The Midwest Manufacturing Index: The Chicago Fed's new regional economic indicator
Technology and manufacturing in the Seventh District
Service sector growth in the Seventh District
Nothing is forever: Boom and bust in Midwest farming
Economic development efforts in the Seventh District
The Midwest Manufacturing Index: 3
The Chicago Fed's new regional economic indicator
Robert H. Schnorbus and Philip R. Isailevich
A new index shows that manufacturing in the Seventh Federal Reserve District has been gradually declining at least since 1973.

Technology and manufacturing in the Seventh District 8
Alenka S. Giese and William A. Testa
The Midwest seems to be adapting high-tech to its old manufacturing base, rather than developing new high-tech industries.

Service sector growth in the Seventh District 15
Eleanor H. Erdevig
Service employment is growing in the Midwest, although not always at the national rate of growth.

Nothing is forever: Boom and bust in Midwest farming 27
Peter J. Heffernan
Agriculture may have hit bottom, but don't expect the "good old days" of surging prosperity any time soon.

Economic development efforts in the Seventh District 32
David R. Allardice and Alenka S. Giese
With new techniques and tools, midwestern state governments are trying to hold on to what they have, and maybe a little bit more.
The Midwest Manufacturing Index: The Chicago Fed’s new regional economic indicator

Robert H. Schnorbus and Philip R. Israilevich

The Federal Reserve Bank (FRB) of Chicago and the community that it serves—the Seventh Federal Reserve District—share a common interest in monitoring regional manufacturing activity on a timely basis. In the process of formulating monetary policy, the Bank is concerned about how economic activity in the Seventh District differs from the nation and how monetary policy affects that difference. Manufacturers need to know how regional economies are performing, in order to interpret their own shipments data and plan production schedules. Local governments must be aware of any changes in economic activity that translate into declining revenues or rising demand on expenditures.

Starting in the September issue of the new Chicago Fed Letter, the FRB of Chicago will publish a unique monthly index of manufacturing activity for its entire five-state District (see Figure 1)—the Midwest Manufacturing Index (MMI, Figure 2). While more or less following the same cyclical pattern as the Federal Reserve Board’s Index of Industrial Production, two aspects of the MMI are noteworthy. First, the MMI shows a much stronger recovery in manufacturing activity since the last recession than is suggested by manufacturing employment expansion. Second, the MMI has a markedly different trend than the Board’s Index. Manufacturing activity in the Seventh District has been on a gradual decline since at least 1973 (the starting point of the MMI), while for the nation as a whole, manufacturing activity has been generally expanding.

The decline in manufacturing activity—in a technical sense, deindustrialization—may be having serious repercussions throughout all sectors of the District’s economy. The ability to separate month-to-month movements in manufacturing activity into an underlying trend component and a business cycle component (which can often conceal the trend) is valuable for understanding not only what is currently happening but also what has been happening in the regional economy—such developments as the growth of “high-tech” industries and the services industry, for example. In addition, the index provides a quantitative background against which to evaluate the effects of national and state policies on the Seventh District’s economy. (These topics are discussed in other articles in this issue of Economic Perspectives.)

A basic understanding of how the MMI was constructed is necessary to make the best use of the timely information it will convey. While similar in intent to the Board’s Index, the MMI is based on methodology developed by the FRB of Atlanta. This article provides a concise description of how the index was formulated and how the data were incorporated.

Conceptual background

Because of its availability and sensitivity to the business cycle, manufacturing employment has long been the primary tool for tracking a regional economy. Unfortunately, manufacturing employment data have a major limitation as a comprehensive measure of manufacturing activity. Employment is only one of many inputs in the production process that transforms labor, capital, energy, and materials into final output—the true measure of manufacturing activity in a region. As a participant in the process, employment can provide, at best, only a partial picture of the manufacturing activity in a region.

Perhaps the most serious omission in the analysis of manufacturing activity has been the measurement of capital usage. For example, during the early stages of a recovery, labor productivity may be expanding as labor and capital are used more intensively. Or, as the economy nears a business-cycle peak, manufacturers may expand their capital stock faster than at any other time over the business cycle. In both cases, changes in employment would

Robert H. Schnorbus and Philip R. Israilevich are regional economists at the Federal Reserve Bank of Chicago. The authors thank Steve Langford and Emad Mikhail for their assistance.
understate the rate at which manufacturing activity is expanding.

