

# Union Membership Byte 2019

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March 2019

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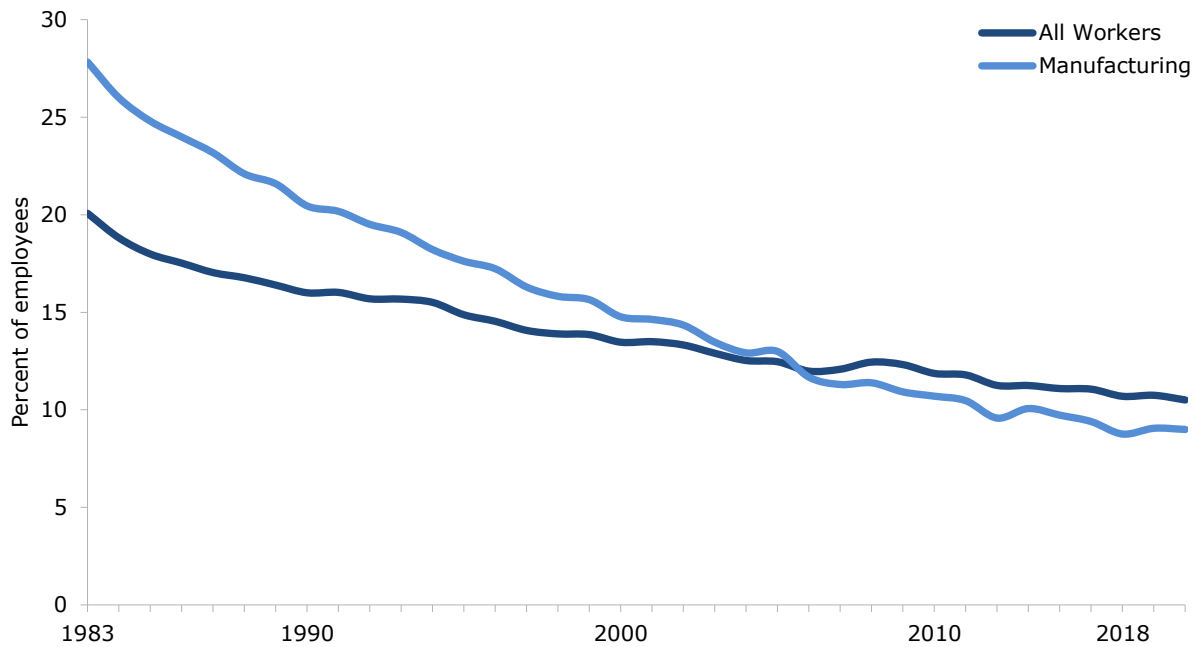
# Acknowledgements

The authors thank Eileen Appelbaum, Alan Barber, Kevin Cashman, Karen Conner, and Adewale Maye for helpful comments.

# Overview

The overall union membership rate declined by 0.2 percentage points between 2017 and 2018 to 10.5 percent of workers (see **Figure 1** and **Table 1**). The union coverage rate, the percent of jobs covered by union and employee association contracts, also dropped 0.2 percentage points to 11.7 percent of the workforce in the United States. The decline reflects an ongoing downward trend of union membership and coverage rates over the last several decades.

**FIGURE 1**  
Union Membership Rate, 1983–2018



Source and notes: CEPR analysis of Current Population Survey Outgoing Rotation Group, 1983–2018.

TABLE 1

## Union Membership and Coverage Rates, 2017–2018

(percent of employees)

