

# The Transformation of Manufacturing Across Federal Reserve Districts: Success for the Great Plains?

*By Chad R. Wilkerson and Megan D. Williams*

**D**espite experiencing solid gains in the last two years, U.S. manufacturing employment is down by about one-third since 1990, as globalization and productivity-enhancing technologies have reduced domestic demand for factory workers. The decline in factory jobs has been uneven across the country. Factory jobs have declined most dramatically in the eastern United States, but by less in the Great Plains region. Among Federal Reserve Districts, factory employment in the Dallas, Kansas City, and Minneapolis Districts has outperformed all other Districts in each of the last three business cycles. As policymakers increasingly look to manufacturing as a source of high-paying jobs, understanding the sector's evolution is important.

Using Federal Reserve Districts to define regional boundaries, this article examines why factory employment has consistently held up better in Federal Reserve Districts in the Great Plains (Dallas, Kansas City, and Minneapolis) than in Districts in other regions. The article also examines whether regions with large factory job losses have had worse overall economic outcomes. It finds that since 2000, nearly half of the better factory jobs performance in the Great Plains has been due simply to

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a more favorable mix of manufacturing industries than other regions. This contrasts with the 1990s, when factors other than industry mix accounted for nearly all of the region's faster manufacturing job growth. The article also finds that the pay of factory jobs has diverged somewhat across the country, tempering the benefits of better job growth in some regions. Moreover, while some regions with sizable factory job losses have maintained solid per capita earnings growth, others have not.

Section I of the article describes how the location of U.S. manufacturing jobs has changed since 1990. Section II analyzes the role of industry mix and other factors in the relative performance of manufacturing employment across Federal Reserve Districts. Section III discusses how the pay of manufacturing jobs has evolved across the United States and whether the Great Plains has benefited from maintaining more factory jobs.

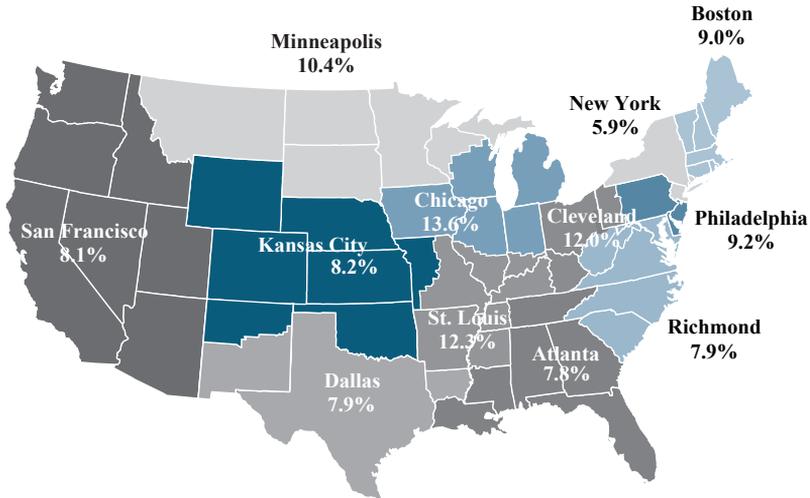
## **I. HOW HAS THE LOCATION OF U.S. MANUFACTURING JOBS CHANGED?**

Overall, U.S. manufacturing employment has declined sharply since 1990, but the Great Plains Fed Districts have consistently outperformed others throughout the period. Variation in job growth across specific manufacturing industries has also transformed the defining factory sectors of many Fed Districts.

### *Growth and decline in factory jobs by Fed District since 1990*

A number of subnational areas could be analyzed to obtain a sense of recent geographic variation in regional manufacturing employment. But the 12 Federal Reserve Districts provide two key advantages. First, the number of Districts provides a more manageable number of areas for analysis than states or metro areas. Aggregating to multistate regions also helps avoid focusing on data disclosure issues for some smaller states.<sup>1</sup> Second, five Fed Districts conduct monthly surveys of manufacturers that are widely followed in the press.<sup>2</sup> Understanding longer-term trends in each Fed District could help both national and regional followers of Fed surveys.<sup>3</sup>

In 1990, manufacturing accounted for nearly one of six jobs in the United States, and for at least one of nine jobs in each Federal Reserve District. But by 2011, U.S. factories employed only about

*Map***MANUFACTURING SECTOR'S SHARE OF EMPLOYMENT BY FEDERAL RESERVE DISTRICT, SECOND QUARTER 2011\***

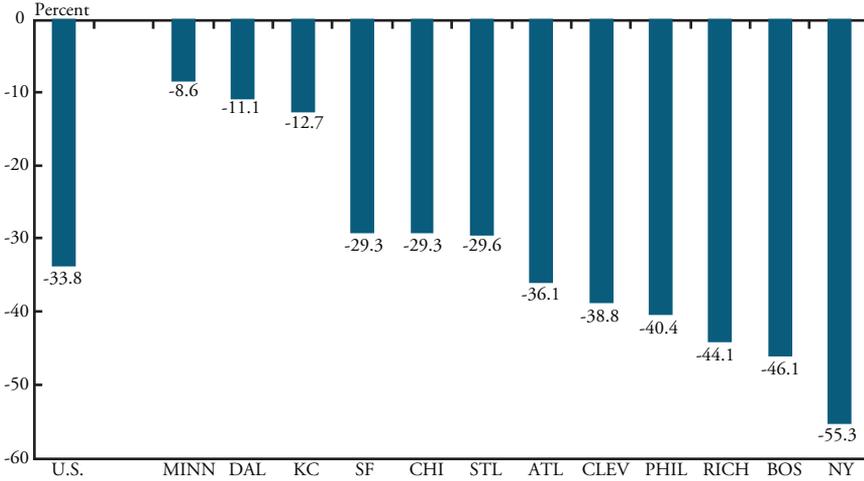
\* From county data based on actual District boundaries  
Source: U.S. Bureau of Labor Statistics

one of 11 workers nationally. The size of the manufacturing sector varies somewhat across Fed Districts. In three Districts, manufacturing still accounts for at least 12 percent of employment, while in one Fed District—New York—factories now employ less than 6 percent of all workers (Map).<sup>4</sup>

The 34-percent decline in U.S. factory jobs from 1990 to 2011 was not evenly spread across the country. The largest manufacturing job losses have occurred in the six eastern-most Federal Reserve Districts (Chart 1). The New York Fed District lost more than half of its factory jobs during that period, while the Boston and Richmond Fed Districts lost nearly half. In the Philadelphia, Cleveland, and Atlanta Fed Districts, factory jobs fell by more than one-third.

Factories in Fed Districts further to the west fared better, although in some cases not by much. In the Chicago, St. Louis, and San Francisco Fed Districts, factory employment fell nearly 30 percent from 1990 to 2011—almost as much as the overall national average. In sharp contrast, manufacturing jobs in each of the three Great Plains Fed

Chart 1

CHANGE IN MANUFACTURING EMPLOYMENT  
BY FEDERAL RESERVE DISTRICT, 1990-2011

Source: U.S. Bureau of Labor Statistics

Districts—Dallas, Kansas City, and Minneapolis—declined by only about 10 percent since 1990.

This pattern of stronger relative manufacturing employment in the Fed Districts to the west—particularly in the Great Plains—has been consistent through the last three business cycles. Manufacturing employment in the United States reached cyclical peaks in mid-1990, mid-2000, and mid-2006. In each subsequent cycle, the three Great Plains Districts have ranked as the top three Fed Districts in relative manufacturing employment growth. Factory jobs actually grew in five Federal Reserve Districts during the 1990s, including more than 12 percent in each of the Great Plains Districts. After 2000, factory employment declined in all Fed Districts, both before and after the 2006 peak. But the decline was less in Districts to the west—and especially in the Great Plains—in both periods.

