E-Stats 2016: Measuring the Electronic Economy
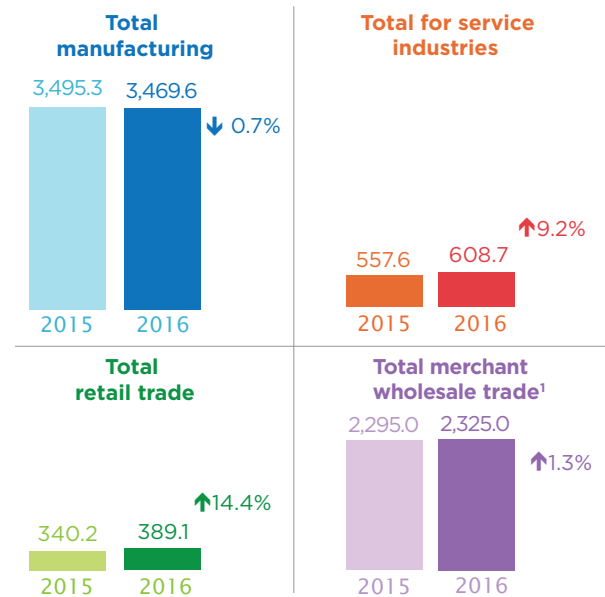
Economy-Wide Statistics Briefs

The 2016 E-Stats provides estimates of e-commerce activity in key sectors of the U.S. economy for 2016, revises previously released estimates for 2015 and earlier, and places these estimates in historical context. Underlying data are collected in four separate surveys of manufacturing, wholesale, service, and retail businesses. Corresponding data tables for each sector can be found at <www.census.gov/programs-surveys/e-stats/data/tables.html>.

MANUFACTURING

E-commerce shipments of U.S. manufactures were $3,469.6 billion in 2016, down 0.7 percent from a revised $3,495.3 billion in 2015 (see Figure 1). Total shipments were $5,354.7 billion in 2016, down 3.0 percent from a revised $5,519.0 billion in 2015.

E-commerce shipments were 64.8 percent of all manufacturing shipments in 2016, up from a revised 63.3 percent in 2015 (see Figure 2).

In 2016, 11 North American Industry Classification System (NAICS) subsectors had e-commerce shipments that accounted for more than 60 percent of their total manufacturing shipments, led by NAICS 336 (83.6 percent), transportation equipment manufacturing; NAICS 312 (74.9 percent), beverage and tobacco product manufacturing; and NAICS 322 (70.5 percent), paper manufacturing.

See Table 1. U.S. Manufacturing Shipments—Total and E-commerce Value: 2016 and 2015 table for more information.

WHOLESALE

Total e-commerce sales for merchant wholesalers in the United States, including manufacturers' sales branches and offices (MSBOs), were up 1.3 percent to $2,325.0 billion in 2016 from a revised $2,295.0 billion in 2015 (see Figure 1). Total sales decreased by 1.4 percent to $7,182.2 billion in 2016 from a revised $7,286.4 billion

Figure 1.

E-commerce Total Shipments/Sales/Revenues: 2015–2016

(In billions of dollars)

Total manufacturing
3,495.3 (2015) | 3,469.6 (2016) ↓ 0.7%

Total for service industries
557.6 (2015) | 608.7 (2016) ↑9.2%

Total retail trade
340.2 (2015) | 389.1 (2016) ↑14.4%

Total merchant wholesale trade[1]
2,295.0 (2015) | 2,325.0 (2016) ↑1.3%

[1] Total merchant wholesale trade including manufacturers' sales branches and offices.

Note: For the estimates of e-commerce total shipments, sales, and revenues, measures of sampling variability can be found at <www.census.gov/data/tables/2016/econ/e-stats/2016-e-stats.html>.

Source: U.S. Census Bureau, 2016 Annual Survey of Manufactures; 2016 Annual Wholesale Trade Survey; 2016 Annual Retail Trade Survey; and 2016 Service Annual Survey.

in 2015. E-commerce sales of merchant wholesalers, including MSBOs, were 32.4 percent of total sales in 2016, an increase from the revised 31.5 percent in 2015 (see Figure 2).

E-commerce sales accounted for 27.2 percent of total sales of merchant wholesalers, excluding MSBOs in 2016, while e-commerce sales were 46.2 percent of the sales of MSBOs.

See Table 2. U.S. Merchant Wholesale Trade Sales, Including Manufacturers' Sales Branches and Offices— Total and E-commerce: 2016 and 2015 tables for more information.

