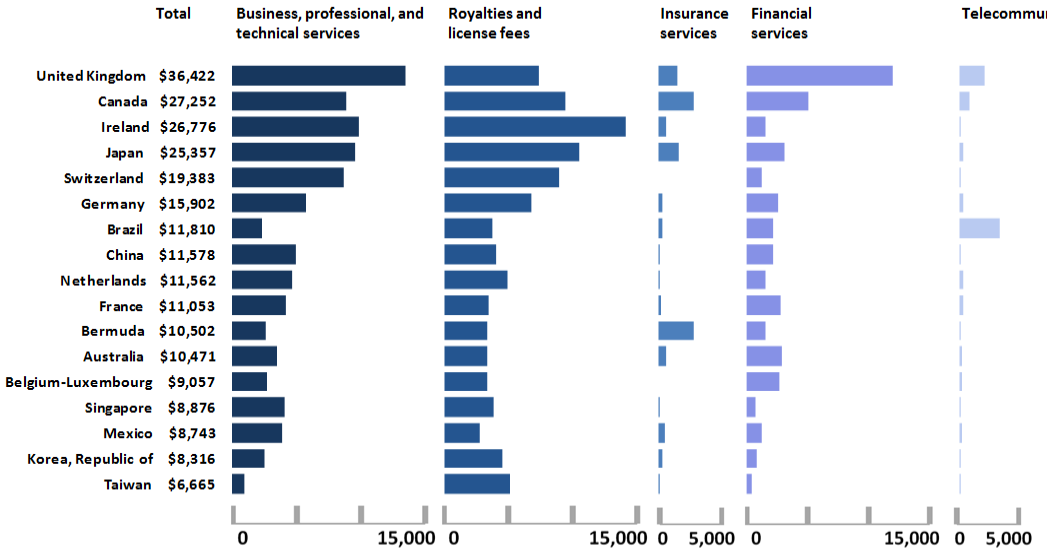
To gain additional insight into how these service categories fit into our overall economy and trade policy, we can look at U.S. exports and imports by trading partner and by service category. To do this, we turn back to the BEA cross-border trade data.

[12] "IFPI Digital Music Report 2012 Engine of a Digital World" Accessed online December 18, 2013. http://www.ifpi.org/content/library/DMR2013.pdf.

[13] "Counting the Change." *The Economist*, August 17, 2013, page 53.

[14] "Omnipotent, or omnishambles?" *The Economist*, August 3, 2012, page 53.

Figure 5. U.S. Exports of Digitally-Deliverable Services by Service Category and Selected Economies of Origin, 2011
(millions of dollars)



Note: Data on exports of insurance services to Belgium-Luxembourg and Switzerland are suppressed to avoid disclosure of data of individual companies.

Source: Economics and Statistics Administration analysis using data from the Bureau of Economic Analysis

Regionally, the United States trades the greatest value of digitally-deliverable services with countries in Europe and the Asia and Pacific region (See Figure 4).[15,16] In 2011, trade with Europe accounted for 45 percent of the total value of both digitally-deliverable service exports and imports. This is down slightly from 2006 when this region accounted for 50 percent of exports and 51 percent of imports within these service categories.

The overall proportion of U.S. digitally-deliverable services exports and imports going to and coming from the Asia and Pacific region has not significantly changed over the past five years—exports to this region accounted for 23 percent of all exports in this category in 2006 compared to 24 percent in 2011, while imports accounted for 20 percent of the U.S. total in 2006 compared to 22 percent in 2011. However, within this region, the countries with which the U.S. conducts digital trade have changed. While Japan remains a top U.S. trading partner in the region, trade of digitally-deliverable services has increased with China and India. Trade of digitally-deliverable services with countries in South and Central America accounted for 9 percent of all U.S. digitally-enabled services exports and 4 percent of U.S. digitally-deliverable services imports in 2011.[17]

