Industrial Composition of State Earnings in 1958–98

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A QUESTION OF long-standing interest in economics is "Are differences in the industrial composition of economies getting smaller—that is, converging—over time?" This question is important for regional economies as well as for national economies, though the differences in industrial composition among regions tend to be smaller than those among nations. For example, because of the close relationship between per capita income and industrial composition, convergence in industrial composition among regions or States is likely to be reflected in convergence in per capita incomes.[1] This article examines these issues by analyzing the industrial composition of State earnings in 1998, the most recent year for which data are available from BEA's regional accounts, and by analyzing trends in State industrial composition from 1958 to 1998. The key findings of this analysis follow:

- The industrial composition of earnings across States varied substantially in 1998, but less than in 1958. The States with the most variation in 1998 had small populations, relatively little manufacturing, and in some cases, relatively large government and large resource-based industries.
- The convergence in State industrial compositions in 1958–98 is primarily attributable to substantial growth in services and to declines in farming and manufacturing.
- In the States that converged the most, the manufacturing share of State earnings tended to rise toward its U.S. average and the farm and government shares tended to fall toward their U.S. averages.

These findings are consistent with the widely accepted view that convergence in industrial composition results from economic growth and integration. Economic theory suggests that the industrial composition of a particular economy is a function of capital stocks, labor supplies, the pattern of demand for final goods and services, transport costs, and the mobility of capital and labor. Most of these factors do not differ substantially among States and are therefore unlikely sources of differences in industrial composition: Transportation barriers between States are rare, transport costs are relatively low, capital and labor are relatively mobile, and final demand patterns are similar.

Nevertheless, differences in the industrial composition of States persist. In some cases, the differences reflect constraints on factor mobility, such as in natural-resource-intensive industries. In addition, the effects of economic geography may explain some of this persistence and have important implications. For instance, some observers speculate that the ongoing unification of Europe might lead to greater regional specialization that results in rich regions becoming richer, and poor regions, poorer.[2] Speculation that further economic integration might reinforce regional differences has rekindled interest among economists and policy makers about trends in State industrial composition. Because the U.S. economy is already highly integrated, analyses of these trends may shed light on what may happen to economies around the world as barriers to trade and to factor mobility are reduced and as national economies become more integrated with each other.[3]

The Heckscher-Ohlin theory of international trade is often used to explain the pattern of industrial production and the reasons for the convergence of industrial compositions over

1. See Sukkoo Kim, "Economic Integration and Convergence: U.S. Regions, 1840–1987," *Journal of Economic History* 58 (1998): 659–683 and Daniel H. Garnick and Howard L. Friedenberg, "Accounting for Regional Differences in Per Capita Personal Income Growth, 1929–79," SURVEY OF CURRENT BUSINESS 62 (September 1982): 24–34.

However, even if State industrial compositions continue to become more similar, further shifts in the share of earnings towards services and away from manufacturing might contribute to a widening of the income distribution in some States. See Constance Mitchell Ford and Patrick Barta, "Income Gap Broadens Amid Boom" *The Wall Street Journal*, January 18, 2000, A2; and Gene Koretz, "Why the Wage Gap Widened." *Business Week*, November 22, 1999, 18.

2. See "Birds of a Feather," *The Economist*, May 29, 1999, 78, and Paul Krugman, *Geography and Trade* (Cambridge, MA: The MIT University Press 1991): 83.

3. Kim, "Economic Integration and Convergence," 661.

time.[4] According to this theory, nations tend to specialize in industries or in groups of industries that intensively use the more abundant factors of production; for example, a nation with relatively more capital than labor will specialize in the production of capital intensive goods and services. Conversely, economies will not tend to specialize if the proportions of the various factors of production are similar.

In contrast to the view that convergence in industrial composition inevitably results from economic growth and integration, certain conditions may lead economies to specialize in particular industries, and this specialization results in a divergence in industrial compositions over time.[5] Positive geographic externalities, especially in the presence of increasing returns to scale, can lead to the clustering of economic activity.[6] This effect

4. The Heckscher-Ohlin theory continues to be one of the mainstays of international trade theory, but empirical support for a number of its predictions has been elusive. For a concise survey, see Elhanan Helpman, "The Structure of Foreign Trade," *Journal of Economic Perspectives* 13 (Spring 1999): 121–144. Although this theory was developed to explain the pattern of international trade and production, it is also commonly applied to State and regional economies.

5. For a recent overview of the relationship between geographic externalities and growth, see Ron Martin and Peter Sunley, "Slow Convergence? The New Endogenous Growth Theory and Regional Development," *Economic Geography* 74 (1998): 201–227.

6. A positive geographic externality exists if the location of an establishment in an area raises the productivity of nearby establishments in some way. For example, firms that locate near their input suppliers create geographic externalities that can lead to clustering because transportation costs are reduced. Moreover, if input suppliers can obtain increasing returns to scale, productivity is further enhanced because the scale of production for input suppliers rises. Similarly, firms that require a labor force with specialized skills can create geographic externalities by locating close to similar firms and establishments because a large pool of skilled workers will be attracted to the

Table 1.—Industry Shares of Earnings, 1998

[Percentage points]