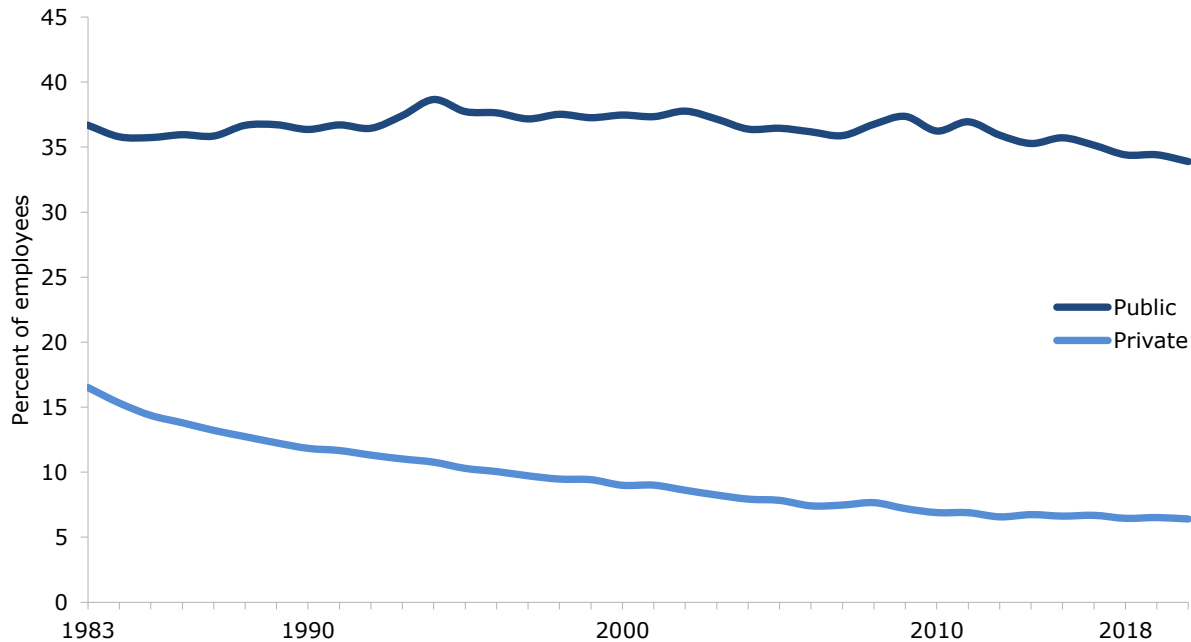
	Membership			Coverage		
	2017	2018	Change (pp.)	2017	2018	Change (pp.)
<i>All</i>	10.7	10.5	-0.2	11.9	11.7	-0.2
<i>Public sector</i>	34.4	33.9	-0.5	37.9	37.2	-0.7
Federal government	26.6	26.4	-0.2	31.0	30.4	-0.6
State government	30.3	28.6	-1.7	33.4	31.8	-1.6
Local government	40.1	40.3	0.2	43.6	43.4	-0.2
<i>Private sector</i>	6.5	6.4	-0.1	7.4	7.2	-0.2
Construction	14.0	12.8	-1.2	14.7	13.8	-0.9
Manufacturing	9.1	9.0	-0.1	10.0	9.7	-0.3
Transportation and utilities	18.3	17.3	-0.9	19.7	18.3	-1.4
Education and health services	8.1	8.1	0.0	9.3	9.3	0.0
<i>Gender</i>						
Women	10.0	9.9	-0.1	11.3	11.1	-0.2
Men	11.4	11.1	-0.3	12.5	12.2	-0.3
<i>Race or ethnicity</i>						
White	10.6	10.4	-0.2	11.8	11.5	-0.3
Black	12.6	12.5	-0.1	14.1	13.8	-0.3
Hispanic	9.3	9.1	-0.2	10.5	10.1	-0.4
Asian	8.9	8.4	-0.5	9.8	9.5	-0.3
<i>Age</i>						
16–24	4.7	4.4	-0.3	5.4	5.2	-0.2
25–34	9.4	9.3	-0.1	10.6	10.4	-0.2
35–44	11.9	11.7	-0.2	13.2	12.9	-0.3
45–54	13.2	12.8	-0.4	14.5	14.1	-0.4
55–64	13.5	13.3	-0.2	14.9	14.7	-0.2
65 and over	9.4	9.3	-0.1	10.4	10.5	0.1
<i>Education*</i>						
Less than high school	5.2	5.4	0.2	5.9	6.1	0.2
High school	10.1	10.0	-0.1	11.1	10.9	-0.3
Some college	10.9	10.5	-0.4	11.9	11.4	-0.5
College	10.3	9.9	-0.3	11.5	11.3	-0.1
Advanced Degree	15.7	15.5	-0.2	17.7	17.5	-0.2
<i>Nativity*</i>						
US-born	11.2	10.9	-0.3	12.4	12.1	-0.3
Foreign-born	8.4	8.5	0.1	9.6	9.6	0.0

Source and notes: Data for all, public, private, gender, race/ethnicity and age, from Bureau of Labor Statistics (2019); \* data for education and nativity from CEPR analysis of Current Population Survey Outgoing Rotation Group, for 2017–2018. Some differences in the third and sixth columns reflect rounding. pp. is percentage points.

