



# The Union Wage Advantage for Low-Wage Workers

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## **About the Author**

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## Executive Summary

Economic data have long demonstrated a substantial wage premium for unionized workers --on the order of 10 to 20 percent-- relative to non-union workers with similar characteristics. This paper uses a straightforward extension of standard statistical techniques to estimate the impact of unionization separately for workers at different wage levels, from the lowest to the highest paid workers.

Using national data for 2003 through 2007, we estimate that unionization raises the wages of the typical low-wage worker (one in the 10th percentile) by 20.6 percent, compared to 13.7 percent for the typical worker (one in the 50th percentile), and 6.1 percent for the typical high-wage worker (one in the 90th percentile).<sup>1</sup> The traditional statistical approach applied to the same data produces an estimate of the average union wage premium of 11.9 percent, which is substantially lower than the union effect on low-wage workers (20.6 percent) and somewhat below the effect for the median-wage worker (13.7 percent).

We also produce separate estimates for each of the 50 states and the District of Columbia. Across states, a similar pattern holds, with unionization raising the wages of the lowest-wage workers most.

## Introduction

Economic data have long demonstrated a substantial wage premium for unionized workers --on the order of 10 to 20 percent-- relative to non-union workers with similar characteristics.<sup>2</sup> The standard techniques for estimating the size of this union wage effect, however, generally have focused on the impact of unions on the *average* worker, with little or no attention on the effects of unionization for workers above or below the average.<sup>3</sup>

As the relative and even absolute circumstances of low-wage workers have deteriorated,<sup>4</sup> the impact of unionization on the bottom half of the wage distribution has taken on particular salience.<sup>5</sup> Is the union effect different for lower-wage workers?

This paper uses a straightforward extension of standard statistical techniques to estimate the impact of unionization on the wages of low-, middle-, and high-wage workers. We find that the union wage premium is substantially higher for low-wage workers than it is for the average worker (and that the union effect is, in turn, higher for middle-wage workers than it is for high-wage workers). Using national data for 2003 through 2007, we estimate that unionization raised the wages of the typical

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1 A 10th percentile worker earns more than 10 percent of all workers, but less than 90 percent of all workers; a 90th percentile worker earns more than 90 percent, but less than 10 percent of all workers. A median or 50th percentile worker is right at the middle of the wage distribution, with half of all workers earning more and half of all workers earning less.

2 See, for example, Freeman and Medoff (1984), Johnson (1984), H. Gregg Lewis (1986), Linneman, Wachter, and Carter (1990), Hirsch and Macpherson (2001), Bratsberg and Ragan (2002), Hirsch, Macpherson, and Schumacher (2004), Hirsch and Schumacher (2004), and Blanchflower and Bryson (2004).

3 For example, all of the papers cited in the preceding footnote estimate the union effect using (sometimes along with other methods), Ordinary Least Squares regressions on individual-level wage data, which gives an estimate of the union-wage premium at the average wage in the sample.

4 For a discussion of long-term problems in the labor market, see Mishel, Bernstein, and Allegretto (2007), especially chapter 3.

5 For a discussion of the impact of unionization on workers in low-wage occupations, including the impact of unionization on health and pension coverage, see Schmitt, Waller, Fremstad, and Zipperer (2007).

low-wage worker (one in the 10th percentile) by 20.6 percent, compared to a 13.7 percent boost for the typical worker (one in the 50th percentile), and 6.1 percent for the typical high-wage worker (one in the 90th percentile).<sup>6</sup> The traditional statistical approach applied to the same data produces an estimate of the average union wage premium of 11.9 percent, which is substantially lower than the union premium for low-wage workers (20.6 percent) and somewhat below the effect for the median-wage worker (13.7 percent).

The paper also reports analogous results for each of the U.S. states, where a broadly similar pattern holds. Lower-wage workers benefit most from unionization. Middle-wage workers typically do better than the "average" worker (the "average" worker earns more than the median worker because very high wage workers pull the average wage up above the median wage). Unionization generally raises the wages of high-wage workers, but high-wage workers see the smallest wage benefits from unionization.

## Data and Methods

Economists have used a variety of techniques to estimate the effect of unions on workers' wages, but by far the most common approach is to use ordinary least squares (OLS) regression to calculate the wage impact of unions at the average wage, holding basic worker characteristics such as gender, race, age or experience, and education constant.<sup>7</sup> This paper, instead, uses quantile regression techniques to estimate the impact of unionization at different points along the entire wage distribution, not just at the average wage. Specifically, this paper estimates the effects of unionization at every decile (the 10th, 20th, 30th percentiles and so on through the 90th percentile).