The Board's Index of Industrial Production avoids the problem of inadequate coverage by using measures of national output that combine data on physical output, such as tons of steel, with data on shipments, hours worked, and electrical power usage. In the 1950s and 1960s, the FRB of Chicago also produced output indexes for the metropolitan areas of its District, based on electrical power data. From time to time, other FRBs have provided a similar service, using various methodologies. At present, however, only indexes for Texas and Ohio are being maintained.

The broad intent of any production index is to provide a means of summing up a diversity of goods manufactured in a region and of monitoring their movement over time, in much the same way as the Gross National Product does for all economic sectors. In its simplest form, an index of manufacturing activity can be formulated as:

$$ I_{t+m} = \left( \sum_{j} w_{j,t+m} Q_{j,t+m} \right) \sum_{j} w_{j,t} Q_{j,t} * 100 $$

where $\sum$ = summation sign

$T = \text{the base period (1973)}$

$t + m = \text{a given month, } m, \text{ in year } t$

In other words, the index is simply the sum of all the industrial items produced by the region in one year divided by the sum of the base year.

Obtaining measures of regional outputs, however, is not an easy task. Although some physical units of output are available on a regional basis (e.g., tons of steel), such data are extremely rare. Dollar values of physical outputs, deflated to remove the influence of inflation, would be an acceptable alternative to physical units, but even information on values of goods produced in a region are rare.

Shipments are an inappropriate measure of output at the regional level. Only that portion actually produced within the region should be included in the index, or the problem of double counting will distort the movement of the index. For example, data on either units or values of automobiles sold by producers in a region would not distinguish between the portion actually contributed by the regional producers and the portion purchased as an intermediate product (e.g., tires, engines, etc.).

A preferred measure for physical output produced in a region is a constant dollar measure of value added. Value added is measured by subtracting purchased materials from the value of shipments. Included in value added are primarily returns to labor and capital, and, to a lesser extent, capital recovery, economic profits, interest on debt, taxes, and the purchase of business services. Using value added, therefore, avoids the double counting problems inherent in shipments data. Unfortunately, value-added data by region are only available on an annual basis and even then with a considerable time lag.

For a monthly index, data from the major inputs that comprise value added—labor and capital services—can be derived on a regional basis from the data collected by the Board for its Index. Labor services can be measured by employment and average monthly hours worked. Capital services can be approximated by data on electrical power usage provided to the Board by utility companies. While these two inputs may still not be capturing all the
construction of the index

Perhaps the most common method of combining labor and capital services into a production index is to use a sum-of-payments approach. Under the proper assumptions, labor and capital services can estimate output by adding the weighted value of both inputs together each month. Starting with an individual industry, the basic formula becomes:

\[(2) \quad RVA_{t+m} = \sum_j P_{lj,t+m}L_j,t+m + \sum_j P_{kj,t+m}K_{j,t+m}\]

where
- \(j\) = a specific product
- \(RVA\) = real value added
- \(P_l\) = price of labor, or average hourly earnings
- \(P_k\) = rental price of capital services
- \(L\) = labor services, or total hours worked
- \(K\) = capital services, or kilowatt hours.

While monthly data on labor and capital services are available, rental prices of capital services are not. To avoid using prices, three modifications are made to this equation. First, prices are multiplied by the ratios of the inputs to the final output to compute each input’s share of output. For example, labor’s share of output would be \(s_l = P_l/L/RVA\). Capital’s share, \(s_k = P_k/K/RVA\), under the constant returns to scale assumption is assumed to be one minus labor’s share. These ratios should be fairly stable over time, so that annual data can be used to represent monthly values with reasonable confidence.

Second, each input’s productivity (i.e., \(q_l = RVA/L\) and \(q_k = RVA/K\)) must be added, so that monthly input data can be converted to a measure of output based on value added (i.e., \(q_l L = RVA\)). The output associated with a given level of labor services can then be combined with the output associated with a given level of capital services by weighting each input by its share of output to produce the desired measure of total output represented in the equation above.