SERVICES

E-commerce revenues for service industries in the United States were $608.7 billion in 2016, up 9.2 percent from a revised $557.6 billion in 2015 (see Figure 1). Total revenues were $14,591.1 billion in 2016, up 4.4 percent from a revised $13,970.7 billion in 2015. E-commerce revenues were 4.2 percent of total revenues in 2016, an increase from the revised 4.0 percent in 2015 (see Figure 2).

See Table 3. U.S. Services Revenue—Total and E-commerce: 2016 and 2015 table for more information.

RETAIL

Sales from e-commerce for U.S. retailers were $389.1 billion in 2016, up 14.4 percent from a revised $340.2 billion in 2015 (see Figure 1). Total sales increased by 2.8 percent to $4,856.3 billion in 2016 from a revised $4,726.0 billion in 2015.
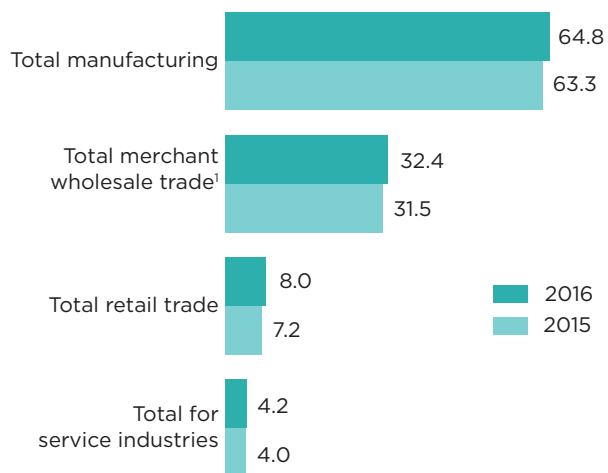
E-commerce sales were 8.0 percent of total sales in 2016, up from a revised 7.2 percent in 2015 (see Figure 2).

See Table 4. U.S. Retail Trade Sales Total and E-commerce: 2016 and 2015 table for more information.

Supplemental tables utilizing annual data on total and e-commerce sales by primary business activity for Electronic Shopping and Mail-Order Houses (NAICS 4541) for 2011–2016 were released in March 2018. For more information, see <www.census.gov/data/tables /2016/econ/arts/supplemental-ecommerce.html>.

Figure 2.

E-commerce as a Percentage of Total Shipments/Sales/Revenues: 2015–2016

Total manufacturing — 64.8 / 63.3
Total merchant wholesale trade[1] — 32.4 / 31.5
Total retail trade — 8.0 / 7.2
Total for service industries — 4.2 / 4.0

2016
2015

[1] Total merchant wholesale trade, including manufacturers' sales branches and offices.
Note: For the estimates of e-commerce as a percentage of total shipments, sales, and revenues, measures of sampling variability can be found at <www.census.gov/data/tables/2016/econ/e-stats /2016-e-stats.html>.
Source: U.S. Census Bureau, 2016 Annual Survey of Manufactures; 2016 Annual Wholesale Trade Survey; 2016 Annual Retail Trade Survey; and 2016 Service Annual Survey.

EXPLANATORY NOTES

General

The estimates in this release are based on data collected by the U.S. Census Bureau for the following four surveys: the Annual Survey of Manufactures (ASM), the Annual Wholesale Trade Survey (AWTS), the Service Annual Survey (SAS), and the Annual Retail Trade Survey (ARTS). All of these surveys were conducted independently. Measures of total economic activity and e-commerce are presented in this report to provide a broad perspective of e-commerce activity across the many sectors. Brief descriptions of the survey methods are given below.

Industry classifications used in this report are based on the NAICS. Information about the NAICS and additional detail about coverage, sample design, and estimation methodology for the annual surveys may be found at <www.census.gov/programs-surveys /e-stats.html>. In addition, all current and prior reports, historical data tables, and past research papers are available at this same Web site.

Measures of economic activity:

ASM. "Value of shipments" is the measure used for manufacturing in the ASM. It is the value of all products shipped plus all miscellaneous receipts. Value of shipments includes shipments to outside customers, as well as to affiliated plants.

E-commerce shipments (e-shipments) are online orders accepted for manufactured products from customers, including shipments to other domestic plants of the same company for further manufacture, assembly, or fabrication where price and terms of sale are negotiated over the Internet, Extranet, Electronic Data Interchange (EDI) network, e-mail, or other online system. Payment may or may not be made online.