	Farms	Agricultural services, forestry, and fishing	Mining	Construction	Manufacturing	Transportation and public utilities	Wholesale trade	Retail trade	Finance, insurance, and real estate	Services	Government
United States	0.8	0.7	0.9	5.9	17.4	6.8	6.4	9.1	8.9	28.8	14.4
Alabama	1.8	.6	1.0	6.4	21.1	6.5	[illegible]	9.6	5.9	23.6	17.7
Alaska	.1	1.7	7.6	7.5	4.6	10.7	3.1	9.7	4.1	21.9	28.9
Arizona	.9	1.0	.9	7.5	13.9	5.8	6.5	10.8	9.1	29.2	14.5
Arkansas	4.2	.8	.5	5.9	22.3	8.2	5.2	11.4	5.0	21.6	14.8
California	1.2	1.1	.3	5.4	15.7	6.2	6.2	8.9	8.7	32.3	14.0
Colorado	1.0	.7	1.8	7.9	11.5	9.6	6.0	9.4	8.4	29.7	14.0
Connecticut	.2	.5	.1	4.7	20.2	5.3	6.5	7.8	13.8	30.3	10.6
Delaware	.8	.4	0	6.8	25.7	4.4	3.8	8.2	14.2	23.7	11.8
District of Columbia	0	.8	0	1.2	2.8	3.3	.9	2.5	6.2	43.2	39.1
Florida	.9	1.0	.2	6.1	8.6	6.6	6.7	11.4	9.6	34.0	14.8
Georgia	1.5	.6	.3	5.9	15.8	9.6	8.9	9.2	7.6	26.3	14.3
Hawaii	.8	.7	.1	6.2	3.6	8.3	3.7	12.0	8.2	31.1	25.3
Idaho	3.5	1.4	1.0	8.5	17.5	6.9	5.6	10.9	5.2	23.4	16.1
Illinois	.4	.5	.3	5.5	19.1	7.3	7.2	8.0	10.3	29.4	11.9
Indiana	.7	.5	.4	6.8	31.2	6.0	5.7	9.2	6.0	21.8	11.7
Iowa	4.3	.8	.2	6.4	21.4	6.2	6.9	9.4	7.7	22.3	14.5
Kansas	2.7	.7	1.0	6.2	18.8	7.7	7.4	9.9	6.1	23.9	15.7
Kentucky	2.4	.7	2.3	6.0	21.6	7.7	5.5	10.2	5.1	22.7	15.7
Louisiana	.6	.5	5.3	8.1	13.6	7.8	5.7	9.4	5.4	26.9	16.7
Maine	.5	1.1	0	6.8	17.9	6.0	5.3	12.0	6.8	27.7	16.0
Maryland	.4	.6	.1	6.9	9.0	5.7	5.6	9.4	8.3	33.3	20.8
Massachusetts	.1	.5	.1	4.9	16.8	5.4	6.8	8.4	10.5	35.5	11.0
Michigan	.2	.5	.2	5.6	31.3	5.0	6.5	8.4	5.6	24.3	12.3
Minnesota	.8	.5	.5	6.1	20.8	6.4	7.9	9.2	8.8	26.7	12.2
Mississippi	2.4	.7	.9	6.6	21.5	6.5	4.9	10.2	4.6	23.0	18.7
Missouri	.3	.5	.3	6.6	19.0	8.4	6.9	9.5	7.8	27.2	13.5
Montana	.8	.9	2.4	8.3	8.1	8.0	5.3	12.7	5.9	28.0	19.4
Nebraska	5.5	1.1	.2	6.2	14.0	9.0	6.6	9.0	7.4	25.5	15.5
Nevada	.3	.7	2.2	11.8	4.7	5.7	4.4	9.8	7.4	40.3	12.7
New Hampshire	.2	.6	.1	6.3	22.5	6.0	7.1	11.7	7.2	27.7	10.7
New Jersey	.1	.4	.1	4.4	15.2	8.5	9.0	7.8	9.6	31.1	13.7
New Mexico	1.5	.7	3.3	7.1	7.8	6.0	4.2	11.4	5.2	28.3	24.5
New York	.1	.3	.1	3.7	11.9	5.9	5.8	6.7	20.1	31.8	13.6
North Carolina	1.9	.6	.2	6.9	23.1	6.1	6.1	9.6	6.8	22.9	15.7
North Dakota	6.0	.8	2.0	7.0	8.2	8.4	8.2	10.0	5.7	25.5	18.2
Ohio	.5	.5	.4	5.7	26.2	5.7	6.8	9.4	6.8	25.3	12.7
Oklahoma	.7	.5	4.7	5.1	16.2	8.3	5.2	10.0	5.4	25.6	18.2
Oregon	1.0	.9	.1	7.4	19.2	6.3	7.4	10.9	6.9	25.8	14.1
Pennsylvania	.4	.5	.7	5.7	20.4	6.9	5.8	9.2	8.0	30.4	12.1
Rhode Island	.2	.7	.1	5.0	18.3	5.2	5.0	9.3	8.2	32.2	15.8
South Carolina	.6	.7	.1	7.3	23.6	5.4	5.2	11.1	5.7	22.4	17.8
South Dakota	7.4	1.2	.8	6.4	14.2	6.4	6.1	10.6	6.9	24.8	15.0
Tennessee	.2	.5	.3	6.4	21.0	7.7	6.6	10.7	6.6	27.5	12.5
Texas	.7	.6	4.3	6.4	16.2	9.1	6.9	8.9	7.2	26.4	13.3
Utah	.7	.4	1.3	8.1	14.3	7.4	5.9	10.7	7.8	27.5	16.0
Vermont	1.7	.7	.3	7.3	20.2	5.8	4.9	10.4	5.6	28.4	14.7
Virginia	.3	.5	.5	6.1	12.7	7.0	5.4	8.6	7.3	30.7	20.9
Washington	1.1	1.0	.2	6.4	16.4	7.0	6.1	9.3	6.4	30.3	15.7
West Virginia	0	.4	6.5	6.2	15.5	7.8	4.9	10.0	4.2	25.7	18.8
Wisconsin	.5	.6	.2	6.5	27.8	5.9	6.3	9.0	6.9	23.4	13.0
Wyoming	–.4	.8	15.8	8.6	5.6	8.9	3.6	10.4	4.7	19.4	22.4

is self-reinforcing because the competitive advantage gained by local establishments increases as the number of establishments in the area increases. Therefore, once a cluster is established, additional economic growth will result in further clustering and specialization and thus in divergence in industrial composition.[7]

The next section of this article describes the industrial composition of State earnings in 1998 and presents an index that measures the degree of similarity between the industrial composition of each State and that of the United States as a whole. The following section discusses the trends in industrial composition of State earnings in 1958–98, and the last section analyzes these trends by decomposing the similarity index into two components.

Industrial composition of State earnings in 1998

In this article, State industrial composition is measured by industry shares of earnings.[8] For the United States, the industries with the largest share of earnings were services (28.8 percent), manufacturing (17.4 percent), and government (14.4 percent) (table 1). These industries also accounted for the largest shares of earnings in almost all the States. Services accounted for the largest share or the second largest share in every State. Government was among the top three industries in all States except Connecticut, Delaware, and New Hampshire. Manufacturing was among the top three in 40 States (and the highest in 8 of these States), but it had only the seventh largest share in Alaska, Nevada, and Wyoming.