The simplest way to understand the quantile regression technique used here is to note that the standard OLS approach calculates the union effect (and the effect of other variables included as controls) so as to provide the best statistical fit at the *average* wage. Quantile regression uses an analogous approach to calculate estimates of the union effect (and the effect of other variables included as controls) so as to provide the best statistical fit at any *given point* in the wage distribution, such as the 10th, 50th, or the 90th percentile of the wage distribution.

In OLS, the estimated coefficients provide the best fit of the regression line through the average of the wage distribution (by minimizing the sum of the squared residuals). In quantile regression, the coefficients give the best fit of the regression line through some other point of the wage distribution (by minimizing the sum of the absolute value of the residual). In OLS, the union wage premium gives the effect, at the average wage, of changing a worker's union status. With quantile regressions, the estimated union wage premium is the effect of changing a worker's union status at the corresponding percentile of the wage distribution.<sup>8</sup>

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6 A 10th percentile worker earns more than 10 percent of all workers, but less than 90 percent of all workers; a 90th percentile worker earns more than 90 percent, but less than 10 percent of all workers. A median or 50th percentile worker is right at the middle of the wage distribution, with half of all workers earning more and half of all workers earning less.

7 See footnote 1 for examples of union-wage premium research that uses OLS. For one example of an alternative approach, see Bryson (2002).

8 For a fuller discussion of quantile regression, see Johnston and DiNardo (1997), pp. 444-45, Koenker and Hallock (2001), or Koenker (2005).

The data used here are from the Outgoing Rotation Group (ORG) of the Current Population Survey (CPS), which is a large, nationally representative survey of households conducted every month by the Census Bureau. The CPS includes detailed questions on respondent's demographics and labor-market situation, including age, race, gender, education level, earnings, industry of employment, state of residence, and union status.<sup>9</sup> We classify workers as unionized if they are a member of a union or represented by a union at their place of work.

## Results

**Table 1** presents the results for the country as a whole. The table shows the estimated union wage premium separately for workers at each decile, from low-wage workers (those in the 10th percentile), through the median worker (in the 50th percentile), to high-wage workers (in the 90th percentile). For purposes of comparison, the table also reports the average union wage premium using the standard OLS regression.<sup>10</sup>

**TABLE 1**  
**Union Hourly Wage Premium, 2003-2007 (percent)**

| State         | Union share | Mean | Percentile |      |      |      |      |      |      |      |      |
|---------------|-------------|------|------------|------|------|------|------|------|------|------|------|
|               |             |      | 10th       | 20th | 30th | 40th | 50th | 60th | 70th | 80th | 90th |
| United States | 13.8        | 11.9 | 20.6       | 18.9 | 16.8 | 15.0 | 13.7 | 12.0 | 10.7 | 9.0  | 6.1  |

Notes: CEPR analysis of CPS ORG, 2003-2007. Data are for workers aged 16 to 64. All regressions include controls for age, gender, race, education, and industry and state. All coefficients are statistically significant at at least the 1% level. Union share refers to workers who are either members of or represented by a union, as a share of total employment.

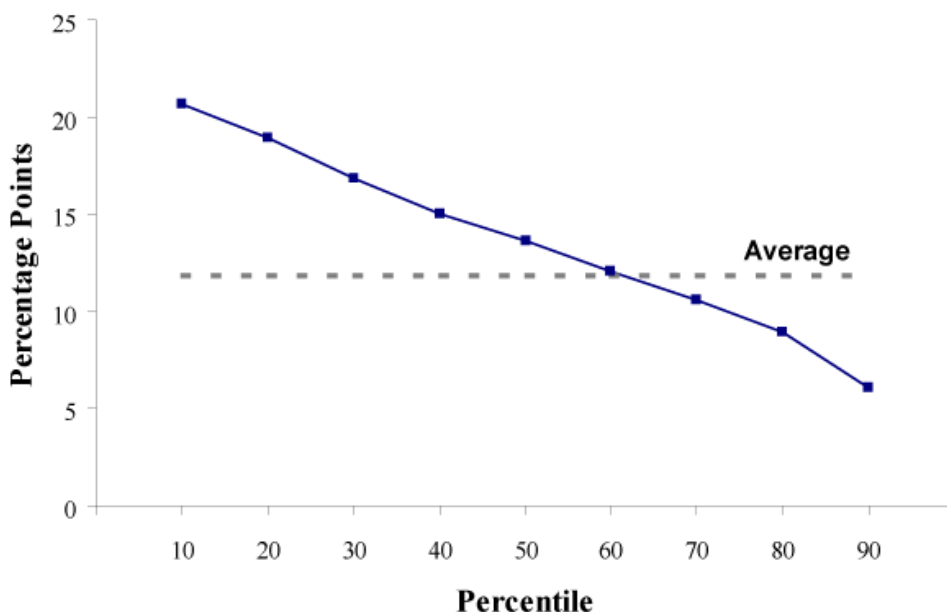
For the period 2003-2007, unionization raised the *average* worker's wage 11.9 percent.<sup>11</sup> The union wage effect, however, was substantially higher for low-wage workers, with a 20.6 percent union wage premium at the 10th percentile, an 18.9 percent premium at the 20th percentile, a 16.9 percent premium at the 30th percentile, and a 15.0 percent premium at the 40th percentile. Even unionized workers at the median (the 50th percentile) --with a 13.7 percent union advantage-- did better than the average (11.9 percent). (The median-wage worker is right in the middle of the wage distribution, but has a wage that is below the average because very high-wage workers pull up the average wage, but have no effect on the median wage.)

