Is the Seventh District's economy deindustrializing?

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The Seventh Federal Reserve District is located on the western flank of what has been called the nation's "rustbelt." It is easy to see how this characterization might be applied to the Seventh District. The District's economy is heavily specialized in a number of troubled industries: automotive (Michigan), steel and machine tools (Illinois, Indiana, and Wisconsin), and a set of industries closely linked to the production and processing of food (Iowa). All of these have been adversely affected by structural changes in the national economy arising from international trade, such as the rising tide of auto and steel imports and the fall of grain exports, or changing product demand, such as the emergence of the computer. Indeed, an image of idle factories and massive blue-collar unemployment that seems to pervade the Seventh District has raised fears of nationwide deindustrialization, or an absolute decline of output produced in the nation's manufacturing sector.

Through analysis of manufacturing employment and output for the Seventh District between 1955 and 1984, this article offers new evidence that deindustrialization has in fact been occurring in the Seventh District, but only since 1970. The study shows how evidence of deindustrialization has been obscured by lumping economically diverse regions into a national aggregate. Also, by identifying a dramatic break in the growth trend of manufacturing output around 1970, the study explains why previous studies of regional deindustrialization, which have been limited to data only through 1978, were less conclusive.[1]

In contrast, claims of deindustrialization for the nation as a whole, have been refuted by convincing research.[2] Treating the nation as a single homogeneous region has allowed analysts to show that the popular view that the economy is reducing its manufacturing sector and replacing it with hamburger stands and laundromats is largely a myth. For example, far from declining, manufacturing output nationally has been on a rising trend for many years. More importantly, manufacturing's share of gross national product (GNP) has been remarkably stable at roughly 25 percent over the post-World War II era (allowing for deviations over the business cycle).

But, when regions are analyzed as separate and distinct (though interdependent) economies, what begins to emerge is a dichotomy between regional economies that are still growing and those that are not. Each region has its own economic history, each has its own specialization of products, and each has a different sensitivity to national and world economic events. The purpose of this article is to put the concept of deindustrialization into its proper perspective as a regional issue.

What is deindustrialization?

The term deindustrialization can cause confusion if used too loosely. For example, one definition that has been offered is "widespread, systematic disinvestment in the nation's basic industrial capacity."[3] Using the level of investment as a measure, however, may be too restrictive to find evidence of deindustrialization except in the nation's aging urban centers. In another recent study, deindustrialization was equated with a decline in regional manufacturing output relative to the whole national economy.[4] However, the manufacturing sector of the entire "rustbelt" has been a declining share of the nation's manufacturing sector *since the turn of the century*.[5]

Definitional problems have not been the only source of confusion in understanding deindustrialization. Distinguishing between an underlying trend that is distinct to a region and a national influence that is affecting all regions more or less equally is another problem. A decline in a region's manufacturing sector over a given period of time may be due solely to a

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hypersensitivity to the national business cycle. Indeed, both manufacturing employment and output in the nation have for the most part been declining since 1979, which is overwhelmingly a short-term business-cycle phenomenon. As such, the period from 1979 to 1984 should not be interpreted as *prima facie* evidence of deindustrialization. A careful analysis of a region's economy must put recent events into an historical perspective that can distinguish between cycle and trend.

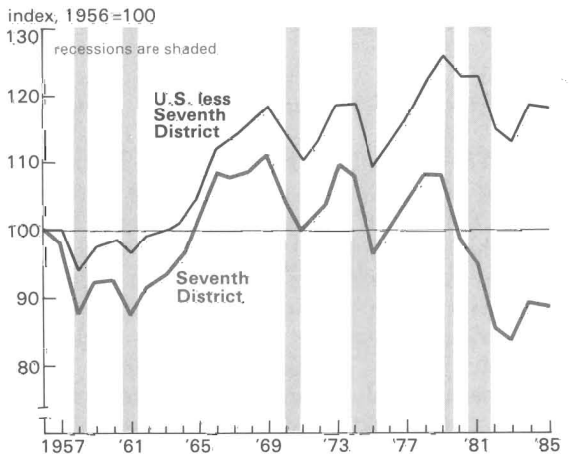
A final problem with analyzing regional trends is that, with the exception of employment measures, economic data for the manufacturing sector are at best fragmented. The Census of Manufacturers (CM) and the Annual Survey of Manufactures (ASM) provides a rich source of data on a region's manufacturing base. However, three critical years are missing from the ASM, preventing time-series analysis beyond 1978. The problem can be overcome by approximating values for the missing observations of the manufacturing output and for nonmanufacturing output (see box).

