
Changes in Unionization Rates: A Decomposition Analysis

This chapter reports fairly standard algebraic techniques for decomposing changes in unionization rates into two parts. The first, generally termed the “between-industries” (or “between-regions”) component, measures the part of the total decrease in the unionization rate attributable to decreases in the share of unionized workers employed in more unionized compared with less unionized industries (or regions), holding unionization rates within each industry (or region) constant.

The second component, the “within-industries” (or “within-regions”) effect, measures the part of the decline in the unionization rate associated with decreases in rates of unionization within the industries (or regions), holding the shares of unionized workers employed in each industry (or region) constant. A finding that the decline in the share of workers who are unionized is associated mainly with changes in the percentage distribution of union workers across industries or regions (the between-industries or -regions component) would tend to rule out an economywide unfavorable shift in the attitude of most employers and employees toward unions or an unfavorable change in government policies toward unions as being the key factors accounting for deunionization. Instead, such factors as uneven technological change among industries (or regions) and shifts in the pattern of spending across industries (or regions) by domestic and foreign consumers would more likely be the main causes of deunionization.

Industry Effects on the National Rate of Unionization

The national share of workers who are unionized can be usefully expressed as the sum across all industries of the share of workers in each industry who are unionized multiplied by each industry's share of all employed workers. Letting U_i be the number of unionized workers in any industry i (where the number of industries runs from $i = 1$ to $i = n$), ΣU_i be the sum of unionized workers (U_i) across all i industries, L_i be the total number of workers (unionized plus nonunionized) in industry i , and ΣL_i be the sum of union plus nonunion workers across all industries, this can be expressed as the equation

$$\Sigma U_i / \Sigma L_i = \Sigma (U_i / L_i * L_i / \Sigma L_i) \quad (3.1)$$

Denoting U_i / L_i as u_i and $L_i / \Sigma L_i$ as l_i , this can, in turn, be expressed more simply as

$$\Sigma s_i = \Sigma (u_i l_i) \quad (3.2)$$

where Σs_i is the sum across industries of each industry's fraction of unionized workers to all union plus nonunionized workers in the economy (the national unionization rate) and $\Sigma (u_i l_i)$ is the sum across all industries of each industry's unionization rate multiplied by its employment share of the national labor force.

Expressing the national unionization rate in this manner brings out clearly that this rate is affected both by the relative importance of the industry's workers (unionized plus nonunionized) in the national labor force and by each industry's own unionization rate. Changes over time in each industry's ratio of unionized workers to all workers rate can be approximated as

$$\Delta s_i = \underbrace{\Delta u_i l_i}_{\text{\{Within-industries component\}}} + \underbrace{\Delta l_i u_i}_{\text{\{Between-industries component\}}} \quad (3.3)$$

where $\Delta u_i l_i$ measures the effect of a change in industry i 's own unionization rate on Δs_i , holding its share of the labor force constant (this is termed the within-industries component of the change in the left-hand-side variable) and $\Delta l_i u_i$ measures the effect of a change in the proportion of all workers employed in industry i (Δl_i) on the change in the industry's ratio of union workers to all workers in the economy (Δs_i), holding the unionization rate in the industry (u_i) constant (this is generally called the between-industries component of the change in the left-hand-side variable). Summing these terms over all industries yields the estimated national change in the proportion of all workers who are unionized.

Richard Freeman (1988) reports that studies of the 1960s through 1970 involving statistical exercises decomposing the change in the national unionization rate into these two components attribute 50–70 percent of the decline in private-sector unionization to the between-industries component, whereas analyses for the mid-1970s to mid-1980s find that less than half of the unionization decline can be assigned to this factor (Dickens and Leonard 1985). Henry Farber and Alan Krueger (1992) conclude from an analysis of the 1977–91 period¹ that only about 25 percent of the overall decline in the unionization rate can be accounted for by the between-industries component.²