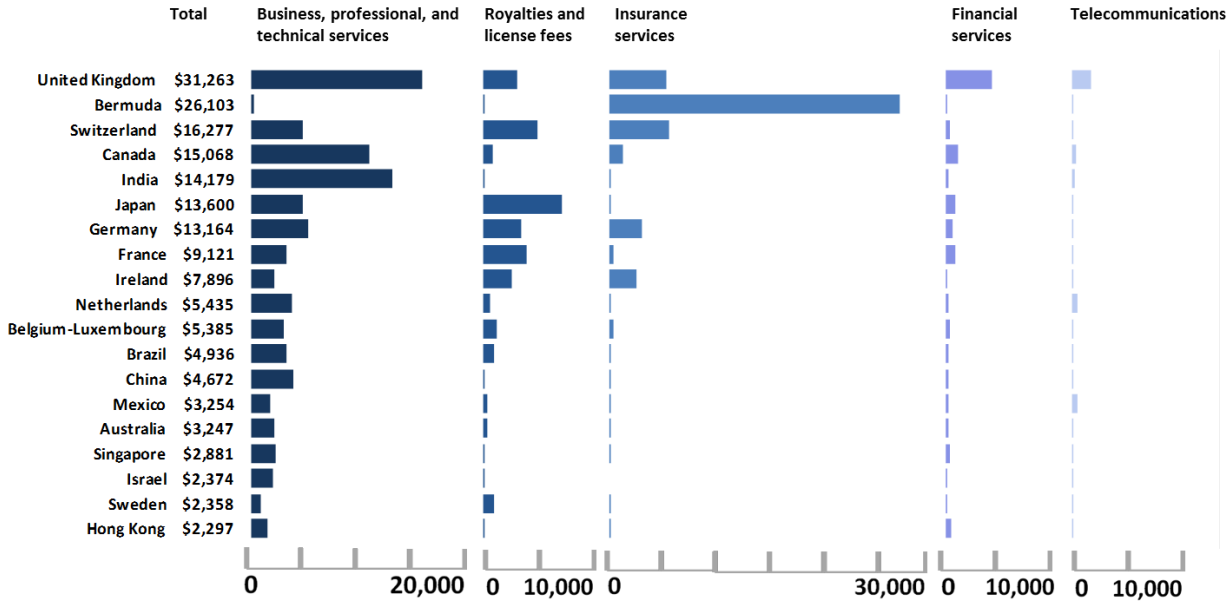
[15] Within the "Europe" category are separate estimates for Belgium-Luxembourg, France, Germany, Ireland, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom, and an "Other" category covering the remainder of Europe.

[16] Within the "Asia and Pacific" category are separate estimates for Australia, China, Hong Kong, India, Indonesia, Japan, Republic of Korea, Malaysia, New Zealand, Philippines, Singapore, Taiwan, Thailand, and an "Other" category covering the remainder of the region.

[17] Within the"South and Central America" category are separate estimates for Argentina, Brazil, Chile, Mexico, Venezuela, and an "Other" category covering the remainder of the region.

Figure 6. U.S. Imports of Digitally-Deliverable Services by Service Category and Selected Economies of Origin, 2011

(millions of dollars)



Note: Data on imports of insurance services to Israel are suppressed to avoid disclosure of data of individual companies.
Source: Economics and Statistics Administration analysis using data from the Bureau of Economic Analysis

The top destination countries for U.S. exports of digitally-deliverable services are shown in Figure 5. Trade with the United Kingdom accounted for 10 percent of U.S. digitally-deliverable services exports in 2011. The top six countries to which the U.S. exports these services did not change from 2006 to 2011, although their respective ranks did change. The biggest gainers were China and Brazil. In 2006, these countries ranked 14th and 18th, respectively, in the list of the largest export destinations for U.S. digitally-deliverable services. In 2011, however, these countries ranked 7th and 8th.

By category, the United States primarily exports business, professional, and technical services and royalties and license fees, as previously mentioned. The United States exports the greatest value of telecommunications services to Brazil (25 percent) and the United Kingdom (15 percent).

