

Benchmark Article

BLS Establishment Estimates Revised to Incorporate March 2011 Benchmarks

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Introduction

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With the release of data for January 2012, the Bureau of Labor Statistics (BLS) introduced its annual revision of National estimates of employment, hours, and earnings from the Current Employment Statistics (CES) monthly survey of nonfarm establishments. Each year, the CES survey realigns its sample-based estimates to incorporate universe counts of employment—a process known as

benchmarking. Comprehensive counts of employment, or benchmarks, are derived primarily from unemployment insurance (UI) tax reports that nearly all employers are required to file with State Workforce Agencies.

Summary of the benchmark revisions

The March 2011 benchmark level for Total nonfarm employment is 130,061,000; this figure is 162,000 above the sample-based estimate for March 2011, an adjustment of 0.1 percent. [Table 1](#) shows the total nonfarm percentage benchmark revisions for the past ten years.

Table 1. Percent differences between nonfarm employment benchmarks and estimates by industry supersector, March 2002-2011 ⁽¹⁾

Industry	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total nonfarm	- 0.2	- 0.1	0.2	- 0.1	0.6	-0.2	-0.1	-0.7	-0.3	0.1
(Level difference in thousands)	(-313)	(-122)	(203)	(-158)	(752)	(-293)	(-89)	(-902)	(-378)	(162)
Total private	- .4	- .2	.2	- .2	.7	-.2	-.1	-.9	-.4	0.1
Mining and logging		.9	.7	-.3	1.2	⁽²⁾	.4	-3.5	-3.0	-.4
Construction		-.8	.6	.5	2.6	.1	.7	-2.9	-1.3	-.5
Manufacturing		-1.1	-.4	-.3	-.1	-1.0	-.1	-.7	-1.0	.1
Trade, transportation, and utilities		⁽²⁾	.2	.3	.6	.5	.2	-1.2	-.6	.4
Information		-2.6	-1.0	-2.1	-.5	-1.8	.3	-1.5	-.4	-.4
Financial activities		.2	.1	-.8	.4	-1.3	-.3	-.1	.4	.9
Professional and business services		-.7	-.2	-.4	1.3	.2	-.4	-.8	⁽²⁾	.7
Education and health services		.3	.2	⁽²⁾	.5	-.2	-.1	-.3	⁽²⁾	-.5
Leisure and hospitality		.5	1.2	.4	.3	-.8	-1.1	-.6	-.6	.7
Other services		1.4	.5	-1.3	.5	.3	.2	-.8	.2	-2.0
Government	1.0	.3	.1	⁽²⁾	⁽²⁾	-.2	.2	.1	.1	.1

⁽¹⁾ Differences are based on comparisons of final published March estimates and benchmark levels, as originally published.

⁽²⁾ Less than 0.05 percent.

[Table 2](#) shows the nonfarm employment benchmarks for March 2011, not seasonally adjusted, by industry. The majority of super sectors had upward revisions, with the exception of Mining and logging, Construction, Information, Education and health services, and Other services. The largest upward revision occurred in Professional and business services, 125,000, or 0.7 percent. Within this sector, the revision was concentrated in Temporary help services, which revised by 47,400 or 2.1 percent. Trade, transportation, and utilities had an upward revision of 95,000 or 0.4 percent, driven mostly by Retail trade, which revised upward 83,800 or 0.6 percent. Within Retail trade, there were a series of large offsetting revisions; Warehouse clubs and supercenters revised up 45,200 or 3.9 percent and Discount department stores revised up 39,300 or 4.1 percent, while Family clothing stores revised down -64,200 or -15.3 percent. Leisure and hospitality revised upward by 93,000 or 0.7 percent, with the largest upward revision of 76,000 or 0.8 percent in Food services and drinking places. Financial activities revised upward by 69,000 or 0.9 percent. Government and manufacturing each had upward revisions of 0.1 percent or 28,000 and 9,000 respectively.

Table 2. Nonfarm employment benchmarks by industry, March 2011 (in thousands)

Industry	Benchmark	Estimate	Differences	
			Amount	Percent
Total nonfarm	130,061	129,899	162	0.1
Total private	107,466	107,332	134	0.1
Goods-producing	17,487	17,507	-20	-0.1
Service-providing	112,574	112,392	182	0.2
Private service-providing	89,979	89,825	154	0.2
Mining and logging	741	744	-3	-0.4
Logging	48	47	1	2.1
Mining	693	696	-3	-0.4
Oil and gas extraction	166	166	0	⁽¹⁾
Mining, except oil and gas	204	200	4	2.0

Coal mining	84	84	0	(1)
Support activities for mining	323	331	-8	-2.5
Construction	5,158	5,184	-26	-0.5
Construction of buildings	1,162	1,168	-6	-0.5
Heavy and civil engineering construction	745	757	-12	-1.6
Specialty trade contractors	3,251	3,259	-8	-0.2
Manufacturing	11,588	11,579	9	0.1
Durable goods	7,176	7,187	-11	-0.2
Wood products	334	335	-1	-0.3
Nonmetallic mineral products	355	358	-3	-0.8
Primary metals	380	375	5	1.3
Fabricated metal products	1,321	1,331	-10	-0.8
Machinery	1,037	1,027	10	1.0
Computer and electronic products	1,101	1,118	-17	-1.5
Computer and peripheral equipment	157	170	-13	-8.3
Communications equipment	115	117	-2	-1.7
Semiconductors and electronic components	381	382	-1	-0.3
Electronic instruments	404	403	1	0.2
Electrical equipment and appliances	362	366	-4	-1.1
Transportation equipment	1,368	1,358	10	0.7
Furniture and related products	350	346	4	1.1
Miscellaneous manufacturing	570	572	-2	-0.4
Nondurable goods	4,412	4,392	20	0.5
Food manufacturing	1,432	1,420	12	0.8
Beverages and tobacco products	177	174	3	1.7
Textile mills	120	121	-1	-0.8
Textile product mills	117	116	1	0.9
Apparel	151	155	-4	-2.6
Leather and allied products	29	29	0	(1)
Paper and paper products	388	395	-7	-1.8
Printing and related support activities	474	472	2	0.4
Petroleum and coal products	109	109	0	(1)
Chemicals	782	774	8	1.0
Plastics and rubber products	632	627	5	0.8

Trade, transportation, and utilities	24,600	24,505	95	0.4
Wholesale trade	5,479	5,492	-13	-0.2
Electronic markets and agents and brokers	827	810	17	2.1
Retail trade	14,343	14,260	83	0.6
Motor vehicle and parts dealers	1,659	1,644	15	0.9
Automobile dealers	1,040	1,024	16	1.5
Furniture and home furnishings stores	433	429	4	0.9
Electronics and appliance stores	525	513	12	2.3
Building material and garden supply stores	1,133	1,114	19	1.7
Food and beverage stores	2,783	2,790	-7	-0.3
Health and personal care stores	968	963	5	0.5
Gasoline stations	813	804	9	1.1
Clothing and clothing accessories stores	1,295	1,372	-77	-5.9
Sporting goods, hobby, book, and music stores	563	564	-1	-0.2
General merchandise stores	3,005	2,918	87	2.9
Department stores	1,500	1,455	45	3.0
Miscellaneous store retailers	749	746	3	0.4
Nonstore retailers	419	405	14	3.3
Transportation and warehousing	4,227	4,204	23	0.5
Air transportation	453	472	-19	-4.2
Rail transportation	226	221	5	2.2
Water transportation	61	62	-1	-1.6
Truck transportation	1,265	1,245	20	1.6
Transit and ground passenger transportation	447	455	-8	-1.8
Pipeline transportation	43	43	0	⁽¹⁾
Scenic and sightseeing transportation	22	22	0	⁽¹⁾
Support activities for transportation	555	547	8	1.4
Couriers and messengers	517	514	3	0.6
Warehousing and storage	639	623	16	2.5
Utilities	552	549	3	0.5
Information	2,667	2,679	-12	-0.4
Publishing industries, except Internet	748	755	-7	-0.9
Motion picture and sound recording industries	360	366	-6	-1.7
Broadcasting, except Internet	282	296	-14	-5.0

Telecommunications	883	873	10	1.1
Data processing, hosting, and related services	244	241	3	1.2
Other information services	150	149	1	0.7
Financial activities	7,641	7,572	69	0.9
Finance and insurance	5,750	5,664	86	1.5
Monetary authorities - central bank	19	21	-2	-10.5
Credit intermediation and related activities	2,551	2,535	16	0.6
Depository credit intermediation	1,727	1,742	-15	-0.9
Commercial banking	1,307	1,315	-8	-0.6
Securities, commodity contracts, investments	806	808	-2	-0.2
Insurance carriers and related activities	2,287	2,213	74	3.2
Funds, trusts, and other financial vehicles	86	87	-1	-1.2
Real estate and rental and leasing	1,891	1,908	-17	-0.9
Real estate	1,375	1,375	0	(1)
Rental and leasing services	493	508	-15	-3.0
Lessors of nonfinancial intangible assets	24	26	-2	-8.3
Professional and business services	16,994	16,869	125	0.7
Professional and technical services	7,669	7,614	55	0.7
Legal services	1,110	1,108	2	0.2
Accounting and bookkeeping services	1,014	1,020	-6	-0.6
Architectural and engineering services	1,269	1,273	-4	-0.3
Computer systems design and related services	1,502	1,478	24	1.6
Management and technical consulting services	1,039	1,014	25	2.4
Management of companies and enterprises	1,899	1,869	30	1.6
Administrative and waste services	7,426	7,386	40	0.5
Administrative and support services	7,071	7,032	39	0.6
Employment services	2,821	2,802	19	0.7
Temporary help services	2,205	2,158	47	2.1
Business support services	813	806	7	0.9
Services to buildings and dwellings	1,641	1,634	7	0.4
Waste management and remediation services	355	353	2	0.6
Education and health services	19,891	19,999	-108	-0.5
Educational services	3,368	3,351	17	0.5
Health care and social assistance	16,523	16,648	-125	-0.8