Table 3.1 shows the results of the decomposition exercise during the 1977–87 and 1987–97 periods for the 137 industries included in the database.³ As is indicated in the first column of the table, out of the –7.5-percentage-point change (a 30 percent decrease) in the unionization rate for all industries during the 1977–87 decade, 5.5 percentage points (about 73 percent of the total decline) is attributable to within-industries decreases in unionization rates, whereas 2.0 percentage points (about 27 percent of the decline) are due to changes in industry shares of total employment away from more highly unionized industries and toward less unionized industries. In the 1987–97 period, not only was the 3.7-percentage-point decline in the national unionization rate less than in the earlier decade, but between-industries shifts in union employment contributed only 11.1 percent to the overall percentage-point decline in the national unionization rate.

1. Farber and Krueger use regression analysis to determine the relative importance of structural changes in accounting for the total change in unionization and also include a broader set of structural variables.

2. Three points are especially important to stress with regard to this kind of standard decomposition analysis. The first is that it is purely an accounting exercise. Any economic implications drawn from the results must be based on prior theoretical reasoning concerning the nature of the underlying causes of changes in the variables.

The second point to emphasize is that the results are quite sensitive to the number of industries included in the analysis. For example, if the whole economy is treated as a single industry, all of the change in the national unionization rate would be attributable to the within-industries component, because the proportion of all workers employed in the single industry would always be 1 and therefore Δl_i would be zero. The third point is that there are a number of different ways of decomposing changes into between-industries and within-industries components. An important difference is whether one uses the initial values of the variables, e.g., their values in an earlier year, and the changes in these variables to their subsequent values, e.g., a latter year, or whether one begins with the end-period values and uses the changes in these values to their earlier levels.

There is no mathematical or economic reason why one approach should be preferred to the other, and yet—unless the changes are very small—the relative magnitudes of the two components can vary appreciably. The approach followed here is to undertake the decomposition in both ways and report the average of the two methods in order to minimize the bias associated with each method.

3. See appendix B for the list of industries.

Table 3.1 Estimated changes in unionization rates due to within-industries shifts in unionization rates and between-industries shifts in employment, 1977–87 and 1987–97 (percentage-point change and percent share)

Contribution	All industries		Primary products		Manufacturing		Services	
	Point change	Share	Point change	Share	Point change	Share	Point change	Share
1977–87								
Total change ^a	-7.5	100	-8.6	100	-13.2	100	-4.6	100
Within-industries contribution ^b	-5.5	73.3	-10.0	114.9	-11.7	88.5	-3.0	65.2
Between-industries contribution ^c	-2.0	26.7	1.3	-14.9	-1.5	11.4	-1.6	34.8
1987–97								
Total change ^a	-3.7	100	-2.0	100	-7.2	100	-2.9	100
Within-industries contribution ^b	-3.2	89.9	-2.2	104.8	-7.4	104.2	-2.4	85.7
Between-industries contribution ^c	-0.4	11.1	0.1	-4.8	0.3	-4.2	-0.4	14.3

a. Because of rounding, the sums of the within-industries and between-industries percentage-point changes, on which the percent shares are based, may not add up exactly to the total percentage-point changes, which are calculated from table 2.1.

b. The effect, summed across all the industries making up an industry group, of a change in an industry's own unionization rate on the change in the industry's proportion of union workers to all workers in the industry group, holding the industry's share of all the workers in the industry constant.

c. The effect, summed across all the industries making up an industry group, of a change in an industry's share of all workers in the industry group on the change in the industry's proportion of union workers in the industry group, holding the industry's unionization rate constant.

Source: Author's calculations.