Public sector unionization continued its fourth year at either a flat or declining rate, dropping half a percentage point to 33.9 percent in 2018 (Figure 2). While the union membership rate in the public sector had been steady since the early 1980s, the rate has dropped 1.8 percentage points since 2014. In the private sector, the union membership rate remained close to flat, dropping 0.1 percentage points to 6.4 percent of workers. The number of private sector union members also fell by 23,000.

**FIGURE 2**

**Union Membership Rate, Public and Private Sectors, 1983–2018**



Source and notes: CEPR analysis of Current Population Survey Outgoing Rotation Group, 1983–2018.

Federal government saw its membership share fall 0.2 percentage points to 26.4 percent, but experienced a modest gain of 5,000 union members. State government lost 118,000 members (Table 2), and its membership share fell 1.7 percentage points to 28.6 percent. Local government, however, added 64,000 union workers in 2018, increasing its membership share by 0.2 percentage points to 40.3 percent.

Union membership in the private sector increased the most in education and health services (up 55,000) and decreased the most in the construction industry (down 54,000); the latter saw its membership rate drop 1.2 percentage points to 12.8 percent. In manufacturing, the union membership rate stayed relatively constant, with a small drop (down 0.1 percentage points) in the union membership rate and a gain in the number of union workers (up 12,000).

**TABLE 2**

**Union Members and Workers Covered by a Union Contract, 2017–2018**

(thousands of employees)

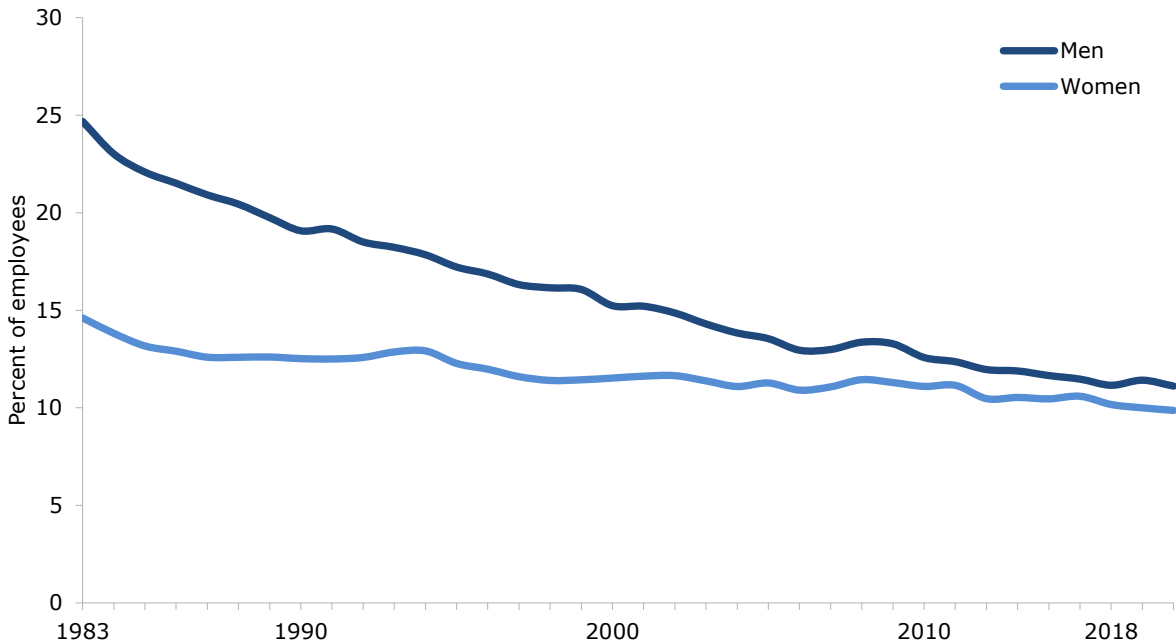
	Membership			Coverage		
	2017	2018	Change	2017	2018	Change
<i>All</i>	14,817	14,744	-73	16,444	16,380	-64
<i>Public sector</i>	7,216	7,167	-49	7,951	7,868	-83
Federal government	972	977	5	1,131	1,128	-3
State government	2,153	2,035	-118	2,371	2,259	-112
Local government	4,091	4,155	64	4,449	4,481	32
<i>Private sector</i>	7,601	7,578	-23	8,494	8,512	18
Construction	1,102	1,048	-54	1,156	1,125	-31
Manufacturing	1,328	1,340	12	1,461	1,444	-17
Transportation and utilities	1,139	1,116	-23	1,125	1,185	60
Education and health services	1,798	1,853	55	2,077	2,144	67
<i>Gender</i>						
Women	6,651	6,662	11	7,514	7,512	-2
Men	8,166	8,082	-84	8,930	8,868	-62
<i>Race or ethnicity</i>						
White	11,358	11,215	-143	12,589	12,471	-118
Black	2,210	2,258	48	2,459	2,487	28
Hispanic	2,201	2,239	38	2,476	2,482	6
Asian	763	758	-5	843	855	12
<i>Age</i>						
16–24	877	823	-54	1,014	966	-48
25–34	3,061	3,084	23	3,426	3,452	26
35–44	3,421	3,445	24	3,806	3,802	-4
45–54	3,771	3,664	-107	4,145	4,029	-116
55–64	3,032	3,041	9	3,329	3,355	26
65 and over	655	687	32	723	777	54
<i>Education*</i>						
Less than high school	520	533	13	587	593	6
High school	3,791	3,778	-13	4,174	4,118	-56
Some college	4,305	4,142	-163	4,713	4,519	-194
College	3,336	3,357	21	3,730	3,833	103
Advanced Degree	2,860	2,930	70	3,233	3,312	79
<i>Nativity*</i>						
US-born	12,861	12,704	-157	14,210	14,073	-137
Foreign-born	1,951	2,036	85	2,227	2,302	75