<sup>9</sup> The paper uses the CEPR CPS ORG files, which are described in detail and available for download at <http://www.cepr.net>.

<sup>10</sup> All regressions include controls for workers' gender, race (white, black, Hispanic, and other), age (and age-squared), educational attainment (four educational categories), state of residence, industry of employment (51 total industry groups), and year observed in sample.

<sup>11</sup> All national level results are statistically significantly different from zero at the one percent level or better. The average union wage premium in Table 1 (11.9 percent, for 2003-2007) is lower than in Mishel, Bernstein, and Allegretto (2007), Table 3.34 (14.7 percent, for 2005). The estimates here: exclude occupation controls (included in Mishel et al); include state-level controls (Mishel et al use regional controls); and include observations where the Census Bureau has imputed missing wages using a hot-decking procedure (excluded in Mishel et al). Census imputes between 30 and 32 percent of reported wages in each year from 2003 to 2007. As Hirsch and Schumacher (2004) demonstrate, the imputation procedure biases downward standard estimates of the union premium. The estimates here include the imputed wage data in order to maintain sample size for smaller states. If we exclude imputed wages, the national sample size falls from 860,968 to 595,106 and the union wage premium rises from 11.9 percent to 15.7 percent. As a result, the results in Table 1 and 2 are conservative estimates of the true union wage effect.

**FIGURE 1**  
**Union Hourly Wage Premium, 2003-2007**



Source: CEPR analysis of CPS ORG data. See Tables 1 and 2.

The estimated union premium for the 60th percentile worker (12.0 percent) is slightly higher than the estimated effect for the average worker (11.9 percent). The union wage premium remains economically important and statistically significant for higher-waged workers, but the premium is below average and falls steadily at higher wages. The union premium is 10.6 percent at the 70th percentile, 9.0 percent at the 80th percentile, and 6.1 percent at the 90th percentile.

[Figure 1](#) displays the national-level union wage premiums at each of the deciles (with a line through the average level of the premium). As the data in the table suggest, unions benefit lower- and middle-wage workers most. The graph shows a smoothly declining relationship between the estimated union wage effect and a worker's position in the wage distribution. The union wage effect is largest for the lowest-wage workers and smallest for the highest wage workers. About 60 percent of workers can expect a union wage boost that is at least as large as the average effect. Roughly the top 40 percent of workers see a smaller than average increase as a result of unionization. The union effect for the 90th percentile worker (6.1 percent) is about half of the average effect (11.9 percent) and less than one-third of the effect for the 10th percentile worker (20.6 percent).

[Table 2](#) gives results from similar, but separate, regressions for each of the 50 states and the District of Columbia.<sup>12</sup> The smaller state sample sizes in some cases produce a less smooth decline in the estimated union effect as the position in the overall wage distribution rises; and some of the estimated effects, especially at the highest points in the wage distribution are not statistically significantly different from zero. Nevertheless, as with the national-level results, across all the separate states, the union wage premium is typically larger for lower-wage workers than it is for middle-wage workers, and larger for middle-wage workers than it is for workers at the top of the distribution.

<sup>12</sup> The state-level regressions include the same controls (excluding state) as appeared in the national-level regressions. All reported results are statistically significantly different from zero at the five-percent level or better. For sample sizes of all regressions, see the Data Appendix.

