

Revisions in State Establishment-based Employment Estimates Effective January 2018

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Introduction

With the release of the payroll employment estimates for January 2018, nonfarm payroll employment, hours, and earnings data for states and areas were revised to reflect the incorporation of the 2017 benchmarks and the recalculation of seasonal adjustment factors. The revisions affect all not seasonally adjusted data from April 2016 to December 2017, all seasonally adjusted data from January 2013 to December 2017¹, and select series subject to historical revisions before April 2016. This article provides background information on benchmarking methods, business birth/death modeling, seasonal adjustment of employment data, and details of the effects of the 2017 benchmark revisions on state and area payroll employment estimates.

Summary of benchmark revisions

The average absolute percentage revision across all states for total nonfarm payroll employment is 0.4 percent for March 2017. This compares to the average of 0.5 percent for the same measure during the five prior benchmark years of 2012 to 2016. For March 2017, the range of the percentage revision for total nonfarm payroll employment across all states is from -1.0 to 1.2 percent.

Benchmark methods

The Current Employment Statistics (CES) program, also known as the payroll survey, is a federal and state cooperative program that provides, on a timely basis, estimates of payroll employment, hours, and earnings for states and areas by sampling the population of employers. Each month the CES program surveys about 149,000 businesses and government agencies, representing approximately 651,000 individual worksites, in order to provide detailed industry level data on employment and the hours and earnings of employees on nonfarm payrolls for all 50 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and about 450 metropolitan areas and divisions.²

As with data from other sample surveys, CES payroll employment estimates are subject to both sampling and nonsampling error. Sampling error is an unavoidable byproduct of forming an inference about a population based on a sample. The larger the sample is, relative to the population size and variance, the smaller the sampling error. The sample-to-population ratio varies across states and industries. Nonsampling error, by contrast, generally refers to errors in reporting and processing.³

In order to control for both sampling and nonsampling error, CES payroll employment estimates are benchmarked annually to employment counts from a census of the employer population. These counts are derived primarily from employment data provided in unemployment insurance (UI) tax reports that nearly all employers are required to file with state workforce agencies. The UI tax reports are collected, reviewed, and edited as part of the Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages (QCEW) program.⁴ As part of the benchmark process for benchmark year 2017, census-derived employment counts replace CES payroll employment estimates for all 50 states and the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and about 450 metropolitan areas and divisions for the period from April 2016 to September 2017.

UI tax reports are not collected on a timely enough basis to allow for replacement of CES payroll estimates for the fourth quarter, October 2017 to December 2017. For this period, estimates based on sample information are revised

¹ Further information regarding the difference in historical reconstruction between not seasonally adjusted data and seasonally adjusted data is available in the seasonal adjustment section of this article and at <https://www.bls.gov/sae/790over.htm>.

² Further information on the sample size for each state is available at <https://www.bls.gov/sae/sample.htm>.

³ Further information on the reliability of CES estimates is contained in the Technical Note of the latest State Employment and Unemployment news release and is available at <https://www.bls.gov/sae/news.htm>.

⁴ Further information on the BLS Quarterly Census of Employment and Wages program is available at <https://www.bls.gov/cew/>.

using the new September 2017 series level derived from census employment counts and incorporate updated business birth/death factors.⁵

Changes to CES published series

Conversion to the 2017 North American Industry Classification System (NAICS)

With the release of January 2018 data on March 12, 2018, the CES survey updated the basis for industry classification to the 2017 North American Industry Classification System (NAICS) from the 2012 NAICS basis.⁶

This conversion resulted in minor revisions reflecting content and coding changes within retail trade and information sectors for CES State and Area. All CES series affected by the revisions remain in-scope; thus, total nonfarm employment is not impacted in any state or metropolitan area. The majority of the changes associated with the 2017 NAICS update impacted levels of detail not published by CES State and Area; therefore, only the cases in which CES State and Area industries were impacted are discussed in detail here.⁷

The conversion from the 2012 NAICS to the 2017 NAICS affected CES industry codes in several ways. Some CES series were converted as a whole from their 2012 NAICS industry code to their new 2017 NAICS industry code. Other 2012 NAICS industry codes were partially distributed to multiple new 2017 NAICS industry codes. The changes resulting from the reclassification from the 2012 NAICS to the 2017 NAICS for CES State and Area can be seen below in exhibit 1.⁸

Exhibit 1. Reclassifications from the 2012 NAICS to the 2017 NAICS

2012 NAICS	2012 Series Code	2012 CES Series Title	2017 NAICS	2017 Series Code	2017 CES Series Title
452111	42452100	Department Stores	452210	42452200	Department Stores
452112*	42452100	Department Stores	452210*	42452200	Department Stores
452112*	42452100	Department Stores	452311*	42452300	General Merchandise Stores, including Warehouse Clubs and Supercenters
452910	42452900	Other General Merchandise Stores	452311	42452300	General Merchandise Stores, including Warehouse Clubs and Supercenters
452990	42452900	Other General Merchandise Stores	452319	42452300	General Merchandise Stores, including Warehouse Clubs and Supercenters
517110	50517100	Wired Telecommunications Carriers	517311	50517311	Wired Telecommunications Carriers
517210	50517200	Wireless Telecommunications Carriers (except Satellite)	517312	50517312	Wireless Telecommunications Carriers (except Satellite)

* indicates partially combined NAICS codes

⁵ Further information on the monthly estimation methods of the CES program can be found in Chapter 2 of the *BLS Handbook of Methods* and is available at <https://www.bls.gov/opub/hom/pdf/homch2.pdf>.