AWTS and ARTS. "Sales" is the measure used in AWTS and ARTS. Sales are the dollar value of transactions between the reporting firm and its customers. Sales include transactions to foreign affiliates, but exclude transactions among domestic affiliates.

SAS. "Revenues" is the measure used in SAS. Revenues are the dollar value of transactions and contracts between reporting firms and their customers. These values include services performed for foreign affiliates, but exclude transactions among domestic affiliates. Revenues include the total value of service contracts, the market value of compensation received in lieu of cash, amounts received for work subcontracted to others, and other industry-specific items.

E-commerce sales/revenues are sales of goods and services where the buyer places an order, or the price and terms of the sale are negotiated, over the Internet, mobile device (m-commerce), Extranet, EDI network, e-mail, or other comparable online system. Payment may or may not be made online.

SURVEY METHODS

Annual Survey of Manufactures

The 2016 estimates of manufacturing shipments and e-shipments were derived from the 2016 ASM. In the ASM, data are collected annually from a probability sample of approximately 50,000 manufacturing plants as defined by the 2012 NAICS. Data for small- and medium-sized single establishment companies are estimated using information obtained from administrative sources. The ASM is a survey of manufacturing plants and represents activities at individual plants rather than the entire company.

E-commerce questions were included on the ASM questionnaires along with questions about employment, payroll, value of shipments, cost of materials consumed, and capital expenditures. Data for nonresponding plants were imputed using information from responding plants with similar characteristics.

Shipments estimates for the NAICS subsectors were calculated by summing both the reported and the imputed plant data. For the ASM, the data were weighted by the reciprocal of the probability of the plant's inclusion in the sample. The estimates were then linked to the 2012 Economic Census results to reduce sampling and nonsampling errors.

For more information on the ASM, see <www.census .gov/programs-surveys/asm.html>.

Annual Wholesale Trade Survey, Service Annual Survey, and Annual Retail Trade Survey

The AWTS measures the economic activity of merchant wholesale firms with paid employees (i.e., employer firms) including MSBOs as defined by the 2012 NAICS. Merchant wholesale firms are those that take title to the goods they sell. The AWTS also collects data from wholesale agents and brokers, but e-commerce sales are not requested. Therefore, agents and brokers are not included in the wholesale E-Stats estimates. Data are requested annually from about 8,400 wholesale firms that included approximately 6,700 merchant firms and 1,000 MSBOs.

For more information about AWTS, see <www.census .gov/programs-surveys/awts.html>.

The SAS measures the economic activity of employer firms classified in 12 service-related sectors as defined by the 2012 NAICS:

- Utilities
- Transportation and Warehousing
- Information
- Finance and Insurance
- Real Estate and Rental and Leasing
- Professional, Scientific, and Technical Services
- Administrative and Support and Waste Management and Remediation Services
- Educational Services

- Health Care and Social Assistance
- Arts, Entertainment, and Recreation
- Accommodation and Food Services
- Other Services (except Public Administration)

Data are requested annually from about 90,000 firms.

For more information about SAS, see <www.census.gov/programs-surveys/sas.html>.

The ARTS measures the economic activity of employer and nonemployer (i.e., businesses without paid employees) firms classified in Retail Trade as defined by the 2012 NAICS. The sample contains approximately 16,500 firms with paid employees. Data for nonemployers are included in the estimates through imputation or administrative data provided by other federal agencies.

For more information about ARTS, see <www.census.gov/programs-surveys/arts.html>.

For these three surveys, stratified random samples of firms are selected from a sampling frame constructed using information from the 2012 Economic Census, and updated with information from the Census Bureau's Business Register. The samples are subsequently updated to represent employer firms in business during 2016.

All wholesale, service, and retail firms surveyed are asked to report total sales/revenues and e-sales/e-revenues for 2016. Wholesalers are also asked to report e-sales made through EDI networks. Retailers in the Electronic Shopping and Mail-Order Houses industry are also asked to report total sales and e-sales for 2016 for specific merchandise lines. E-commerce data for nonresponding employer firms and all retail nonemployers were imputed from responding firms within the same kind of business.

Estimates of total sales/revenues and e-sales/e-revenues were calculated by summing data (both reported and imputed) weighted by the reciprocal of the probability of the firm's inclusion in the appropriate sample. The services, retail, and wholesale estimates in this report have been adjusted using results of the 2012 Economic Census to reduce sampling error and to allow comparability with the census results.