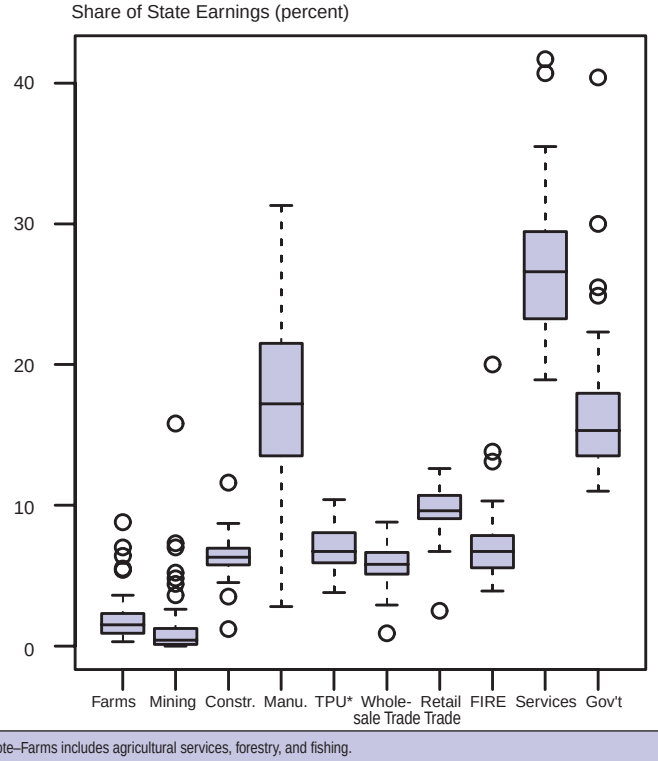
area, so labor costs for all local establishments will be lower. Finally, having more establishments in the area will enhance information flows between establishments. See Paul Krugman, "The Role of Geography in Development," *International Regional Science Review* 22 (1999): 142–161; Anthony J. Venables, "Equilibrium Location of Vertically Linked Industries," *International Economic Review* 37 (1996): 341–360; and Paul A. David and Joshua L. Rosenbloom, "Marshallian Factor Market Externalities and the Dynamics of Industrial Localization," *Journal of Urban Economics* 28 (November 1990): 349–70.

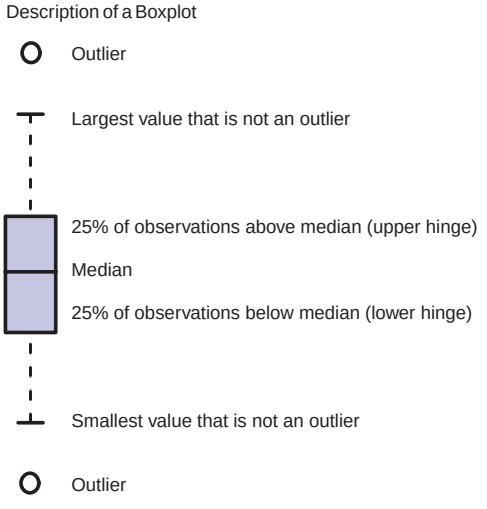
7. However, growth may be constrained by negative geographic externalities, such as congestion costs.

8. A more comprehensive measure of State economic activity, such as gross state product, would be preferable, but estimates of earnings are available for a much longer time period.

CHART 1

Distribution of Industry Shares of State Earnings, 1998





Outliers are values greater than the upper hinge + 1.5 times the Hspread (or less than the lower hinge minus 1.5 times the Hspread), where the Hspread is the difference between the upper and lower hinges. See Terrence C. Mills, *Time Series Techniques for Economists* (Cambridge: Cambridge University Press, 1991): 26-29, and Robert Haining, *Spatial Data Analysis in the Social and Environmental Sciences* (Cambridge: Cambridge University Press, 1993): 201-213.

Note–Farms includes agricultural services, forestry, and fishing.
*Transportation and public uitlities

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The variation in industry shares among States can be seen in box plots of the earnings shares (see chart 1 and the accompanying box).Manufacturing exhibited the greatest range in shares of earnings, from 31.3 percent (in Indiana and Michigan) to 3.7 percent (in Hawaii). In addition, the range of the shares of the 50-percent of States around the median (indicated by the size of the box) was relatively large—from 13.8 percent to 21.6 percent, a difference of 7.8 percentage points, or 45 percent of the median share. For services, the range of shares was smaller—from 40.7 percent (in Nevada) to 18.9 percent (in Wyoming). Shares of half of the States ranged from 23.2 percent to 29.3 percent, a range equal to 23 percent of the median share. For government, the range was slightly larger than that for services but smaller than that for manufacturing. The highest share was 30 percent (in Alaska), and the lowest share was 11 percent (in Connecticut). Shares of half of the States ranged from 13.3 percent to 17.9 percent, or 30 percent of the median share.

In order to quantify the differences in industry compositions, similarity indexes were calculated using the following formula:

$$SI_S = [1 - (\sum_{i=1}^{n} |S_{i,S} - S_{i,n}|)] \times 100,$$

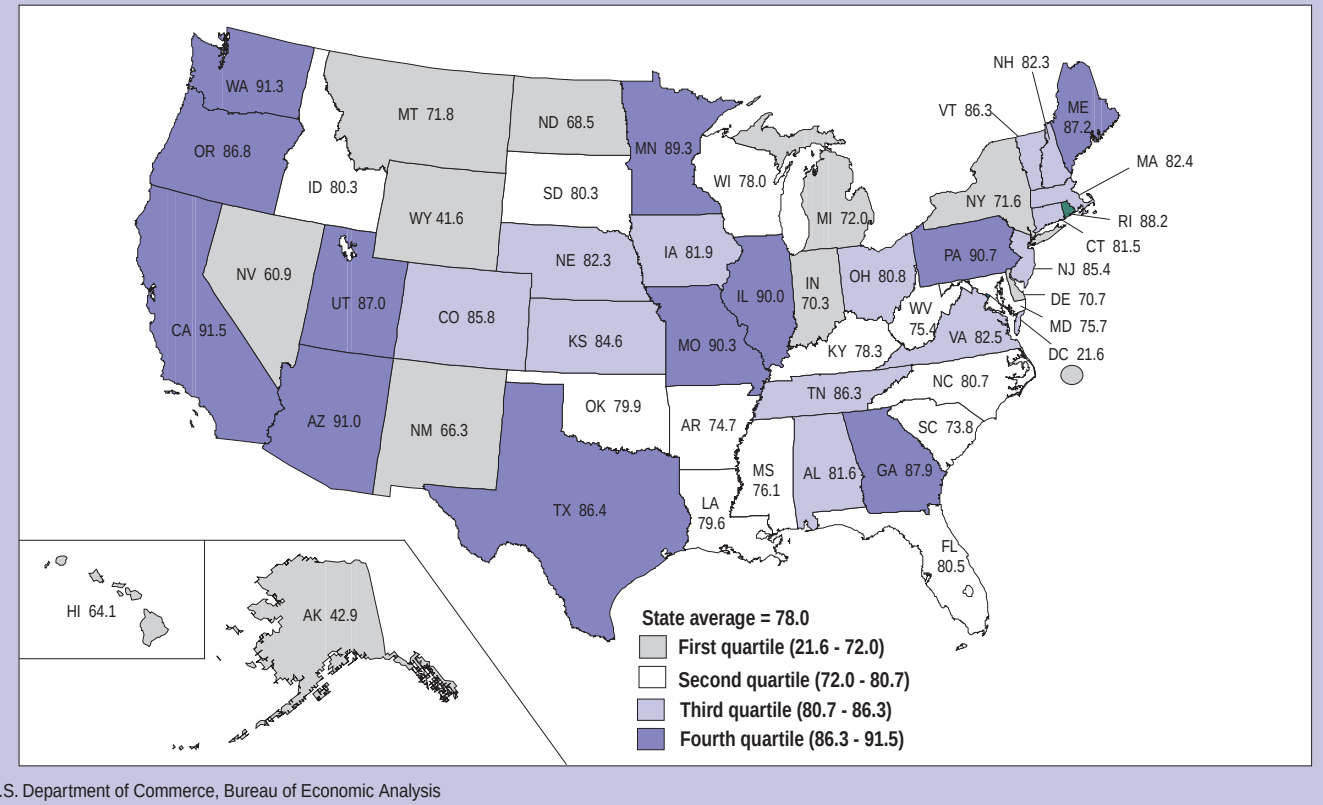
where SI_S is the similarity index for State s; $S_{i,s}$ is industry i's share of earnings in State s; $S_{i,n}$ is industry i's share of total U.S. earnings; and n is the number of industries.[9] The larger the value of the index, the more similar is the State's industrial composition to that of the United States; an index value of 100 would indicate that the State's industrial composition is identical to that of the United States.