Source and notes: Data for all, public, private, gender, race/ethnicity and age, from Bureau of Labor Statistics (2019); \* data for education and nativity from CEPR analysis of Current Population Survey Outgoing Rotation Group, for 2017–2018. Some differences in the third and sixth columns reflect rounding.

# Demographic Groups

The gender gap in union membership continued to narrow, following the historical pattern since the early 1980s (Figure 3). The unionization rate for men declined 0.3 percentage points to 11.1 percent (down 84,000 union members), while the rate for women fell 0.1 percentage points to 9.9 percent in 2018 (Table 1). With respect to the number of members, women gained 11,000 union workers, while men lost 84,000 union workers.

**FIGURE 3**  
**Union Membership Rate, by Gender, 1983–2018**



Source and notes: CEPR analysis of Current Population Survey Outgoing Rotation Group, 1983–2018.

Union membership rates declined among all races. Hispanics and whites saw their membership rates shrink by 0.2 percentage points to 9.1 percent and 10.4 percent, respectively. The union membership rate dropped the least for blacks (0.1 percentage points to 12.5 percent) and the most for Asians (0.5 percentage points to 8.4 percent). The number of union members increased for blacks (up 48,000) and Hispanics (up 38,000), but contracted for Asians (down 5,000) and whites (down 143,000) in 2018.

Union membership slumped for all age groups, with large drops in the number of members for young workers ages 16–24 (down 54,000) and workers ages 45–54 (down 107,000). The membership rate fell by 0.3 percentage points to 4.4 percent in the younger group and by 0.4 percentage points to 12.8

percent among those ages 45–54. Older workers ages 55–64 and 65 and older saw some gains in the number of members even though their respective rates declined.

Tables 1 and 2 also show that union membership declined for most workers across educational backgrounds. Workers with less than high school degree were the exception; union membership in this group increased by 0.2 percentage points to a rate of 5.4 percent, with 13,000 more union members in 2018 than in 2017. Workers with undergraduate and advanced degrees saw some decline their union membership rates, but increases in the number of union workers. Union membership decreased the most for those with some college education (down 163,000).