### *The changing structure of manufacturing in Fed Districts*

One reason some Fed Districts could have outpaced others in relative manufacturing employment is the different industrial makeup

of their factory sectors. Also, some regions could have become more attractive for specific types of manufacturing, or for manufacturing generally. A formal analysis that decomposes these possibilities will be conducted in the next section, but a simple description of how key manufacturing industries have changed across Fed Districts illustrates that industry mix has likely played some role in the regional variation of U.S. factory job growth.

Of the 83 U.S. manufacturing industries for which detailed employment data are available at the state level, 78 lost jobs from 1990 to 2011.<sup>5</sup> The six largest percentage declines were in textile-related industries, led by apparel knitting mills (85 percent of jobs lost). The largest decline in the absolute number of jobs—by far—was in cut and sew apparel manufacturing (648,000 jobs, equal to an 84-percent decline), followed by printing and related industries (366,000; 44 percent). Printing and textiles historically relied heavily on relatively low-wage, labor-intensive production, and the globalization and productivity enhancements of the past few decades have decimated U.S. workforces in these industries.

In contrast, five factory industries have added jobs in the United States since 1990. This list of diverse industries includes meat processing (64,000 jobs); pharmaceutical and medicine manufacturing (49,000); other food processing (36,000); machine shops (33,000); and agriculture, construction, and energy machinery (14,000). These industries have maintained their solid demand for domestic labor for a number of important reasons, including their proximity to natural resources, their need for highly-skilled factory labor, and their proximity to other factory industries that need timely deliveries of specialized parts.

This large disparity in job growth across manufacturing industries has transformed the character of factory sectors of many Federal Reserve Districts. For example, the largest factory industry in each of the New York, Philadelphia, and Atlanta Fed Districts in 1990 was cut and sew apparel manufacturing; in the Richmond District this industry was a close second. By 2011, cut and sew apparel manufacturing had dropped from the top five largest industries in each of these Districts, replaced at the top by pharmaceutical and medicine manufacturing, plastics manufacturing, and meat processing (Table 1 lists the three largest factory industries in each District in 1990 and 2011).

Table 1

**TOP 3 MANUFACTURING INDUSTRIES BY DISTRICT,  
SECOND QUARTER 1990 AND SECOND QUARTER 2011**

<b>1-Boston</b>	<b>Q2 '90 Emp</b>	<b>1-Boston</b>	<b>Q2 '11 Emp</b>
Aerospace Product and Parts	86,139	Aerospace Product and Parts	43,241
Nav., Electromed, and Control Instr.	71,800	Nav., Electromed, and Control Instr.	42,974
Semiconductor and Other Elec. Comp.	56,501	Semiconductor and Elec. Comp.	28,760
<b>2-New York</b>	<b>Q2 '90 Emp</b>	<b>2-New York</b>	<b>Q2 '11 Emp</b>
Cut and Sew Apparel	109,136	Pharmaceutical and Medicine	49,556
Printing and Support Activities	91,597	Printing and Support Activities	39,461
Nav., Electromed, and Control Instr.	70,423	Nav., Electromed, and Control Instr.	36,219
<b>3-Philadelphia</b>	<b>Q2 '90 Emp</b>	<b>3-Philadelphia</b>	<b>Q2 '11 Emp</b>
Cut and Sew Apparel	58,768	Plastics Product	31,534
Printing and Support Activities	51,474	Printing and Support Activities	27,962
Plastics Product	37,419	Machine Shops, Screw, Nut and Bolt	22,388
<b>4-Cleveland</b>	<b>Q2 '90 Emp</b>	<b>4-Cleveland</b>	<b>Q2 '11 Emp</b>
Motor Vehicle Parts	103,293	Motor Vehicle Parts	56,604
Printing and Support Activities	42,417	Plastics Product	38,725
Plastics Product	39,195	Machine Shops, Screw, Nut and Bolt	24,085
<b>5-Richmond</b>	<b>Q2 '90 Emp</b>	<b>5-Richmond</b>	<b>Q2 '11 Emp</b>
Fabric Mills	143,006	Meat Processing	62,215
Cut and Sew Apparel	112,753	Plastics Product	50,255
Household, Furniture and Cabinet	104,803	Printing and Support Activities	36,650
<b>6-Atlanta</b>	<b>Q2 '90 Emp</b>	<b>6-Atlanta</b>	<b>Q2 '11 Emp</b>
Cut and Sew Apparel	213,236	Meat Processing	93,713
Printing and Support Activities	92,807	Motor Vehicle Parts	59,363
Household, Furniture and Cabinet	83,391	Aerospace Product and Parts	56,417
<b>7-Chicago</b>	<b>Q2 '90 Emp</b>	<b>7-Chicago</b>	<b>Q2 '11 Emp</b>
Motor Vehicle Parts	336,678	Motor Vehicle Parts	178,094
Printing and Support Activities	150,464	Plastics Product	122,924
Plastics Product	128,980	Printing and Support Activities	96,897
<b>8-St Louis</b>	<b>Q2 '90 Emp</b>	<b>8-St Louis</b>	<b>Q2 '11 Emp</b>
Cut and Sew Apparel	47,630	Meat Processing	56,666
Meat Processing	46,259	Motor Vehicle Parts	38,862
Printing and Support Activities	43,924	Plastics Product	28,948
<b>9-Minnesota</b>	<b>Q2 '90 Emp</b>	<b>9-Minnesota</b>	<b>Q2 '11 Emp</b>
Printing and Support Activities	29,487	Printing and Support Activities	26,931

Table 1 (continued)

Computer and Peripheral Equip.	26,530	Nav., Electromed, and Control Instr.	24,892
Nav., Electromed, and Control Instr.	19,701	Meat Processing	21,988
<b>10-Kansas City</b>	<b>Q2 '90 Emp</b>	<b>10-Kansas City</b>	<b>Q2 '11 Emp</b>
Aerospace Product and Parts	65,620	Meat Processing	59,331
Meat Processing	44,790	Aerospace Product and Parts	45,378
Printing and Support Activities	35,968	Agri., Const., and Mining Machinery	24,848
<b>11-Dallas</b>	<b>Q2 '90 Emp</b>	<b>11-Dallas</b>	<b>Q2 '11 Emp</b>
Aerospace Product and Parts	71,788	Agri., Const., and Mining Machinery	51,328
Cut and Sew Apparel	46,639	Aerospace Product and Parts	48,103
Communications Equipment	42,290	Semiconductor and Elec. Comp.	43,021
<b>12-San Francisco</b>	<b>Q2 '90 Emp</b>	<b>12-San Francisco</b>	<b>Q2 '11 Emp</b>
Aerospace Product and Parts	375,270	Aerospace Product and Parts	192,094
Nav., Electromed, and Control Instr.	216,326	Semiconductor and Elec. Comp.	159,166
Semiconductor and Elec. Comp.	201,646	Nav., Electromed, and Control Instr.	121,015

Source: U.S. Bureau of Labor Statistics

In contrast, the top factory industry in a few Fed Districts was the same in 2011 as in 1990, although in most cases the workforce in the top industry declined sharply. For example, motor vehicle parts manufacturing remained the largest factory industry in the Cleveland and Chicago Fed Districts, while aerospace product and parts manufacturing was still the top industry in the Boston and San Francisco Districts. But even in these Districts, several formerly large factory industries were surpassed by others that either grew more or declined less.