The State similarity indexes for 1998, which are presented in chart 2, were calculated using

9. This index is based on an index used in Sukkoo Kim, "Expansion of Markets and the Geographic Distribution of Economic Activities: The Trends in U.S. Manufacturing Structure, 1860–1987," *The Quarterly Journal of Economics* 110 (November 1995): 881–908, and in Paul Krugman, *Geography and Trade* (Cambridge, MA: MIT Press, 1991).

CHART 2

Similarity Index, by State, 1998



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annual State personal income data on earnings by place of work for the 11 Standard Industrial Classification (SIC) one-digit industries. The indexes range from 41.6 in Wyoming to 91.5 in California. The States with industrial compositions that were most similar to that of the United States are California, Washington, Arizona, Pennsylvania, and Missouri. The States with industrial compositions that were least similar to that of the United States are five western States—Wyoming, Alaska, Nevada, Hawaii, and New Mexico.

Sorting the shares of earnings by the similarity index for 1998 reveals that the six States with the lowest similarity indexes all have relatively small populations and below-average shares of manufacturing earnings (table 2). In all of these States except Nevada, government accounted for a larger share of earnings than in the United States. Other industries that accounted for a much larger share of State earnings than of U.S. earnings were mining in New Mexico, Wyoming, and Alaska and construction and services in Nevada.

Trends in State industrial composition

To examine trends in State industrial composition, similarity indexes were also calculated beginning with 1958 using annual State personal income data on earnings by place of work for the

Table 2.—Difference between State and U.S. Industry Shares of Earnings, 1998

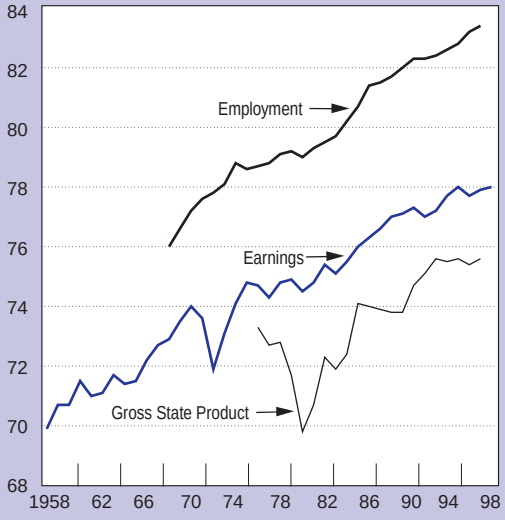
[Percentage points]