Turning to U.S. imports of digitally-deliverable services, from 2006 to 2011 the top ten U.S. trading partners did not change, although the rankings did shift within the top ten (See Figure 6). In 2011, the U.S. imported $9.3 billion more in digitally-deliverable services from India than in 2006, moving the country from 9th place to 5th, overtaking Japan, Germany, France, and Ireland. This $9.3 billion increase accounts for 12.5 percent of the increase in U.S. imports of digitally-deliverable services across all countries during this period. In the Western Hemisphere, outside of South and Central America and Canada, there was a considerable amount of U.S. trade in digitally-deliverable services.[18] In 2011, this

[18] Within the "Other Western Hemisphere" category, Bermuda is the only country specifically broken out due to the higher volumes of trade that occur between Bermuda

region accounted for 8 percent of all exports of this type from the U.S. and 17 percent of all imports. In the insurance services category, this region played a large role in both U.S. exports and imports. In 2011, Bermuda, which identifies itself as "the world's risk capital," was the recipient of 18 percent of U.S. exports and the source of 49 percent of U.S. imports of insurance services.[19,20]

Conclusion

Digitally-deliverable services are an important contributor to U.S. trade and help to improve the overall trade balance. When these services are considered as inputs throughout the production process, their value is even more apparent. Virtually no good or service is produced in the United States without input from one of the digitally-deliverable services studied in this report. Although we do not have precise data on the amount of these services that is actually delivered digitally, we do know that digital service delivery is becoming increasingly important.

Even agriculture uses digital services—ranchers are embedding sensors into cattle that transmit data on location and health—and it is estimated that each cow generates 200 megabits of data per year. Healthcare providers diagnose cataracts and skin disorders using pictures sent by patients via mobile phone.[21] Cisco predicts that by 2015, there will be 25 billion connected Internet devices—3.5 times the predicted world population.[22] As people around the world become more connected, industries will continue to find ways to serve customers digitally.

To fully understand how the U.S. economy is adapting to these changes and how to properly implement policies on international trade and other economic matters, the Federal government must continue to adapt and expand its statistics to capture these changes.

and the United States compared to other countries in the region.

[19] http://www.bermuda-insurance.org/

[20] See also: United States International Trade Commission. Property and Casualty Insurance Services: Competitive Conditions in Foreign Markets, Box 3.4 Bermuda's International Insurance Industry. USITC Publication 4068. March 2009. Accessed online September 4, 2013. http://www.usitc.gov/publications/332/pub4068.pdf.

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[22] "The Internet of Things: How the Next Evolution of the Internet is Changing Everything." Cisco White Paper. Accessed online December 12, 2013. http://www.cisco.com/web/about/ac79/docs/innov/IoT_IBSG_0411FINAL.pdf.

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The authors are economists in the Office of the Chief Economist of the U.S. Department of Commerce's Economics and Statistics Administration.

Technical inquiries:
Office of the Chief Economist
(202) 482-3523

Media inquiries:
Office of Communications
(202) 482-3331

U.S. Department of Commerce
Economics and Statistics Administration
1401 Constitution Ave., NW
Washington, DC 20230
www.esa.doc.gov

Technical Appendix

Input-Output Analysis

This section describes the methodology used to calculate the value of digitally-deliverable services including inputs throughout the supply chain for the production process for these services. Because BEA's service categories are not based on the industry codes used by Census and for the input-output (I-O) tables, we developed a concordance (see Table A-1) that matches the BEA categories to the I-O codes used in the annual I-O tables and the 2002 benchmark I-O table. We also included the 2002 North American Industrial Classification System (NAICS) industry codes that correspond to the cross-border trade in services categories and the I-O codes. Because the BEA service categories are broad, they capture several industries that are less likely to be highly digitally-deliverable—for example, 5621 (waste collection) and 8121 (personal care services), as well as many others. However, BEA does not have cross-border trade in services data at a finer level of detail. For consistency across data sources, we included all of these NAICS codes in our analysis.