Ambulatory health care services	6,072	6,076	-4	-0.1
Offices of physicians	2,329	2,339	-10	-0.4
Outpatient care centers	616	615	1	0.2
Home health care services	1,124	1,111	13	1.2
Hospitals	4,699	4,721	-22	-0.5
Nursing and residential care facilities	3,151	3,168	-17	-0.5
Nursing care facilities	1,664	1,676	-12	-0.7
Social assistance	2,601	2,684	-83	-3.2
Child day care services	867	879	-12	-1.4
Leisure and hospitality	12,881	12,788	93	0.7
Arts, entertainment, and recreation	1,763	1,749	14	0.8
Performing arts and spectator sports	378	391	-13	-3.4
Museums, historical sites, zoos, and parks	123	122	1	0.8
Amusements, gambling, and recreation	1,262	1,237	25	2.0
Accommodation and food services	11,118	11,039	79	0.7
Accommodation	1,721	1,720	1	0.1
Food services and drinking places	9,396	9,320	76	0.8
Other services	5,305	5,413	-108	-2.0
Repair and maintenance	1,156	1,150	6	0.5
Personal and laundry services	1,273	1,272	1	0.1
Membership associations and organizations	2,876	2,991	-115	-4.0
Government	22,595	22,567	28	0.1
Federal	2,861	2,834	27	0.9
Federal, except U.S. Postal Service	2,225	2,204	21	0.9
U.S. Postal Service	637	630	7	1.1
State government	5,239	5,253	-14	-0.3
State government education	2,528	2,541	-13	-0.5
State government, excluding education	2,712	2,713	-1	⁽¹⁾
Local government	14,495	14,480	15	0.1
Local government education	8,300	8,291	9	0.1
Local government, excluding education	6,194	6,189	5	0.1

⁽¹⁾Less than 0.05 percent.

Five sectors saw negative revisions. The largest downward revision occurred in Other services, -108,000, or -2.0 percent. Within Other services, large percentage downward revisions were seen in Miscellaneous professional and similar organizations, down 42,200 or 28.8 percent, and Grantmaking foundations, down 35,100 or 38.3 percent revision. Education and health services also had a -108,000 or -0.5 percent downward revision, concentrated mostly in Vocational rehabilitation services which had a -81,700 or -24.1 percent revision. Construction revised down 26,000 or 0.5 percent. Smaller revisions were in Information, revising down 12,000 or 0.4 percent, and Mining and logging, revising down 3,000 or 0.4 percent.

Revisions in the post-benchmark period

Post-benchmark period estimates from April 2011 to December 2011 were calculated for each month based on new benchmark levels. Also, beginning in April, model-based estimates for the net birth/death employment were revised to incorporate information from the most recent year of universe employment counts. [Table A](#) shows the net birth/death model figures for the supersectors over the post-benchmark period. From April 2011 to December 2011, the cumulative net birth/death model added 677,000, compared with 600,000 in the previously published April to December estimates.

Text Table A. Net Birth/Death Estimates, Post-Benchmark 2011 (in thousands)

2011	Mining & Logging	Construction	Manufacturing	Trade, Transportation, & Utilities	Information	Financial Activities	Professional & Business Services	Education & Health Services	Leisure & Hospitality	Other Services	Monthly Amount Contributed
April	1	24	-6	5	2	-7	58	16	72	7	172
May	2	37	7	25	4	8	26	18	76	8	211
June	2	22	4	12	1	5	20	-7	77	5	141
July	2	-6	-8	-12	-2	-6	2	4	38	-7	5
August	2	7	4	13	4	2	20	15	19	3	89
September	1	3	0	8	1	-3	-8	12	-38	-2	-26
October	2	2	-2	27	3	14	52	49	-35	4	116
November	0	-16	0	1	2	1	0	4	-21	-1	-30
December	0	-22	0	4	2	9	-1	0	6	1	-1
Cumulative Total	12	51	-1	83	17	23	169	111	194	18	677

Table 3 presents revised total nonfarm employment data on a seasonally adjusted basis for January through December 2011. The revised data for April 2011 forward incorporate the effect of applying the rate of change measured by the sample to the new benchmark level, as well as updated net birth/death model adjustments and new seasonal adjustment factors. Revisions to November and December also reflect incorporation of the annual CES sample update.

Table 3. Differences in seasonally adjusted levels and over-the-month changes, Total nonfarm employment, January 2011-December 2011 (in thousands)

2011	Levels			Over-the-month changes		
	As previously published	As revised	Difference	As previously published	As revised	Difference
January	130,328	130,456	128	68	110	42
February	130,563	130,676	113	235	220	-15
March	130,757	130,922	165	194	246	52
April	130,974	131,173	199	217	251	34
May	131,027	131,227	200	53	54	1
June	131,047	131,311	264	20	84	64
July	131,174	131,407	233	127	96	-31
August	131,278	131,492	214	104	85	-19
September	131,488	131,694	206	210	202	-8
October	131,600	131,806	206	112	112	0
November	131,700	131,963	263	100	157	57
December ^(P)	131,900	132,166	266	200	203	3

^(P)Preliminary

Changes to the CES published series

All CES series are evaluated annually for sample size, coverage, and response rates. The following series changes result from a re-evaluation of the sample and universe coverage for NAICS industries. Some small industries no longer have sufficient sample to be estimated and published separately and have been combined with other similar industries for estimation and publication purposes, as shown below. Most of the collapsed and deleted series are in the Manufacturing sector where employment has been declining over a number of years. Historical data for the series with changed scope were reconstructed to provide consistent time series.

All Employee (AE) series are published at a more detailed level than All Employee Hours and Earnings, Production Employee, Women Employee, or Production Employee Hours and Earnings series, collectively called Non-AE series. The Non-AE series will be sometimes unaffected or affected at a less-detailed level than the AE series. Consequently, tables are provided below for both the AE and Non-AE series.

Exhibit 1. Discontinued Employment Series

NAICS 2007	CES NAICS 2007 Tabcode	CES NAICS 2007 Industry	Next Highest Published Level
333611	31-333611	Turbine and turbine generator set units	Turbine and power transmission equipment (31-333600)
333618	31-333618	Power transmission and miscellaneous engine equipment	Turbine and power transmission equipment (31-333600)
311422	32-311422	Fruit, vegetable, and specialty canning	Fruit and vegetable canning and drying (32-311420)
311423	32-311423	Dried and dehydrated food	Fruit and vegetable canning and drying (32-311420)
3162	32-316200	Footwear	Leather and allied products (32-316000)
325613	32-325613	Polishes and other sanitation goods and other surface active agents	Soaps and cleaning compounds (32-325610)

Exhibit 2. Collapsed Employment Series

NAICS 2007	CES NAICS 2007 Tabcode	CES NAICS 2007 Industry	Collapsed into CES NAICS 2012 Industry
322212	32-322212	Folding paperboard boxes	Folding boxes and miscellaneous paperboard containers (32-322219)
322215	32-322215	Miscellaneous paperboard containers	Folding boxes and miscellaneous paperboard containers (32-322219)

Exhibit 3. Discontinued Non-AE Employment, Hours, and Earnings Series

NAICS 2007	CES NAICS 2007 Tabcode	CES NAICS 2007 Industry	Next Highest Published Level
3311	31-331100	Iron and steel mills and ferroalloy production	Primary metals (31-331000)
3312	31-331200	Steel products from purchased steel	Primary metals (31-331000)
332721	31-332721	Precision turned products	Turned products and screws, nuts, and bolts (31-332720)
332722	31-332722	Bolts, nuts, screws, rivets, and washers	Turned products and screws, nuts, and bolts (31-332720)
33391	31-333910	Pumps and compressors	Other general purpose machinery (31-333900)
33392	31-333920	Material handling equipment	Other general purpose machinery (31-333900)
33399	31-333990	All other general purpose machinery	Other general purpose machinery (31-333900)
334515	31-334515	Electricity and signal testing instruments	Electromedical apparatus (31-334510)
3366	31-336600	Ship and boat building	Transportation equipment (31-336000)
3369	31-336900	Railroad rolling stock and other transportation equipment	Transportation equipment (31-336000)
3152	32-315200	Cut and sew apparel	Apparel (32-315000)
31521	32-315210	Cut and sew apparel contractors	Apparel (32-315000)
3159	32-315900	All other apparel manufacturing	Apparel (32-315000)
3253	32-325300	Agricultural chemicals	Chemicals (32-325000)
3259	32-325900	Other chemical products and preparations	Chemicals (32-325000)
221121	44-221121	Electric bulk power transmission and control	Electric power transmission and distribution (44-221120)