⁶ Further information about the 2012 NAICS and the 2017 NAICS classifications can be found at the Census Bureau’s NAICS page at <https://www.census.gov/eos/www/naics/>.

⁷ Further information on NAICS codes and CES industry codes, as well as previous NAICS conversions, is available at <https://www.bls.gov/sae/saenaics2017.htm>.

⁸ Further information on the impact of the 2017 NAICS update to CES National can be found in the CES National Benchmark Article at <https://www.bls.gov/web/empsit/cesbmart.htm>.

Special notice regarding the impact of Hurricanes Harvey, Irma, and Maria on CES re-estimation

A series of hurricanes struck Florida, Texas, Puerto Rico, and the U.S. Virgin Islands in August and September 2017, complicating the post-benchmark (October-December 2017) re-estimation process for these areas. Hurricane Harvey made landfall on the Texas Gulf Coast in late August. The population counts obtained from QCEW indicated that the September CES sample-based estimates suitably captured the employment drops associated with this event. No modifications were made for Texas October or November re-estimates, which saw corresponding returns in employment.

Hurricane Irma hit Florida just prior to the September reference period for many establishments. The benchmark data showed a much larger decline in September than the CES estimates did. A large part of this discrepancy was attributed to a spike in employment loss associated with business deaths, although there was information that many of these establishments returned to normal operation prior to October. Consequently, establishments which reported positive employment to the CES survey in August and October, and zero in September, were used in the Florida October re-estimates matched sample, a modification of the standard handling of business births and deaths. In the same fashion, a small number of establishments that reported they were shut down through the October reference period but reported positive employment in November were used in November's matched sample.

Hurricane Irma also struck Puerto Rico, although job losses there were more evident in October following the destruction caused by Hurricane Maria. Modifications were made to the birth/death procedure for re-estimates in Puerto Rico as well, to use reported zero employment for establishment deaths attributed to the storm in the October matched sample, and to use returning units in November and December. This procedure was also used when making the initial sample-based estimates for October through December.

The U.S. Virgin Islands showed large job losses in the aftermath of both Irma and Maria. No modifications were made to the re-estimation procedures for the U.S. Virgin Islands, which uses a quota-based sample design that differs from the rest of the CES program.

Business birth/death modeling

Sample-based estimates are adjusted each month by a statistical model designed to reduce a primary source of nonsampling error: the inability of the sample to capture employment growth generated by new business formations on a timely basis. There is an unavoidable lag between an establishment opening for business and its appearance in the sample frame, making it unavailable for sampling. Because new firm births generate a portion of employment growth each month, nonsampling methods must be used to estimate this growth.

Earlier research indicated that, while both the business birth and death portions of total employment are generally significant, the net contribution is relatively small and stable. To account for this net birth/death portion of total employment, BLS uses an estimation procedure with two components. The first component excludes employment losses due to business deaths from sample-based estimation in order to offset the missing employment gains from business births. This is incorporated into the sample-based estimate procedure by simply not reflecting sample units going out of business, but rather imputing to them the same employment trend as the other continuing firms in the sample. This step accounts for most of the birth and death changes to employment.⁹

The second component is an autoregressive integrated moving average (ARIMA) time series model designed to estimate the residual birth/death change to employment not accounted for by the imputation. To develop the history for modeling, the same handling of business deaths as described for the CES monthly estimation is applied to the population data. Establishments that go out of business have employment imputed for them based on the rate of change of the continuing units. The employment associated with continuing units and the employment imputed from deaths are aggregated and compared to actual population levels. The differences between the two series reflect

⁹ Technical information on the estimation methods used to account for employment in business births and deaths is available at <https://www.bls.gov/web/emp/sit/cesbd.htm>.

the actual residual of births and deaths over the past five years. The historical residuals are converted to month-to-month differences and used as input series to the modeling process. Models for the residual series are then fit and forecasted using X-13 ARIMA-SEATS software.¹⁰ The residuals exhibit a seasonal pattern and may be negative for some months. This process is performed at the national level and for each individual state. Finally, differences between forecasts of the nationwide birth/death factors and the sum of the states' birth/death factors are reconciled through a ratio-adjustment procedure, and the factors are used in monthly estimation of payroll employment in 2018. The updated birth/death factors are also used as inputs to produce the revised estimates of payroll employment for October 2017 to December 2017.

Seasonal adjustment

CES State and Area payroll employment data are seasonally adjusted by a two-step process.¹¹ BLS uses the X-13 ARIMA-SEATS program to remove the seasonal component of employment time series. This process uses the seasonal trends found in census-derived employment counts to adjust historical benchmark employment data while also incorporating sample-based seasonal trends to adjust sample-based employment estimates. These two series are independently adjusted then spliced together at the benchmark month (in this case September 2017).¹² By accounting for the differing seasonal patterns found in historical benchmark employment data and the sample-based employment estimates, this technique yields improved seasonally adjusted series with respect to analysis of month-to-month employment change.¹³ Seasonally adjusted employment data for the most recent 13 months are published regularly in table D-1.¹⁴