US-born workers have traditionally been more likely than foreign-born workers to be union members, though the gap narrowed in 2018. The rate of union membership among foreign-born workers increased by 0.1 percentage points to 8.5 percent, and the number of union members in this group increased by 85,000. By contrast, native-born workers lost 157,000 union members and saw their membership rate decline by 0.3 percentage points to 10.9 percent.



## Detailed Estimates by Sector

**Tables 3 and 4** show union membership by state and sector. In 2018, the states with the five largest increases in union membership were Washington (up 65,000), Massachusetts (up 63,000), Arizona (up 45,000), Colorado (up 43,000), and Alabama (up 42,000). The states with some of the largest increases in unionization share were Hawaii (up 1.8 percentage points), Alabama (up 1.8 percentage points), Maine (up 1.5 percentage points), and Colorado (up 1.4 percentage points).

The five states with the largest decreases in union membership were New York (down 145,000), California (down 86,000), New Jersey (down 43,000), Illinois (down 41,000), and Michigan (down 33,000). The five states with the largest decreases in unionization rate were Nebraska (down 1.6 percentage points), New York (down 1.5 percentage points), New Jersey (down 1.3 percentage points), Illinois (down 1.2 percentage points), and New Hampshire (down 1.1 percentage points).

In the public sector, the five states that saw the largest increases in union membership were Missouri (up 48,000), Washington (up 34,000), Ohio (up 31,000), Arizona (up 29,000), and Florida (up 27,000). The five states that saw the largest decrease in union membership were California (down 126,000), Texas (down 41,000), Michigan (down 34,000), Virginia (down 32,000), and Connecticut (down 23,000).

The unionization rate in the public sector increased the most in Missouri (up 12.0 percentage points), Oklahoma (up 6.1 percentage points), Hawaii (up 6.0 percentage points), Wisconsin (up 5.5 percentage points), and Minnesota (up 5.4 percentage points). The rate declined the most in Nebraska (down 6.7 percentage points), followed by Indiana (down 5.8 percentage points), New Hampshire (down 5.7 percentage points), Michigan (down 4.8 percentage points), and California (down 4.7 percentage points).

In the private sector, the five states that saw the largest increases in union membership were Massachusetts (up 49,000), California (up about 41,000), Pennsylvania (up about 36,000), Washington (up 31,000), and Colorado (up 27,000). The five states that saw the largest decrease in union membership were New York (down 134,000), Illinois (up 44,000), Wisconsin (up 34,000), Ohio (up 26,000), and New Jersey (up 25,000). The rate at which unionization membership rose or declined in the private sector ranged from a 1.5 percentage point increase (Alabama) to a 1.8 percentage point decrease (New York).