The next three pairs of columns in table 3.1 show this breakdown for broad groups of industries. Interestingly, changes in the distribution of industry employment (the between-industries component) in the primary-products and construction group (7 industries) had a positive effect on the overall unionization rate in both periods, largely because the two main gainers in employment shares, landscape and horticultural services and construction, were more highly unionized than the main market-share loser, agricultural products. The between-industries component was negative for both the manufacturing (74 industries) and the services group (56 industries) between 1977 and 1987, accounting for about 11 percent of the decline in the share of unionized workers in manufacturing and about 35

percent of the overall decline in services, as more highly unionized sectors lost employment shares to less-unionized industries. The decomposition results for the following decade indicate that the significant decline in deunionization attributable to within-industries declines in unionization rates held for all three sectors. Between-industries employment shifts in the primary-product and manufacturing sectors had the effect during the 1987–97 period of increasing the overall unionization rate in these sectors, but for services the between-industries component was negative.

The main conclusion to be drawn from table 3.1 is that, consistent with the more recent studies of labor economists, the declines in the rate of unionization in the US economy as a whole and in broad subgroupings of industries are mainly the result of decreases in unionization rates within industries rather than shifts in the distribution of employment from industries with high to low unionization rates. Moreover, the relative importance of between-industries employment shifts in bringing about deunionization seems to have decreased significantly. One implication of this finding is that broad antiunion attitudes and policies on the part of employers and the government cannot be ruled out as the major factor accounting for deunionization.⁴

Industry Effects on Regional Unionization Rates in Manufacturing

People often suspect that deunionization has been aggravated by shifts from the North to the South (and the West) in the United States, just as they also suspect the influence of declines in manufacturing employment. Table 3.2 presents the results of decomposing the changes in manufacturing unionization rates⁵ (comparably detailed data for nonmanufacturing were not available) in each of nine regions in the United States analyzed

4. As is explained more fully in the next chapter, one can draw only limited conclusions about which factors are most important in accounting for deunionization, because most of the possible economic factors tend to affect both the between-industries and within-industries components.

5. The industry breakdown within the manufacturing sector consists of the 20 industries making up the Commerce Department's 2-digit 1987 Standard Industrial Classification (SIC) system: (1) food and kindred products; (2) tobacco products; (3) textile mill products; (4) apparel and other textile products; (5) lumber and wood products; (6) furniture and fixtures; (7) paper and allied products; (8) printing and publishing; (9) chemicals and allied products; (10) petroleum and coal products; (11) rubber and miscellaneous plastics; (12) leather and leather products; (13) stone, glass, and clay products; (14) primary metal industries; (15) fabricated metal products; (16) industrial machinery and equipment; (17) electronic and other electric equipment; (18) transportation equipment; (19) instruments and related products; and (20) miscellaneous manufacturing products. Unionization rates for the services sector are not available on a regional basis.

Table 3.2 Estimated percent distribution of changes in regional unionization rates in manufacturing due to within-industries and between-industries shifts in employment, 1977–87 and 1987–97
(percentage-point change and percent share)

Region ^a	1977–87			1987–97		
	Point change in unionization rate	Share due to within-industries component ^b	Share due to between-industries component ^b	Point change in unionization rate	Share due to within-industries component ^b	Share due to between-industries component ^c
1	-11.0	97.3	2.7	-5.8	93.0	7.0
2	-16.9	87.9	12.1	-5.4	102.9	-2.9
3	-16.8	84.6	15.4	-8.9	95.0	5.0
4	-8.2	106.9	-6.9	-3.5	116.2	-16.2
5	-16.3	94.5	5.5	-10.0	94.7	5.3
6	-9.7	100.5	-0.5	-5.6	93.9	6.1
7	-13.2	94.9	5.1	-4.6	90.7	9.3
8	-12.5	86.6	13.4	-7.7	94.7	5.3
9	-17.5	82.5	17.5	-10.6	84.6	15.4

a. Explanation of regional codes: 1: New England; 2: New York and New Jersey; 3: Pennsylvania, Delaware, Maryland, Virginia, and West Virginia; 4: North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Tennessee, and Kentucky; 5: Ohio, Indiana, Illinois, Michigan, Wisconsin, and Minnesota; 6: Louisiana, Texas, Arkansas, Oklahoma, and New Mexico; 7: Missouri, Iowa, Nebraska, Kansas, North Dakota, South Dakota, Montana, Wyoming, Utah, and Colorado; 8: California, Nevada, Arizona, and Hawaii; 9: Oregon, Washington, Idaho, and Alaska.