Employment trends—overstating the decline

Given the completeness of regional employment data, it is not surprising that the image of District trends has been heavily shaped by the relative and absolute performance of manufacturing employment. Although highly cyclical in nature, manufacturing employment in the United States has been virtually flat since the mid-1960s.[6] In contrast, the Seventh District's manufacturing employment has been declining visibly over the same period (see Figure 1). Moreover, once the District's trend is removed from the national data, the rest of the nation can be seen to continue expanding manufacturing employment (again, taking into consideration cyclical swings).[7]

Three problems occur with drawing conclusions about regional deindustrialization that are based on employment trends. First, because the District has a high proportion of both mature and cyclically sensitive industries, some of the observed weakness in the District's economy may be attributed to its industrial mix. Obvious examples are the decline of the domestic steel industry, heavily concentrated in the Chicago-Gary area, and of the automotive

Figure 1
Manufacturing employment trends



SOURCE: Department of Labor; Bureau of Labor Statistics.

industry, concentrated in the Detroit area. Since virtually all of the District's industries have lagged their national counterparts, however, the problem is clearly not confined to an unfavorable industrial structure.[8]

Second, some of the states in the District could account for all of the decline in the District, while other states were expanding employment. Iowa, for example, is much more of an agriculturally oriented state than the rest of the District and its manufacturing employment growth up until the late 1970s was exceptionally stronger than any of the other states.[9] Wisconsin has also experienced above-average employment growth for a District state. In the three biggest District states, however, manufacturing employment has been declining. So, even within the District there existed a split at least until the 1980s between states that were industrializing and states that were deindustrializing.

The third problem with focusing on employment is that, if labor is becoming more efficient, employment can be declining at the same time that output in the region is rising. Alternatively, a region may shift its production processes away from labor without sacrificing output by substituting capital for labor or by purchasing more business services.[10] Finally, the region may be expanding its capital stock more rapidly than its employment.[11] In each of these cases, labor productivity could rise

Filling in the blanks

The Bureau of the Census did not publish regional data in the ASM for the years 1979, 1980, and 1981. Data for value added of total manufacturing by state for 1980 was obtained upon request from the Bureau, but estimates had to be made for the remaining years. Estimates of hours worked for all three years were also needed to compute labor productivity. The Longitudinal Establishment Data (LED) file (which was developed by the Bureau of the Census) provided the basis for estimating these missing observations. The LED file contains all of the information originally in the 1972 and 1977 CM and the 1978-81 ASM. From the LED file, a sample of all firms with over 100 employees was obtained. Depending on the state and the particular variable, this LED sample represented between 60 and 80 percent of the ASM data for the years in which the two series overlapped (1972 to 1978). (For further information see James L. Monahan, "Procedures for Using the Longitudinal Establishment Data File," *Technical Notes*, Bureau of the Census, April 1983.)

The formula applied to the LED data for nominal value added (NVALED) to approximate the missing ASM data (NVAASM) during a given year, using 1979 and the Seventh District (7G) as an example, was:

$$\hat{NVA7G}_{79} = NVALED_{79} * \left[\frac{NVAASMUS79}{NVALEDUS79} \div \frac{\sum_{t=72}^{78} \frac{NVAASMUS_t}{NVALEDUS_t} * \frac{NVALEDG_t}{NVAASM7G_t}}{7} \right]$$

aproximated values, $\hat{NVA}\_\_$, were then deflated by the Producer Price Index for all commodities and converted to their log values to get the final estimated measure of output ($LNVA\_\_$) that was entered in the model.

The formula is a modification of a simple formula that would compute the average ratio of LED to ASM data during the overlapping years (1972 to 1978) and assume that the ratio holds for the missing years. Because the ratio is known at the national level during the missing years, its inclusion provides useful information for those years. The assumption is that the regional ratio of LED to ASM moves in the same direction as the ratio for the nation. In addition, the inclusion of the national data provides a more stable ratio upon which to estimate the missing regional observations.