**TABLE 2**  
**Union Hourly Wage Premium, 2003-2007 (percent)**

| State          | Union |      | Percentile |      |      |      |      |      |      |      |      |
|----------------|-------|------|------------|------|------|------|------|------|------|------|------|
|                | share | Mean | 10th       | 20th | 30th | 40th | 50th | 60th | 70th | 80th | 90th |
| Alabama        | 10.8  | 8.0  | 21.4       | 16.3 | 13.5 | 11.3 | 8.0  | 5.6  | 4.9  | 4.2  | 1.9  |
| Alaska         | 24.2  | 9.6  | 17.1       | 15.9 | 14.7 | 13.1 | 11.1 | 10.1 | 7.0  | 3.9  | -1.1 |
| Arizona        | 8.4   | 8.7  | 11.0       | 12.5 | 11.3 | 11.6 | 10.9 | 8.0  | 5.6  | 5.1  | 3.1  |
| Arkansas       | 6.1   | 10.3 | 14.6       | 14.6 | 13.7 | 13.2 | 12.5 | 10.2 | 6.1  | 2.5  | 7.2  |
| California     | 17.9  | 13.3 | 16.5       | 18.2 | 17.4 | 17.2 | 15.9 | 14.2 | 12.1 | 9.6  | 6.0  |
| Colorado       | 9.2   | 5.4  | 16.5       | 12.4 | 10.2 | 8.0  | 6.1  | 4.4  | 2.1  | -0.2 | -3.9 |
| Connecticut    | 16.9  | 12.3 | 20.9       | 19.1 | 15.7 | 15.2 | 14.1 | 12.9 | 11.0 | 7.1  | 3.2  |
| D.C.           | 14.1  | 5.7  | 8.9        | 7.7  | 8.6  | 7.9  | 6.2  | 4.0  | 3.2  | 3.4  | 0.4  |
| Delaware       | 12.7  | 10.3 | 11.9       | 15.1 | 13.5 | 11.9 | 10.9 | 10.0 | 8.3  | 6.0  | 4.0  |
| Florida        | 7.5   | 8.3  | 11.2       | 10.7 | 11.8 | 12.1 | 10.7 | 10.6 | 8.0  | 6.2  | 3.7  |
| Georgia        | 6.6   | 9.3  | 13.8       | 11.8 | 9.0  | 10.6 | 9.8  | 7.1  | 6.5  | 8.2  | 5.7  |
| Hawaii         | 25.6  | 8.6  | 13.2       | 15.0 | 14.3 | 12.5 | 11.1 | 8.3  | 7.2  | 4.4  | 1.4  |
| Idaho          | 7.4   | 13.6 | 24.0       | 22.2 | 20.8 | 18.6 | 15.9 | 12.4 | 10.9 | 7.8  | 1.5  |
| Illinois       | 17.5  | 11.4 | 12.9       | 14.7 | 14.9 | 14.4 | 14.6 | 13.4 | 10.8 | 9.1  | 4.1  |
| Indiana        | 13.1  | 12.8 | 14.9       | 13.8 | 14.7 | 15.9 | 14.5 | 13.0 | 10.8 | 9.0  | 8.4  |
| Iowa           | 13.8  | 10.0 | 19.6       | 18.1 | 16.8 | 13.4 | 11.4 | 9.9  | 7.1  | 4.9  | 0.1  |
| Kansas         | 9.9   | 17.1 | 27.2       | 26.5 | 24.8 | 21.1 | 19.4 | 16.3 | 14.8 | 12.4 | 10.3 |
| Kentucky       | 11.7  | 11.1 | 15.7       | 15.2 | 14.6 | 13.5 | 10.9 | 9.6  | 8.2  | 7.3  | 4.4  |
| Louisiana      | 7.7   | 8.5  | 17.0       | 14.5 | 12.9 | 10.8 | 9.7  | 8.4  | 6.5  | 4.2  | 0.5  |
| Maine          | 13.8  | 8.3  | 20.1       | 17.8 | 15.0 | 12.0 | 9.7  | 7.4  | 4.8  | 1.0  | -4.5 |
| Maryland       | 14.8  | 8.1  | 15.1       | 13.1 | 11.9 | 10.7 | 9.6  | 8.3  | 6.0  | 3.4  | -1.2 |
| Massachusetts  | 15.0  | 7.3  | 12.9       | 14.6 | 10.9 | 9.7  | 8.4  | 5.7  | 3.9  | 2.1  | -1.8 |
| Michigan       | 21.8  | 9.7  | 13.9       | 13.1 | 11.3 | 11.1 | 10.6 | 10.0 | 9.4  | 7.1  | 4.1  |
| Minnesota      | 17.5  | 12.2 | 19.8       | 18.5 | 16.0 | 14.2 | 12.4 | 10.5 | 9.4  | 8.0  | 4.1  |
| Mississippi    | 7.9   | 8.8  | 18.1       | 13.5 | 11.2 | 11.6 | 7.9  | 8.0  | 6.2  | 4.9  | -2.0 |
| Missouri       | 13.1  | 14.7 | 19.6       | 20.7 | 19.3 | 16.7 | 15.5 | 14.8 | 14.8 | 12.5 | 9.7  |
| Montana        | 13.9  | 16.5 | 27.1       | 24.6 | 20.5 | 18.2 | 15.7 | 15.6 | 12.4 | 10.7 | 4.9  |
| Nebraska       | 10.0  | 12.4 | 25.5       | 22.2 | 18.2 | 15.5 | 13.3 | 11.8 | 9.2  | 4.8  | 2.5  |
| Nevada         | 16.2  | 12.6 | 19.5       | 17.2 | 16.2 | 15.1 | 14.5 | 13.1 | 10.8 | 9.0  | 6.5  |
| New Hampshire  | 11.4  | 6.9  | 15.4       | 9.5  | 9.0  | 8.9  | 7.4  | 6.0  | 4.6  | 3.0  | 0.4  |
| New Jersey     | 21.4  | 9.8  | 13.8       | 12.1 | 12.9 | 12.7 | 11.7 | 9.0  | 7.9  | 5.2  | 4.4  |
| New Mexico     | 10.6  | 11.0 | 19.7       | 15.4 | 14.7 | 10.6 | 8.9  | 6.5  | 5.4  | 9.5  | 11.0 |
| New York       | 26.4  | 11.9 | 16.3       | 15.6 | 14.8 | 14.5 | 13.7 | 12.3 | 10.1 | 7.0  | 3.3  |
| North Carolina | 3.9   | 9.7  | 13.9       | 11.1 | 11.8 | 12.3 | 12.1 | 10.7 | 7.6  | 5.4  | -0.1 |
| North Dakota   | 8.7   | 13.8 | 22.4       | 20.5 | 19.8 | 19.1 | 17.6 | 14.4 | 13.1 | 10.0 | 5.7  |
| Ohio           | 16.7  | 11.1 | 14.7       | 15.7 | 15.0 | 13.0 | 12.6 | 11.3 | 9.1  | 6.3  | 4.5  |