	1998 similarity index	Farms	Agricultural services, forestry, and fishing	Mining	Construction	Manufacturing	Transportation and public utilities	Wholesale trade	Retail trade	Finance, insurance, and real estate	Services	Government	Population
California	91.5	0.4	0.4	–0.6	–0.5	–1.7	–0.6	–0.2	–0.2	–0.2	3.5	–0.4	32,682,794
Washington	91.3	.3	.3	–.7	.5	–1.0	.2	–.3	.2	–2.5	1.5	1.3	5,687,832
Arizona	91.0	.1	.3	0	1.6	–3.5	–1.0	.1	1.7	.2	.4	.1	4,667,277
Pennsylvania	90.7	–.4	–.2	–.2	–.2	3.0	.1	–.6	.1	–.9	1.6	–2.3	12,002,329
Missouri	90.3	–.5	–.2	–.6	.7	1.6	1.6	.5	.4	–1.1	–1.6	–.9	5,437,562
Illinois	90.0	–.4	–.2	–.6	–.4	1.7	.5	.8	–1.1	1.4	.6	–2.5	12,069,774
Minnesota	89.3	0	–.2	–.4	.2	3.4	–.4	1.5	.1	–.1	–2.1	–2.2	4,726,411
Rhode Island	88.2	–.6	0	–.8	–.9	.9	–1.6	–1.4	.2	–.7	3.4	1.4	987,704
Georgia	87.9	.7	–.1	–.6	0	–1.6	2.8	2.5	.1	–1.3	–2.5	–.1	7,636,522
Maine	87.2	–.3	.4	–.9	.9	.5	–.8	–1.1	2.9	–2.1	–1.1	1.6	1,247,554
Utah	87.0	–.1	–.3	.4	2.2	–3.1	.6	–.5	1.6	–1.1	–1.3	1.6	2,100,562
Oregon	86.8	.2	.2	–.8	1.5	1.8	–.5	1.0	1.8	–2.0	–3.0	–.3	3,282,055
Texas	86.4	–.1	–.1	3.4	.5	–1.2	2.3	.5	–.2	–1.7	–2.4	–1.1	19,712,389
Tennessee	86.3	–.6	–.2	–.6	.5	3.6	.9	.2	1.6	–2.3	–1.3	–1.9	5,432,679
Vermont	86.3	.9	0	–.6	1.4	2.8	–1.0	–1.5	1.3	–3.3	–.4	.3	590,579
Colorado	85.8	.2	0	.9	2.0	–5.9	2.8	–.4	.3	–.5	.9	–.4	3,968,967
New Jersey	85.4	–.7	–.3	–.8	–1.5	–2.2	1.7	2.6	–1.3	.7	2.3	–.7	8,095,542
Kansas	84.6	1.9	0	.1	.3	1.4	.9	1.0	.8	–2.8	–4.9	1.3	2,638,667
Virginia	82.5	–.5	–.2	–.4	.2	–4.7	.2	–1.0	–.5	–1.6	1.9	6.5	6,789,225
Massachusetts	82.4	–.7	–.2	–.8	–1.0	–.6	–1.4	.4	–.7	1.6	6.7	–3.4	6,144,407
Nebraska	82.3	4.7	.4	–.7	.3	–3.4	2.2	.2	–.1	–1.5	–3.3	1.1	1,660,772
New Hampshire	82.3	–.6	–.1	–.8	.4	5.1	–.8	.7	2.6	–1.7	–1.1	–3.7	1,185,823
Iowa	81.9	3.5	.1	–.7	.5	4.0	–.6	.5	.3	–1.2	–6.5	.1	2,861,025
Alabama	81.6	1.0	–.1	.1	.5	3.7	–.3	–.6	.5	–3.0	–5.2	3.3	4,351,037
Connecticut	81.5	–.6	–.2	–.8	–1.2	2.8	–1.5	.1	–1.3	4.9	1.5	–3.8	3,272,563
Ohio	80.8	–.3	–.2	–.5	–.2	8.8	–1.1	.4	.3	–2.1	–3.5	–1.7	11,237,752
North Carolina	80.7	1.1	–.1	–.7	1.0	5.7	–.7	–.3	.5	–2.1	–5.9	1.3	7,545,828
Florida	80.5	.1	.3	–.7	.2	–8.8	–.2	.3	2.3	.7	5.2	.4	14,908,230
Idaho	80.3	2.7	.7	.1	2.6	.1	.1	–.8	1.8	–3.7	–5.4	1.7	1,230,923
South Dakota	80.3	6.6	.5	–.1	.5	–3.2	–.4	–.3	1.5	–2.0	–4.0	.6	730,789
Oklahoma	79.9	–.1	–.2	3.8	–.8	–1.2	1.5	–1.2	.9	–3.5	–3.2	3.8	3,339,478
Louisiana	79.6	–.2	–.2	4.4	2.2	–3.8	1.0	–.7	.3	–3.5	–1.9	2.3	4,362,758
Kentucky	78.3	1.6	0	1.4	.1	4.2	.9	–.9	1.1	–3.8	–6.1	1.3	3,934,310
Wisconsin	78.0	–.3	–.1	–.7	.6	10.4	–.9	–.1	–.1	–2.0	–5.4	–1.4	5,222,124
Mississippi	76.1	1.6	0	0	.7	4.1	–.3	–1.5	1.1	–4.3	–5.8	4.3	2,751,335
Maryland	75.7	–.4	–.1	–.8	1.0	–8.4	–1.1	–.8	.3	–.6	4.5	6.4	5,130,072
West Virginia	75.4	–.8	–.3	5.6	.3	–1.9	1.0	–1.5	.9	–4.7	–3.1	4.4	1,811,688
Arkansas	74.7	3.4	.1	–.4	0	4.9	1.4	–1.2	2.3	–3.9	–7.2	.4	2,538,202
South Carolina	73.8	–.2	0	–.8	1.4	6.2	–1.4	–1.2	2.0	–3.2	–6.4	3.4	3,839,578
Michigan	72.0	–.6	–.2	–.7	–.3	13.9	–1.8	.1	–.7	–3.3	–4.5	–2.1	9,820,231
Montana	71.8	0	.2	1.5	2.4	–9.3	1.2	–1.1	3.6	–3.0	–.8	5.0	879,533
New York	71.6	–.7	–.4	–.8	–2.2	–5.5	–.9	–.6	–2.4	11.2	3.0	–.8	18,159,175
Delaware	70.7	0	–.3	–.9	.9	8.3	–2.4	–2.6	–.9	5.3	–5.1	–2.6	744,066
Indiana	70.3	–.1	–.2	–.5	.9	13.8	–.8	–.7	.1	–2.9	–7.0	–2.7	5,907,617
North Dakota	68.5	5.2	.1	1.1	1.1	–9.2	1.6	1.8	.9	–3.2	–3.3	3.8	637,808
New Mexico	66.3	.7	0	2.4	1.2	–9.6	–.8	–2.2	2.3	–3.7	–.5	10.1	1,733,535
Hawaii	64.1	0	0	–.8	.3	–13.8	1.5	–2.7	2.9	–.7	2.3	10.9	1,190,472
Nevada	60.9	–.5	0	1.3	5.9	–12.7	–1.1	–2.0	.7	–1.5	11.5	–1.7	1,743,772
Alaska	42.9	–.7	1.0	6.7	1.6	–12.8	3.9	–3.3	.6	–4.8	–6.9	14.5	615,205
Wyoming	41.6	–1.2	.1	14.9	2.7	–11.8	2.1	–2.8	1.3	–4.2	–9.4	8.0	480,045
District of Columbia	21.6	–.8	.1	–.9	–4.7	–14.6	–3.5	–5.5	–6.6	–2.7	14.4	24.7	521,426

NOTE.—Industry shares are sorted based on the 1998 similarity index.

CHART 3

Average Similarity Index for States, 1958–98



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11 SIC one-digit industries.[10] The average similarity index for State earnings rose steadily from 69.9 in 1958 to 78.0 in 1998 (chart 3). The upward trend was interrupted in the early 1970's, when farm earnings increased substantially in several States. In 1971–73, the farm share of U.S. earnings increased 1.4 percentage points, but its share of State earnings increased 23 percentage points in North Dakota, 15 percentage points in South Dakota, and 11 percentage points in Iowa.