The aggregation method of seasonally adjusted data is based upon the availability of underlying industry data. For all 50 states, the District of Columbia, and Puerto Rico, the following series are sums of underlying industry data: total private, goods-producing, service-providing, and private service-providing. The same method is applied for the U.S. Virgin Islands with the exception of goods-producing, which is independently seasonally adjusted because of data limitations. For all 50 states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands, data for manufacturing, trade, transportation, and utilities, financial activities, education and health services, leisure and hospitality, and government are aggregates wherever exhaustive industry components are available; otherwise these industries' employment data are directly seasonally adjusted. In a very limited number of cases, the not seasonally adjusted data for mining, construction, manufacturing, trade, transportation, and utilities, financial activities, education and health services, leisure and hospitality, and government do not exhibit enough seasonality to be adjusted; in those cases the not seasonally adjusted data are used to sum to higher level industries. The seasonally adjusted total nonfarm data for all metropolitan statistical areas (MSAs) and metropolitan divisions are not an aggregation but are derived directly by applying the seasonal adjustment procedure to the not seasonally adjusted total nonfarm level.¹⁵

Implementation of concurrent seasonal adjustment

With the release of January 2018 data, CES State and Area converted to concurrent seasonal adjustment which uses all available estimates, including those for the current month, in developing sample-based seasonal factors.¹⁶ Concurrent sample-based seasonal factors are created every month for the current month's preliminary estimates

¹⁰ Further information on X-13 ARIMA-SEATS is available on the Census Bureau website at <https://www.census.gov/srd/www/x13as/>.

¹¹ Research from the Dallas Federal Reserve has shown that CES benchmarked population data exhibits a seasonal pattern different from the sample-based estimates. Please see Berger, Franklin D. and Keith R. Phillips (1994) "Solving the Mystery of the Disappearing January Blip in State Employment Data," Federal Reserve Bank of Dallas, Economic Review, April, 53-62, available at <http://www.dallasfed.org/assets/documents/research/er/1994/er9402d.pdf>.

¹² The two-step seasonal adjustment process is explained in detail by Scott, Stuart; Stamas, George; Sullivan, Thomas; and Paul Chester (1994), "Seasonal Adjustment of Hybrid Economic Time Series," *Proceedings of the Section on Survey Research Methods*, American Statistical Association, available at <https://www.bls.gov/osmr/abstract/st/st940350.htm>.

¹³ A list of all seasonally adjusted employment series is available at <https://www.bls.gov/sae/saeseries.htm>.

¹⁴ Table D-1 can be viewed at <https://www.bls.gov/sae/tables.htm>.

¹⁵ A list of BLS MSAs is available at <https://download.bls.gov/pub/time.series/sm/sm.area>.

¹⁶ Technical information on concurrent seasonal adjustment for CES State and Area can be found at <https://www.bls.gov/sae/saeconcurrent.htm>.

as well as the previous month's final estimates in order to incorporate the real-time estimates. Previously, CES State and Area forecasted the sample-based seasonal factors once annually and applied these factors to the sample estimates for the remainder of the year. CES State and Area research shows that concurrent seasonal adjustment will reduce the revisions of the seasonally adjusted estimates compared to seasonally adjusted benchmark data as well as reduce the month-to-month variability of the seasonally adjusted time series.¹⁷

Variable survey intervals

BLS utilizes special model adjustments to control for survey interval variations, sometimes referred to as the 4 vs. 5 week effect, for all nonfarm seasonally adjusted series. Although the CES survey is referenced to a consistent concept, the pay period including the 12th day of each month, inconsistencies arise because there are sometimes 4 and sometimes 5 weeks between the weeks including the 12th day in a given pair of months. In highly seasonal industries, these variations can be an important determinant of the magnitude of seasonal hires or layoffs that have occurred at the time the survey is taken.¹⁸

Metropolitan statistical area (MSA) updates

Beginning in early 2015 with the release of the 2014 benchmark, CES updated its area definitions to reflect new area delineations announced by the Office of Management and Budget (OMB) based on the application of new data standards from the 2010 Census.¹⁹ New areas resulting from the BLS update in the 2014 benchmark to official 2010 area delineations now meet the minimum requirement of three years of sample history to reliably forecast seasonal factors.²⁰ Therefore, all redelineated areas are now published seasonally adjusted at the total nonfarm level.²¹

CES updated its list of covered areas to include the Enid, OK MSA (FIPS 21420) beginning in early 2017 with the release of the 2016 benchmark. This was formerly a micropolitan statistical area that now meets the Office of Management and Budget (OMB) criteria to qualify as a metropolitan statistical area (MSA).²² Due to the availability of only one year of sample history, BLS will not be publishing any seasonally adjusted data for this area for at least two more years.

Benchmark revisions

Revisions by industry

The magnitude of benchmark revisions is commonly gauged by the percentage difference between the sample-based estimates of payroll employment and the revised benchmark payroll employment levels for March of the benchmark year, presently March 2017. As noted earlier, the average absolute percentage revision across all states for total nonfarm payroll employment is 0.4 percent for March 2017. This compares to the average of 0.5 percent for the same measure during the five prior benchmark years of 2012 to 2016. For March 2017, the range of the percentage revision for total nonfarm payroll employment across all states is from -1.0 to 1.2 percent. (See table 1a.)

For December 2017, the average absolute percentage revision for state total nonfarm payroll employment is 0.6 percent. This compares to the average of 0.6 percent for the same measure during the five prior benchmark years of 2012 to 2016. The range of the percentage revision for state total nonfarm payroll employment is from -2.0 to 1.9 percent for December 2017. (See table 1a.)