TABLE 3

**Union Membership Rate, By State and Sector, 2017–2018**  
 (percent of employees)

	All			Public Sector			Private Sector		
	2017	2018	Change (pp.)	2017	2018	Change (pp.)	2017	2018	Change (pp.)
Alabama	7.4	9.2	1.8	22.3	24.9	2.7	4.5	6.0	1.5
Alaska	18.1	18.5	0.4	43.6	44.0	0.4	8.7	9.0	0.3
Arizona	4.0	5.3	1.3	16.9	20.4	3.6	1.8	2.4	0.6
Arkansas	5.1	4.8	-0.3	10.7	8.6	-2.0	3.9	4.1	0.1
California	15.5	14.7	-0.8	55.0	50.3	-4.7	8.3	8.4	0.1
Colorado	9.6	11.0	1.4	21.7	24.8	3.1	7.1	8.2	1.1
Connecticut	16.9	16.0	-0.9	66.2	62.6	-3.6	7.8	8.3	0.5
Delaware	10.7	10.3	-0.4	40.6	37.9	-2.7	6.1	5.9	-0.2
D.C.	9.8	9.9	0.1	22.9	21.3	-1.6	5.3	5.9	0.6
Florida	5.6	5.6	0.0	25.5	26.8	1.4	2.7	2.4	-0.3
Georgia	4.0	4.5	0.5	11.8	14.2	2.4	2.5	2.7	0.2
Hawaii	21.3	23.1	1.8	46.6	52.6	6.0	15.2	15.1	-0.1
Idaho	4.8	4.7	-0.1	14.3	16.1	1.8	3.1	2.6	-0.5
Illinois	15.0	13.8	-1.2	51.0	46.4	-4.6	9.8	8.7	-1.1
Indiana	8.9	8.8	-0.1	27.7	21.9	-5.8	6.5	7.0	0.5
Iowa	7.0	7.7	0.7	21.4	21.4	0.0	4.1	5.2	1.1
Kansas	7.8	7.0	-0.8	17.9	17.7	-0.2	5.8	4.9	-0.9
Kentucky	9.6	8.9	-0.7	19.0	21.2	2.2	8.0	6.8	-1.2
Louisiana	4.4	5.0	0.6	12.1	13.6	1.5	2.9	3.1	0.2
Maine	11.4	12.9	1.5	48.2	50.5	2.4	5.1	5.8	0.7
Maryland	10.8	11.0	0.2	28.1	28.7	0.6	4.9	5.8	0.8
Massachusetts	12.4	13.7	1.3	54.5	57.5	3.0	5.9	7.2	1.3
Michigan	15.6	14.5	-1.1	46.7	41.9	-4.8	11.3	11.0	-0.3
Minnesota	15.2	15.0	-0.2	54.0	59.3	5.4	9.3	8.9	-0.4
Mississippi	5.3	5.1	-0.2	13.0	11.9	-1.2	3.5	3.6	0.1
Missouri	8.7	9.4	0.7	15.3	27.3	12.0	7.5	6.4	-1.1
Montana	11.9	11.8	-0.1	34.0	37.5	3.5	5.8	5.7	-0.2
Nebraska	8.2	6.6	-1.6	28.7	22.0	-6.7	4.4	3.7	-0.7
Nevada	12.7	13.9	1.2	33.7	32.9	-0.8	9.7	11.1	1.4
New Hampshire	11.3	10.2	-1.1	48.1	42.4	-5.7	4.6	4.9	0.3
New Jersey	16.2	14.9	-1.3	59.5	59.7	0.1	8.6	7.8	-0.9
New Mexico	6.7	6.8	0.1	16.6	14.5	-2.1	3.6	4.1	0.6
New York	23.8	22.3	-1.5	67.4	66.6	-0.8	15.0	13.2	-1.8
North Carolina	3.4	2.7	-0.7	9.4	6.6	-2.8	2.4	2.0	-0.4
North Dakota	5.1	5.2	0.1	16.2	15.1	-1.1	3.0	3.5	0.5
Ohio	12.5	12.6	0.1	42.9	44.9	2.0	7.9	7.4	-0.5
Oklahoma	5.5	5.7	0.2	14.5	20.6	6.1	3.5	2.4	-1.1
Oregon	14.9	13.9	-1.0	53.1	51.0	-2.1	8.3	7.1	-1.3
Pennsylvania	12.0	12.6	0.6	49.8	53.0	3.2	7.4	8.0	0.6
Rhode Island	16.1	17.4	1.3	63.9	64.4	0.5	8.2	8.8	0.6
South Carolina	2.6	2.7	0.1	7.1	8.7	1.6	1.7	1.6	-0.1
South Dakota	5.4	5.6	0.2	18.9	20.0	1.1	2.5	3.0	0.4
Tennessee	5.7	5.5	-0.2	19.4	17.6	-1.8	3.5	3.2	-0.3
Texas	4.7	4.3	-0.4	16.0	14.0	-1.9	2.7	2.7	0.0
Utah	3.9	4.1	0.2	13.1	13.1	0.0	2.2	2.5	0.3
Vermont	11.0	10.5	-0.5	46.4	42.3	-4.1	4.5	4.7	0.2
Virginia	4.6	4.3	-0.3	12.7	9.2	-3.5	2.5	3.2	0.7
Washington	18.8	19.8	1.0	52.6	51.9	-0.6	12.1	12.9	0.7
West Virginia	11.0	10.0	-1.0	25.4	21.5	-3.9	7.7	7.7	0.1
Wisconsin	8.3	8.1	-0.2	18.9	24.4	5.5	6.7	5.5	-1.2
Wyoming	6.0	6.5	0.5	10.7	13.0	2.3	4.5	4.5	0.0

Source and notes: “All” category from Bureau of Labor Statistics (2019); public and private sector data from CEPR analysis of CPS ORG, 2017-2018. pp. is percentage points.