Exhibit 4. Discontinued Women Employment, Hours, and Earnings Series

NAICS 2007	CES NAICS 2007 Tabcode	CES NAICS 2007 Industry	Next Highest Published Level
33611	31-336110	Automobiles and light trucks	Motor vehicles (31-336100)
336111	31-336111	Automobiles	Motor vehicles (31-336100)
336112	31-336112	Light trucks and utility vehicles	Motor vehicles (31-336100)
33612	31-336120	Heavy duty trucks	Motor vehicles (31-336100)

Exhibit 5. Discontinued All Employee and Production Employee Overtime Hours Series

NAICS 2007	CES NAICS 2007 Tabcode	CES NAICS 2007 Industry	Next Highest Published Level
3343	31-334300	Audio and video equipment	Computer and electronic products (31-334000)
3346	31-334600	Magnetic media manufacturing and reproduction	Computer and electronic products (31-334000)
334515	31-334515	Electricity and signal testing instruments	Electromedical apparatus (31-334510)
336411	31-336411	Aircraft	Aerospace products and parts (31-336400)
3369	31-336900	Railroad rolling stock and other transportation equipment	Transportation equipment (31-336000)
312	32-312000	Beverages and tobacco products	Nondurable goods (32-000000)
31321	32-313210	Broadwoven fabric mills	Fabric mills (32-313200)
316	32-316000	Leather and allied products	Nondurable goods (32-000000)

Why benchmarks differ from estimates

A benchmark revision is the difference between the benchmark employment level for a given March and its corresponding sample-based estimate. The overall accuracy of the establishment survey is usually gauged by the size of this difference. The benchmark revision often is regarded as a proxy for total survey error, but this does not take into account error in the universe data. The employment counts obtained from quarterly unemployment insurance tax forms are administrative data that reflect employer record-keeping practices and differing State laws and procedures. The benchmark revision can be more precisely interpreted as the difference between two independently derived employment counts, each subject to its own error sources.

Like all sample surveys, the establishment survey is susceptible to two sources of error: sampling error and nonsampling error.

Sampling error is present any time a sample is used to make inferences about a population. The magnitude of the sampling error, or

variance, relates directly to sample size and the percentage of the universe covered by that sample. The CES monthly survey captures slightly under one-third of the universe, exceptionally high by usual sampling standards. This coverage ensures a small sampling error at the total nonfarm employment level.

Both the universe counts and the establishment survey estimates are subject to nonsampling errors common to all surveys—coverage, response, and processing errors. The error structures for both the CES monthly survey and the UI universe are complex. Still, the two programs generally produce consistent total employment figures, each validating the other. Over the last decade, annual benchmark revisions at the Total nonfarm level have averaged 0.3 percent (in absolute terms), with an absolute range of 0.1 percent to 0.7 percent.

Benchmark revision effects for other data types

The routine benchmarking process results in revisions to the series for production and nonsupervisory workers. There are no benchmark employment levels for these series; they are revised by preserving ratios of employment for the particular data type to all employee employment prior to benchmarking, and then applying these ratios to the revised all employee figures. These figures are calculated at the basic cell level and then aggregated to produce the summary estimates. Average weekly hours and average hourly earnings are not benchmarked; they are estimated solely from reports supplied by survey respondents at the basic estimating cell level.

The aggregate industry level of the hours and earnings series is derived as a weighted average. The production or nonsupervisory employee employment estimates for the basic cells are used as weights for the hours and earnings estimates for broader industry

groupings. Adjustments of the all employee estimates to new benchmarks may alter the weights, which, in turn, may change the estimates for hours and earnings of production or nonsupervisory employees at higher levels of aggregation.

Generally, new employment benchmarks have little effect on hours and earnings estimates for major groupings. To influence the hours and earnings estimates of a broader group, employment revisions have to be relatively large and must affect industries that have hours or earnings averages that are substantially different from those of other industries in their group. [Table 4A](#) and [Table 4B](#) give information on the levels of specific hours and earnings series resulting from the March 2011 benchmark. At the total private level, there was no change in average weekly hours for all employees and production and nonsupervisory employees from the previously published level. Average hourly earnings increased by 1 cent for all employees and 3 cents for production and nonsupervisory employees from the previously published level.

Industry	Average weekly hours			Average hourly earnings		
	As previously published	As revised	Difference	As previously published	As revised	Difference
Total private	34.1	34.1	0.0	\$ 22.92	\$ 22.93	\$ 0.01
Goods-producing	39.6	39.7	.1	24.32	24.31	-.01
Private service-providing	33.0	33.0	.0	22.59	22.61	.02
Mining and logging	43.8	43.8	.0	28.38	28.36	-.02
Construction	37.5	37.5	.0	25.40	25.40	.00
Manufacturing	40.4	40.4	.0	23.59	23.58	-.01
Durable goods	40.8	40.8	.0	25.11	25.10	-.01
Wood products	39.6	39.6	.0	17.34	17.34	.00
Nonmetallic mineral products	39.7	39.7	.0	20.97	20.95	-.02
Primary metals	44.0	44.0	.0	23.18	23.25	.07

Fabricated metal products	40.4	40.4	.0	21.29	21.27	-.02
Machinery	41.7	41.7	.0	24.52	24.51	-.01
Computer and electronic products	39.9	39.9	.0	32.97	32.93	-.04
Electrical equipment and appliances	40.3	40.3	.0	22.68	22.68	.00
Transportation equipment	42.6	42.6	.0	29.13	29.12	-.01
Furniture and related products	39.1	39.1	.0	18.43	18.47	.04
Miscellaneous manufacturing	38.6	38.6	.0	23.61	23.66	.05
Nondurable goods	39.6	39.6	.0	21.03	21.05	.02
Food manufacturing	38.9	38.9	.0	17.50	17.57	.07
Beverages and tobacco products	37.0	37.0	.0	22.80	22.80	.00
Textile mills	40.3	40.3	.0	17.16	17.17	.01
Textile product mills	37.1	37.1	.0	15.27	15.28	.01
Apparel	37.1	37.1	.0	16.27	16.27	.00
Leather and allied products	37.8	37.8	.0	16.87	16.87	.00
Paper and paper products	42.1	42.1	.0	23.12	23.13	.01
Printing and related support activities	36.8	36.8	.0	20.87	20.85	-.02
Petroleum and coal products	42.1	42.0	-.1	33.40	33.31	-.09
Chemicals	41.2	41.2	.0	27.49	27.46	-.03
Plastics and rubber products	41.2	41.2	.0	19.67	19.67	.00
Trade, transportation, and utilities	34.2	34.2	.0	19.90	19.89	-.01
Wholesale trade	38.3	38.3	.0	26.00	26.03	.03
Retail trade	31.1	31.1	.0	15.74	15.75	.01
Transportation and warehousing	38.5	38.6	.1	21.40	21.38	-.02
Utilities	41.8	41.8	.0	33.52	33.52	.00
Information	36.2	36.3	.1	31.71	31.77	.06
Financial activities	36.7	36.8	.1	27.56	27.59	.03
Professional and business services	35.4	35.4	.0	27.54	27.55	.01
Education and health services	32.6	32.6	.0	23.32	23.40	.08
Leisure and hospitality	25.7	25.7	.0	13.25	13.24	-.01
Other services	31.5	31.6	.1	20.44	20.46	.02

Table 4b. Effect of March 2011 benchmark revisions to production employee hours and earnings estimates, selected industries

Industry	Average weekly hours			Average hourly earnings		
	As previously published	As revised	Difference	As previously published	As revised	Difference
Total private	33.3	33.3	0.0	\$ 19.32	\$ 19.35	\$.03
Goods-producing	40.5	40.5	.0	20.48	20.48	.00
Private service-providing	32.1	32.2	.1	19.08	19.12	.04
Mining and logging	45.4	45.3	-.1	24.69	24.68	-.01
Construction	38.1	38.1	.0	23.37	23.38	.01
Manufacturing	41.3	41.3	.0	18.89	18.90	.01
Durable goods	41.8	41.9	.1	20.11	20.12	.01
Wood products	39.7	39.8	.1	14.82	14.82	.00
Nonmetallic mineral products	41.4	41.4	.0	17.84	17.81	-.03
Primary metals	45.1	45.1	.0	19.95	19.99	.04
Fabricated metal products	41.8	41.8	.0	18.08	18.07	-.01
Machinery	43.1	43.1	.0	19.38	19.38	.00
Computer and electronic products	40.3	40.4	.1	23.23	23.23	.00
Electrical equipment and appliances	41.0	41.0	.0	17.99	17.99	.00
Transportation equipment	43.5	43.6	.1	25.48	25.49	.01
Furniture and related products	40.4	40.3	-.1	15.22	15.24	.02
Miscellaneous manufacturing	38.9	38.9	.0	16.91	16.93	.02
Nondurable goods	40.5	40.5	.0	16.97	16.97	.00
Food manufacturing	39.4	39.4	.0	14.52	14.57	.05
Beverages and tobacco products	38.8	38.8	.0	20.58	20.58	.00
Textile mills	40.8	40.7	-.1	13.94	14.00	.06
Textile product mills	39.4	39.4	.0	12.20	12.19	-.01
Apparel	38.6	38.6	.0	11.72	11.71	-.01
Leather and allied products	39.3	39.3	.0	13.35	13.35	.00
Paper and paper products	43.3	43.3	.0	19.95	19.96	.01
Printing and related support activities	37.8	37.8	.0	17.25	17.24	-.01
Petroleum and coal products	41.8	41.8	.0	31.88	31.79	-.09
Chemicals	42.6	42.6	.0	21.38	21.34	-.04
Plastics and rubber products	41.9	41.9	.0	15.85	15.84	-.01