Absolute level revisions provide further insight on the magnitude of benchmark revisions. Absolute level revisions are measured as the absolute difference between the sample-based estimates of payroll employment and the

¹⁷ Mance, S. Concurrent Seasonal Adjustment of State and Metro Payroll Employment Series October 2015. Available at <https://www.bls.gov/osmr/pdf/st150110.pdf>.

¹⁸ For more information on the presence and treatment of calendar effects in CES data, see <https://www.bls.gov/ore/pdf/st960190.pdf>.

¹⁹ For a summary of changes to statistical areas made with the 2014 benchmark, see <https://www.bls.gov/sae/benchmark2015.pdf>.

²⁰ The X-13 ARIMA-SEATS software used by BLS requires a minimum of 3 years of data to reliably forecast seasonal factors.

²¹ Lists of redelineated and new areas added in 2015 now published seasonally adjusted are available in tables A1 and A2 of the Appendix.

²² MSA delineations may be found at <https://www.bls.gov/sae/saemsa.htm>.

benchmark levels of payroll employment for March 2017. A relatively large benchmark revision in terms of percentage can correspond to a relatively small benchmark revision in terms of level due to the amount of employment in the industry.

Table 1a. Absolute percentage differences between state employment estimates and benchmarks by industry, not seasonally adjusted, March 2012–March 2017 and December 2017 (all values in percent)

Industry	Mar. 2012 ¹	Mar. 2013 ²	Mar. 2014	Mar. 2015	Mar. 2016	Mar. 2017	Dec. 2017
Total nonfarm.....	0.7	0.4	0.5	0.4	0.4	0.4	0.6
Mining and logging.....	4.7	3.7	2.8	4.2	4.5	3.7	6.1
Construction.....	4.4	3.1	3.0	2.6	2.3	2.5	3.8
Manufacturing.....	1.5	1.4	1.2	1.3	1.3	1.3	2.1
Trade, transportation, and utilities.....	1.1	1.0	0.7	0.6	0.8	0.7	0.9
Information.....	3.2	2.2	2.0	2.6	3.0	2.7	3.6
Financial activities.....	2.2	1.6	2.0	1.9	2.3	1.6	1.9
Professional and business services.....	1.9	1.8	1.6	1.6	1.4	1.5	2.1
Education and health services.....	1.4	1.6	0.9	0.9	0.8	0.8	0.9
Leisure and hospitality.....	2.3	1.4	1.4	1.4	1.5	1.6	1.7
Other services.....	2.7	2.1	2.4	2.1	2.4	2.7	3.3
Government.....	1.0	0.7	0.9	0.7	0.5	0.8	0.9
Total nonfarm:							
Range.....	-1.5	-0.7	-1.5	-1.8	-1.6	-1.0	-2.0
	to	to	to	to	to	to	to
	2.2	2.9	2.0	1.3	0.9	1.2	1.9
Mean.....	0.6	0.3	0.1	(3)	-0.1	-0.1	-0.3
Standard deviation.....	0.7	0.6	0.6	0.5	0.6	0.5	0.7

¹ CES State and Area payroll employment estimates are typically replaced with census-derived employment counts through the third quarter of the benchmark year. However, in the 2011 benchmark year, CES estimates were replaced only through the second quarter of 2011 (through June 2011). As a result, the March 2012 benchmark revisions reflect revisions to cumulatively more months of sample-based estimates than is typical, contributing to generally higher rates of revision. For more information, see <https://www.bls.gov/sae/benchmark2013.pdf>.

² The CES estimates in this column were subject to large revisions and historical reconstructions due to substantial reclassifications by the QCEW program in the financial activities and education and health services sectors. For more information, see https://www.bls.gov/news.release/archives/cewqtr_09262013.htm.

(3) Less than +/- 0.05 percent

The following example demonstrates the necessity of considering both percentage revision and level revision when evaluating the magnitude of a benchmark revision in an industry. The average absolute percentage benchmark revisions across all states for information and for professional and business services are 3.6 and 2.1 percent, respectively, for December 2017. However, for December 2017, the absolute level revision across all states for the information industry is 1,400, while the absolute level revision across all states for the professional and business services industry is 6,000. (See table 1b.) Relying on a single measure to characterize the magnitude of benchmark revisions in an industry can potentially lead to an incomplete interpretation.

Table 1b. Absolute level differences between state employment estimates and benchmarks by industry, not seasonally adjusted, March 2012–March 2017 and December 2017 (all values payroll employment)