b. The effect, summed across all the industries making up an industry group, of a change in an industry's own unionization rate on the change in the industry's proportion of union workers to all workers in the industry group, holding the industry's share of all the workers in the industry constant.

c. The effect, summed across all the industries making up an industry group, of a change in an industry's share of all workers in the industry group on the change in the industry's proportion of union workers in the industry group, holding the industry's unionization rate constant.

Source: Author's calculations.

in table 3.2⁶ into the part attributable to shifts in the structure of industry employment across each region (the between-industries component for each region) and the part attributable to decreases in industry unionization rates within each region (the within-industries component for each region).⁷

In other words, the decomposition undertaken for the economy as a whole reported in table 3.1 is undertaken for each region.⁸ The effect of changes in a region's manufacturing structure, possibly due to shifts in production from or to other regions within the country, on a region's overall unionization rate has long been of interest. The first and fourth columns of table 3.2 indicate the percentage-point changes in the share of unionized workers in each of the nine regions between 1977 and 1987 and 1987 and 1997, respectively.

As in the case of the national data, table 3.2 indicates that between-industries changes in the distribution of employment among the 20 manufacturing industries have not been a major factor contributing to the overall decrease in unionization for any region; decreases in unionization rates within industries have been much more important. In the 1977–87 decade, the relatively largest adverse effects from shifts in industry employment structures occurred in the Mid-Atlantic area (regions 2 and 3) and the Pacific area (regions 8 and 9), but even the highest of these (region 9) was only 17.5 percent. In New York and New Jersey (region 2), the industry contributing the largest negative effect from between-industries changes in the first period was the apparel sector,⁹ which both had a high share in the loss of employment and was highly unionized.¹⁰

6. It was not always possible to follow conventional regional breakdowns owing to the need to obtain an adequate sample size of union workers for each region.

7. For the sake of simplicity, the within-industries and between-industries components of the percentage-point changes in unionization for each region are reported only as percentage shares of the percentage-point changes rather than, as in table 3.1, in both percentage shares and percentage-point changes.

8. There is an equation similar to equation 3.3 in the text for each region, where the industry coverage is confined to the 20 manufacturing sectors listed in footnote 5 above.

9. The discussion here (and throughout this section) concerning the relative importance of particular industries toward contributing to the between-industries and within-industries components is based on detailed tables (not presented here, but available from the author) of the behavior of each of the 20 industries in each of the nine regions.

10. As is evident from the analysis of the between-industries and within-industries components on the change in the national unionization rate (see equation 3.3), the magnitude of an industry's between-industries effect on the change in a region's unionization rate depends on the change in the share of the region's workers employed in the industry and on the level of the industry's unionization rate. Similarly, the impact of an industry's within-industries effect on a region's unionization rate depends on the change in the industry's unionization rate and on the proportion of the region's workers employed in the industry.

In Pennsylvania, Delaware, Maryland, West Virginia, and Virginia (region 3) for the 1977–87 period, the largest between-industries contribution to the overall decline in unionization was made by the highly unionized primary metal industries, which suffered the largest employment-share loss. The largest positive between-industries effect (i.e., boosting unionization) in both regions 2 and 3 came from the printing and publishing industry. In regions 9 and 8 of the upper and lower Pacific area (Oregon, Washington, Alaska, and Idaho and California, Arizona, Nevada, and Hawaii), lumber and wood products and food and kindred products, respectively, were the largest contributors to the relatively high negative impact of between-industries changes in employment shares.