In the three Great Plains Fed Districts, most key manufacturing industries remained relatively stable. Printing and related activities and production of control instruments remained near the top in the Minneapolis Fed District. In the Kansas City and Dallas Districts, aerospace product and parts manufacturing fell from first to second. Aerospace was replaced in the Kansas City District by meat processing and in the Dallas District by agriculture, construction, and mining machinery manufacturing.

## II. WHY HAVE FACTORY JOBS HELD UP BETTER IN THE GREAT PLAINS?

Manufacturing industry mix appears to have played at least some role in the relative fortunes of the factory sectors of Fed Districts in recent

decades. But the effect of industry mix on relative job growth has varied greatly across the country and across time. Also important to the variation have been other factors that can make a region more attractive for either manufacturing activity generally or for specific types of manufacturing.

### *The role of industry mix in relative regional factory job growth*

The manufacturing industry mix of the 12 Federal Reserve Districts varies considerably. Also, the rate of growth of factory jobs has differed greatly across regions and industries in recent decades. Together, these facts suggest that manufacturing industry mix could have played a role in the regional variation of U.S. factory job growth in recent decades. Shift-share analysis can determine how much of the variation was due to each region's industry mix alone, as opposed to other factors that caused manufacturing employment to grow differently than expected given the regional industry mix.<sup>6</sup> These other factors could include such regional attributes as productivity, wages, taxes, incentives, unionization, and population and together make up the regional effect of shift-share analysis.

From 1990 to 2011, industry mix was more important in some regions than others. For example, the Richmond District's larger decline in factory jobs in the last two decades has been due to its less favorable industry mix—primarily its high concentration in textile-related industries. Similarly, the Chicago Fed District's decline in factory jobs has been slightly smaller than the nation's because of its more favorable industry mix—primarily auto-related manufacturing, which outperformed overall manufacturing for much of the period. In contrast, manufacturing industry mix explains little if any of the much larger declines in factory jobs in the Boston, New York, Philadelphia, and Cleveland Fed Districts than the nation. In these Districts, region-specific factors were the driving forces.

In the three Great Plains Fed Districts, industry mix explains some of the considerably better performance of manufacturing employment than the nation but, on average, only about a quarter of the total difference since 1990. More important have been other regional factors affecting specific manufacturing industries, or broad categories of industries. In particular, in the Dallas Fed District, the regional effect has

accounted for nearly 90 percent of the region's better factory job growth than the nation in the past two decades.

However, the relative importance of industry mix compared to the regional effect has changed somewhat over time, at least in most Fed Districts. In general, industry mix has become more important than regional factors. Thus, conducting separate shift-share analyses for each of the three manufacturing business cycles since 1990 allows for a more dynamic description of changes affecting Fed District manufacturing sectors.

### *Regional effects generally dominated in the 1990s*

In the 1990s, the location of U.S. manufacturing activity shifted from the Northeast to the Midwest and Great Plains. Based on the results of a shift-share analysis, the factory industry mix of Fed Districts generally played only a small role in this transition. Rather, most of the change was due to regional factors (Chart 2). In many Districts, a few specific industries accounted for much of the regional effect, while in others the regional effect was more widespread across industries (Appendix 1 details the industries contributing the most to both effects in each District).

From 1990 to 2000, factory employment fell 5 percentage points more in the Boston, New York, Philadelphia, and Richmond Fed Districts than in the nation. Only in the Richmond District—due primarily to its particularly heavy concentration in several clothing-related industries—did industry mix account for a sizable portion of the larger relative decline, as many apparel industries moved overseas. Indeed, the Philadelphia District's factory industry mix remained slightly favorable overall.

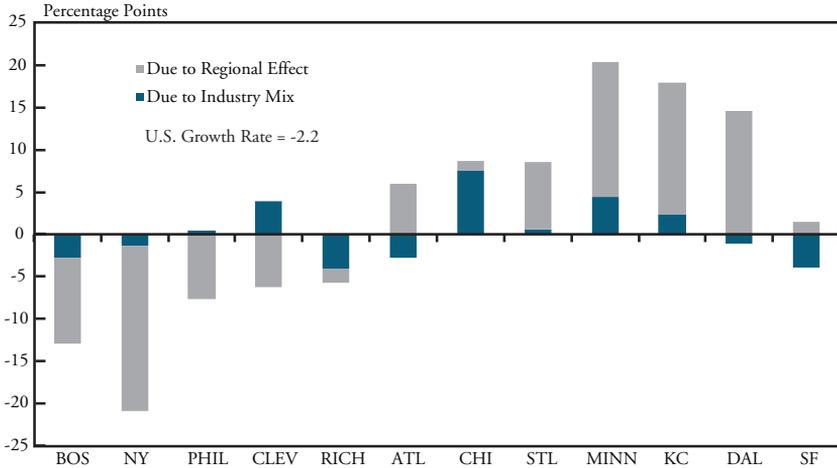
Rather, regional factors explain most of the weaker performance in these Districts. In the New York District, nearly all manufacturing industries (73 of 83) underperformed the rest of the country in job growth, while the regional effect in the other northeastern Districts was more concentrated in a few industries. In Boston, the plastics and computer and semiconductor industries underperformed these same industries elsewhere, while plastics and several steel-related industries in the Philadelphia district also underperformed their national counterparts.

A number of region-specific factors could have contributed to this weaker factory performance of the northeastern Districts in the 1990s. Overall, the trend is consistent with the eventual movement of manufacturing activity in other developed nations from initially highly industrial

Chart 2

## MANUFACTURING JOB GROWTH RELATIVE TO THE NATION

SECOND QUARTER 1990–SECOND QUARTER 2000



Source: U.S. Bureau of Labor Statistics

areas to less industrial regions (Banasick and Hanham; Brown; Keil). One reason could be that factory wages in the Boston and New York Districts were the highest among Fed Districts in 1990, perhaps driving some firms to seek cheaper domestic labor elsewhere. Also, population in the United States in the 1990s moved from the Northeast toward the South and West. In addition, land costs for factory expansion and the cost to upgrade or replace the capital stock could have been higher in the Northeast. Other factors such as unionization, right-to-work laws, and state tax rates and incentives may have also made other parts of the country look more appealing to at least some manufacturers.

In contrast to the Northeast, the Midwest Fed Districts of Chicago and St. Louis saw factory employment increase slightly in the 1990s, outperforming the nation by more than 5 percentage points. In the Chicago District, this better performance was due almost entirely to a more favorable industry mix. In particular, auto-related industries added jobs in the United States in the 1990s, and no District has a higher concentration in these industries than the Chicago District, which includes the Detroit area. In contrast, in the St. Louis District, regional

factors explained nearly all of its better relative performance. Again, the reason was auto-related manufacturing, but in this case industry growth that outpaced the nation was a larger factor than a particularly large initial concentration.

Each of the three Great Plains Fed Districts saw factory employment grow more than 12 percent in the 1990s, greatly outpacing all other Districts. In the Minneapolis and Kansas City Fed Districts, a favorable industry mix explains a small part of the better performance. In both Districts, this was mostly due to high concentrations in meat processing and plastics manufacturing, both of which grew at above-average rates in the nation. In contrast, the Dallas District actually had a slightly unfavorable manufacturing industry mix in the 1990s, so all of its better factory job growth that decade was due to regional factors. Most significantly, the Dallas District saw its semiconductor and computer manufacturing sectors grow much faster than in the nation. As for regional factors in the Minneapolis and Kansas City Districts, a couple of key industries explain a sizable portion of the better performance. Both Districts saw computer-related manufacturing grow faster than in the nation in the 1990s, and the Kansas City District also gained aerospace manufacturing jobs at the expense of other Districts.