TABLE 4

## Union Membership, By State and Sector, 2017–2018

(thousands of employees)

	All			Public Sector			Private Sector		
	2017	2018	Change	2017	2018	Change	2017	2018	Change
Alabama	138	180	42	67	83	16	71	98	27
Alaska	55	55	0	36	35	0	19	20	0
Arizona	111	156	45	68	96	29	44	60	16
Arkansas	62	56	-6	23	16	-7	39	40	1
California	2,491	2,405	-86	1,368	1,242	-126	1,121	1,163	41
Colorado	238	281	43	92	108	16	147	173	27
Connecticut	278	268	-10	171	148	-23	108	120	12
Delaware	45	45	0	23	23	0	22	22	0
D.C.	34	35	1	20	20	0	14	15	2
Florida	480	484	4	277	304	27	203	180	-23
Georgia	173	201	28	83	98	15	90	102	12
Hawaii	129	139	10	55	68	13	74	71	-3
Idaho	35	34	-1	16	18	3	19	16	-3
Illinois	827	786	-41	358	360	2	470	426	-44
Indiana	266	269	3	94	82	-12	172	187	15
Iowa	104	113	9	54	49	-5	50	64	14
Kansas	101	90	-11	38	38	-1	62	53	-10
Kentucky	174	161	-13	52	54	2	123	106	-17
Louisiana	78	89	11	36	44	8	42	45	3
Maine	66	74	8	41	46	5	25	28	3
Maryland	299	307	8	195	183	-12	103	124	21
Massachusetts	401	464	63	235	249	13	165	214	49
Michigan	658	625	-33	240	205	-34	420	419	0
Minnesota	411	395	-16	195	190	-5	216	206	-10
Mississippi	59	58	-1	28	25	-3	31	33	2
Missouri	226	251	25	57	104	48	169	147	-22
Montana	50	50	0	30	31	0	19	20	0
Nebraska	70	59	-11	38	31	-7	32	28	-4
Nevada	164	191	27	55	58	3	110	133	23
New Hampshire	72	68	-4	47	39	-8	25	28	3
New Jersey	630	587	-43	342	325	-17	287	263	-25
New Mexico	52	56	4	31	30	0	21	25	4
New York	2,017	1,872	-145	960	952	-8	1,057	922	-134
North Carolina	145	118	-27	58	44	-14	87	73	-13
North Dakota	18	18	0	9	8	-1	9	10	1
Ohio	635	639	4	289	321	31	345	319	-26
Oklahoma	84	90	6	40	58	18	44	32	-12
Oregon	262	242	-20	138	137	0	125	104	-21
Pennsylvania	665	701	36	297	297	-1	367	404	36
Rhode Island	78	83	5	44	47	3	34	36	2
South Carolina	52	55	3	25	28	3	27	27	0
South Dakota	20	22	2	12	12	0	8	10	2
Tennessee	155	155	0	72	78	5	82	76	-6
Texas	543	512	-31	281	240	-41	261	272	11
Utah	54	56	2	29	27	-1	25	28	3
Vermont	32	31	-1	21	19	-2	11	12	1
Virginia	176	168	-8	101	69	-32	75	98	23
Washington	584	649	65	267	302	34	315	346	31
West Virginia	75	68	-7	33	24	-8	42	44	2
Wisconsin	230	219	-11	67	89	22	163	129	-34
Wyoming	15	15	0	7	7	1	8	8	0

Source and notes: “All” category from Bureau of Labor Statistics (2019); public and private sector data from CEPR analysis of CPS ORG, 2017-2018.

**Tables 5 and 6** display union membership by occupation and sector. The major type of occupation with the largest growth in private sector union membership was professional and related occupations (up about 82,000), followed by protective service occupations (up about 19,000). Protective service occupations saw their union membership rate increase by 1.5 percentage points to 9.7 percent.