Trade, transportation, and utilities	33.4	33.4	.0	17.05	17.05	.00
Wholesale trade	38.2	38.2	.0	21.67	21.70	.03
Retail trade	30.0	30.1	.1	13.42	13.43	.01
Transportation and warehousing	37.6	37.8	.2	19.28	19.30	.02
Utilities	42.4	42.4	.0	30.83	30.84	.01
Information	36.0	36.0	.0	26.37	26.42	.05
Financial activities	35.8	35.9	.1	21.72	21.79	.07
Professional and business services	34.9	34.9	.0	23.00	23.00	.00
Education and health services	32.0	32.0	.0	20.46	20.55	.09
Leisure and hospitality	24.7	24.7	.0	11.42	11.42	.00
Other services	30.6	30.6	.0	17.22	17.34	.12

Methods

Benchmark adjustment procedure. Establishment survey benchmarking is done on an annual basis to a population derived primarily from the administrative file of employees covered by unemployment insurance (UI). The time required to complete the revision process—from the full collection of the UI population data to publication of the revised industry estimates—is about ten months. The benchmark adjustment procedure replaces the March sample-based employment estimates with UI-based population counts for March. The benchmark therefore determines the final employment levels, while sample movements capture month-to-month trends.

Benchmarks are established for each basic estimating cell and are aggregated to develop published levels. On a not-seasonally adjusted basis, the sample-based estimates for the year preceding and the year following the benchmark also are then subject to revision. Employment estimates for the months between the most recent March benchmark and the previous year's benchmark are adjusted using a "wedge-back" procedure. In this process, the difference between the benchmark level and the previously published

March estimate for each estimating cell is computed. This difference, or error, is linearly distributed across the 11 months of estimates subsequent to the previous benchmark; eleven-twelfths of the March difference is added to February estimates, ten-twelfths to January estimates, and so on, ending with the previous April estimates, which receive one-twelfth of the March difference. The wedge procedure assumes that the total estimation error accumulated at a steady rate since the last benchmark. Applying previously derived over-the-month sample changes to the revised March level yields revised estimates for the months following the March benchmark. New net birth/death model estimates also are calculated and applied during post-benchmark estimation, and new sample is introduced from the annual update.

Benchmark source material. The principal source of benchmark data for private industries is the Quarterly Census of Employment and Wages (QCEW). These employment data are provided to State Employment Security Agencies by employers covered by State UI laws. BLS uses several other sources to establish benchmarks for the remaining industries partially covered or exempt from mandatory UI coverage, accounting for nearly 3 percent of the nonfarm employment total.

Data on employees covered under Social Security laws, published by the U.S. Census Bureau in [County Business Patterns](#), are used to augment UI data for industries not fully covered by the UI scope, such as Nonoffice insurance sales workers, child daycare workers, Religious organizations, and Private schools and hospitals. Benchmarks for State and Local government hospitals and Educational institutions are based on the Annual Census of Governments conducted by the Census Bureau. Benchmark data from these sources are available only on a lagged basis. Extrapolation to a current level is accomplished by applying the employment trends from the UI-

covered part of the population in these industries to the noncovered part. Universe data for interstate railroads are obtained from the Railroad Retirement Board.

Business birth and death estimation. Regular updating of the CES sample frame with information from the UI universe files helps to keep the CES survey current with respect to employment from business births and business deaths. The timeliest UI universe files available, however, always will be a minimum of nine months out of date. The CES survey thus cannot rely on regular frame maintenance alone to provide estimates for business birth and death employment contributions. BLS has researched both sample-based and model-based approaches to measuring birth units that have not yet appeared on the UI universe frame. Since the research demonstrated that sampling for births was not feasible in the very short CES production timeframes, the Bureau is utilizing a model-based approach for this component.

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 is utilizing an estimation procedure with two components. The first component excludes employment losses from business deaths from sample-based estimation in order to offset the missing employment gains from business births. This is incorporated into the sample-based link relative estimate procedure by simply not reflecting sample units going out of business, but imputing to them the same trend as the other firms in the sample. The second component is an ARIMA time series model designed to estimate the residual net birth/death employment not accounted for by the imputation. The historical time series used to create and test the ARIMA model was derived

from the UI universe micro level database, and reflects the actual residual net of births and deaths over the past five years. The net birth/death model component figures are unique to each month and include negative adjustments in some months. Furthermore, these figures exhibit a seasonal pattern similar to the seasonal patterns of the continuing businesses.

Only error from the second component is directly measurable. Error from this component is measured by comparing the actual residual from March 2010-11 — once it becomes available — with the model-based estimate. As [Exhibit 6](#) shows, the actual net birth/death residual for April 2010 to March 2011 was approximately 12,000 below the forecasted amount used in the CES monthly estimates for the time period.

Exhibit 6. Differences between forecasted and actual net birth/death from April 2010 to March 2011 (in thousands)

Benchmark 2011	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Total
Actual Net Birth/Death	106	205	138	55	70	-49	185	-33	-20	-356	72	64	437
Forecast Net Birth/Death	141	192	131	-38	91	-25	71	-32	6	-339	112	117	427
Difference	-35	13	7	93	-21	-24	114	-1	-26	-17	-40	-53	10
Cumulative Difference	-35	-22	-15	78	57	33	147	146	120	103	63	10	

Conversion to the 2012 North American Industry Classification System

Also with the release of the January 2012 estimates, the CES National nonfarm payroll series were updated to the 2012 North American Industry Classification System (NAICS) from the 2007 NAICS basis. The conversion to NAICS 2012 resulted in minor definitional changes within the Construction, Manufacturing, and Retail trade sectors, as well as minor coding changes within the

Utilities and the Leisure and hospitality sectors. Several industry titles and descriptions were also updated. None of the revisions crossed supersector boundaries.

All series were converted to the 2012 NAICS basis prior to annual benchmark processing. In order to avoid time series breaks, all impacted series were reconstructed back to at least 1990. The reconstruction methodology is based on the first quarter 2011 UI microdata, which were coded on both a 2007 NAICS and a 2012 NAICS basis. Ratios were established from this dual coded file; the ratios were used to map employment from the 2007 NAICS series to the 2012 NAICS series. For example, the March 2011 employment ratios for 2007 CES NAICS industry 31-337129 (Miscellaneous household and institutional furniture) indicate that 96.1 percent of the employment will go to 2012 CES NAICS series 31-337127 (Miscellaneous household and institutional furniture) and 3.9 percent to 31-321990 (All other wood products). The 2007 NAICS to 2012 NAICS employment ratios, or distribution of employment from 2007 NAICS to 2012 NAICS, can be seen in [Exhibit 7](#). The 2012 NAICS to 2007 NAICS employment ratios, or the composition of the 2012 NAICS series from 2007 NAICS, can be seen in [Exhibit 8](#).

Exhibit 7. NAICS 2007 to NAICS 2012 All Employee Employment Ratios

CES NAICS 2007		CES NAICS 2012		Ratio
Tabcode	NAICS 2007 Industry	Tabcode	NAICS 2012 Industry	
31-321990	All other wood products	31-321990	All other wood products	100.0
31-337129	Miscellaneous household and institutional furniture	31-321990	All other wood products	3.9
31-332995	Small arms, ammunition, and other ordnance and accessories	31-332994	Small arms, ammunition, and other ordnance and accessories	100.0
31-333513	Metal cutting and forming machine tools	31-333517	Machine tool manufacturing	100.0

31-333518	Miscellaneous metalworking machinery	31-333519	Miscellaneous metalworking machinery	100.0
31-334119	Computer terminals and other computer peripheral equipment	31-334118	Computer terminals and other computer peripheral equipment	100.0
31-336321	Vehicular lighting equipment	31-336320	Motor vehicle electric equipment	100.0
31-336322	Other motor vehicle electric equipment	31-336320	Motor vehicle electric equipment	100.0
31-337129	Miscellaneous household and institutional furniture	31-337127	Miscellaneous household and institutional furniture	96.1
32-311330	Chocolate confectioneries	32-311350	Chocolate and confectionery manufacturing	100.0
32-315290	Women's and all other cut and sew apparel	32-315280	Women's and all other cut and sew apparel	100.0
32-322215	Miscellaneous paperboard containers	32-322219	Folding boxes and miscellaneous paperboard containers	100.0
32-323110	Commercial lithograph printing	32-323117	Commercial printing, except screen	100.0
32-323112	Commercial flexographic printing	32-323117	Commercial printing, except screen	100.0
32-323114	Quick printing	32-323117	Commercial printing, except screen	100.0
32-323119	Miscellaneous commercial printing	32-323117	Commercial printing, except screen	100.0
42-443111	Household appliance stores	42-443141	Household appliance stores	100.0
42-443112	Radio, TV, and other electronics stores	42-443142	Electronics stores	100.0
42-443130	Computer, software, camera, and photography supply stores	42-443142	Electronics stores	100.0
42-451220	Prerecorded tape, CD, and record stores	42-443142	Electronics stores	100.0
42-454311	Heating oil dealers	42-454310	Fuel dealers	100.0
42-454319	Liquefied petroleum gas, bottled gas, and other fuel dealers	42-454310	Fuel dealers	100.0
44-221119	Nuclear and other electric power generation	44-221118	Nuclear and other electric power generation	100.0
70-722100	Full-service restaurants	70-722511	Full-service restaurants	100.0
70-722211	Limited-service restaurants	70-722513	Limited-service restaurants	100.0