Industry	Mar. 2012 ¹	Mar. 2013 ²	Mar. 2014	Mar. 2015	Mar. 2016	Mar. 2017	Dec. 2017
Total nonfarm.....	14,800	16,900	11,500	9,200	7,700	7,100	13,300
Mining and logging.....	600	600	400	800	500	500	1,000
Construction.....	4,200	2,700	2,800	2,500	2,700	2,200	3,500
Manufacturing.....	2,200	1,500	1,700	2,200	2,200	2,200	3,400
Trade, transportation, and utilities.....	3,900	3,900	2,600	2,700	3,300	2,600	3,900
Information.....	1,500	800	900	1,100	1,400	1,000	1,400
Financial activities.....	2,500	2,000	2,100	1,900	2,300	1,600	2,200
Professional and business services.....	5,500	4,100	3,900	5,100	4,400	3,300	6,000
Education and health services.....	4,600	12,000	3,400	3,700	3,000	3,200	3,800
Leisure and hospitality.....	5,200	2,900	3,500	2,600	2,900	3,400	3,700
Other services.....	2,300	2,000	2,000	1,800	1,800	2,200	3,000
Government.....	4,100	2,500	3,900	2,600	2,300	3,000	3,900
Total nonfarm:							
Range.....	-28,900 to 59,400	-13,700 to 428,200	-40,800 to 103,800	-103,600 to 21,200	-26,500 to 40,400	-44,900 to 16,400	-99,000 to 30,800
Mean.....	13,100	13,800	5,500	-2,400	200	-2,300	-7,200
Standard deviation.....	16,200	60,800	20,200	17,400	11,600	11,000	20,500

¹ CES State and Area payroll employment estimates are typically replaced with census-derived employment counts through the third quarter of the benchmark year. However, in the 2011 benchmark year, CES estimates were replaced only through the second quarter of 2011 (through June 2011). As a result, the March 2012 benchmark revisions reflect revisions to cumulatively more months of sample-based estimates than is typical, contributing to generally higher rates of revision. For more information, see <https://www.bls.gov/sae/benchmark2013.pdf>.

² The CES estimates in this column were subject to large revisions and historical reconstructions due to substantial reclassifications by the QCEW program in the financial activities and education and health services sectors. For more information, see https://www.bls.gov/news.release/archives/cewqtr_09262013.htm.

Revisions by state

For March 2017, 23 states and the District of Columbia revised nonfarm payroll employment upward, while 27 states revised payroll employment downward. (See table 2 or map 1.)

For December 2017, 17 states revised nonfarm payroll employment upward, while 33 states and the District of Columbia revised payroll employment downward. (See table 2 or map 2.) The distribution of percent revisions for March 2017 and December 2017 can be found in exhibit 2.

Table 2. Percent differences between nonfarm payroll employment benchmarks and estimates by state, not seasonally adjusted, March 2012–March 2017 and December 2017 (all values in percent)

State	Mar. 2012	Mar. 2013	Mar. 2014	Mar. 2015	Mar. 2016	Mar. 2017	Dec. 2017
Alabama.....	0.6	0.4	-0.1	-0.3	0.4	0.8	0.2
Alaska.....	0.8	0.1	-0.2	0.2	-1.1	0.2	-0.7
Arizona.....	0.3	0.3	0.1	-0.2	-0.3	0.5	0.8
Arkansas.....	1.2	-0.5	-0.7	-0.6	(1)	-0.2	-1.0
California.....	0.3	2.9	0.7	-0.7	(1)	(1)	0.2
Colorado.....	0.2	0.5	0.5	0.7	-0.5	0.4	0.6
Connecticut.....	0.6	0.2	-0.1	-1.0	-0.2	-0.2	-0.1
Delaware.....	0.1	0.2	0.3	0.4	-1.1	0.1	0.4
District of Columbia.....	-0.8	1.1	0.3	0.4	0.9	0.3	(1)
Florida.....	0.5	0.3	-0.1	-0.2	0.5	-0.1	-0.5
Georgia.....	0.7	(1)	0.7	-0.3	-0.6	-0.8	-0.7
Hawaii.....	0.5	1.0	0.6	0.7	-0.7	0.4	-0.4
Idaho.....	0.3	0.2	2.0	-0.4	(1)	0.4	0.6
Illinois.....	0.7	0.1	0.5	0.2	0.1	0.3	0.4
Indiana.....	0.7	-0.2	-0.1	-0.1	0.6	-0.3	-0.6
Iowa.....	0.8	-0.1	(1)	-0.5	-0.3	-0.5	-1.1
Kansas.....	0.9	-0.2	0.5	-0.2	0.9	-0.4	-0.3
Kentucky.....	-0.1	-0.3	0.3	-0.6	-0.2	-0.9	-1.4
Louisiana.....	-1.5	-0.1	0.5	0.3	(1)	0.1	-0.4
Maine.....	0.3	(1)	-0.7	0.3	0.6	0.2	0.1
Maryland.....	-0.2	-0.4	-0.3	-0.2	-0.1	-1.0	-1.9
Massachusetts.....	1.3	1.2	0.1	0.5	0.5	-0.2	-0.6
Michigan.....	1.1	0.9	1.1	-0.6	-0.5	-0.2	-0.7
Minnesota.....	0.8	(1)	-0.6	-0.1	0.1	(1)	-0.6
Mississippi.....	1.1	-0.7	(1)	0.2	0.1	0.5	0.1
Missouri.....	0.4	1.1	-1.5	0.4	0.7	-0.3	-0.5
Montana.....	2.1	0.6	0.2	1.3	0.8	-0.8	-0.7
Nebraska.....	1.5	1.3	0.7	(1)	-0.2	-0.2	-1.2
Nevada.....	0.4	0.5	-0.6	0.7	0.2	0.8	-0.2
New Hampshire.....	0.8	(1)	-0.3	-0.1	(1)	-0.3	-0.3
New Jersey.....	0.3	-0.1	0.5	(1)	-0.2	(1)	0.5
New Mexico.....	-0.2	0.2	0.5	-0.4	0.2	-0.8	-1.3
New York.....	(1)	(1)	0.6	0.1	0.4	0.1	0.1
North Carolina.....	0.3	-0.3	-0.1	-0.5	0.1	(1)	-0.2
North Dakota.....	2.0	-0.2	-1.4	-1.8	-1.6	-1.0	-2.0
Ohio.....	0.6	0.9	0.4	0.1	-0.2	(1)	-0.2
Oklahoma.....	1.5	0.4	-0.3	0.5	-0.5	-0.1	0.5
Oregon.....	0.7	0.2	-0.4	(1)	0.1	0.2	-0.3
Pennsylvania.....	0.4	(1)	0.2	-0.1	-0.2	(1)	(1)
Rhode Island.....	1.7	0.4	-0.2	0.1	(1)	-0.7	(1)
South Carolina.....	0.3	0.2	0.5	-0.2	-0.1	0.5	-0.3
South Dakota.....	1.4	-0.1	0.8	(1)	-0.1	-0.6	-0.2
Tennessee.....	0.8	-0.2	0.4	0.4	(1)	-0.5	(1)
Texas.....	0.5	(1)	0.1	0.1	0.1	-0.4	-0.8
Utah.....	0.9	-0.2	-0.1	-0.2	0.3	-0.1	0.2
Vermont.....	0.5	0.1	(1)	-0.8	-1.5	-0.7	-1.0
Virginia.....	0.1	0.3	-0.3	0.6	-0.3	-0.2	-0.4
Washington.....	0.1	1.9	0.6	-0.6	-0.4	-0.2	0.3
West Virginia.....	1.0	-0.7	-0.9	1.3	-1.2	0.2	0.1
Wisconsin.....	2.2	0.6	-0.3	0.2	-0.2	(1)	-0.8
Wyoming.....	1.0	0.4	-0.7	-0.4	0.4	1.2	1.9