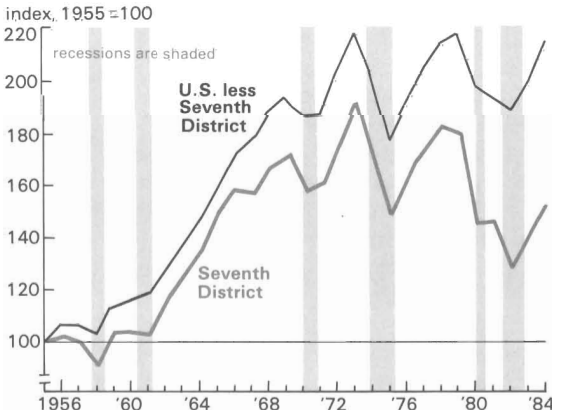
enough to offset declines in employment, so that the region's output continues to expand.

In the case of the Seventh District, labor productivity in manufacturing has been rising steadily throughout the post-World War II era. However, its productivity has lagged the rest of the nation. Labor productivity in the District grew 2.0 percent annually between 1955 and 1984 (but only 1.3 percent if Iowa and Wisconsin are excluded). In contrast, the rest of the nation expanded labor productivity at a 2.2 percent annual rate. The question now becomes whether the growth in productivity was enough to offset employment declines in manufacturing, so that manufacturing output continued to expand. If so, the District's economy could still be industrializing in terms of output, if not in terms of employment.

Output trends—nearer the mark

Observing the underlying trend in the District's manufacturing output from the raw data is more difficult than was the case with employment data (see Figure 2). What is obvious from the data is first that manufacturing output had been trending upwards in both the District and the rest of the nation at least until

Figure 2
Trends in manufacturing output



SOURCE: Department of Commerce, Bureau of the Census.

the early 1970s. Second, manufacturing output in the District has yet to surpass its 1973 peak. Recessions in both the early 1970s and 1980s account for some of the difference before and after the early 1970s. But, unless the business cycle can explain all of the difference, the weakness since the early 1970s signals a fundamental break in the underlying output trend.[12]

Separating the influence of business-cycle fluctuations from the underlying trend can be achieved through regression analysis. A model was constructed to determine if there was any period of statistically significant decline in the District's manufacturing output (using value added deflated by the Producer Price Index as a proxy for output). The basic form of the model was:

$$LNVA\_\_ = a_1 + a_2 D71 + bLNGNPCHG + c_1 T + c_2 D71{*}T + e$$

where $LNVA\_\_$ = natural log of real value added in manufacturing

LNGNPCHG = change in the natural log of real gross national product (the business-cycle variable)

T = time trend

D71 = dummy variable (D71 = 1 beyond 1970 and 0 otherwise).

By testing a variety of years to serve as the dividing point of the dummy variable in the model, the year 1971 was found to give the best statistical results.[13]

Because the model in effect has two slopes and two intercepts, the actual year of the break in trend may differ from the year chosen for the dummy variable. Therefore, the model must be solved for the break, which was usually during 1970 or 1971 for the Seventh District and its five states. The causes for the break are associated with such factors as technological changes and shifting product demand, whose impact may have been building for several years prior to 1970. It is interesting to note that, while the energy shocks in 1973 and 1979 certainly contributed to the decline, the break occurred about three years prior to the onset of the energy crisis.

The results of the regression analysis show that, after growing on average at an annual rate of 4.4 percent up to 1970, manufacturing output in the District has since been declining at a 1.4 percent annual rate (see Table 1). In other words, even after accounting for the cyclical weakness of the 1970s and 1980s, there is significant evidence that the District has been deindustrializing.

In contrast, the rest of the nation was still edging upward at 0.2 percent per year over the post-1970 period. While that growth rate was not large enough to be significantly different from zero, it supports the argument that the rest of the nation was not deindustrializing. More importantly, the disparity between the District and the rest of the nation helps explain why evidence of deindustrialization has not been discovered at the national level. From a long-term perspective, the level of manufacturing output for the nation as a whole was virtually flat between 1970 and 1984. As in the case of employment, opposing regional trends in manufacturing output are roughly offsetting each other.