70-722212	Cafeterias, grill buffets, and buffets	70-722514	Cafeterias, grill buffets, and buffets	100.0
70-722213	Snack and nonalcoholic beverage bars	70-722515	Snack and nonalcoholic beverage bars	100.0

Exhibit 8. NAICS 2012 to NAICS 2007 All Employee Employment Ratios

CES NAICS 2012		CES NAICS 2007		
Tabcode	NAICS 2012 Industry	Tabcode	NAICS 2007 Industry	Ratio
31-321990	All other wood products	31-321990	All other wood products	97.3
31-321990	All other wood products	31-337129	Miscellaneous household and institutional furniture	2.7
31-332994	Small arms, ammunition, and other ordnance and accessories	31-332995	Small arms, ammunition, and other ordnance accessories	100.0
31-333517	Machine tools	31-333513	Metal cutting and forming machine tools	100.0
31-333519	Miscellaneous metalworking machinery	31-333518	Miscellaneous metalworking machinery	100.0
31-334118	Computer terminals and other computer peripheral equipment	31-334119	Computer terminals and other computer peripheral equipment	100.0
31-336320	Motor vehicle electric equipment	31-336321	Vehicular lighting equipment	22.3
31-336320	Motor vehicle electric equipment	31-336322	Other motor vehicle electric equipment	77.7
31-337127	Miscellaneous household and institutional furniture	31-337129	Miscellaneous household and institutional furniture	100.0
32-311350	Chocolate and confectionery manufacturing	32-311330	Chocolate confectioneries	100.0
32-315280	Women's and all other cut and sew apparel	32-315290	Women's and all other cut and sew apparel	100.0
32-322219	Folding boxes and miscellaneous paperboard containers	32-322215	Miscellaneous paperboard containers	100.0
32-323117	Commercial printing, except screen	32-323110	Commercial lithograph printing	46.2
32-323117	Commercial printing, except screen	32-323112	Commercial flexographic printing	8.4
32-323117	Commercial printing, except screen	32-323114	Quick printing	11.5
32-323117	Commercial printing, except screen	32-323119	Miscellaneous commercial printing	34.0
42-443141	Household appliance stores	42-443111	Household appliance stores	100.0

42-443142	Electronics stores	42-443112	Radio, TV, and other electronics stores	70.8
42-443142	Electronics stores	42-443130	Computer, software, camera, and photography supply stores	25.0
42-443142	Electronics stores	42-451220	Prerecorded tape, CD, and record stores	4.2
42-451200	Book stores and news dealers	42-451210	Book stores and news dealers	100.0
42-454310	Fuel dealers	42-454311	Heating oil dealers	50.2
42-454310	Fuel dealers	42-454319	Liquefied petroleum gas, bottled gas, and other fuel dealers	49.8
44-221118	Nuclear and other electric power generation	44-221119	Nuclear and other electric power generation	100.0
70-722511	Full-service restaurants	70-722100	Full-service restaurants	100.0
70-722513	Limited-service restaurants	70-722211	Limited-service restaurants	100.0
70-722514	Cafeterias, grill buffets, and buffets	70-722212	Cafeterias, grill buffets, and buffets	100.0
70-722515	Snack and nonalcoholic beverage bars	70-722213	Snack and nonalcoholic beverage bars	100.0

The conversion to 2012 NAICS caused several changes to CES published series. [Exhibit 9](#) shows new all employee series as a result of 2012 NAICS. [Exhibit 10](#) shows changes in scope to published all employee series due to the 2012 NAICS reclassification. [Exhibit 11](#) shows discontinued NAICS 2007 series that have been reclassified into 2012 NAICS.

Exhibit 9. New All Employee series as a result of reclassification of 2007 NAICS to 2012 NAICS

NAICS 2007	CES NAICS 2007 Tabcode	CES NAICS 2007 Industry	Reclassification into CES NAICS 2012 Industries
332995	31-332995	Small arms, ammunition, and other ordinance and accessories	Moved into new NAICS 2012 industry Small arms, ammunition, and other ordinance and accessories (31-332994)
333513	31-333513	Metal cutting and forming machine tools	Moved into new NAICS 2012 industry Machine tools (31-333517)

333518	31-333518	Miscellaneous metalworking machinery	Moved into new NAICS 2012 industry Miscellaneous metalworking machinery (31-333519)
334119	31-334119	Computer terminals and other computer peripheral equipment	Moved into new NAICS 2012 industry Computer terminals and other computer peripheral equipment (31-334118)
31133	32-311330	Chocolate confectioneries	Moved into new NAICS 2012 industry Chocolate and confectionery manufacturing (32-311350)
31529	32-315290	Women's and all other cut and sew apparel	Moved into new NAICS 2012 industry Women's and all other cut and sew apparel (32-315280)
322215	32-322215	Miscellaneous paperboard containers	Moved into new NAICS 2012 industry Folding boxes and miscellaneous paperboard containers (32-322219)
323110	32-323110	Commercial lithograph printing	Combined into new NAICS 2012 Commercial printing (except screen) (32-323117)
323112	32-323112	Commercial flexographic printing	Combined into new NAICS 2012 Commercial printing (except screen) (32-323117)
323114	32-323114	Quick printing	Combined into new NAICS 2012 Commercial printing (except screen) (32-323117)
323119	32-323119	Miscellaneous commercial printing	Combined into new NAICS 2012 Commercial printing (except screen) (32-323117)
443111	42-443111	Household appliance stores	Moved into new NAICS 2012 industry Household appliance stores (42-443141)
443112	42-443112	Radio, TV, and other electronics stores	Combined into new NAICS 2012 industry Electronics stores (42-443142)
44313	42-443130	Computer, software, camera, and photography supply stores	Combined into new NAICS 2012 industry Electronics stores (42-443142)
45122	42-451220	Prerecorded tape, CD, and record stores	Combined into new NAICS 2012 industry Electronics stores (42-443142)
221119	44-221119	Nuclear and other electric power generation	Moved into new NAICS 2012 industry Nuclear and other electric power generation (44-221118)
7221	70-722100	Full-service restaurants	Moved into new NAICS 2012 industry Full-service restaurants (70-722511)

722211	70-722211	Limited-service restaurants	Moved into new NAICS 2012 industry Limited-service restaurants (70-722513)
722212	70-722212	Cafeterias, grill buffets, and buffets	Moved into new NAICS 2012 industry Cafeterias, grill buffets, and buffets (70-722514)
722213	70-722213	Snack and nonalcoholic beverage bars	Moved into new NAICS 2012 industry Snack and nonalcoholic beverage bars (70-722515)
7225	70-722500	Restaurants and other eating places	The new NAICS 2012 series Restaurants and other eating places (70-722500) combines Full-service restaurants (70-722100) with Limited-service eating places (70-722200).

Exhibit 10. Change in Scope of All Employee Series Due to 2012 NAICS

NAICS 2012	CES NAICS 2012 Tabcode	CES NAICS 2012 Industry	Reclassified CES NAICS 2007 Industry
32199	31-321990	All other wood products	All other wood products (31-321990) gains a portion of Miscellaneous household and institutional furniture (31-337129)
337127	31-337127	Miscellaneous household and institutional furniture	A portion of Miscellaneous household and institutional furniture (31-337129) was moved to All other wood products (31-321990). The rest is reclassified into new NAICS 2012 industry Miscellaneous household and institutional furniture (31-337127).
323110	32-323110	Printing	The new NAICS 2012 series Printing (32-323110) was originally only Commercial lithograph printing, but now is an aggregate level containing Commercial screen printing (32-323113) and Commercial printing, except screen (32-323117).
4512	42-451200	Book stores and news dealers	A portion of Book, periodical, and music stores (42-451200) that is associated with Pre-recorded tape, CD, and record stores (42-451220) is moved to Electronics stores (42-443142). Book, periodical, and music stores (42-451200) is renamed Book stores and news dealers.

Exhibit 11. Discontinued 2007 NAICS All Employee series

NAICS 2007	CES NAICS 2007 Tabcode	CES NAICS 2007 Industry	Next Highest Published Level
332116	31-332116	Metal Stamping	Forging and stamping (31-332100)
336321	31-336321	Vehicular lighting equipment	Motor vehicle electric equipment (31-336320)
336322	31-336322	Other motor vehicle electric equipment	Motor vehicle electric equipment (31-336320)
323112	32-323112	Commercial flexographic printing	Commercial printing (except screen) (32-323117)
323114	32-323114	Quick printing	Commercial printing (except screen) (32-323117)
323119	32-323119	Miscellaneous commercial printing	Commercial printing (except screen) (32-323117)
443112	42-443112	Radio, TV, and other electronics stores	Electronics stores (42-443142)
44313	42-443130	Computer, software, camera, and photography supply stores	Electronics stores (42-443142)
45121	42-451210	Book stores and news dealers	Book stores and news dealers (42-451200)
454311	42-454311	Heating oil dealers	Fuel dealers (42-454310)
454319	42-454319	Liquefied petroleum gas, bottled gas, and other fuel dealers	Fuel dealers (42-454310)

The CES survey also updated industry titles to reflect similar changes in the 2012 NAICS industry definitions, shown in [Exhibit 12](#). In most cases the scope of each industry is not affected by the title changes, except where the industries are also listed in the "Change in Scope" tables above.