Some of the main reasons for the strong regional effect in the Great Plains in the 1990s are likely the converse of many of the reasons for the negative regional effect in the Northeast. For example, factory wages in the Great Plains in 1990 were lower than in the Northeast (although somewhat higher than in the Southeast), potentially making the region more attractive (Green and Sanchez). Land for expansion was also likely more available and cheaper in the Great Plains in the 1990s than in other regions. Overall population flows to these districts may have led to more factory job growth as well, including shifts within specific companies with multiple plants across the country (Schuh and Triest). These Districts may also have benefited from closer proximity to the other NAFTA countries following the passage of that trade pact in 1994.

### *Factory industry mix became more important after 2000*

In the two U.S. manufacturing cycles since 2000, factory employment has fallen in all Federal Reserve Districts, though again with considerable regional variation. The first cycle was mid-2000 through mid-2006, when

factory employment began declining even before the rest of the economy entered recession in late 2007. The second cycle continues to the present, although detailed data are available only through the second quarter of 2011. This latter period includes the Great Recession of 2007-09, which could have had unique effects on the U.S. manufacturing industry. The latter period also does not constitute a full cycle, and so results must be interpreted with caution.

As in the 1990s, the three Great Plains Fed Districts experienced better manufacturing employment trends than all other Districts in both of the post-2000 cycles, though the relative difference was not quite as large. However, in all three Districts, but especially in the Kansas City District, factory industry mix contributed more to the stronger performance than in the 1990s.

The better factory performance in the Kansas City Fed District from mid-2000 to mid-2006 was due almost completely to the region's more favorable industry mix (Chart 3). In particular, the District's high concentrations in meat processing, aerospace manufacturing, cement and concrete manufacturing, and agricultural and energy machinery production all benefited its overall manufacturing sector (Appendix 2). The Kansas City District's better relative growth after mid-2006 was also due in very large part to its industry mix, attributable largely to the same industries as from mid-2000 to mid-2006 (Chart 4). The exception was cement and concrete manufacturing, which declined nationally following the housing bust, providing a drag on the region's factory sector (Appendix 3).

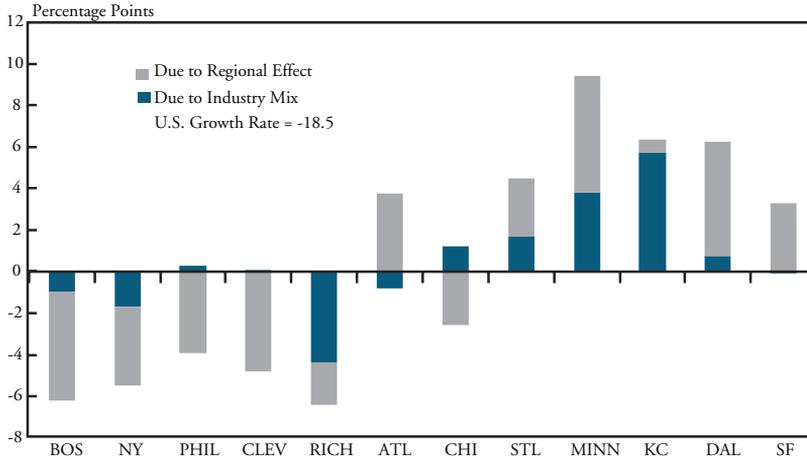
Industry mix was also much more important in the Minneapolis and Dallas Districts after 2000, though somewhat less than in the Kansas City District. High concentrations in food processing and in production of energy and agricultural equipment were positives for Minneapolis and Dallas both before and after 2006. Even so, the regional effect has remained larger than the industry mix effect in both of these Districts since 2000 as they generally remained more popular locations for manufacturing activity than other areas.

In much of the rest of the nation, industry mix also became relatively more important in the 2000s, especially in several cases after mid-2006. In the Boston and New York Districts, for example, high concentrations in medical equipment production helped relative

Chart 3

MANUFACTURING JOB GROWTH RELATIVE TO THE NATION

Second Quarter 2000–Second Quarter 2006

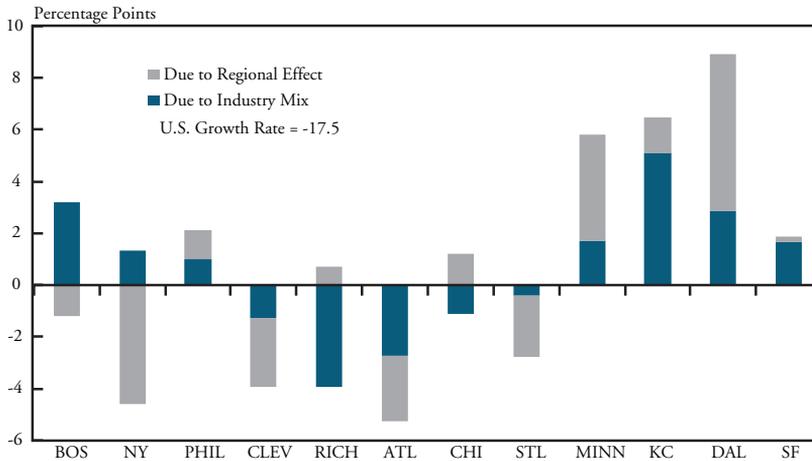


Source: U.S. Bureau of Labor Statistics

Chart 4

MANUFACTURING JOB GROWTH RELATIVE TO THE NATION

Second Quarter 2006–Second Quarter 2011



Source: U.S. Bureau of Labor Statistics

factory performance from mid-2006 to mid-2011. Over the same time period, the high concentration of auto manufacturers in the Cleveland and Chicago Districts were drags after 2006. In the Richmond and Atlanta Districts, industry mix was a drag in both post-2000 cycles, but due to different industries. Prior to mid-2006, clothing-related industries remained the biggest constraint, while in more recent years these Districts' high concentrations of furniture manufacturing—which was decimated by the housing bust—resulted in larger factory job losses.

The regional effect in relative factory job growth—while generally smaller in recent years—switched directions in several Fed Districts after 2006 for the first time since at least 1990. For example, the Philadelphia and Richmond Districts have had positive regional effects since 2006, meaning factory employment performed better than expected given the industry mixes in these Districts. By contrast, the Atlanta and St. Louis Districts had negative regional effects after 2006, the opposite of the previous decade and a half.

There are several possible reasons why industry mix has become more important over time than regional factors in describing relative factory employment. One is that manufacturing activity is distributed more evenly across the country now than in 1990. Thus many of the gains that manufacturers could reap from moving domestically may have already been realized (Lanaspa-Santolaria and others). Similarly, gains from moving to less expensive overseas locations may also have been largely realized. In addition, some industries that held up best in several regions may be more tied to relatively immobile natural or other resources, and thus not as able to move. These industries could include meat processing or agricultural and energy equipment manufacturing in the Great Plains, shipbuilding in the Richmond District, or even high-tech manufacturing in the San Francisco District, which may rely on a local high-skilled labor market. Finally, the abrupt decline of many types of U.S. manufacturing activity during the Great Recession likely meant that a region's factory performance may have depended more on which industries it had at the time of the financial crisis.