Variations in output performance within the District followed a pattern similar to the one found in employment (see Figure 3). Declines in manufacturing output during the post-1970 period were most pronounced in Illinois, Indiana, and Michigan. Both Iowa and Wisconsin behaved more like the national average by flattening out rather than reducing their level of manufacturing output. Both

Table 1

Regression results: Absolute change in manufacturing value added

Dependent variable	Independent variables					R^2	Break in trend (year)
	Intercept	D71	LNGNPCHG	t	D71*t		
LNVA7G	11.42 (.0001)	.95 (.0001)	2.17 (.0001)	.044 (.0001)	-.058 (.0001)	.83	mid-1970
LNVAUS	12.91 (.0001)	.76 (.0001)	1.41 (.0001)	.048 (.0001)	-0.48 (.0001)	.92	1970
LNVAUSX	12.64 (.0001)	.71 (.0001)	1.21 (.002)	.049 (.0001)	-.045 (.0001)	.93	1970
LNVAIL	10.43 (.0001)	.96 (.0001)	1.50 (.004)	0.41 (.0001)	-0.59 (.0001)	.74	1971
LNVAIN	9.63 (.0001)	1.02 (.0001)	2.30 (.0001)	.049 (.0001)	-.062 (.0001)	.86	mid-1970
LNVAIA	8.37 (.0001)	.93 (.0001)	1.06 (.02)	.061 (.0001)	-0.56 (.0001)	.92	1971
LNVAMI	10.15 (.0001)	1.09 (.0001)	3.57 (.0001)	.045 (.0001)	-.065 (.0001)	.80	1971
LNVAWI	9.37 (.0001)	.69 (.0001)	1.47 (.0004)	.042 (.0001)	-.041 (.0001)	.92	1971

NOTE: Figures in parentheses are levels of significance. A level of less than or equal to .05 (i.e. 5%) indicates that the variable has a significant impact on the dependent variable.
To correct for 1st-order serial correlation, a two-step full transformation method was applied.

The dependent variables: *LNVA__* = natural log of real value added for the Seventh District (7G), the U.S., the US excluding the 7G (USX), Illinois (IL), Indiana (IN), Iowa (IA), Michigan (MI), and Wisconsin (WI)

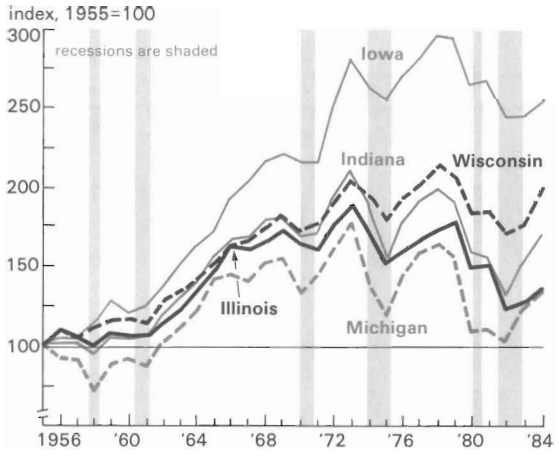
The independent variables: D71 = dummy variable for years ≥ 1971.
LNGNPCHG = change in natural log of real GNP.
t = the time trend.
D71*t = the product of the time trend (t) and D71 (i.e., growth rate post 1971).

states began to plateau about the same time as the national slowdown, rather than one to two years before when the other three states began to decline. In addition, the model was able to explain only 70 percent of the variation in the data for Michigan and Illinois, compared to about 90 percent for the nation, which suggests that other factors that are unique to these states have been influencing their growth.

It is interesting to note differences in sensitivity to the business cycle, which help obscure the differences in trend growth among the District states. On average, the District (with an elasticity of 1.78) is about two and a half times more sensitive to the business cycle than the rest of the nation (with an elasticity of 0.72). Iowa again turns out to be more similar to the rest of the nation, while Michigan is more than four times as sensitive as Iowa to swings in national business-cycle activity.

The variations in behavior with respect to both cycle and trend raise the possibility that differences in industrial structure may account for the District's poor output performance relative to the nation. For example, the domestic auto and steel industries are both highly cyclical and mature industries. The District's declining manufacturing output might simply be due to the exceptionally high concentration of these two industries in the Seventh District. The data used in this study do not adjust for structural differences among regions. Other estimates of District output, such as the Midwest Manufacturing Index (MMI), can be ad-

Figure 3
Seventh District manufacturing output trends by state



SOURCE: Department of Commerce, Bureau of the Census.

justed for industrial structure. However, adjusting the MMI shows a similar (but less severe) pattern of decline since the early 1970s.[14] Thus, an unfavorable mix of industries (i.e., industries that are performing poorly across the nation, but are concentrated in the Seventh District) can not alone explain the decline in the District's manufacturing output.