Region 4 (South) was the only area in which changes in the distribution of employment together with levels of industry unionization (the between-industries employment effect) had an appreciable positive impact on overall unionization rates in the 1977–87 period.¹¹ Employment shares in region 4 for textiles and apparel decreased appreciably, but the region's low unionization rates in these sectors mitigated the negative impact of this shift on the overall unionization rate. The positive effect of the region's diversification into more unionized industries—such as electric and electronic equipment, transportation equipment, and instruments and related products—more than offset the negative impact of the relative shift out of textiles and apparel.

The comparatively low adverse effect on overall unionization of between-industries employment shifts in region 5 (the Midwest) between 1977 and 1987 is somewhat surprising, because of the declines in employment shares of such highly unionized sectors as leather and leather products; stone, clay, and glass products; primary metal industries; and transportation equipment. However, relative shifts in employment toward such sectors as fabricated metal products and rubber and miscellaneous plastics, which are among the more-unionized sectors in the region, acted to moderate these adverse between-industries effects.

In the 1987–97 period, there was both a slowing of the pace of deunionization and a decline in the relative importance of the between-industries component in the overall change in unionization for the four regions where the relative importance of this component had been the highest (though modest) in the previous decade: regions 2, 3, 8, and 9. Not only did the between-industries employment component for the South (region 4) continue to have the effect of increasing unionization, as in the previous decade, but employment shifts in New York and New Jersey (region 2) also had this effect. Textiles and apparel continued to decline in region 4 as a source of employment, but continued structural diversi-

11. In region 6 (Texas, Oklahoma, Louisiana, Arkansas, and New Mexico) the between-industries effect contributed slightly to increasing the overall unionization rate.

fication in other manufacturing industries where the unionization rates were higher acted to produce a net positive between-industries effect.

The Pacific Northwest (region 9) again had the largest relative adverse between-industries employment effect, in which the continued sharp fall in the employment share of the fairly well unionized lumber and wood products sector played the most important role. Also again, the adverse structural employment effect within the Midwest (region 5) was relatively small.

Regional Effects on the National Unionization Rate in Manufacturing

A final decomposition exercise is reported in table 3.3. This focuses on the change on the national unionization rate in manufacturing due to within-regions shifts (rather than within-industries changes) in unionization rates for manufacturing and to between-regions shifts in the distribution of manufacturing employment (rather than, as in table 3.1, on between-industries changes). Such an analysis indicates the extent to which the national unionization rate for manufacturing is affected by a change in unionization rates within the different regions versus a redistribution of national employment among the regions from more unionized regions toward less unionized ones, or vice versa.

The procedure for dividing the change in the national unionization rate in manufacturing into these two components is the same as described by the three equations set forth in the first section of this chapter except that the subscript i now refers to a region rather than an industry and the industry group being analyzed is confined to manufacturing. Specifically, the national unionization rate in manufacturing is the sum of all the union workers in each region divided by the sum of all union and nonunion workers in each region, namely, $\Sigma U_i / \Sigma L_i$, where the regions run from $i = 1$ to $i = 9$. This national unionization rate can be expressed as the weighted average of the manufacturing unionization rates in each region, U_i / L_i , where the weights are each region's share of the national labor force, $L_i / \Sigma L_i$. Expressed as an equation,

$$\Sigma U_i / \Sigma L_i = U_1 / L_1 * L_1 / \Sigma L_i + U_2 / L_2 * L_2 / \Sigma L_i + \dots + U_9 / L_9 * L_9 / \Sigma L_i \quad (3.4)$$

Denoting U_i / L_i as u_i and $L_i / \Sigma L_i$ as l_i , the change in the national unionization rate in manufacturing during a time period can be approximated as

$$\Delta(\Sigma U_i / \Sigma L_i) = \Sigma(\Delta u_i l_i + \Delta l_i u_i) \quad (3.5)$$

{Within-
regions
component}

{Between-
regions
component}

Table 3.3 Regional distribution of change in national unionization rate in manufacturing due to within-regions shifts in unionization rates and between-regions shifts in employment shares, 1977–87 and 1987–97
(percentage-point change)