### III. HOW BENEFICIAL HAS IT BEEN TO MAINTAIN FACTORY JOBS?

The three Great Plains Fed Districts have consistently maintained more factory jobs than other Fed Districts since 1990. However, trends in the pay of factory jobs have varied across Fed Districts, tempering the benefits of stronger jobs performance in some districts. In addition, sizable factory job losses have not always coincided with sluggish regional income growth. And while the near-term outlook for U.S. factory jobs is positive, over longer time periods the sector has generally been more volatile and added jobs at slower rates than other sectors.

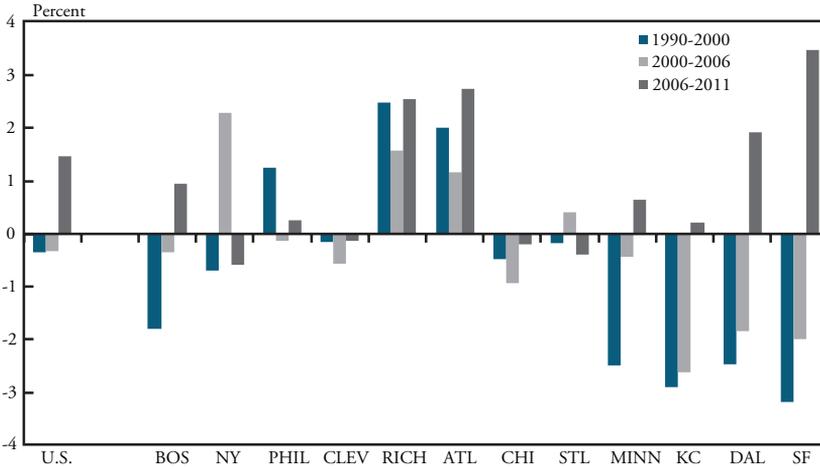
#### *Lower-paying factory jobs did better until recently*

One way to assess how the quality of factory jobs has evolved regionally over time is to compare the growth of higher-paying jobs with the growth of lower-paying jobs. This can be done by comparing how a region's overall manufacturing pay would change if local wages in each industry were held constant during a period and only the factory industry mix were allowed to change. Using this method for the United States, higher-paying factory jobs fell slightly more than lower-paying jobs in the 1990s and early 2000s (Chart 5). But since 2006, higher-paying factory jobs have held up much better than lower-paying jobs in the nation.

In each of the three Great Plains Fed Districts, the pay of factory jobs based on this exercise declined both absolutely and relative to the nation in the 1990s and early 2000s. Since 2006, higher-paying jobs have outpaced lower-paying jobs throughout the Great Plains, but only the Dallas District has exceeded the nation. In other Districts, only San Francisco experienced similar relative declines in the pay of factory jobs from 1990 through 2006 as the Great Plains Districts (before rebounding even more than the Dallas District after 2006). The Richmond and Atlanta Districts actually saw steady increases in the pay of remaining factory jobs in their regions, as lower-paying apparel manufacturing jobs disappeared. And in the Cleveland, Chicago, and St. Louis Fed Districts, the pay of factory jobs declined only slightly over time.

Chart 5

### CHANGE IN AVERAGE MANUFACTURING PAY DUE TO CHANGE IN MIX OF FACTORY INDUSTRIES



Source: U.S. Bureau of Labor Statistics

As a result, the ranking of Fed Districts in average annual pay of factory jobs has changed somewhat since 1990, including a divergence in the Great Plains. The Dallas District has risen from sixth to third, and now pays more than \$63,000 per factory job, a premium of 35 percent above overall average pay in that District (Table 2). Over the same period, the Minneapolis District has stayed at eighth place, and the Kansas City District has dropped from ninth to 10th place, with both Districts paying in the low \$50,000 range per factory job—which pay, by an average of about 20 percent. So by this measure, the Dallas District has benefited from retaining more factory jobs than other Districts.

#### *Per capita earnings growth also strongest in Great Plains*

A comparison of regional changes in overall per capita earnings provides some additional perspective on the benefits to Fed Districts that have retained more factory jobs.<sup>7</sup> In all 12 Federal Reserve Districts, and throughout the past two decades, the average pay of manufacturing jobs has exceeded overall pay by an average of about 20 percent.<sup>8</sup> Therefore, all else being equal, the loss of factory jobs would seem to be detrimental to income growth for a region, unless these jobs could be replaced by other high-paying work.

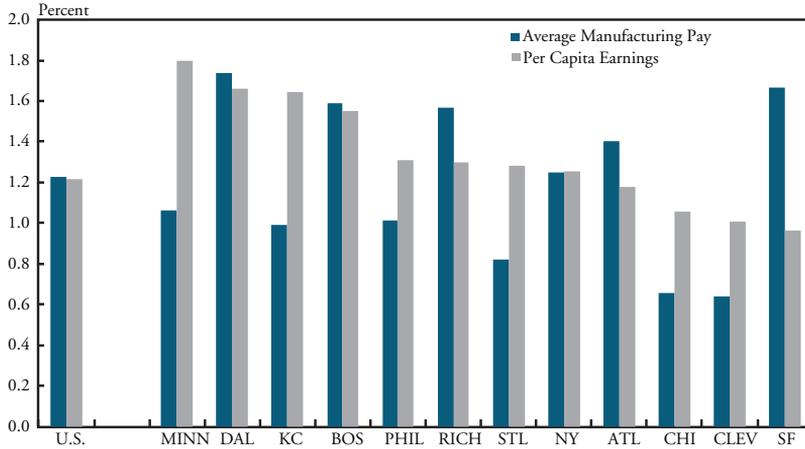
*Table 2*  
**AVERAGE REAL MANUFACTURING PAY BY FED DISTRICT**

		Q2 1990		Q2 2000		Q2 2006		Q2 2011
	U.S.	\$44,077	U.S.	\$52,648	U.S.	\$54,925	U.S.	\$56,964
1	BOS	\$49,556	SF	\$63,319	BOS	\$63,917	BOS	\$68,988
2	NY	\$48,064	BOS	\$61,439	SF	\$62,541	SF	\$66,757
3	CHI	\$47,451	DAL	\$55,035	NY	\$60,614	DAL	\$63,286
4	SF	\$47,180	NY	\$54,401	DAL	\$60,080	NY	\$62,373
5	CLEV	\$45,908	CHI	\$53,242	CHI	\$54,800	CHI	\$54,420
6	DAL	\$44,095	CLEV	\$52,502	CLEV	\$53,313	PHIL	\$53,552
7	PHIL	\$43,354	PHIL	\$50,538	PHIL	\$52,429	RICH	\$53,162
8	MINN	\$42,090	MINN	\$48,406	MINN	\$51,871	MINN	\$52,548
9	KC	\$41,055	KC	\$47,523	RICH	\$49,861	CLEV	\$52,491
10	STL	\$38,827	RICH	\$46,634	KC	\$49,567	KC	\$50,503
11	RICH	\$38,347	STL	\$44,140	ATL	\$47,360	ATL	\$50,019
12	ATL	\$37,316	ATL	\$43,936	STL	\$47,235	STL	\$46,100

Source: U.S. Bureau of Labor Statistics

Consistent with stronger relative factory employment, and generally irrespective of differing rates of growth in average factory pay, per capita earnings growth in the three Great Plains Fed Districts has been stronger than all other Districts over the past two decades (Chart 6). Factors other than manufacturing employment trends have contributed to these gains—including, for example, the rebounds by these regions from the agricultural and energy busts of the 1980s, along with more recent boosts from multiple commodities booms. Nevertheless, that per capita earnings rose solidly with stronger relative manufacturing employment is reassuring for the region.