In the public sector, the major type of occupation with the largest growth in union membership was transportation and material moving occupations (up about 49,000), followed by office and administrative support occupations (up about 20,000). The union membership rate also grew 5.8 percentage points to 40.3 percent in transportation and material moving occupations. Sales and related occupations also saw an increase in union membership rate of 7.1 percentage points to 25.3 percent, followed by the office and administrative support occupations (up 1.1 percentage points to 33.0 percent).

**TABLE 5**

**Union Membership Rate, by Occupation**

(percent of employees)

	2017	2018	Change (pp.)
<i>Public Sector</i>			
Management, business, and financial operations occupations	18.7	18.7	0.0
Professional and related occupations	38.7	37.8	-0.8
Healthcare support occupations	27.3	24.6	-2.7
Protective service occupations	47.1	45.4	-1.8
Food preparation and serving related occupations	20.9	20.4	-0.5
Building and grounds cleaning and maintenance occupations	26.3	27.1	0.9
Personal care and service occupations	21.2	20.5	-0.6
Sales and related occupations	18.2	25.3	7.1
Office and administrative support occupations	31.9	33.0	1.1
Farming, fishing, and forestry occupations	24.4	15.5	-8.9
Construction and extraction occupations	38.3	32.8	-5.5
Installation, maintenance, and repair occupations	42.0	34.4	-7.6
Production occupations	34.1	32.6	-1.4
Transportation and material moving occupations	34.5	40.3	5.8
<i>Private Sector</i>			
Management, business, and financial operations occupations	2.3	2.2	-0.1
Professional and related occupations	6.7	6.7	0.0
Healthcare support occupations	7.1	6.9	-0.2
Protective service occupations	8.3	9.7	1.5
Food preparation and serving related occupations	2.9	3.1	0.1
Building and grounds cleaning and maintenance occupations	6.2	6.2	0.0
Personal care and service occupations	3.5	3.3	-0.2
Sales and related occupations	3.0	3.1	0.1
Office and administrative support occupations	4.2	4.3	0.1
Farming, fishing, and forestry occupations	2.5	2.0	-0.6
Construction and extraction occupations	18.0	16.0	-2.0
Installation, maintenance, and repair occupations	13.1	13.3	0.2
Production occupations	11.6	11.2	-0.4
Transportation and material moving occupations	13.1	12.4	-0.7

Source and notes: CEPR analysis of CPS ORG, 2017–2018. pp. is percentage points.

**TABLE 6****Number of Union Members, by Occupation**

(thousands of employees)

	2017	2018	Change
<i>Public Sector</i>			
Management, business, and financial operations occupations	487	507	20
Professional and related occupations	3,676	3,613	-63
Healthcare support occupations	60	58	-3
Protective service occupations	1,001	982	-19
Food preparation and serving related occupations	84	79	-4
Building and grounds cleaning and maintenance occupations	184	185	1
Personal care and service occupations	130	127	-3
Sales and related occupations	29	40	11
Office and administrative support occupations	902	922	20
Farming, fishing, and forestry occupations	11	5	-6
Construction and extraction occupations	161	140	-20
Installation, maintenance, and repair occupations	162	133	-29
Production occupations	94	92	-2
Transportation and material moving occupations	231	280	49
<i>Private Sector</i>			
Management, business, and financial operations occupations	416	407	-9
Professional and related occupations	1,570	1,652	82
Healthcare support occupations	227	227	0
Protective service occupations	82	101	19
Food preparation and serving related occupations	231	235	4
Building and grounds cleaning and maintenance occupations	257	266	9
Personal care and service occupations	138	130	-8
Sales and related occupations	402	415	12
Office and administrative support occupations	609	614	5
Farming, fishing, and forestry occupations	26	19	-7
Construction and extraction occupations	1,101	1,019	-82
Installation, maintenance, and repair occupations	555	550	-5
Production occupations	912	894	-19
Transportation and material moving occupations	1,073	1,050	-23

Source and notes: CEPR analysis of CPS ORG, 2017–2018.

## References

Bureau of Labor Statistics. 2019. "Union Members — 2018." Washington, D.C.: Bureau of Labor Statistics. <http://www.bls.gov/news.release/pdf/union2.pdf>.