(1) Less than +/- 0.05 percent

Exhibit 2. Distribution of percent revisions, March 2017 and December 2017 (all values in percent)

Percentiles of Percent Revisions	March 2017	December 2017
20th percentile.....	-0.5	-0.8
40th percentile.....	-0.2	-0.4
60th percentile.....	(1)	-0.1
80th percentile.....	0.3	0.2
100th percentile.....	1.2	1.9

(1) Less than +/- 0.05 percent

Revisions by MSA

For all metropolitan statistical areas (MSAs) published by the CES program, the percentage revisions ranged from -7.1 to 3.3 percent, with an average absolute percentage revision of 0.9 percent across all MSAs for March 2017. (See table 3a.) Comparatively, at the statewide level the range was -1.0 to 1.2 percent, with an average absolute percentage revision of 0.4 percent for March 2017. (See table 1a.) As MSA size decreases so does the sample size, resulting in larger relative standard errors and therefore increasing both the range of percentage revisions and the average absolute percentage revision. Metropolitan areas with 1 million or more employees during March 2017 had an average absolute revision of 0.4 percent, while metropolitan areas with fewer than 100,000 employees had an average absolute revision of 1.1 percent. (See table 3a.)

For December 2017, the percentage revisions ranged from -12.0 to 7.8 percent, with an average absolute percentage revision of 1.2 percent across all published MSAs. (See table 3b.) Comparatively, at the statewide level the range was -2.0 to 1.9 percent, with an average absolute percentage revision of 0.6 percent for December 2017. (See table 1a.) As noted previously, both the range of percentage revisions and the average absolute percentage revision generally increase as the amount of employment in an MSA decreases. Metropolitan areas with 1 million or more employees during December 2017 had an average absolute revision of 0.6 percent, while metropolitan areas with fewer than 100,000 employees had an average absolute revision of 1.5 percent. (See table 3b.)

Table 3a. Benchmark revisions for nonfarm employment in metropolitan areas for March 2017, not seasonally adjusted