Exhibit 12. Changes to Industry Titles

NAICS 2007	CES NAICS 2007 Tabcode	CES NAICS 2007 Industry	CES NAICS 2012 Industry
333517	31-333517	Metal cutting and forming machine tools	Machine tools
31522	32-315220	Men's cut and sew apparel	Men's and boys' cut and sew apparel
322219	32-322219	Miscellaneous paperboard containers	Folding boxes and miscellaneous paperboard containers

4512	42-451200	Book, periodical, and music stores	Book stores and news dealers
561422	60-561422	Telemarketing bureaus and other contact centers	Telemarketing bureaus
62321	65-623210	Residential mental retardation facilities	Residential intellectual and developmental disability facilities
623312	65-623312	Homes for the elderly	Assisted living facilities for the elderly
71219	70-712190	Historical sites, zoos, botanical gardens, nature parks and similar institution	Historical sites, zoos, botanical gardens, nature parks, and similar institution
7211	70-721100	Traveler accommodation and other longer-term accommodation	Traveler accommodation
72119	70-721190	Miscellaneous traveler accommodation	Other traveler accommodation
8123	80-812300	Dry-cleaning and laundry services	Drycleaning and laundry services
81231	80-812310	Coin-operated laundries and dry cleaners	Coin-operated laundries and drycleaners
81232	80-812320	Dry-cleaning and laundry services, except coin-operated	Drycleaning and laundry services, except coin-operated

Changes to noncovered employment

As part of a review of unemployment insurance tax laws BLS has identified several industries that have noncovered employment that have not been included previously. As such, BLS will now be calculating employment for those industries as well as collecting supplemental information on them from the States. The addition of these industries will add 95,000 jobs to the cumulative noncovered employment level. In order to avoid introducing series breaks, employment level shifts, and extensive historical revisions in the affected industries, the additional jobs were incorporated in the Match 2011 benchmark levels and wedged back using standard benchmark methodology.

Exhibit 13. Industries with Noncovered Employment Introduced with the 2011 Benchmark (in thousands)

NAICS Industry Code	Industry Title	Noncovered Employment
524126	Direct property and casualty insurance carriers	72
524127	Direct title insurance carriers	0
524128	Other direct insurance carriers	5
524130	Reinsurance carriers	0
524210	Insurance agencies and brokerages	11
611410	Business and secretarial schools	0
611420	Computer training	0
611430	Professional and management development training	0
611511	Cosmetology and barber schools	0
611512	Flight training	0
611513	Apprenticeship training	2
611519	Other technical and trade schools	1
611610	Fine arts schools	4

Technical changes to historical data

In addition to the normal benchmark process and revisions due to the conversion to NAICS 2012, the CES survey recalculated historical data for some aggregate series and annual averages for hours and earnings data prior to April 2010.

Aggregate series. In previous years, changes in the industry aggregation structure that resulted from the annual sample adequacy review had not included a reaggregation of the series using consistent aggregation rules. Aggregation procedures are described in the [CES technical notes](#). This year, all aggregate data series were recalculated using standard formulas. This resulted in minor differences to not seasonally adjusted data – no more than 2,000 for employment series, 0.1 for hours series, and \$0.01 for earnings series – primarily related to rounding.

Data for these series prior to 2007 were re-seasonally adjusted. While the re-adjusted series contained considerably more historical data than when originally adjusted, the resulting revisions affected fewer than 2% of employment, 5% of hours, and 8% of earnings data points.

Annual averages. Annual average calculations for hours and earnings data prior to 1990 were calculated using a different formula than has been used for the post 1990 period. The differences in formula resulted in minor differences in the calculated value. With this change, all annual average data will use standardized calculations for the series.

Availability of revised data

LABSTAT, the BLS public database on the Internet, contains all historical employment, hours, and earnings data revised as a result of this benchmark, including both unadjusted and seasonally adjusted data. The data can be accessed at <http://www.bls.gov/ces/>, the Current Employment Statistics homepage.

Small domain model

The CES Small Domain Model (SDM) is used for industries where the sample alone is insufficient for reliable estimates. The CES SDM is a Weighted Least Squares model with two employment inputs: (1) an estimate based on available CES sample for that series, and (2) an ARIMA projection based on 10 years of historical QCEW data. Further background on the SDM is provided in the [CES technical notes](#).

There are six industries estimated by using the SDM. These industries are Lessors of nonfinancial intangible assets, Direct health and medical insurance carriers, Tax preparation services, Other technical consulting services, Remediation services, and Recreational and vacation camps.

Seasonal adjustment procedure

BLS uses X-12 ARIMA software developed by the U.S. Census Bureau to seasonally adjust National employment, hours, and earnings series derived from the CES program. Individual series are seasonally adjusted using either a multiplicative or an additive model ([Exhibit 14](#)), and seasonal adjustment factors are directly applied to the component levels. For employment, individual 3-digit NAICS levels are seasonally adjusted, and higher level aggregates are formed by summing these components. Seasonally adjusted totals for hours and earnings are obtained by taking weighted averages of the seasonally adjusted data for the component series.

Special model adjustments

Variable survey intervals. Beginning with the release of the 1995 benchmark, BLS refined the seasonal adjustment procedures to control for survey interval variations, sometimes referred to as the 4- versus 5-week effect. Although the CES survey is referenced to a consistent concept—the pay period including the 12th of each month—inconsistencies arise because there are sometimes four and sometimes five weeks between the week including the 12th 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, thereby complicating seasonal adjustment.

Standard seasonal adjustment methodology relies heavily on the experience of the most recent three years to determine the expected seasonal change in employment for each month of the current year. Prior to the implementation of the adjustment, the procedure did not distinguish between 4- and 5-week survey intervals, and the accuracy of the seasonal expectation depended in large measure on how well the current year's survey interval corresponded with those of the previous three years. All else the same, the greatest potential for distortion occurred when the current month being estimated had a 5-week interval but the three years preceding it were all 4-week intervals, or conversely when the current month had a 4-week interval but the three years preceding it were all 5-week intervals.

BLS adopted REGARIMA (regression with auto-correlated errors) modeling to identify the estimated size and significance of the calendar effect for each published series. REGARIMA combines standard regression analysis, which measures correlation among two or more variables, with ARIMA modeling, which describes and predicts the behavior of data series based on its own past history. For many economic time series, including nonfarm payroll employment, observations are auto-correlated over time; that is, each month's value is significantly dependent on the observations that precede it. These series, therefore, usually can be successfully fit using ARIMA models. If auto-correlated time series are modeled through regression analysis alone, the measured relationships among other variables of interest may be distorted due to the influence of the auto-correlation. Thus, the REGARIMA technique is appropriate for measuring relationships among variables of interest in series that exhibit auto-correlation, such as Nonfarm payroll employment.

In this application, the correlations of interest are those between employment levels in individual calendar months and the lengths of the survey intervals for those months. The REGARIMA models evaluate the variation in employment levels attributable to eleven separate survey interval variables, one specified for each month, except March. March is excluded because there are almost always four weeks between the February and March surveys. Models for individual basic series are fit with the most recent ten years of data available, the standard time span used for CES seasonal adjustment.

The REGARIMA procedure yields regression coefficients for each of the eleven months specified in the model. These coefficients provide estimates of the strength of the relationship between employment levels and the number of weeks between surveys for the eleven modeled months. The X-12 ARIMA software also produces diagnostic statistics that permit the assessment of the statistical significance of the regression coefficients, and all series are reviewed for model adequacy.

Because the eleven coefficients derived from the REGARIMA models provide an estimate of the magnitude of variation in employment levels associated with the length of the survey interval, these coefficients are used to adjust the CES data to remove the calendar effect. These "filtered" series then are seasonally adjusted using the standard X-12 ARIMA software.

For a few series, REGARIMA models do not fit well; these series are seasonally adjusted with the X-12 software but without the interval effect adjustment. There are several additional special effects modeled through the REGARIMA process; they are described below.

Construction series. Beginning with the 1996 benchmark revision, BLS utilized special treatment to adjust construction industry series. In the application of the interval effect modeling process to the construction series, there initially was difficulty in accurately identifying and measuring the effect because of the strong influence of variable weather patterns on employment movements in the industry. Further research allowed BLS to incorporate interval effect modeling for the construction industry by disaggregating the construction series into its finer industry and geographic estimating cells and tightening outlier designation parameters. This allowed a more precise identification of weather-related outliers that had masked the interval effect and clouded the seasonal adjustment patterns in general. With these outliers removed, interval effect modeling became feasible. The result is a seasonally adjusted series for construction that is improved because it is controlled for two potential distortions: unusual weather events and the 4- versus 5-week effect.