In other regions, some Fed Districts with sizable factory job losses have nonetheless maintained solid per capita earnings growth for the past few decades. For example, the Boston District, which has lost nearly half its factory jobs since 1990, ranks just behind the Great Plains Districts in per capita earnings growth. Moreover, the St. Louis District—which lost nearly a third of its manufacturing jobs—also posted slightly above-average per capita earnings growth, despite manufacturing pay growing much slower than the national average. In the Richmond District, where factory employment has also been decimated—although

*Chart 6***ANNUAL REAL CHANGE IN PER CAPITA EARNINGS  
AND AVERAGE MANUFACTURING PAY***1990-2011*

Source: U.S. Bureau of Labor Statistics, U.S. Bureau of Economic Analysis

with remaining factory jobs paying relatively better—per capita earnings growth has also slightly exceeded the national average.

However, overall per capita earnings growth has clearly lagged in three Fed Districts. Of these, the manufacturing sector remains especially important in the Chicago and Cleveland Districts. Growth in average factory pay has lagged in these two Districts—and actually fell slightly in real terms from mid-2006 to mid-2011—suggesting that large losses in higher-paying manufacturing jobs were not offset by the addition of higher-paying jobs in other sectors. The San Francisco District ranks last in per capita earnings growth since 1990, despite average manufacturing pay outpacing nearly all other Districts. The slowdown in growth in per capita earnings was sharpest after mid-2006, as the region was hit hard in the housing bust.

*Costs and benefits relative to other sectors*

Another factor in assessing the benefits of manufacturing employment is how the sector has performed—and is expected to perform—relative to other sectors of the economy. For example, while factory employment has fallen by a third since 1990, nonmanufacturing employment in the United States has risen by almost a third, even

after the Great Recession. In addition, factory employment tends to fall much more sharply during recessions than other types of employment, producing more cyclical volatility in a region over time.

Economists recently have debated whether manufacturing provides unique positive externalities not always captured in standard economic data. If so, retaining manufacturing jobs may benefit a region beyond just the direct jobs and incomes manufacturing provides. Such spillovers may warrant national policies that promote manufacturing.

For example, a recent Brookings Institution study touts the manufacturing sector's contributions to commercial innovation, trade deficit reduction, and environmental sustainability. Although these factors are seldom considered when factory jobs are lost, they can provide measurable benefits (Helper and others). Helper and others find that the U.S. factory industries with the largest potential spillovers include computer and electronics, chemicals and pharmaceuticals, aerospace, motor vehicles, and machinery.

Other economists, though, question whether focusing special attention on manufacturing is justified. For example, Romer (2012) argues that there is a lack of evidence of market failure in the sector, citing work showing little evidence of spillover benefits from factories locating close to one another. Boskin (2012) cites the poor track record of past U.S. experience with industrial policy and thus encourages removing general barriers to trade rather than instituting more focused industrial policy.

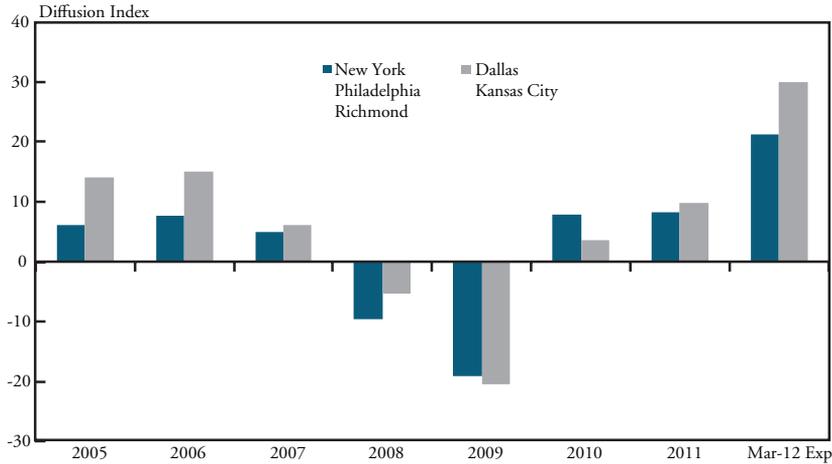
In the nearer term, expectations for U.S. factory employment are rather solid. For example, most forecasters expect U.S. factory job growth to exceed overall job growth in 2012 and 2013 before reverting to similar or slower growth in subsequent years. In addition, the employment expectations indexes in the five regional Fed manufacturing surveys were quite positive in early 2012, suggesting solid factory job growth could continue through the year.

Moreover, these regional Fed surveys suggest that past trends in regional variation in factory employment growth may persist. The two Great Plains Districts that conduct surveys—Kansas City and Dallas—together have higher expectations for factory employment in 2012 than the three eastern Fed Districts that conduct surveys (Chart 7). Kansas City and Dallas also had stronger employment indexes than

Chart 7

## FEDERAL RESERVE DISTRICT MANUFACTURING EMPLOYMENT INDEXES

*Annual Average*



Source: Federal Reserve District Manufacturing Surveys

the eastern Districts in five of the past seven years, consistent with previous findings in this article.<sup>9</sup>

## IV. SUMMARY AND CONCLUSIONS

Despite solid recent gains, factory employment in the United States has fallen drastically over the past two decades. Yet some regions of the country have lost considerably fewer jobs than others. In particular, the three Federal Reserve Districts in the Great Plains—Dallas, Kansas City, and Minneapolis—have consistently had either faster manufacturing job growth or smaller factory job losses than all other regions. Initially, this was due primarily to unique aspects about those regions that made them more attractive for factory activity. More recently, the more favorable factory industry mixes of these regions have become more important in explaining their better performance.

Generally, the Great Plains Fed Districts have benefited from retaining more factory jobs than other regions. While the quality of factory jobs—in terms of relative pay—has diminished slightly in the Kansas City and Minneapolis Districts since 1990, it has risen in the Dallas District. In addition, overall per capita earnings growth in these three

Districts has risen more than in any other District since 1990. Some analysts also suggest that manufacturing provides positive externalities not always captured by looking at only jobs and pay in the manufacturing sector.

At the same time, the loss of considerable numbers of factory jobs has not always meant declining regional incomes. While per capita earnings in the manufacturing-heavy Chicago and Cleveland Fed Districts have indeed lagged the rest of the country, average earnings growth in the Boston, Richmond, and St. Louis Fed Districts have outpaced the nation since 1990. This has occurred despite sizable factory job losses. In addition, the manufacturing sector has historically been more volatile and created fewer jobs—even in better performing Fed Districts—than other sectors of the economy, providing some caution to relying too heavily on the sector.