Region ^a	1977–87			1987–97		
	Point change in unionization rate	Point change due to within-regions component ^b	Point change due to between-regions component ^c	Point change in unionization rate	Point change due to within-regions component ^b	Point change due to between-regions component ^c
1	-0.7	-0.7	0.0	-0.5	-0.3	-0.2
2	-2.2	-1.7	-0.5	-1.2	-0.5	-0.7
3	-2.3	-1.7	-0.6	-1.0	-0.8	-0.2
4	-0.9	-1.3	0.4	-0.5	-0.6	0.1
5	-5.2	-3.8	-1.4	-2.6	-2.1	-0.5
6	-0.5	-0.6	0.1	-0.2	-0.4	0.2
7	-0.6	-0.7	0.1	-0.1	-0.3	0.2
8	-0.4	-1.1	0.1	-1.0	-0.9	-0.1
9	-0.4	-0.5	0.1	-0.1	-0.3	0.2
Total change	-13.2	-12.1	-1.1	-7.2	-6.2	-1.0

a. Explanation of regional codes: 1: New England; 2: New York and New Jersey; 3: Pennsylvania, Delaware, Maryland, Virginia, and West Virginia; 4: North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Tennessee, and Kentucky; 5: Ohio, Indiana, Illinois, Michigan, Wisconsin, and Minnesota; 6: Louisiana, Texas, Arkansas, Oklahoma, and New Mexico; 7: Missouri, Iowa, Nebraska, Kansas, North Dakota, South Dakota, Montana, Wyoming, Utah, and Colorado; 8: California, Nevada, Arizona, and Hawaii; 9: Oregon, Washington, Idaho, and Alaska.

b. The percentage-point contribution of a region to the percentage-point change in the national unionization rate for manufactures of a change in the region's unionization rate, holding its share of the national labor force constant.

c. The percentage-point contribution of a region to the percentage-point change in the national unionization rate for manufactures of a change in the region's share of the national labor force, holding its unionization rate constant.

Source: Author's calculations.

where the terms are summed over the nine regions. The results shown in table 3.3 indicate that only a small part of the decline in the overall unionization rate in manufacturing is attributable to a relative shift of the workforce from more-unionized to less-unionized regions. The South and all regions west of the Mississippi gained in national employment shares in the 1977–87 period and also in the following decade, with the exception of region 8. In contrast, the Midwest and all the northeastern regions lost in relative employment terms.

Because the unionization rate was higher in those regions that lost in employment-share terms than those that gained, the redistribution of the national labor force had the net effect of reducing the national unionization rate in manufacturing. The importance of this redistribution effect in accounting for the overall deunionization in manufacturing unionization rate was modest, however, compared with the effect of the declines in unionization rates within all regions. For example, of the 13.2-percentage-point decline in the national unionization rate in manufacturing between 1977 and 1987¹² (see the bottom row of table 3.3), 12.1 points (92 percent) is attributable to within-regions decreases in unionization rates and only 1.1 points (8 percent) to a redistribution of employment among the regions from more-unionized regions to less-unionized ones. As was pointed out above, the national unionization rate fell much less during the 1987–97 period, namely, only 7.2 percentage points, but the 1.0-percentage-point decline attributable to between-regions shifts in employment amounts to 14 percent of the total percentage-point decline.

Although every region contributed to the national decline in the rate of unionization, the differences among regions in the extent and nature of this contribution varied widely. The Midwest (region 5) stands out in both periods as the most significant contributor to the overall decrease in unionization, both because it had the highest proportion of the nation's unionized manufacturing workers (26 percent in 1977) and it lost national employment share. New York and New Jersey (region 2) and Pennsylvania, Delaware, Maryland, Virginia, and West Virginia (region 3) were also important sources of the overall decline in unionization, especially in the 1977–87 period, as the regional distribution of manufacturing shifted in favor of the South and the West.

12. Because of rounding, the sums for the nine regions may not exactly equal the total change for the country.