We used two of the annual I-O tables—the industry-by-commodity total requirements table and the use table—to calculate the percentage of export value contributed by digitally-deliverable services throughout the production process for the years 2002 through 2011.

The step-by-step process below describes how to use the I-O tables to calculate the percentage of U.S. export value contributed by digitally-deliverable services throughout the production process. This process was repeated using annual I-O tables for the years 2002 through 2011.

1. For each row (industry) in the industry-by-commodity table, multiply each column entry (commodity) in the row by the corresponding row entry (commodity) in the exports column of the use table. Sum the results for each row (industry) in the industry-by-commodity table to obtain the gross output of each industry required to produce total U.S. goods and services exports.
2. For each column (industry) in the use table, divide the entry for "Total Value Added" by "Total Industry Output" to obtain the share of value added to output for each industry.
3. For each industry, multiply the result obtained in step 1 by the result obtained in step 2 to obtain the export value added for each industry for the given year.
4. Using the results of step 3, locate the export value added for the digitally-deliverable service industries. The included industries have the following I-O codes: 511, 512, 513, 514, 521CI, 523, 524, 525, 531, 532RL, 5411, 5415, 5412OP, 55, 561, 562, 621, 622HO, 624, 711AS, 713, and 81.
5. Sum the results of step 4 to obtain the total value added by digitally-deliverable services in the export supply chain.
6. Divide the value of digitally-deliverable service inputs obtained in Step 5 by the sum of the value of total inputs obtained in step 3 and multiply by 100. This is the percentage of export value contributed by digitally-deliverable services throughout the production process.

Sensitivity Analysis

As previously mentioned, and as the industry concordance shows, the limited number of BEA cross-border trade-in-services categories leads us to include in our analysis some NAICS industries that are less likely to be digitally-deliverable (having the potential or likelihood to be delivered digitally) or actually delivered digitally. Specifically, the business, professional, and technical services category includes several NAICS industries that are arguably not digitally-deliverable. In an attempt to understand how

the portion of exports attributed to digitally-deliverable services, including intermediate inputs, might change if we altered the mix of industries included in our analysis, we conducted a sensitivity analysis using the 2002 benchmark I-O tables. The goal of the sensitivity analysis was to see how the inclusion or exclusion of various industries affected the overall proportion of exports attributable to digitally-deliverable services.

Using the 2002 I-O benchmark tables and the BEA cross-border trade categories, we found that digitally-deliverable services contributed 39.5 percent of the value of all exports that year. Following the methodology described above, we calculated the percentage of export value added by digitally-deliverable services for a subset of the industries included in the BEA categories. We developed two new sets of digitally-enabled services categories; Table A-2 displays the I-O industries included in each of the three groupings: BEA, ESA 1, and ESA 2. For the two new groups, we removed I-O industries that, in our judgment, were unlikely to be highly digitally-deliverable. For example, it is hard to imagine digital delivery of services in the automotive equipment rental and leasing industry. The same is true for offices of physicians, dentists, and other health practitioners. It is important to emphasize that industries were included or not included based solely on our understanding of the services provided and our judgment as to whether or not the service can be delivered, and traded, digitally. Services that may be enhanced or improved by digital processes remain excluded if the ultimate delivery of the service to the customer is not performed digitally.

For ESA 2, we were stricter in our judgment and removed industries that we believe are unlikely to deliver a large portion of their services digitally. For example, although it is likely that industry 621B00 (medical and diagnostic labs and outpatient and other ambulatory care services) provides digital X-ray and other medical imaging services, it is more difficult to imagine outpatient and other ambulatory care services that can be provided digitally. For this reason, we included the industry in the ESA 1 category but excluded it from the ESA 2 category.