Another concern is the extent to which productivity differences between the District and the rest of the nation may account for the District's declining manufacturing output. Indeed, if labor productivity for the rest of the nation were applied to the District's level of manufacturing employment, the hypothetical level of District output that is attained does not show a statistically significant decline during the post-1970 period. However, the District would still have experienced more of a slowdown during that period than the rest of the nation. This finding indicates that productivity differences are important in explaining the District's deindustrialization, but are not the only explanation. Competitive disadvantages of District producers, often attributed to wage rate differentials, unionism, and shifting regional markets, are also important.[15]

Some qualified answers

The volatile behavior of the Seventh District's economy in recent years has raised many questions and concerns about its future viability. Among the most pressing is whether deindustrialization is a valid description of what is afflicting the District's economy. This study provides evidence that since 1970 the Seventh District's manufacturing sector has been producing fewer and fewer goods. This decline represents deindustrialization in the sense of an absolute decline in output.

The exact causes of the District's deindustrialization are complex and beyond the scope of this study. The fact that growth of manufacturing output in the District has been lagging the nation over the past four decades or so indicates that the stage was being set for absolute deindustrialization whenever the national economy faltered. And, indeed, a break in the trend since 1970, which represented a national slowdown in the growth of manufacturing output, finally translated into an absolute decline in the District's output. Of course, a resurgence in the national economy might provide a short-term solution to the District's decline in output by literally pulling the District out of its deindustrialization.

A strong national expansion, however, would not change the underlying factors in the District's economy that have caused the District's manufacturing sector to lag the nation. Viewed from this perspective, the period of deindustrialization has been a culmination of underlying factors that became the dominant forces shaping regional growth after 1970. Further research in identifying these factors and quantifying their impact on regional growth patterns may help state and local governments design policies to help District producers improve their competitiveness and to reverse the District's current trend in manufacturing output.

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[1] Studies of regional deindustrialization to date have generally been inconclusive and often differed as to what they meant by deindustrialization. See, for example, Bluestone, 1984 and Bartholomew, et al., 1986.

[2] See Lawrence, 1984, for the most persuasive argument on the subject to date.

[3] See Bluestone, 1984, p. 39.

[4] See Bartholomew, et al., 1986.

[5] See North and Rees, 1979.

[6] See Tatom, 1986, for a detailed discussion of manufacturing employment trends at the national level.

[7] Taking a simple regression of employment levels over time and controlling for the business cycle indicates that the District was declining at a 1.1 percent rate, compared to a 0.3 percent growth for the nation excluding the District, while the nation as a whole was virtually flat.

[8] For an extensive set of data that compares industry growth rates by state with their national counterparts, see *The Iowa Economy: Dimensions of Change, 1987.*

[9] For more details of Iowa's economy, see *The Iowa Economy: Dimensions of Change, 1987*

[10] A good example is the case of General Motors (GM) acquiring Electronic Data Systems (EDS). When GM transfered approximately 6000 of its employees to EDS, it reduced its labor force without affecting output, which caused its productivity to show a rise.

[11] Hulten and Schwab, 1984, attribute much of the regional differences in output growth to expansion of labor and capital, rather than to differences in efficiency of the work force.

[12] Johnson, 1981, also cites the effects of a weak economy on investment and capital formation in the 1970s.

[13] In this model, the slope of the time trend in the post-1970 period would be the sum of the time trend coefficient, c_1, and the dummy variable times the trend coefficient, c_2. A separate model was necessary to test whether the coefficient for the time trend after 1970 was significantly different from zero. In the second model, separate dummy variables were incorporated for pre-1971 and post-1970 in both the intercept and the time trend variable. Coefficients for the post-1970 trend variable were significantly different from zero at the 0.05 probability level for Illinois, Indiana, and Michigan. However, the model using pooled data for the District states (with dummy variables controlling for the states) did confirm that the coefficient for the trend was significantly different from zero after 1970. Tests to see if a dummy variable should be applied to the cycle variable (i.e., if cycles were more intense in the post-70 period than the pre-71 period) proved negative and, therefore, were not included in the final model.

[14] The Midwest Manufacturing Index is a weighted combination of 17 manufacturing industries. To see the effect of industrial structure, the District weights were replaced with national weights. The resulting combination of District industries would then reflect the District's performance, if it had the same proportional mix of industries as the nation. For a discussion of the Index, see Schnorbus and Israilevich, 1987.

[15] See Hekman and Strong, 1980.

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