**TABLE 2** (Continued)

| State          | Union |      | Percentile |      |      |      |      |      |      |      |      |
|----------------|-------|------|------------|------|------|------|------|------|------|------|------|
|                | share | Mean | 10th       | 20th | 30th | 40th | 50th | 60th | 70th | 80th | 90th |
| Oklahoma       | 7.6   | 15.3 | 22.2       | 22.2 | 20.9 | 18.5 | 16.3 | 14.8 | 13.7 | 11.5 | 7.2  |
| Oregon         | 15.9  | 13.2 | 21.1       | 21.3 | 20.2 | 17.6 | 16.5 | 13.4 | 11.4 | 8.9  | 5.8  |
| Pennsylvania   | 15.9  | 8.5  | 12.7       | 13.2 | 11.9 | 11.0 | 10.2 | 9.1  | 6.5  | 4.6  | 1.4  |
| Rhode Island   | 16.7  | 11.5 | 15.4       | 17.3 | 15.7 | 15.8 | 13.5 | 12.4 | 9.6  | 6.8  | 4.5  |
| South Carolina | 4.7   | 11.7 | 11.9       | 14.4 | 12.3 | 9.5  | 10.9 | 10.5 | 12.5 | 9.7  | 6.9  |
| South Dakota   | 7.6   | 14.5 | 27.1       | 21.5 | 19.5 | 15.9 | 14.7 | 13.9 | 9.5  | 8.6  | 4.7  |
| Tennessee      | 7.4   | 13.3 | 17.1       | 20.3 | 18.9 | 18.9 | 17.4 | 16.7 | 12.8 | 7.5  | 2.4  |
| Texas          | 6.2   | 14.0 | 20.5       | 17.4 | 15.7 | 15.4 | 13.5 | 12.5 | 11.6 | 9.4  | 8.3  |
| Utah           | 6.5   | 13.2 | 22.6       | 21.2 | 18.7 | 17.5 | 15.4 | 12.9 | 11.8 | 8.7  | 4.4  |
| Vermont        | 12.5  | 10.4 | 21.3       | 19.4 | 16.2 | 13.9 | 11.0 | 7.8  | 5.1  | 4.3  | -0.4 |
| Virginia       | 6.1   | 13.6 | 16.0       | 19.7 | 15.2 | 14.1 | 14.5 | 12.8 | 10.7 | 8.8  | 7.8  |
| Washington     | 20.9  | 10.1 | 18.2       | 17.7 | 13.9 | 13.4 | 12.0 | 9.5  | 7.3  | 6.6  | 3.7  |
| West Virginia  | 15.4  | 11.1 | 15.8       | 15.4 | 13.8 | 11.7 | 11.5 | 9.9  | 7.2  | 7.3  | 3.1  |
| Wisconsin      | 16.7  | 12.6 | 20.7       | 18.4 | 15.9 | 14.0 | 12.1 | 11.3 | 10.4 | 10.8 | 9.5  |
| Wyoming        | 9.9   | 16.6 | 26.2       | 23.4 | 20.1 | 20.7 | 18.1 | 14.6 | 12.9 | 12.3 | 8.4  |