Industry 561500 (travel arrangement and reservation services) was not originally included in the BEA digitally-enabled services categories, but we have included it in both the ESA 1 and ESA 2 groups of digitally-deliverable services for the sensitivity analysis. In our judgment, the output of this particular industry, which is included in the travel category of BEA's cross-border trade data, could be and very often is delivered digitally. According to the Census Bureau's E-Stats report, 28 percent of revenues in this industry were from e-commerce sales in 2011.[23]

Table A-3. Results of Sensitivity Analysis, 2002

Industry Group	Share of digitally-deliverable exports (including intermediate inputs)
BEA	39.5%
ESA 1	33.8%
ESA 2	20.7%

Source: Economics and Statistics Administration analysis of data from the Bureau of Economic Analysis

In both of the industry groups we created for the sensitivity analysis, the share of exports accounted for by digitally-deliverable services is lower than in the industry group assembled by BEA (See Table A-3). In large part, this is due to the variety of industries included in business, professional, and technical services. Due to data limitations, BEA's cross-border trade statistics cannot be broken down to a low enough level of detail to match the industries we selected from the I-O tables.

[23] http://www.census.gov/econ/estats/2011/all2011tables.html, Table 3

Because the detailed, benchmark I-O tables are only available every five years and have a considerable time lag, it is not possible to perform this analysis on an annual basis. The results of this sensitivity analysis can serve as upper and lower bounds to the actual percentage of exports attributable to digitally-deliverable services. To maintain consistency with the UNCTAD definition for cross-country comparisons, however, the full business, professional, and technical services category may need to be included in any analysis of digitally-deliverable services.

Notes on Other Service Industries

Wholesale trade is not included in the digitally-deliverable services group because of the way trade in this service industry is measured. Cross-border wholesale trade margins are included in the value of goods trade, so they don't appear in the cross-border trade in services data. One exception is if a wholesaler purchases a good from one country and sells it to another country with the good never entering the United States. In this situation, that wholesaler's margin is included in merchanting services and is included in the BEA business, professional, and technical services category (as a trade-related service). As there is no way to parse out which portion of the wholesale trade industry's exports are attributable to this service, it is excluded from our analysis.

Retail trade does not record any exports. Because cross-border trade data are collected at ports, wholesalers and truck services are typically the only parties involved in the transactions. Retailers are not present at the port and there is no retail price associated with exported items. As previously mentioned, any retail transaction costs associated with the exported digitally-deliverable services are included with the value of the exported service in the digitally-deliverable service category.