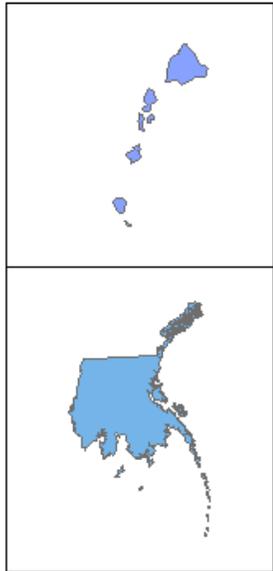
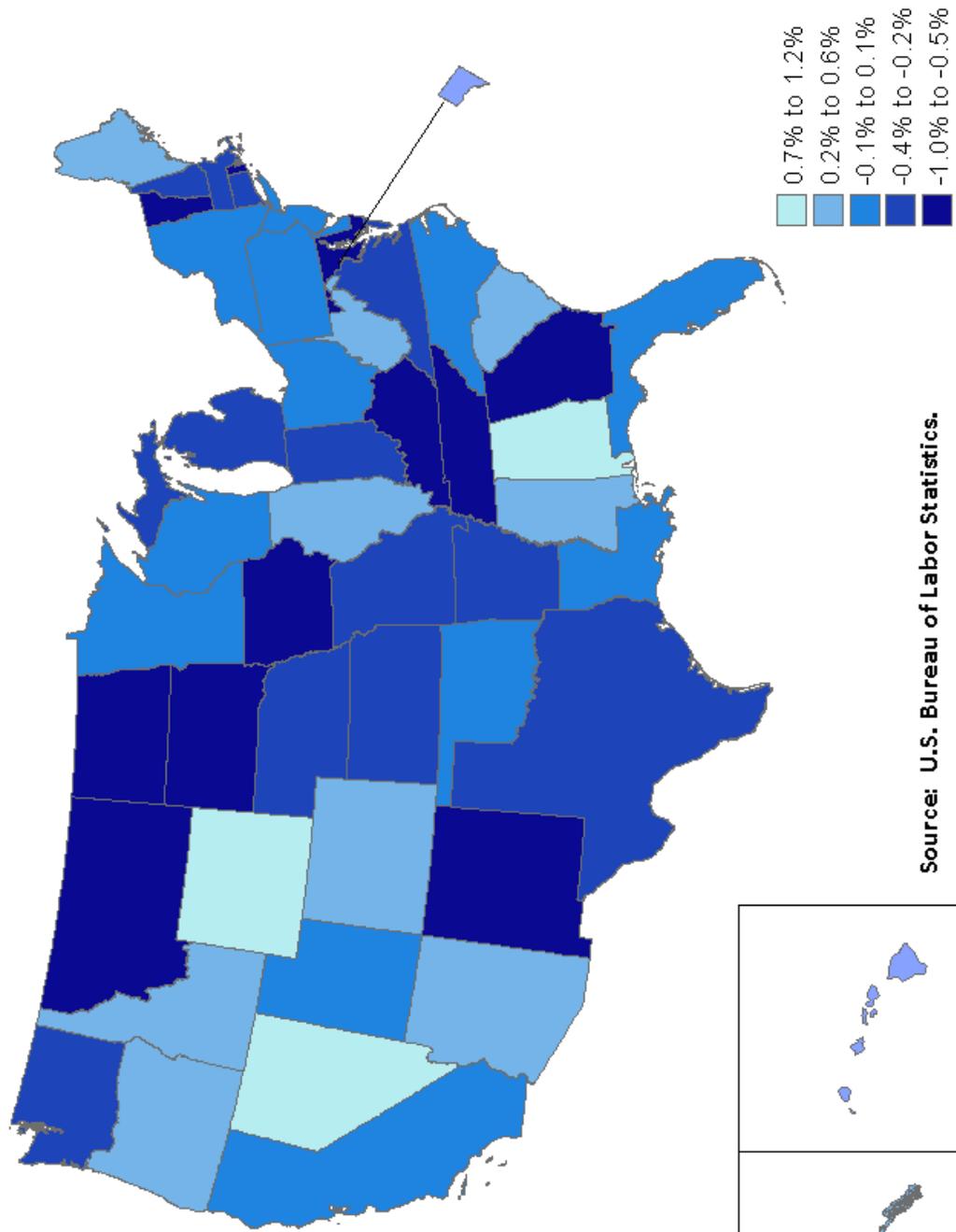
Measure	All MSAs	MSAs grouped by level of total nonfarm employment			
		Less than 100,000	100,000 to 499,999	500,000 to 999,999	1 million or more
Number of MSAs.....	388	186	150	19	33
Average absolute percentage revision.....	0.9	1.1	0.8	0.5	0.4
Range.....	-7.1 to 3.3	-7.1 to 3.3	-2.7 to 2.5	-1.1 to 1.1	-1.3 to 0.8
Mean.....	-0.1	-0.2	-0.1	(1)	-0.1
Standard deviation.....	1.2	1.5	1.0	0.6	0.5