Floating holidays. BLS is continuing the practice of making special adjustments for average weekly hours and average weekly overtime series to account for the presence or absence of religious holidays in the April survey reference period and the occurrence of Labor Day in the September reference period, back to the start date of each series.

Local government series. A special adjustment also is made in November each year to account for variations in employment due to the presence or absence of poll workers in Local government, excluding educational services.

Refinements in hours and earnings seasonal adjustment. With the release of the 1997 benchmark, BLS implemented refinements to the seasonal adjustment process for the hours and earnings series to correct for distortions related to the method of accounting for the

varying length of payroll periods across months. There is a significant correlation between over-the-month changes in both the average weekly hour (AWH) and the average hourly earnings (AHE) series and the number of weekdays in a month, resulting in noneconomic fluctuations in these two series. Both AWH and AHE show more growth in "short" months (20 or 21 weekdays) than in "long" months (22 or 23 weekdays). The effect is stronger for the AWH than for the AHE series.

The calendar effect is traceable to response and processing errors associated with converting payroll and hours information from sample respondents with semi-monthly or monthly pay periods to a weekly equivalent. The response error comes from sample respondents reporting a fixed number of total hours for workers regardless of the length of the reference month, while the CES conversion process assumes that the hours reporting will be variable. A constant level of hours reporting most likely occurs when employees are salaried rather than paid by the hour, as employers are less likely to keep actual detailed hours records for such employees. This causes artificial peaks in the AWH series in shorter months that are reversed in longer months.

The processing error occurs when respondents with salaried workers report hours correctly (vary them according to the length of the month), which dictates that different conversion factors be applied to payroll and hours. The CES processing system uses the hours conversion factor for both fields, resulting in peaks in the AHE series in short months and reversals in long months.

REGARIMA modeling is used to identify, measure, and remove the length-of-pay-period effect for seasonally adjusted average weekly hours and average hourly earnings series. The length-of-pay-period variable proves significant for explaining AWH movements in all the service-providing industries except Utilities. For AHE, the length-of-pay-period variable is significant for

Wholesale trade, Retail trade, Information, Financial activities, Professional and business services, and Other services. All AWH series in the service-providing industries except Utilities have been adjusted from January 1990 forward. The AHE series for Wholesale trade, Retail trade, Information, Financial activities, Professional and business services, and Other services have been adjusted from January 1990 forward as well. For this reason, calculations of over-the-year change in the establishment hours and earnings series should use seasonally adjusted data.

The series to which the length-of-pay-period adjustment is applied are not subject to the 4- versus 5-week adjustment, as the modeling cannot support the number of variables that would be required in the regression equation to make both adjustments.

Seasonal adjustment of all employee hours and earning series

The X-12 ARIMA software requires at least five years of data to adjust for variation due to the calendar effects (4- vs. 5-week, 10- vs. 11-day). Previously, CES had used a special procedure (https://www.bls.gov/ces/ces_aeppsa.pdf) to seasonally adjust these short series with less than five years of history. Now, CES has five full years of history for the new all employee hours and earnings series, allowing it to begin seasonal adjustment of the all employee hours and earnings series to incorporate the special model adjustments described above. This year, CES will replace the entire 70 months of seasonally adjusted all employee hours and earnings data, ensuring all data is adjusted using the same methodology.

Exhibit 14. Model specifications

Seasonal Adjustment – AE				
NAICS Tabcode	Tabcode title	Mode	4/5 week adj	Other adj
1011330000	Logging	MULT	X	
1021100000	Oil and gas extraction	MULT	X	
1021200000	Mining, except oil and gas	-	X	Indirect ¹
1021210000	Coal mining	MULT	X	
1021300000	Support activities for mining	MULT	X	
2023610000	Residential building	-	X	Indirect
2023620000	Nonresidential building	-	X	Indirect
2023700000	Heavy and civil engineering construction	ADD	X	
2023800000	Specialty trade contractors	-	X	Indirect
2023800100	Residential specialty trade contractors	MULT	X	Raked ²
2023800200	Nonresidential specialty trade contractors	ADD	X	Raked
3132100000	Wood products	ADD	X	
3132700000	Nonmetallic mineral products	ADD	X	
3133100000	Primary metals	ADD	X	
3133200000	Fabricated metal products	ADD	X	
3133300000	Machinery	MULT	X	
3133400000	Computer and electronic products	-	X	Indirect
3133410000	Computer and peripheral equipment	MULT	X	
3133420000	Communications equipment	MULT	X	
3133440000	Semiconductors and electronic components	MULT	X	
3133450000	Electronic instruments	MULT	X	
3133500000	Electrical equipment and appliances	MULT	X	
3133600000	Transportation equipment	ADD		
3133600100	Motor vehicles and parts	ADD		
3133700000	Furniture and related products	ADD	X	
3133900000	Miscellaneous manufacturing	MULT	X	
3231100000	Food manufacturing	MULT	X	
3231200000	Beverages and tobacco products	MULT	X	
3231300000	Textile mills	MULT	X	
3231400000	Textile product mills	MULT	X	

3231500000	Apparel	MULT	X	
3231600000	Leather and allied products	ADD	X	
3232200000	Paper and paper products	MULT	X	
3232300000	Printing and related support activities	MULT	X	
3232400000	Petroleum and coal products	ADD	X	
3232500000	Chemicals	MULT	X	
3232600000	Plastics and rubber products	ADD	X	
4142300000	Durable goods	MULT	X	
4142400000	Nondurable goods	MULT	X	
4142500000	Electronic markets and agents and brokers	MULT	X	
4244100000	Motor vehicle and parts dealers	-	X	Indirect
4244110000	Automobile dealers	ADD	X	
4244200000	Furniture and home furnishings stores	MULT	X	
4244300000	Electronics and appliance stores	MULT	X	
4244400000	Building material and garden supply stores	MULT	X	
4244500000	Food and beverage stores	MULT	X	
4244600000	Health and personal care stores	MULT	X	
4244700000	Gasoline stations	MULT	X	
4244800000	Clothing and clothing accessories stores	MULT	X	
4245100000	Sporting goods, hobby, book, and music stores	MULT	X	
4245200000	General merchandise stores	-	X	Indirect
4245210000	Department stores	MULT	X	
4245300000	Miscellaneous store retailers	MULT	X	
4245400000	Nonstore retailers	MULT	X	
4348100000	Air transportation	MULT	X	
4348200000	Rail transportation	MULT	X	
4348300000	Water transportation	ADD	X	
4348400000	Truck transportation	ADD	X	
4348500000	Transit and ground passenger transportation	ADD		
4348600000	Pipeline transportation	MULT	X	
4348700000	Scenic and sightseeing transportation	MULT	X	
4348800000	Support activities for transportation	MULT	X	
4349200000	Couriers and messengers	MULT	X	
4349300000	Warehousing and storage	ADD	X	

4422000000	Utilities	MULT	X	
5051100000	Publishing industries, except Internet	MULT	X	
5051200000	Motion picture and sound recording industries	MULT	X	
5051500000	Broadcasting, except Internet	MULT	X	
5051700000	Telecommunications	MULT	X	
5051800000	Data processing, hosting and related services	MULT	X	
5051900000	Other information services	MULT	X	
5552100000	Monetary authorities - central bank	MULT	X	
5552200000	Credit intermediation and related activities	-	X	Indirect
5552210000	Depository credit intermediation	MULT	X	
5552211000	Commercial banking	MULT	X	
5552300000	Securities, commodity contracts, investments	MULT	X	
5552400000	Insurance carriers and related activities	MULT	X	
5552500000	Funds, trusts, and other financial vehicles	ADD	X	
5553100000	Real estate	MULT	X	
5553200000	Rental and leasing services	ADD	X	
5553300000	Lessors of nonfinancial intangible assets	MULT	X	
6054000000	Professional and technical services	-	X	Indirect
6054110000	Legal services	MULT	X	
6054120000	Accounting and bookkeeping services	ADD	X	
6054130000	Architectural and engineering services	MULT	X	
6054150000	Computer systems design and related services	ADD	X	
6054160000	Management and technical consulting services	MULT	X	
6055000000	Management of companies and enterprises	ADD	X	
6056100000	Administrative and support services	-	X	Indirect
6056130000	Employment services	ADD	X	
6056132000	Temporary help services	ADD	X	
6056140000	Business support services	ADD	X	
6056170000	Services to buildings and dwellings	MULT	X	
6056200000	Waste management and remediation services	ADD	X	
6561000000	Educational services	ADD	X	
6562100000	Ambulatory health care services	-	X	Indirect
6562110000	Offices of physicians	MULT	X	
6562140000	Outpatient care centers	MULT	X	

6562160000	Home health care services	ADD	X	
6562200000	Hospitals	ADD	X	
6562300000	Nursing and residential care facilities	-	X	Indirect
6562310000	Nursing care facilities	MULT	X	
6562400000	Social assistance	-	X	Indirect
6562440000	Child day care services	MULT	X	
7071100000	Performing arts and spectator sports	MULT	X	
7071200000	Museums, historical sites, zoos, and parks	MULT	X	
7071300000	Amusements, gambling, and recreation	MULT	X	
7072100000	Accommodation	MULT	X	
7072200000	Food services and drinking places	MULT	X	
8081100000	Repair and maintenance	MULT	X	
8081200000	Personal and laundry services	MULT	X	
8081300000	Membership associations and organizations	MULT		
9091100000	Federal, except U.S. Postal Service	MULT	X	
9091912000	U.S. Postal Service	MULT	X	
9092161100	State government education	ADD	X	
9092200000	State government, excluding education	MULT	X	
9093161100	Local government education	ADD	X	
9093200000	Local government, excluding education	MULT	X	Election adjustment ³