Table A-1. Industry Concordance of Digitally-Deliverable Services

BEA Trade in Services Category	Input-Output Codes (Annual Table)	Input-Output Codes (Benchmark Table)	2002 NAICS Codes
Business, professional, and technical services (except construction)	511 (part) Publishing industries (includes software)	511110 Newspaper publishers	5111 Newspaper, periodical, book, and directory publishers
		511120 Periodical publishers	
		511130 Book publishers	
		5111A0 Directory, mailing list, and other publishers	
		516100 Internet publishing and broadcasting	5161 Internet publishing and broadcasting
	514 Information and data processing services	518100 Internet service providers and web search portals	5181 Internet service providers and web search portals
		518200 Data processing, hosting, and related services	5182 Data processing, hosting, related services
		519000 Other information services	5191 Other information services
	531 Real estate	531000 Real estate	5311 Lessors of real estate
			5312 Offices of real estate agents and brokers
			5313 Activities related to real estate
	532RL (part) Rental and leasing services and lessors of intangible assets	532100 Automotive equipment rental and leasing	5321 Automotive equipment rental and leasing
		532230 Video tape and disc rental	5322 (part) Consumer goods rental
		532A00 General and consumer goods rental except video tapes and discs	5322 (part) Consumer goods rental
			5323 General rental centers
		532400 Commercial and industrial machinery and equipment rental and leasing	5324 Commerical and industrial machinery and equipment rental and leasing
	5411 Legal services	541100 Legal services	5411 Legal services
	5412OP Miscellaneous professional, scientific, and technical services	541200 Accounting, tax preparation, bookkeeping, and payroll services	5412 Accounting, tax preparation, bookkeeping, and payroll services
		541300 Architectural, engineering, and related services	5413 Architectural, engineering, and related services
		541400 Specialized design services	5414 Specialized design services
		541610 Management, scientific, and technical consulting services	5416 Management, scientific, and technical consulting services
		5416A0 Environmental and other technical consulting services	
		541700 Scientific research and development services	5417 Scientific research and development services
		541800 Advertising and related services	5418 Advertising and related services
		5419A0 All other miscellaneous professional, scientific, and technical services	5419 Other professional, scientific, and technical services
		541920 Photographic services	
		541940 Veterinary services	
	5415 Computer systems design and related services	541511 Custom computer programming services	5415 Computer systems design and related services
		541512 Computer systems design services	
		54151A Other computer related services, including facilities management	
	55 Management of companies and enterprises	55000 Management of companies and enterprises	5511 Management of companies and enterprises
	561 (part) Administrative and support services*	561100 Office administrative services	5611 Office administrative services
		561200 Facilities support services	5612 Facilities support services
		561300 Employment services	5613 Employment services
		561400 Business support services	5614 Business support services
		561600 Investigation and security services	5616 Investigation and security services
		561700 Services to buildings and dwellings	5617 Services to buildings and dwellings
		561900 Other support services	5619 Other support services
	562 Waste management and remediation services	562000 Waste management and remediation services	5621 Waste collection
			5622 Waste treatment and disposal
			5629 Remediation and other waste management services
	621 Ambulatory health care services	621A00 Offices of physicians, dentists, and other health practitioners	6211 Office of physicians
			6212 Offices of dentists
			6213 Offices of other health practitioners
		621B00 Medical and diagnostic labs and outpatient and other ambulatory care services	6214 Outpatient care centers
			6215 Medical and diagnostic laboratories
			6219 Other ambulatory health care services
		621600 Home health care services	6216 Home health care services
	622HO Hospitals and nursing and residential care facilities	622000 Hospitals	6221 General medical and surgical hospitals
			6222 Psychiatric and substance abuse hospitals
			6223 Specialty (except psychiatric and substance abuse) hospitals
		623000 Nursing and residential care facilities	6231 Nursing care facilities
			6232 Residential mental retardation, mental health and substance abuse facilities
			6233 Community care facilities for the elderly
			6239 Other residential care facilities

*5615 Travel arrangement and reservation services are inlcuded in travel services which is not considered a digitally-deliverable service category

Source: Economics and Statistics Administration and the Bureau of Economic Analysis

Table A-1. Industry Concordance of Digitally-Deliverable Services (continued)