(1) Less than +/- 0.05 percent

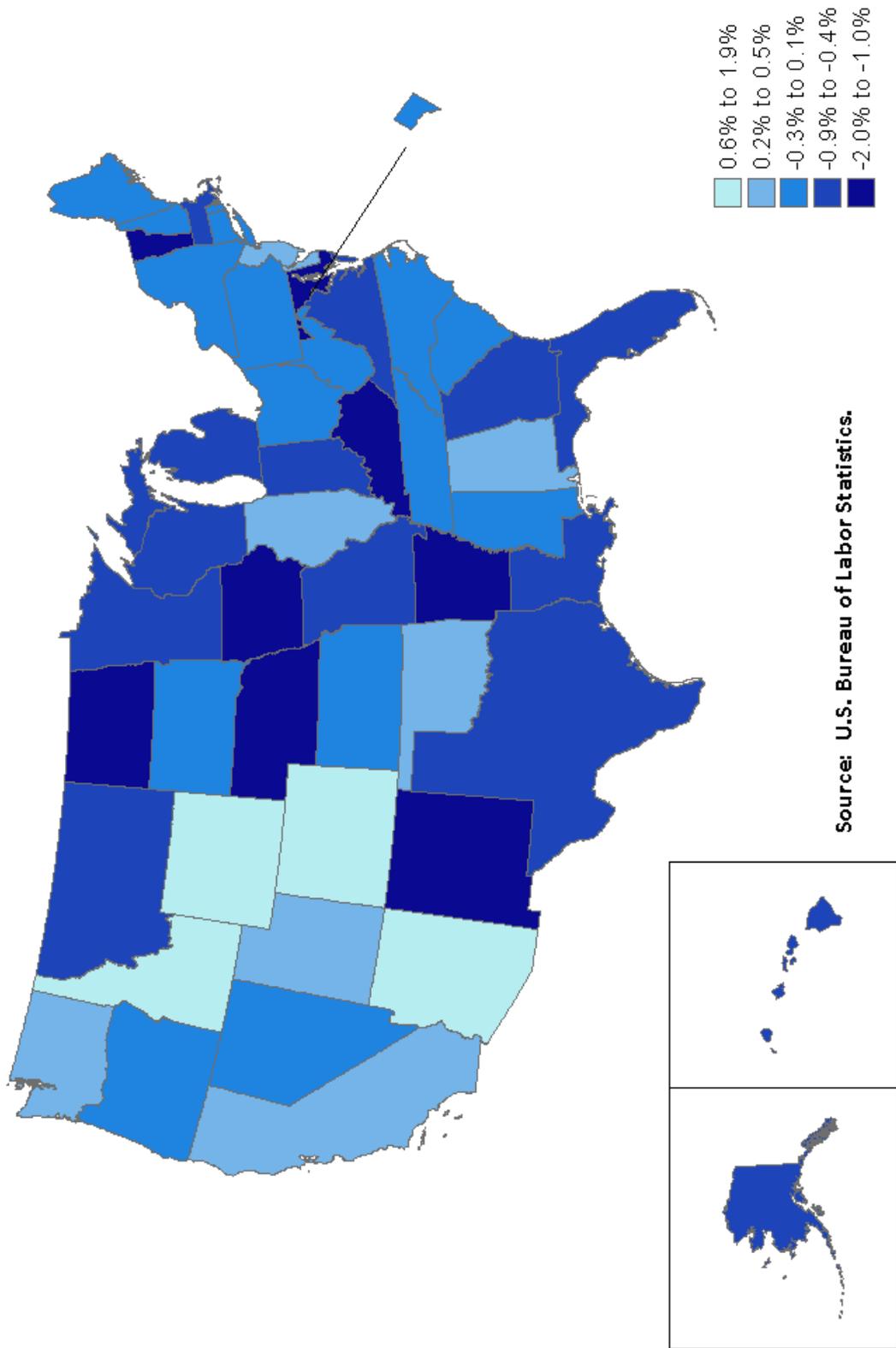
Table 3b. Benchmark revisions for nonfarm employment in metropolitan areas for December 2017, not seasonally adjusted

Measure	All MSAs	MSAs grouped by level of total nonfarm employment			
		Less than 100,000	100,000 to 499,999	500,000 to 999,999	1 million or more
Number of MSAs.....	388	186	150	19	33
Average absolute percentage revision.....	1.2	1.5	1.1	0.7	0.6
Range.....	-12.0 to 7.8	-12.0 to 7.8	-4.3 to 3.2	-1.3 to 1.9	-1.4 to 1.0
Mean.....	-0.3	-0.3	-0.3	0.2	-0.2
Standard deviation.....	1.7	2.2	1.3	0.9	0.6

Map 1. Percent differences between nonfarm payroll employment benchmarks and estimates by State, March 2017



Map 2. Percent differences between nonfarm payroll employment benchmarks and estimates by State, December 2017



Appendix

Table A1. Redelineated areas with CES publication in 2015 published seasonally adjusted beginning in 2018

Area Code	Area Title	Area Code	Area Title
31740	Manhattan, KS	74204	Lawrence-Methuen Town-Salem, MA-NH NECTA Division
37964	Philadelphia, PA Metropolitan Division ¹	78254	Taunton-Middleborough-Norton, MA NECTA Division
41540	Salisbury, MD-DE		

¹ Redelineated and added to BLS published areas

Table A2. New areas added to CES publication in 2015 published seasonally adjusted beginning in 2018

Area Code	Area Title	Area Code	Area Title
10540	Albany, OR	26140	Homosassa Springs, FL
11640	Arecibo, PR	27980	Kahului-Wailuku-Lahaina, HI
13220	Beckley, WV	33220	Midland, MI
14100	Bloomsburg-Berwick, PA	33874	Montgomery County-Bucks County-Chester County, PA
15680	California-Lexington Park, MD	35100	New Bern, NC
16060	Carbondale-Marion, IL	42034	San Rafael, CA
16540	Chambersburg-Waynesboro, PA	42700	Sebring, FL
19300	Daphne-Fairhope-Foley, AL	43420	Sierra Vista-Douglas, AZ
20524	Dutchess County-Putnam County, NY	44420	Staunton-Waynesboro, VA
20700	East Stroudsburg, PA	45540	The Villages, FL
20994	Elgin, IL Metropolitan Division	47460	Walla Walla, WA
23900	Gettysburg, PA	48060	Watertown-Fort Drum, NY
24260	Grand Island, NE	74854	Lynn-Saugus-Marblehead, MA
24420	Grants Pass, OR	93565	Middlesex-Monmouth-Ocean, NJ
25220	Hammond, LA	97962	Delaware County, PA
25940	Hilton Head Island-Bluffton-Beaufort, SC		

Table A3. New area added to CES publication in 2017 not published seasonally adjusted in 2018

Area Code	Area Title
21420	Enid, OK

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Additional information

Historical state and area employment, hours, and earnings data are available on the BLS website at <https://www.bls.gov/sae>. Inquiries for additional information on the methods or estimates derived from the CES survey should be sent by email to sminfo@bls.gov. Assistance and response to inquiries by telephone is available Monday through Friday, during the hours of 8:30 am to 4:30 pm EST by dialing (202) 691-6559.

Previously released CES State and Area benchmark articles are available at <https://www.bls.gov/sae/saebmk.htm>.