*Appendix 1*  
**TOP CONTRIBUTING INDUSTRIES TO EMPLOYMENT SHIFT SHARE EFFECTS, Q2 1990-Q2 2000**

<b>1-BOSTON</b>		<b>2-NEW YORK</b>		<b>3-PHILADELPHIA</b>		Number of Jobs	
	Number of Jobs		Number of Jobs		Number of Jobs		Number of Jobs
<i>Industry mix</i>	-25,585	<i>Industry mix</i>	-19,875	<i>Industry mix</i>			3,319
Aerospace Products	-30,520	Cut and Sew Apparel	-50,313	Cut and Sew Apparel			-27,093
Nav. and Electromed. Instr.	-17,269	Plastics Product	18,853	Plastics Product			12,262
Semiconductor and Comp.	11,660	Nav. and Electromed. Instr.	-16,938	Arch. and Structural Metals			8,241
<i>Regional effect</i>	-103,251	<i>Regional effect</i>	-285,740	<i>Regional effect</i>			-71,586
Computer and Equipment	-13,565	Plastics Product	-21,295	Arch. and Structural Metals			-7,478
Other Miscellaneous	-13,228	Chem. Product and Prep.	-19,477	Cut and Sew Apparel			-7,390
Semiconductor and Comp.	-11,891	Semiconductor and Comp.	-18,668	Motor Vehicle Parts			-5,794
<b>4-CLEVELAND</b>		<b>5-RICHMOND</b>		<b>6-ATLANTA</b>			
<i>Industry mix</i>	39,598	<i>Industry mix</i>	-69,933	<i>Industry mix</i>			-61,965
Motor Vehicle Parts	18,980	Cut and Sew Apparel	-51,981	Cut and Sew Apparel			-98,305
Aerospace Products	-13,267	Fabric Mills	-27,943	Aerospace Products			-21,369
Plastics Product	12,844	Textile Mills	-17,939	Plastics Product			18,445
<i>Regional effect</i>	-64,921	<i>Regional effect</i>	-11,128	<i>Regional effect</i>			125,257
Med. Equip. and Supplies	-15,188	Cut and Sew Apparel	-25,354	Cut and Sew Apparel			-39,594
Plastics Product	11,000	House Furn. and Cabinet	-16,514	Meat Processing			12,987
Semiconductor and Comp.	-7,560	Elec. Equip. and Component	10,128	Arch. and Structural Metals			12,704

Appendix 1 (continued)

<b>7-CHICAGO</b>	Number of Jobs	<b>8-ST. LOUIS</b>	Number of Jobs	<b>9-MINNEAPOLIS</b>	Number of Jobs
<i>Industry mix</i>	221,077	<i>Industry mix</i>	3,102	<i>Industry mix</i>	17,271
Motor Vehicle Parts	61,866	Cut and Sew Apparel	-21,958	Nav. and Electromed. Instr.	-4,738
Plastics Product	42,266	Aerospace Products	-15,335	Meat Processing	4,190
Motor Vehicle Body and Trailer	24,125	Meat Processing	10,467	Plastics Product	3,922
<i>Regional effect</i>	34,244	<i>Regional effect</i>	63,957	<i>Regional effect</i>	57,285
Motor Vehicle	-14,339	Motor Vehicle Parts	13,874	Nav. and Electromed. Instr.	9,068
Plastics Product	11,633	Motor Vehicle	6,666	Printing Support Activities	9,037
Fabricated Metal	10,804	Aerospace Products	-5,902	Computer and Equipment	-4,771
<b>10-KANSAS CITY</b>		<b>11-DALLAS</b>		<b>12-SAN FRANCISCO</b>	
<i>Industry mix</i>	14,046	<i>Industry mix</i>	-10,115	<i>Industry mix</i>	-110,944
Aerospace Products	-23,250	Aerospace Products	-25,435	Aerospace Products	-132,963
Meat Processing	10,135	Cut and Sew Apparel	-21,501	Cut and Sew Apparel	-57,769
Plastics Product	5,733	Arch. and Structural Metals	10,273	Nav. and Electromed. Instr.	-52,031
<i>Regional effect</i>	86,927	<i>Regional effect</i>	136,106	<i>Regional effect</i>	32,856
Aerospace Products	19,113	Semiconductor and Comp.	27,623	Cut and Sew Apparel	57,886
Meat Processing	9,952	Computer and Equipment	11,369	Other Wood Product	-21,282
Nav. and Electromed. Instr.	7,404	House Furn. and Cabinet	8,286	Other Miscellaneous	17,131

Source: U.S. Bureau of Labor Statistics

*Appendix 2*  
**TOP CONTRIBUTING INDUSTRIES TO EMPLOYMENT SHIFT SHARE EFFECTS, Q2 2000-Q2 2006**

1-BOSTON		2-NEW YORK		3-PHILADELPHIA		Number of Jobs	
	Number of Jobs						
<i>Industry Mix</i>	-7,953	<i>Industry Mix</i>	-15,731	<i>Industry Mix</i>			2,779
Semiconductor and Comp.	-6,937	Cut and Sew Apparel	-25,294	Cut and Sew Apparel			-8,162
Communications Equip.	-5,141	Pharm. and Medicine	14,250	Pharm. and Medicine			6,208
Pharm. and Medicine	4,795	Semiconductor and Comp.	-5,456	Meat Processing			3,987
<i>Regional effect</i>	-34,964	<i>Regional effect</i>	-34,768	<i>Regional effect</i>			-28,168
Semiconductor and Comp.	-5,431	Computer Equip.	8,553	Semiconductor and Comp.			-5,542
Converted Paper Product	-3,881	Other Miscellaneous	-7,252	Pharm. and Medicine			-4,468
Communications Equip.	-3,452	Plastics Product	-4,909	Other Wood Product			4,466
<b>4-CLEVELAND</b>		<b>5-RICHMOND</b>		<b>6-ATLANTA</b>			
<i>Industry Mix</i>	817	<i>Industry Mix</i>	-57,599	<i>Industry Mix</i>			-12,869
Machine Shops	4,493	Fabric Mills	-36,169	Cut and Sew Apparel			-25,084
Motor Vehicle Parts	-4,125	Textile Mills	-13,650	Meat Processing			18,771
Metalworking Machinery	-3,201	Cut and Sew Apparel	-11,697	Fabric Mills			-14,904
<i>Regional effect</i>	-39,783	<i>Regional effect</i>	-37,312	<i>Regional effect</i>			67,492
Other Wood Product	-4,429	House Furn. and Cabinet	-16,478	Motor Vehicle Parts			12,766
Motor Vehicle	-4,062	Semiconductor and Comp.	-8,680	Motor Vehicle			12,275
Nav. and Electromed. Instr.	-3,931	Motor Vehicle Parts	6,639	Aerospace Products			7,933

## Appendix 2 (continued)

	7-CHICAGO	8-ST. LOUIS	9-MINNEAPOLIS	Number of jobs	Number of jobs
	Number of Jobs				Number of jobs
<i>Industry Mix</i>	33,585	<i>Industry Mix</i>	<i>Industry Mix</i>	12,627	13,141
Motor Vehicle Parts	-13,992	Meat Processing	Meat Processing	10,681	3,799
Machine Shops	13,946	Cut and Sew Apparel	Medical Equip. and Supplies	-6,862	2,500
Meat Processing	13,597	Cement and Concrete	Semiconductor and Comp.	3,133	-2,454
<i>Regional effect</i>					
<i>Regional effect</i>	-68,177	<i>Regional effect</i>	<i>Regional effect</i>	19,202	21,133
Motor Vehicle Parts	-25,317	Motor Vehicle Parts	Printing and Support Activities	10,570	5,571
Motor Vehicle	-13,848	Plastics Product	Nav. and Electromed. Instr.	3,856	3,692
Ag., Const., and Mining Mach.	-8,031	House Furn. and Cabinet	House Furn. and Cabinet	-2,975	3,038
<b>10-KANSAS CITY</b>					
		<b>11-DALLAS</b>	<b>12-SAN FRANCISCO</b>		
<i>Industry Mix</i>	30,570	<i>Industry Mix</i>	<i>Industry Mix</i>	5,659	-5,031
Meat Processing	11,403	Cut and Sew Apparel	Cut and Sew Apparel	-10,398	-43,523
Aerospace Products	5,441	Semiconductor and Comp.	Semiconductor and Comp.	-9,554	-31,809
Cement and Concrete	4,125	Communications Equip.	Aerospace Products	-7,288	19,754
<i>Regional effect</i>					
<i>Regional effect</i>	4,302	<i>Regional effect</i>	<i>Regional effect</i>	49,323	81,736
Aerospace Products	-4,284	Aerospace Products	Semiconductor and Comp.	10,034	20,041
Computer Equip.	-3,158	Ag., Const., and Mining Mach.	Cut and Sew Apparel	7,860	18,691
Motor Vehicle Body and Trailer	-2,539	Cut and Sew Apparel	Aerospace Products	-7,560	-15,560