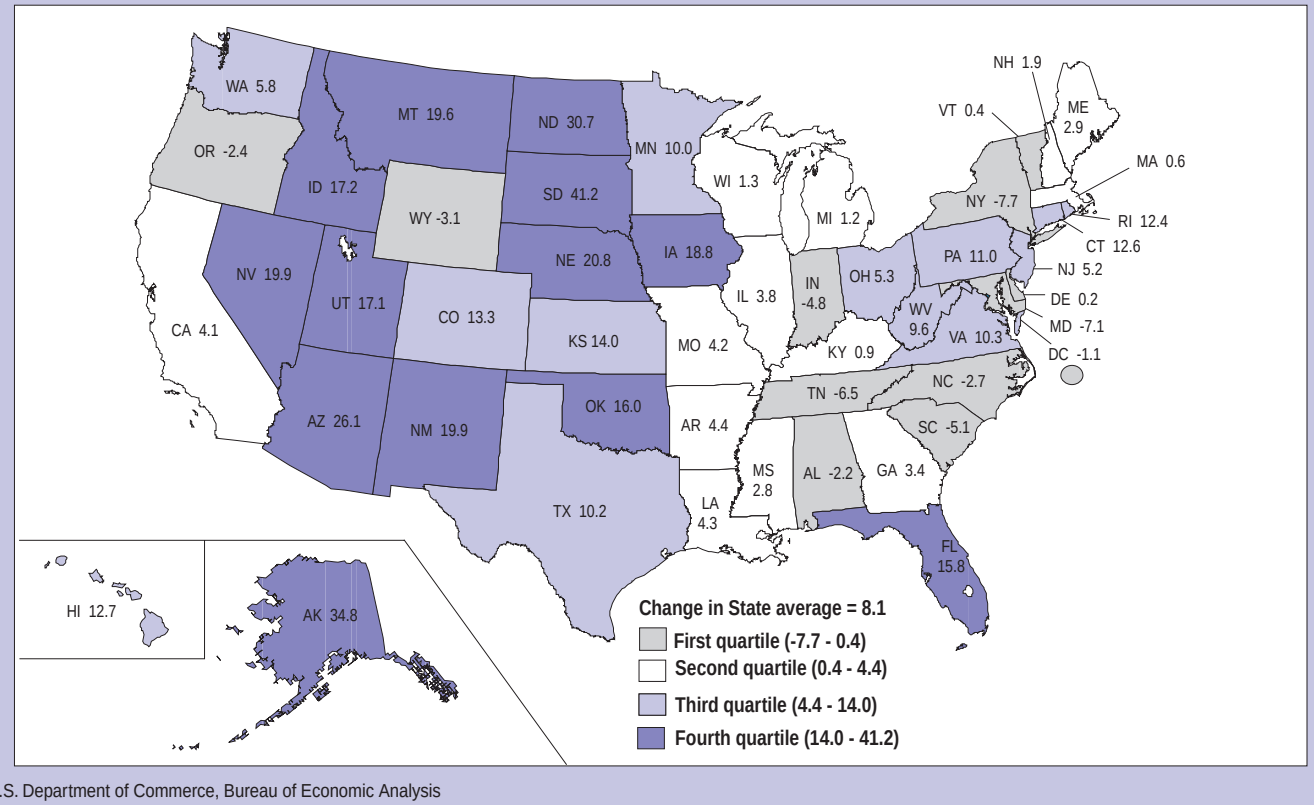
The index that is based on employment is higher than the earnings-based index because of the variation in industry earnings per job among States, but it exhibits the same trend. Unlike the earnings index, the employment index does not fall in the early 1970's, because farm employment did not increase substantially.

10. The year 1958 was chosen as the beginning year for this analysis for consistency with the length of time series frequently studied in the literature on the convergence in per capita incomes. The results are not very sensitive to this particular choice.

The average annual similarity index was also calculated from data for SIC two-digit industries. This index was lower, but the trend was the same. Data for 1958–97 are from Bureau of Economic Analysis (BEA), *State Personal Income, 1929–97* [CD-ROM] (Washington, DC: BEA, 1998).

CHART 4

Change in State Similarity Indexes, 1958-98



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The similarity index that is based on gross state product is lower than the earnings index because of variation in capital-type income among States. The trends in both indexes are similar, but there is much more variation in the gross state product index because, over the business cycle, capital-type income varies much more than earnings.

These results are consistent with earlier studies. For example, Kim uses the Heckscher-Ohlin theory as a framework for his analysis of shifts in employment among U.S. regions in 1840–1987.[11] He concludes that the degree of regional specialization was high in the 1800's and the early 1900's because high transportation and communication costs were significant barriers to capital and labor mobility. As transportation and communication costs declined and as factor mobility increased, regional economies gradually became more similar.

Although the industrial composition of most States converged in 1958–98, some States diverged: The similarity indexes for 41 States increased and those for 9 States decreased (chart 4). The 12 States with the largest increases were all west of the Mississippi River; South Dakota, Alaska, North Dakota, Arizona, and Nebraska had the largest increases. Of the nine States with decreases in their similarity indexes, seven were east of the Mississippi River; New York, Maryland,

11. Sukkoo Kim, "Regions, Resources, and Economic Geography: Sources of U.S. Regional Comparative Advantage, 1840–1987," *Journal of Regional Science and Urban Economics* 29 (1999): 1–32; see also Sukkoo Kim, "Expansion of Markets," 881–908.

Table 3.—Change in Industry Shares of Earnings, 1958–98

[Percentage points]