Reliability of Estimates

The estimates in this report are based on sample surveys and are subject to sampling error and nonsampling error. Sampling error occurs because only a subset of the entire population is measured. Nonsampling error encompasses all other factors that contribute to the total error of a sample survey estimate and may occur in censuses.

Sampling Error

Two measures of sampling error are provided for data in this report—standard errors for estimates of percentages and coefficients of variation for estimates of total dollar value. See tables at <www.census.gov/data/tables/2016/econ/e-stats/2016-e-stats.html>. The standard error measures the extent to which estimates derived from all possible samples of the same size drawn using the same design differ from the average of these estimates. The coefficient of variation (expressed as a percentage) is the standard error of the estimate divided by the estimate. Note that standard errors and coefficients of variation are estimates derived from the sample and are also subject to sampling error. The coefficients of variation and standard errors presented in the tables may be used to compute confidence intervals about the sample estimates.

The particular sample used for each survey included in this report is one of a large number of samples of the same size that could have been selected using the same design. For ASM, we estimate sampling variances using the Poisson variance estimator rather than the method of random groups. In about 9 out of 10 (90 percent) of the possible samples, the estimates would differ from the results of a complete enumeration by less than 1.645 times the estimated standard error. For AWTS, ARTS, and SAS, we use the method of random groups (G=16 random groups) to estimate sampling variances for estimates produced from these samples. In about 9 out of 10 (90 percent) of the possible samples, the estimates would differ from the results of a complete enumeration by less than 1.753 (a t-statistic with 15 [G-1] degrees of freedom) times the estimated standard error.

To compute a 90 percent confidence interval for an estimated total, multiply the estimate by its coefficient of variation and then by either 1.753 or 1.645, as indicated above. This amount is then added to and subtracted from the estimate to give the upper and lower bounds of the interval. As an example, suppose the estimated total revenue is $51,770 million and the estimated coefficient of variation for this estimate is 1.3 percent (0.013). Multiplying $51,770 million by 0.013 and by 1.753 gives $1,180 million. Subtracting $1,180 million from and adding $1,180 million to $51,770 million gives a

90 percent confidence interval of $50,590 million to $52,950 million. Confidence statements for estimated percentages are computed in a similar manner. The Census Bureau recommends that individuals using estimates in this report incorporate this information into their analyses, as sampling error could affect the conclusions drawn from these estimates. All comparative statements in this report have undergone statistical testing and, unless otherwise noted, comparisons are statistically significant at the 90 percent confidence level.

Nonsampling Error

One source of nonsampling error is the inability to obtain response for all cases in the sample. One measure of this type of nonsampling error is response rates.

Economic surveys at the Census Bureau are required to compute two different types of response rates: a unit response rate and weighted item response rate. Refer to each survey's Internet page (links provided previously) for the unit response rates of the surveys that contribute to this report. The weighted item response rates are called Total Quantity Response Rates (TQRR) and are item-level indicators of the quality of each estimate. The following table shows the TQRRs for e-commerce activity for the sectors included in this report. More detailed information about calculating and reporting response rates for economic surveys can be found at <www.census.gov /about/policies/quality/standards/appendixd3b.html>.

Other sources of nonsampling error include response errors, unclear definitions, differences in the interpretation of questions, mistakes in recording or coding the data obtained, and other errors of collection, response, coverage, and estimation of missing data. Although no direct measures of these sources of nonsampling error have been obtained, precautionary steps were taken in all phases of the collection, processing, and tabulation of the data in an effort to minimize their influence.

Total Quantity Response Rate for 2016 Total Shipments/Sales/Revenues and E-Commerce

Sector	Total sales	E-commerce sales
Manufacturing	70.4	66.2
Wholesale	87.5	64.3
Retail	91.9	84.2
Services.	85.4	82.5

CONTACTS

For additional information regarding surveys included in this report, and for general information about the Census Bureau's e-commerce measurement program, contact:

Data User Outreach and Education Office
International Trade Management Division
<ewd.outreach@census.gov>
800-242-2184

Future E-Stats Reports

- Quarterly retail e-commerce data will be released August 17, 2018, and November 19, 2018.
- E-Stats for 2017 is expected to be released in mid-2019.

The 2017 manufacturing data are collected as part of the overall economic census program with shipments data scheduled to be available beginning September 2019.

All E-Stats reports, including prior reports, historical data tables, and past research papers, are available at <www.census.gov/programs-surveys/e-stats.html>.