Source: U.S. Bureau of Labor Statistics

*Appendix 3*  
**TOP CONTRIBUTING INDUSTRIES TO EMPLOYMENT SHIFT SHARE EFFECTS, Q2 2006-Q2 2011**

	Number of Jobs	2-NEW YORK	Number of Jobs	3-PHILADELPHIA	Number of Jobs
<b>1-BOSTON</b>					
<i>Industry Mix</i>	17,265	<i>Industry Mix</i>	9,867	<i>Industry Mix</i>	5,660
Aerospace Products	8,898	Pharm. and Medicine	6,207	Other Wood Product	-4,660
Nav. and Electromed. Instr.	4,558	Cut and Sew Apparel	-5,604	House Furn. and Cabinet	-4,224
Medical Equip. and Supplies	4,218	Bakeries and Tortilla	5,381	Meat Processing	3,079
<i>Regional effect</i>	-3,824	<i>Regional effect</i>	-34,215	<i>Regional effect</i>	6,376
Other Miscellaneous	-3,719	Pharm. and Medicine	-7,751	Plastics Product	3,043
Communications Equip.	-2,199	Chemical Product and Prep.	-6,616	Aerospace Products	2,710
Aerospace Products	-1,970	Printing and Support Activities	-3,841	Motor Vehicle Body and Trailer	-2,548
<b>4-CLEVELAND</b>		<b>5-RICHMOND</b>		<b>6-ATLANTA</b>	
<i>Industry Mix</i>	-8,639	<i>Industry Mix</i>	-40,430	<i>Industry Mix</i>	-41,753
Motor Vehicle Parts	-13,974	House Furn. and Cabinet	-15,922	House Furn. and Cabinet	-18,181
Motor Vehicle	-4,779	Fabric Mills	-9,980	Meat Processing	14,651
House Furn. and Cabinet	-3,942	Meat Processing	8,846	Other Wood Product	-12,186
<i>Regional effect</i>	-17,511	<i>Regional effect</i>	8,744	<i>Regional effect</i>	-38,913
Motor Vehicle Parts	-5,545	Bev. and Tobacco Product	-3,781	Meat Processing	-7,871
Rubber Product	-2,644	Ship and Boat Building	3,726	Arch. and Structural Metals	-6,960
Nonferrous Metal	-2,250	Nav. and Electromed. Instr.	3,476	Motor Vehicle Parts	6,352

Appendix 3 (continued)

	7-CHICAGO	8-ST. LOUIS	9-MINNEAPOLIS	Number of Jobs	Number of Jobs
	Number of Jobs				
<i>Industry Mix</i>	-24,442	<i>Industry Mix</i>	<i>Industry Mix</i>	-2,532	5,683
Motor Vehicle Parts	-41,629	Motor Vehicle Parts	Other Wood Product	-8,572	-3,815
Motor Vehicle	-13,480	3363	House Furn. and Cabinet	8,088	-3,244
Other Wood Product	-13,048	3116	Medical Equip. and Supplies	-5,137	3,002
		3361			
<i>Regional effect</i>	25,240	<i>Regional effect</i>	<i>Regional effect</i>	-14,346	13,134
House Furn. and Cabinet	8,575	Motor Vehicle	Computer and Equip.	-4,525	-2,627
Printing and Support Activities	7,335	3361	Ag., Const., and Mining Mach.	-3,182	-1,832
Motor Vehicle Parts	-7,051	3339	Other Wood Product	2,991	1,730
		3231			
<b>10-KANSAS CITY</b>		<b>11-DALLAS</b>	<b>12-SAN FRANCISCO</b>		
<i>Industry Mix</i>	24,346	<i>Industry Mix</i>	<i>Industry Mix</i>	21,818	33,148
Aerospace Products	10,134	3364	Aerospace Products	10,017	36,788
Meat Processing	8,608	3331	House Furn. and Cabinet	7,608	-17,091
Ag., Const., and Mining Mach.	4,444	3371	Nav. and Electromed. Instr.	-5,703	14,143
<i>Regional effect</i>	6,053	<i>Regional effect</i>	<i>Regional effect</i>	46,135	3,145
Aerospace Products	-6,114	3331	Computer and Equip.	10,969	9,243
Cement and Concrete Product	2,291	3119	Nav. and Electromed. Instr.	-4,932	-8,290
Basic Chemical	2,077	3363	Cur and Sew Apparel	4,713	7,725

Source: U.S. Bureau of Labor Statistics

## ENDNOTES

<sup>1</sup>The detailed employment and wage data used in this article come from the U.S. Bureau of Labor Statistics' Quarterly Census of Employment and Wages (QCEW).

<sup>2</sup>Specifically, the Dallas, Kansas City, New York, Philadelphia, and Richmond Feds each release information about factory activity, prices, and expectations in their region, on much timelier and less revised bases than standard state or regional economic data.

<sup>3</sup>Analysis of data at the Federal Reserve District level presents some challenges, however. For example, many Fed Districts share states. In these cases, analysis of county data would be most exact, but such data are often suppressed at detailed industry levels. As a result, nearly all of the analysis in this article assigns each state to one Fed District, based on which District includes the most overall economic activity in that state.

<sup>4</sup>In this case, county-level data, for which total manufacturing employment is almost always available, were used to compute employment within actual Federal Reserve District boundaries.

<sup>5</sup>The QCEW state manufacturing employment and wage data analyzed in this article are primarily at the 4-digit NAICS level. The only exceptions are the use of NAICS 312—Beverage and Tobacco Manufacturing—and NAICS 316—Leather and Allied Products Manufacturing—both of which had more than 25 percent of the data at the 4-digit level suppressed. More than 90 percent of the data was available for all other 4-digit NAICS factory codes, and well over 95 percent for most 4-digit industries. Overall, the data available for the 83 industries analyzed represent 97 percent of total U.S. manufacturing employment.

<sup>6</sup>Shift-share analysis decomposes the difference between a region's factory job growth and national factory job growth into two components. The first component is the industry mix effect, which describes how much of the region's relative difference in growth was due to changes in industries at the national level. For example, if all manufacturing industries in a region added or lost jobs at exactly the same rate as they did in the nation, then any difference in the region's factory job growth from national factory job growth would be attributed solely to the region's differing industry mix. The second component is what is often termed the regional effect, which describes how much of the relative change was due to factors other than industry mix. The regional effect captures the extent that specific manufacturing industries grew at a different rate in the region than in the nation.

<sup>7</sup>Per capita earnings are analyzed rather than per capita income primarily to exclude capital income from the analysis.

<sup>8</sup>The full range of the manufacturing pay premium across time and regions is 8 percent in the Richmond District in 1990 to 36 percent in the San Francisco District in 2011.

<sup>9</sup>The Dallas Fed manufacturing survey's results are available only back to mid-2004.

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