	Change in the similarity index	Farms	Agricultural services, forestry, and fishing	Mining	Construction	Manufacturing	Transportation and public utilities	Wholesale trade	Retail trade	Finance, insurance, and real estate	Services	Government
ed States		–4.5	0.3	–0.7	–0.3	–11.3	–1.0	0.1	–2.8	4.0	15.7	0.6
South Dakota	41.2	–24.4	.6	–.5	.5	7.7	.5	.4	–2.5	3.7	15.2	–1.4
Alaska	34.8	–.2	–1.4	5.7	–6.8	–1.9	4.5	.8	2.5	1.9	14.6	–19.9
North Dakota	30.7	–26.7	.3	.3	.2	4.4	0	1.5	–3.8	2.4	16.1	5.2
Arizona	26.1	–6.4	.5	–4.1	–2.6	1.0	–1.5	1.4	–3.5	4.3	15.7	–4.7
Nebraska	20.8	–16.3	.6	–.4	.3	.7	–.7	.5	–3.6	2.5	14.6	1.7
Nevada	19.9	–3.7	.5	–.8	3.8	–.6	–2.3	1.5	–4.1	3.7	7.7	–5.7
New Mexico	19.9	–6.7	.4	–5.3	–1.2	1.7	–1.8	.3	–.2	1.8	12.0	–.9
Montana	19.6	–20.4	.6	–2.3	1.7	–2.0	–2.0	.7	–.5	2.7	16.7	4.6
Iowa	18.8	–18.3	.1	–.2	.8	1.1	–1.1	.8	–3.3	3.4	11.9	4.9
Idaho	17.2	–13.9	1.1	–1.3	.1	2.9	–1.6	.9	–2.8	1.8	11.5	1.4
Utah	17.1	–3.5	.3	–5.2	.4	–1.9	–2.2	–.7	–1.4	3.5	15.0	–4.0
Oklahoma	16.0	–9.1	.1	–5.0	–1.0	2.5	.3	–.6	–2.0	1.4	14.0	–.7
Florida	15.8	–4.9	.2	–.4	–3.7	–3.5	–1.1	–.4	–3.6	3.4	16.1	–2.2
Kansas	14.0	–12.1	.4	–2.3	0	–.6	–1.2	2.7	–2.7	2.2	13.5	.2
Colorado	13.3	–5.5	.3	–1.3	–.7	–3.5	.6	–.8	–3.8	3.0	16.0	–4.2
Hawaii	12.7	–5.6	.4	0	–.7	–6.4	1.1	–1.6	1.4	3.7	18.8	–11.0
Connecticut	12.6	–1.3	.1	0	–2.4	–21.9	.2	2.0	–3.6	7.6	17.5	1.7
Rhode Island	12.4	–.5	.3	0	–.4	–16.8	–.5	–.8	–2.0	3.6	20.8	–3.7
Pennsylvania	11.0	–1.7	.3	–1.4	0	–17.2	–1.5	–.4	–2.4	3.8	18.3	2.3
Virginia	10.3	–5.1	0	–.9	–.1	–6.8	–1.0	1.2	–2.8	3.3	18.6	–6.3
Texas	10.2	–6.9	.3	–2.8	–.2	–2.0	.8	0	–3.8	2.6	14.3	–2.3
Minnesota	10.0	–10.7	.1	–1.4	–.5	–1.4	–2.6	.2	–3.1	3.5	14.9	1.0
West Virginia	9.6	–2.8	.2	–9.7	1.2	–11.7	–2.4	.6	–.7	1.4	15.6	8.4
Washington	5.8	–3.6	.1	0	–.6	–9.0	–.3	–.7	–3.4	1.4	18.7	–2.7
Ohio	5.3	–2.1	.2	–.3	–.6	–14.7	–1.7	1.4	–1.9	2.9	14.1	2.9
New Jersey	5.2	–1.3	.1	–.1	–1.6	–23.4	.8	3.3	–3.7	4.9	18.1	2.9
Arkansas	4.4	–11.5	.3	–1.4	.1	4.4	–.2	.3	–2.3	1.2	9.5	–.6
Louisiana	4.3	–4.2	–.1	–2.1	0	–4.0	–2.2	–.6	–3.0	1.1	13.9	1.3
Missouri	4.2	–7.6	.2	–.3	.8	–7.6	–1.5	–.9	–3.0	2.8	14.5	2.5
California	4.1	–3.2	.5	–.4	–1.4	–9.2	–.9	0	–3.8	3.7	17.2	–2.5
Illinois	3.8	–3.8	.3	–.7	–1.0	–13.9	–1.2	–.3	–3.4	5.0	16.4	2.4
Georgia	3.4	–5.9	–.1	–.1	.4	–7.9	2.0	1.0	–2.7	3.0	13.6	–3.3
Maine	2.9	–7.2	–.4	–.1	1.1	–11.4	–1.2	–.3	.8	3.4	17.0	–1.6
Mississippi	2.8	–11.9	0	–.8	.9	1.0	.1	.2	–2.7	1.4	9.7	2.1
New Hampshire	1.9	–2.6	.2	0	–.5	–14.4	.2	3.1	–1.2	2.8	14.6	–2.1
Wisconsin	1.3	–7.0	.3	–.1	.4	–9.5	–.7	.8	–3.8	3.1	13.4	3.2
Michigan	1.2	–2.4	.3	–.4	.2	–12.0	–1.0	1.4	–2.9	1.8	13.0	1.8
Kentucky	.9	–8.2	.4	–2.9	0	–.6	–.7	.9	–2.5	1.3	11.3	.8
Massachusetts	.6	–.7	0	0	–.8	–18.2	–.7	.2	–3.3	4.7	20.8	–2.1
Vermont	.4	–9.4	.2	–.8	.4	–6.3	–1.5	.8	–2.1	1.5	15.7	1.3
Delaware	.2	–3.4	–.1	0	–.2	–16.9	–2.0	.9	–2.0	10.7	12.6	.2
District of Columbia	–1.1	0	.4	0	–2.9	–1.8	–3.7	–4.0	–6.5	1.8	25.5	–8.8
Alabama	–2.2	–6.2	.1	–.7	.9	–5.0	–.3	.3	–1.6	2.2	11.6	–1.2
Oregon	–2.4	–5.6	.2	–0.2	.7	–6.2	–2.8	.9	–2.8	2.3	12.9	.5
North Carolina	–2.7	–9.7	.1	0	1.8	–6.6	.5	.1	–1.8	3.2	11.3	.9
Wyoming	–3.1	–13.9	.6	5.7	–.7	–1.9	–2.7	–.1	–1.9	1.9	7.9	5.1
Indiana	–4.8	–5.4	.3	–.4	.7	–9.2	–1.2	.9	–2.3	2.0	12.2	2.3
South Carolina	–5.1	–7.0	.2	–.1	1.4	–7.2	.4	1.0	–.9	2.4	11.7	–2.0
Tennessee	–6.5	–7.3	.2	–.4	.9	–7.3	.7	–.7	–1.5	2.4	14.2	–1.2
Maryland	–7.1	–2.1	.1	–.2	.1	–18.3	–2.1	.9	–2.6	4.1	21.0	–.8
New York	–7.7	–1.1	.1	–.1	–1.5	–17.8	–2.8	–2.6	–4.0	12.3	15.2	2.3

Note.—Industry shares are sorted based on the change in the similarity index.

Tennessee, South Carolina, and Indiana had the largest decreases.

A State's industrial composition will converge in 1958–98 if the earnings share of an industry with a below-U.S.-average earnings share in 1958 increases relative to the U.S. average, or if the earnings share of an industry with an above-U.S.-average share in 1958 decreases relative to the U.S. average share. The strong convergence exhibited by the States with the largest increases in the index was primarily the result of increases in low manufacturing shares of earnings (in South Dakota, North Dakota, Arizona, and Nebraska), decreases in high farm shares (in South Dakota, North Dakota, and Nebraska), and decreases in high government shares (in Alaska and Arizona) (table 3).

Conversely, a State's industrial composition will diverge in 1958–98 if the earnings share of an industry with a below-U.S.-average earnings share in 1958 decreases relative to the U.S. average share, or if the earnings share of an industry with an above-U.S.-average share in 1958 increases relative to the U.S. average share. The largest decreases in the State indexes were primarily the result of changes in the shares of manufacturing (in Indiana, South Carolina, Tennessee, Maryland, and New York), of services (in Indiana, Maryland, South Carolina, and Tennessee), and of finance, insurance, and real estate (in Indiana, South Carolina, Tennessee, and New York).

National and State growth components of trends

The convergence in State industrial compositions in 1958–98 that was indicated by the rise in the similarity index can be decomposed into two components. First, the U.S. industrial composition of earnings has shifted from goods-producing industries to services-producing industries as a result of economy-wide changes in production technology, trade relationships, and consumption patterns. The share of U.S. earnings accounted for by services increased substantially in 1958–98, while the shares accounted for by farms and manufacturing declined (chart 5). Because services-producing industries tend to be more evenly distributed across the Nation than goods-producing industries, this shift contributed to the increase in overall similarity.