BEA Trade in Services Category	Input-Output Codes (Annual Table)	Input-Output Codes (Benchmark Table)	2002 NAICS Codes
Business, professional, and technical services (except construction) (continued)	624 Social assistance	624A00 Individual and family services	6241 Individual and family services
		624200 Community food, housing, and other relief services, including rehabilitation services	6242 Community food and housing, and emergency and other relief services
			6243 Vocational rehabilitation services
		624400 Child day care services	6244 Child day care services
	711AS Performing arts, spectator sports, museums, and related activities	711100 Performing arts companies	7111 Performing arts companies
		711200 Spectator sports	7112 Spectator sports
		711A00 Promoters of performing arts and sports and agents for public figures	7113 Promoters of performing arts, sports, and similar events
			7114 Agents and managers for artists, athletes, entertainers, and other public figures
		711500 Independent artists, writers, and performers	7115 Independent artists, writers, and performers
		712000 Museums, historical sites, zoos, and parks	7121 Museums, historical sites, and similar institutions
	713 Amusements, gambling, and recreation industries	713A00 Amusement parks, arcades, and gambling industries	7131 Amusement parks and arcades
			7132 Gambling industries
		713B00 Other amusement and recreation industries	7139 Other amusement and recreation industries
		713940 Fitness and recreational sports centers	
		713950 Bowling centers	
	81 Other services, except government	8111A0 Automotive repair and maintenance, except car washes	8111 Automotive repair and maintenance
		811192 Car washes	
		811200 Electronic and precision equipment repair and maintenance	8112 Electronic and precision equipment repair and maintenance
		811300 Commercial and industrial machinery and equipment repair and maintenance	8113 Commercial and industrial machinery and equipment (except automotive and electronic) repair and maintenance
		811400 Personal and household goods repair and maintenance	8114 Personal and houshold good repair and maintenance
		812100 Personal care services	8121 Personal care services
		812200 Death care services	8122 Death care services
		812300 Dry-cleaning and laundry services	8123 Drycleaning and laundry services
		812900 Other personal services	8129 Other personal services
		813100 Religious organizations	8131 Religious organizations
		813A00 Grantmaking, giving, and social advocacy organizations	8132 Grantmaking and giving services
			8133 Social advocacy organizations
		813B00 Civic, social, professional, and similar organizations	8134 Civic and social organizations
			8139 Business, professional, labor, political, and similar organizations
		814000 Private households	8141 Private households
Royalties and license fees	511 (part) Publishing industries (includes software)	511200 Software publishers	5112 Software publishers
	512 Motion picture and sound recording industries	512100 Motion picture and video industries	5121 Motion picture and video industries
		512200 Sound recording industries	5122 Sound recording industries
	532RL (part) Rental and leasing services and lessors of intangible assets	533000 Lessors of nonfinancial intangible assets	5331 Lessors of nonfinancial intangible assets (except copyrighted works)
Insurance services	524 Insurance carriers and related activities	524100 Insurance carriers	5241 Insurance carriers
		524200 Insurance agencies, brokerages, and related activities	5242 Agencies, brokerages, and other insurance related activities
Financial services	521CI Federal Reserve banks, credit intermediation, and related activities	52A000 Monetary authorities and depository credit intermediation	5211 Monetary authorities - central bank
			5221 Depository credit intermediation
		522A00 Nondepository credit intermediation and related activities	5222 Nondepository credit intermediation
			5223 Activities related to credit intermediation
	523 Securities, commodity contracts, and investments	523000 Securities, commodity contracts, investments, and related activities	5231 Securities and commodity contracts intermediation and brokerage
			5232 Securities and commodity exchanges
			5239 Other financial investment activities
	525 Funds, trusts, and other financial vehicles	525000 Funds, trusts, and other financial vehicles	5251 Insurance and employee benefit funds
			5259 Other investment pools and funds
Telecommunications	513 Broadcasting and telecommunications	515100 Radio and television broadcasting	5151 Radio and television broadcasting
		515200 Cable and other subscription programming	5152 Cable and other subscription programming
		517000 Telecommunications	5171 Wired telecommunications carriers
			5172 Wireless telecommunications carriers (except satellite)
			5173 Telecommunications resellers
			5174 Satellite telecommunications
			5175 Cable and other program distribution
			5179 Other telecommunications

Source: Economics and Statistics Administration and the Bureau of Economic Analysis