Notes: CEPR analysis of CPS ORG, 2003-2007. Data are for workers aged 16 to 64. All coefficients are statistically significant at at least the 5% level, except highlighted coefficients. Union share refers to workers who are either members of or represented by a union, as a share of total employment.

## Conclusion

The most recently available wage data --consistent with a large body of economic research-- show a strong effect of unionization on the wage of the average worker. On average, a worker who is a member of a union or represented by a union earns about 11.9 percent more than a comparable worker who is not unionized. The statistical analysis here, however, also demonstrates that the union effect is substantially larger for workers at the bottom of the income distribution than it is for the average worker. Unionization, for example, raises the wage of a typical low-wage worker (one in the 10th percentile of the wage distribution) about 20.6 percent. Meanwhile, unions have an important, but smaller impact on higher-wage workers. For a high-wage worker (one in the 90th percentile of the wage distribution), unionization increases wages about 6.1 percent, less than one third of the impact for the typical low-wage worker.



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## Appendix

The results presented in [Tables 1](#) and [2](#) were calculated using Stata's `sqreg` command, with bootstrapped standard errors based on 50 iterations of each regression. For a detailed discussion of quantile regression, see Kroenker (2005).

**APPENDIX TABLE**  
**Sample Sizes for Regressions in Tables 1 and 2 (percent)**

| State         | Sample size | State                | Sample size    |
|---------------|-------------|----------------------|----------------|
| Alabama       | 10,089      | Montana              | 8,452          |
| Alaska        | 11,854      | Nebraska             | 14,445         |
| Arizona       | 11,299      | Nevada               | 15,022         |
| Arkansas      | 8,752       | New Hampshire        | 18,505         |
| California    | 62,541      | New Jersey           | 19,791         |
| Colorado      | 18,823      | New Mexico           | 8,404          |
| Connecticut   | 18,024      | New York             | 37,405         |
| DC            | 10,440      | North Carolina       | 17,402         |
| Delaware      | 13,147      | North Dakota         | 11,882         |
| Florida       | 34,004      | Ohio                 | 26,013         |
| Georgia       | 15,940      | Oklahoma             | 9,731          |
| Hawaii        | 12,205      | Oregon               | 11,766         |
| Idaho         | 10,036      | Pennsylvania         | 28,744         |
| Illinois      | 28,500      | Rhode Island         | 15,700         |
| Indiana       | 15,042      | South Carolina       | 10,647         |
| Iowa          | 16,728      | South Dakota         | 13,820         |
| Kansas        | 13,865      | Tennessee            | 11,068         |
| Kentucky      | 11,621      | Texas                | 39,708         |
| Louisiana     | 7,810       | Utah                 | 12,154         |
| Maine         | 15,695      | Vermont              | 13,195         |
| Maryland      | 18,535      | Virginia             | 17,676         |
| Massachusetts | 14,832      | Washington           | 15,381         |
| Michigan      | 22,207      | West Virginia        | 9,858          |
| Minnesota     | 20,733      | Wisconsin            | 18,007         |
| Mississippi   | 7,433       | Wyoming              | 11,588         |
| Missouri      | 14,449      | <b>United States</b> | <b>860,968</b> |

Notes: CEPR analysis of CPS ORG, 2003-2007. Data are for workers aged 16 to 64.