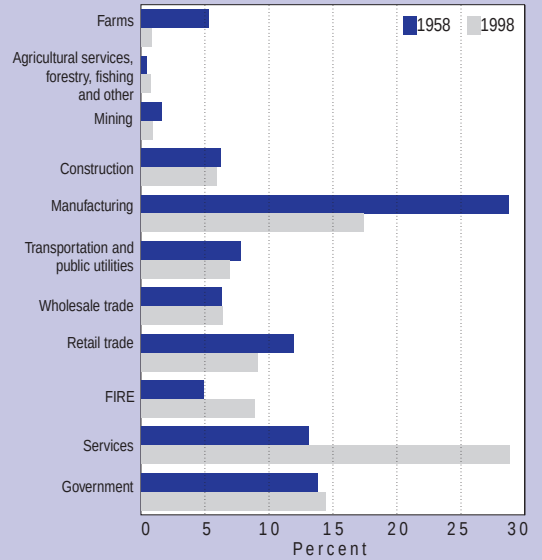
Second, the geographic distribution of U.S. industry earnings across States has become more evenly distributed. All else being equal, if a State has above-average growth in an industry for which the share of State earnings is below the U.S. average and if the industry growth rate exceeds the growth rate of total State earnings, the similarity index for that State will increase. Similarly, if a State has below-average growth in an industry for which the share of State earnings is above the U.S. average and if the growth rate of total State earnings exceeds the industry growth rate, the similarity index for the State will increase. Thus, changes in the similarity index for a State depend on the initial industry shares of earnings, on the industry growth rates, and on the growth rate of total State earnings.

In order to determine the importance of these two factors, the change in the similarity index for each State was decomposed into a national growth component and a State growth component (table 4). The national growth component shows the contribution of economy-wide changes in the industrial composition of earnings to changes in the similarity index from 1958 to 1998.[12] If these had been the only changes in the economy, the similarity indexes for all States except Maine and South Carolina would have increased, and the average similarity index would have increased 7.4 points to 77.3 in 1998.

12. The national growth component is defined as the difference between the similarity index that is calculated on the assumption that State industries grow at the national rate of growth for the industry and the similarity index for 1958. It is equivalent to the index calculated on the sum of the national share and industrial-mix components in a shift and share analysis. For more information, see "Projections of Employment Growth in Georgia: A Shift and Share Analysis," in *On the Use of Input-Output Models for Regional Planning*, ed. William A. Schaffer (Leiden: Martinus Nijhoff, 1976).

CHART 5

Industry Shares of U.S. Earnings, 1958 and 1998



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The State growth component shows the contribution of differences in State industry growth rates to changes in the similarity indexes from 1958 to 1998.[13] The average State growth component was 0.7 points, indicating that shifts in industry earnings among States also contributed to the overall convergence in industrial composition but that the effect was small. The State growth component was positive for 28 States and negative for 22 States. In some States, the effect of State industry growth was relatively large. For the States with the largest increases in their similarity indexes in 1958–98, both the national growth rates and the differences in State industrial growth rates contributed substantially to convergence. For the States with the largest decreases in their similarity indexes, the national growth rates had little effect, but the differences in State industrial growth rates contributed substantially to divergence.

13. The State growth component is analogous to the region-share component in a shift and share analysis. It was calculated by subtracting the national growth component from the actual change in the similarity index.

Table 4.—Similarity Index and Components of Change, 1958–98

	Similarity index		Change in the similarity index	Components of change in the similarity index			Similarity index		Change in the similarity index	Components of change in the similarity index	
	1958	1998		National growth	State growth		1958	1998		National growth	State growth
State average	**69.9**	**78.0**	**8.1**	**7.4**	**0.7**	New Jersey	80.2	85.4	5.2	7.7	–2.5
South Dakota	39.1	80.3	41.2	26.1	15.1	Arkansas	70.3	74.7	4.4	12.6	–8.2
Alaska	8.1	42.9	34.8	4.8	30.0	Louisiana	75.3	79.6	4.3	7.2	–2.9
North Dakota	37.8	68.5	30.7	23.8	6.9	Missouri	86.1	90.3	4.2	3.6	.6
Arizona	64.9	91.0	26.1	10.8	15.3	California	87.4	91.5	4.1	2.1	2.0
Nebraska	61.5	82.3	20.8	16.3	4.5	Illinois	86.2	90.0	3.8	2.5	1.3
Nevada	41.0	60.9	19.9	6.5	13.4	Georgia	84.5	87.9	3.4	3.0	.4
New Mexico	46.4	66.3	19.9	11.9	8.0	Maine	84.3	87.2	2.9	–1.0	3.9
Montana	52.2	71.8	19.6	18.5	1.1	Mississippi	73.3	76.1	2.8	7.8	–5.0
Iowa	63.1	81.9	18.8	20.2	–1.4	New Hampshire	80.4	82.3	1.9	5.7	–3.8
Idaho	63.1	80.3	17.2	14.1	3.1	Wisconsin	76.7	78.0	1.3	2.8	–1.5
Utah	69.9	87.0	17.1	7.0	10.1	Michigan	70.8	72.0	1.2	8.1	–6.9
Oklahoma	63.9	79.9	16.0	10.9	5.1	Kentucky	77.4	78.3	.9	6.9	–6.0
Florida	64.7	80.5	15.8	10.6	5.2	Massachusetts	81.8	82.4	.6	6.2	–5.6
Kansas	70.6	84.6	14.0	8.9	5.1	Vermont	85.9	86.3	.4	6.3	–5.9
Colorado	72.5	85.8	13.3	10.0	3.3	Delaware	70.5	70.7	.2	6.1	–5.9
Hawaii	51.4	64.1	12.7	6.1	6.6	District of Columbia	22.7	21.6	–1.1	18.4	–19.5
Connecticut	68.9	81.5	12.6	7.9	4.7	Alabama	83.8	81.6	–2.2	2.8	–5.0
Rhode Island	75.8	88.2	12.4	4.9	7.5	Oregon	89.2	86.8	–2.4	2.9	–5.3
Pennsylvania	79.7	90.7	11.0	5.4	5.6	North Carolina	83.4	80.7	–2.7	4.5	–7.2
Virginia	72.2	82.5	10.3	.7	9.6	Wyoming	44.7	41.6	–3.1	15.0	–18.1
Texas	76.2	86.4	10.2	7.2	3.0	Indiana	75.1	70.3	–4.8	2.0	–6.8
Minnesota	79.3	89.3	10.0	6.5	3.5	South Carolina	78.9	73.8	–5.1	–1.2	–3.9
West Virginia	65.8	75.4	9.6	8.5	1.1	Tennessee	92.8	86.3	–6.5	1.4	–7.9
Washington	85.5	91.3	5.8	.3	5.5	Maryland	82.8	75.7	–7.1	.9	–8.0
Ohio	75.5	80.8	5.3	6.0	–.7	New York	79.3	71.6	–7.7	1.4	–9.1

NOTE.—Similarity indexes and components are sorted based on the change in the index.