Table A-2: Digitally-Deliverable Service Industries for Sensitivity Analysis					
BEA Trade in Services Category	I-O Industry Code and Title		BEA	ESA 1	ESA 2
Business, professional, and technical services (except construction)	511110	Newspaper publishers	✓	✓	✓
	511120	Periodical publishers	✓	✓	✓
	511130	Book publishers	✓	✓	✓
	5111A0	Directory, mailing list, and other publishers	✓	✓	✓
	516110	Internet publishing and broadcasting	✓	✓	✓
	518100	Internet service providers and web search portals	✓	✓	✓
	518200	Data processing, hosting, and related services	✓	✓	✓
	519100	Other information services	✓	✓	✓
	531000	Real estate	✓		
	532100	Automotive equipment rental and leasing	✓		
	532230	Video tape and disc rental	✓	✓	✓
	532A00	General and consumer goods rental except video tapes and discs	✓		
	532400	Commercial and industrial machinery and equipment rental and leasing	✓		
	541100	Legal services	✓	✓	
	541200	Accounting, tax preparation, bookkeeping, and payroll services	✓	✓	
	541300	Architectural, engineering, and related services	✓	✓	
	541400	Specialized design services	✓	✓	
	541511	Custom computer programming services	✓	✓	✓
	541512	Computer systems design services	✓	✓	✓
	54151A	Other computer related services, including facilities management	✓	✓	✓
	541610	Management, scientific, and technical consulting services	✓	✓	✓
	5416A0	Environmental and other technical consulting services	✓	✓	✓
	541700	Scientific research and development services	✓	✓	✓
	541800	Advertising and related services	✓	✓	
	5419A0	All other miscellaneous professional, scientific, and technical services	✓	✓	
	541920	Photographic services	✓	✓	✓
	541940	Veterinary services	✓		
	550000	Management of companies and enterprises	✓	✓	
	561100	Office administrative services	✓	✓	✓
	561200	Facilities support services	✓		
	561300	Employment services	✓	✓	
	561400	Business support services	✓	✓	✓
	561600	Investigation and security services	✓		
	561700	Services to buildings and dwellings	✓		
	561900	Other support services	✓		
	562000	Waste management and remediation services	✓		
	621A00	Offices of physicians, dentists, and other health practitioners	✓		
	621B00	Medical and diagnostic labs and outpatient and other ambulatory care services	✓	✓	
	621600	Home health care services	✓		
	622000	Hospitals	✓		
	623000	Nursing and residential care facilities	✓		
	624A00	Individual and family services	✓		
	624200	Community food, housing, and other relief services, including rehabilitation services	✓		
	624400	Child day care services	✓		
	711100	Performing arts companies	✓		
	711200	Spectator sports	✓		
	711A00	Promoters of performing arts and sports and agents for public figures	✓	✓	
	711500	Independent artists, writers, and performers	✓		
	712000	Museums, historical sites, zoos, and parks	✓		
	713A00	Amusement parks, arcades, and gambling industries	✓		
	713B00	Other amusement and recreation industries	✓		
	713940	Fitness and recreational sports centers	✓		
	713950	Bowling centers	✓		
	8111A0	Automotive repair and maintenance, except car washes	✓		
	811192	Car washes	✓		
	811200	Electronic and precision equipment repair and maintenance	✓		
	811300	Commercial and industrial machinery and equipment repair and maintenance	✓		
	811400	Personal and household goods repair and maintenance	✓		
	812100	Personal care services	✓		
	812200	Death care services	✓		
	812300	Dry-cleaning and laundry services	✓		
	812900	Other personal services	✓		
	813100	Religious organizations	✓		
	813A00	Grantmaking, giving and social advocacy organizations	✓	✓	
	813B00	Civic, social, professional, and similar organizations	✓		
	814000	Private households	✓		
Royalties and license fees	511200	Software publishers	✓	✓	✓
	512100	Motion picture and video industries	✓	✓	✓
	512200	Sound recording industries	✓	✓	✓
	533000	Lessors of nonfinancial intangible assets	✓	✓	✓

Table A-2: Digitally-Deliverable Service Industries for Sensitivity Analysis (continued)					
Insurance services	524100	Insurance carriers	✓	✓	✓
	524200	Insurance agencies, brokerages, and related activities	✓	✓	✓
Financial services	52A000	Monetary authorities and depository credit intermediation	✓	✓	✓
	522A00	Nondepository credit intermediation and related activities	✓	✓	✓
	523000	Securities, commodity contracts, investments, and related activities	✓	✓	✓
	525000	Funds, trusts, and other financial vehicles	✓	✓	✓
Telecommunications	515100	Radio and television broadcasting	✓	✓	✓
	515200	Cable and other subscription programming	✓	✓	✓
	517000	Telecommunications	✓	✓	✓
Travel*	561500	Travel arrangement and reservation services		✓	✓
*Other I-O Codes are included in the the travel category, but are not listed here since they are not included in our analysis.					