Seasonal Adjustment – AE AWH

NAICS Tabcode	Tabcode title	Mode	4/5 week adj	10/11 day adj	Easter/Labor Day adj
1000000000	Mining and logging	MULT	X		X
2000000000	Construction	MULT	X		X
3132100000	Wood products	MULT	X		X
3132700000	Nonmetallic mineral products	ADD	X		X
3133100000	Primary metals	MULT	X		X
3133200000	Fabricated metal products	MULT	X		X
3133300000	Machinery	MULT	X		X
3133400000	Computer and electronic products	MULT		X	X
3133500000	Electrical equipment and appliances	MULT	X		X

3133600000	Transportation equipment	MULT	X		X
3133600100	Motor vehicles and parts	ADD	X		X
3133700000	Furniture and related products	MULT	X		X
3133900000	Miscellaneous manufacturing	MULT	X		X
3231100000	Food manufacturing	MULT	X		X
3231200000	Beverages and tobacco products	MULT	X		X
3231300000	Textile mills	MULT	X		X
3231400000	Textile product mills	MULT	X		X
3231500000	Apparel	MULT	X		X
3231600000	Leather and allied products	MULT	X		X
3232200000	Paper and paper products	MULT	X		X
3232300000	Printing and related support activities	MULT	X		X
3232400000	Petroleum and coal products	ADD	X		X
3232500000	Chemicals	MULT	X		
3232600000	Plastics and rubber products	MULT	X		X
4142000000	Wholesale trade	MULT		X	X
4200000000	Retail trade	MULT		X	
4300000000	Transportation and warehousing	MULT		X	X
4422000000	Utilities	MULT	X		
5000000000	Information	MULT		X	
5500000000	Financial activities	MULT		X	
6000000000	Professional and business services	MULT		X	X
6500000000	Education and health services	MULT		X	
7000000000	Leisure and hospitality	MULT		X	
8000000000	Other services	MULT		X	X

Seasonal Adjustment – AE AHE

NAICS Tabcode	Tabcode title	Mode	4/5 week adj	10/11 day adj
1000000000	Mining and logging	ADD	X	
2000000000	Construction	ADD	X	
3100000000	Durable goods	ADD	X	
3200000000	Nondurable goods	ADD	X	
4142000000	Wholesale trade	MULT		X
4200000000	Retail trade	MULT		X

4300000000	Transportation and warehousing	MULT			X
4422000000	Utilities	ADD	X		
5000000000	Information	MULT			X
5500000000	Financial activities	ADD			X
6000000000	Professional and business services	ADD			X
6500000000	Education and health services	ADD	X		
7000000000	Leisure and hospitality	MULT	X		
8000000000	Other services	MULT			X

Seasonal Adjustment – AE AOH

NAICS Tabcode	Tabcode title	Mode	4/5 week adj	10/11 day adj	Easter/Labor Day adj
3100000000	Durable goods	ADD	X		X
3200000000	Nondurable goods	MULT	X		X

Seasonal Adjustment – PE

NAICS Tabcode	Tabcode title	Mode	4/5 week adj	Other adj
1000000000	Mining and logging	MULT	X	
2000000000	Construction	ADD	X	
3132100000	Wood products	ADD	X	
3132700000	Nonmetallic mineral products	ADD	X	
3133100000	Primary metals	ADD	X	
3133200000	Fabricated metal products	ADD	X	
3133300000	Machinery	MULT	X	
3133400000	Computer and electronic products	MULT	X	
3133500000	Electrical equipment and appliances	MULT	X	
3133600000	Transportation equipment	ADD		
3133600100	Motor vehicles and parts	ADD		
3133700000	Furniture and related products	ADD	X	
3133900000	Miscellaneous manufacturing	MULT	X	
3231100000	Food manufacturing	MULT	X	
3231200000	Beverages and tobacco products	MULT	X	
3231300000	Textile mills	MULT	X	
3231400000	Textile product mills	MULT	X	

3231500000	Apparel	MULT	X
3231600000	Leather and allied products	MULT	X
3232200000	Paper and paper products	MULT	X
3232300000	Printing and related support activities	MULT	X
3232400000	Petroleum and coal products	ADD	X
3232500000	Chemicals	MULT	X
3232600000	Plastics and rubber products	ADD	X
4142000000	Wholesale trade	MULT	X
4200000000	Retail trade	MULT	X
4300000000	Transportation and warehousing	ADD	X
4422000000	Utilities	MULT	X
5000000000	Information	MULT	X
5500000000	Financial activities	MULT	X
6000000000	Professional and business services	MULT	X
6500000000	Education and health services	ADD	X
7000000000	Leisure and hospitality	MULT	X
8000000000	Other services	MULT	X

Seasonal Adjustment – PE AWH

NAICS Tabcode	Tabcode title	Mode	4/5 week adj	10/11 day adj	Easter/Labor Day adj
1000000000	Mining and logging	MULT	X		X
2000000000	Construction	ADD	X		X
3132100000	Wood products	MULT	X		X
3132700000	Nonmetallic mineral products	ADD	X		X
3133100000	Primary metals	MULT	X		X
3133200000	Fabricated metal products	MULT	X		X
3133300000	Machinery	ADD	X		X
3133400000	Computer and electronic products	MULT	X		X
3133500000	Electrical equipment and appliances	MULT	X		X
3133600000	Transportation equipment	MULT	X		X
3133600100	Motor vehicles and parts	ADD	X		X
3133700000	Furniture and related products	MULT	X		X
3133900000	Miscellaneous manufacturing	MULT	X		X

3231100000	Food manufacturing	MULT	X		X
3231200000	Beverages and tobacco products	ADD	X		X
3231300000	Textile mills	ADD	X		X
3231400000	Textile product mills	MULT	X		X
3231500000	Apparel	MULT	X		X
3231600000	Leather and allied products	ADD	X		X
3232200000	Paper and paper products	MULT	X		X
3232300000	Printing and related support activities	MULT	X		X
3232400000	Petroleum and coal products	MULT	X		X
3232500000	Chemicals	MULT	X		
3232600000	Plastics and rubber products	MULT	X		X
4142000000	Wholesale trade	MULT		X	X
4200000000	Retail trade	MULT		X	
4300000000	Transportation and warehousing	MULT		X	X
4422000000	Utilities	MULT	X		
5000000000	Information	MULT		X	
5500000000	Financial activities	MULT		X	
6000000000	Professional and business services	MULT		X	X
6500000000	Education and health services	MULT		X	
7000000000	Leisure and hospitality	MULT		X	
8000000000	Other services	MULT		X	X

Seasonal Adjustment – PE AHE

NAICS Tabcode	Tabcode title	Mode	4/5 week adj	10/11 day adj
1000000000	Mining and logging	MULT	X	
2000000000	Construction	MULT	X	
3100000000	Durable goods	MULT	X	
3200000000	Nondurable goods	MULT	X	
4142000000	Wholesale trade	MULT		X
4200000000	Retail trade	MULT		X
4300000000	Transportation and warehousing	MULT		X
4422000000	Utilities	MULT	X	
5000000000	Information	MULT		X
5500000000	Financial activities	MULT		X

6000000000	Professional and business services	MULT			X
6500000000	Education and health services	ADD		X	
7000000000	Leisure and hospitality	ADD		X	
8000000000	Other services	MULT			X

Seasonal Adjustment – PE AOH

NAICS Tabcode	Tabcode title	Mode	4/5 week adj	10/11 day adj	Easter/Labor Day adj
3100000000	Durable goods	MULT	X		X
3200000000	Nondurable goods	ADD	X		X

Seasonal Adjustment – WE

NAICS Tabcode	Tabcode Title	Mode	4/5 week adj	Other adj
1000000000	Mining and logging	MULT	X	
1021000000	Mining	MULT	X	
2000000000	Construction	ADD	X	
3100000000	Durable goods	MULT	X	
3200000000	Nondurable goods	MULT	X	
4142000000	Wholesale trade	MULT	X	
4200000000	Retail trade	MULT	X	
4300000000	Transportation and warehousing	ADD	X	
4422000000	Utilities	MULT	X	
5000000000	Information	MULT	X	
5552000000	Finance and insurance	MULT	X	
5553000000	Real estate and rental and leasing	MULT	X	
6054000000	Professional and technical services	ADD	X	
6055000000	Management of companies and enterprises	ADD	X	
6056000000	Administrative and waste services	ADD	X	
6561000000	Educational services	ADD	X	
6562000000	Health care and social assistance	ADD	X	
7071000000	Arts, entertainment, and recreation	MULT	X	

7072000000	Accommodation and food services	MULT	X	
8000000000	Other services	MULT	X	
9091000000	Federal	MULT	X	
9092000000	State government	ADD	X	
9093000000	Local government	ADD	X	Election adjustment ³

¹ Seasonal adjustment occurs at the lowest available industry level.

² Residential and nonresidential specialty trade estimates are raked to the specialty trade estimates to ensure consistency.

³ Special adjustment for the presence/absence of poll workers in local government.

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