Finally, both the share weights and the productivity weights would be expected to change gradually from month to month, reflecting the underlying trend in each measure. To capture that trend on a monthly basis requires distributing the annual growth rates evenly over twelve months. For example, labor’s share of output grows from one year to the next at a compounded growth rate, or:

\[C_{j,t} = (s_{j,t}/s_{j,t-1})^{1/12} - 1\]

where \(d\) equals 12. The compounded growth rate is then distributed by taking the value of the first year and adding the monthly adjustment, such that

\[s_{j,t+m} = s_{j,t}(1 + C_{j,t+m})\]

where \(m\) takes a value from 1 to 12. Monthly values for capital shares, \(s_{k,j,t+m}\), and both productivity weights, \(q_{k,j,t+m}\) and \(q_{k,j,t+m}\), are constructed to accompany the monthly labor and capital services data.

The final formula for estimated output for a specific industry becomes:

\[(3) \quad RVA_{j,t+m} = s_{j,t+m} q_{j,t+m} L_{j,t+m} + s_{k,j,t+m} q_{k,j,t+m} K_{j,t+m}\]

Since this equation is used to construct an index for each industry, each industry index must be combined, according to its share of total output, to generate a composite index of man-
The final formula that represents the MMI is:

\[ I_{i+m} = \sum_j w_{j,i} R^* V A_{j,i+m} / \sum_j w_{j,i} R^* V A_{j,i, T} \]

where \( w_{j,i} = (R^* V A_{j,i} / \sum_j R^* V A_{j,i}) \).

The data-base manipulations

The raw data needed to assemble the index are derived from three sources: the Bureau of Labor Statistics, the Bureau of the Census, and the Federal Reserve Board. The labor data are based on total work hours for 17 two-digit industries collected at the state level for each of the five states composing the Seventh District (Indiana, Illinois, Iowa, Michigan, and Wisconsin). Total worker hours were computed by multiplying total workers times average hours worked. An assumption is made that the ratio of total workers to production workers is constant, so that the total hours measure is proportional to actual production worker hours. Value added and payroll data, used in constructing weights, also correspond to the entire five states in the District. Capital services, however, are limited to electrical power usage within the District itself (southern Wisconsin and Michigrn, northern Illinois and Indiana, and all of Iowa).

Transforming the raw data into the ultimate form in which they will enter the equations involves several manipulations. The first and most basic step is to seasonally adjust all raw monthly data and to deflate all nominal dollar values to constant 1982 dollars. Nominal dollar values are deflated using national producer price indexes for the appropriate industries (actually, using wholesale price indexes for commodities that correspond closest to an industry's output). Seasonal adjustments are made using the widely used X-11 seasonal adjustment procedure.

In some cases, a complete set of monthly data could not be obtained for a given industry or for a given state within an industry. Three industries (tobacco, textiles, and apparel) were dropped from the index, because employment data were nonexistent. These three industries in aggregate represent less than 1.5 percent of the total value added of manufacturing in the District. Also, five industries (printing, petroleum, stone/clay/glass, and miscellaneous) lacked employment data for at least one state prior to 1980, again because the industry was insignificant in that state's economy. For these five industries, the labor input was measured by the reporting states. Because the productivity adjustment factor was also based on the limited state data, labor's share of the estimated index was unaffected. Although these industries were also a comparatively small portion of total value added (less than 3 percent), the information contained in the employment data is worth saving. As a result, these industries were not excluded from the index.

For a similar reason, average hours worked data were inserted for the period prior to 1976. Little data on hours were reported prior to 1976 and, rather than lose the information contained in the movement of employment levels and electrical power usage between 1972 and 1976, the observed values for January 1976 were applied to all previous months. Since the value for average hours worked ranged between 38 and 40 hours per week and tended to change in small increments, the labor component based solely on employment levels still contributes a substantial amount of information about fluctuations in manufacturing activity. Moreover, these early years are of primary interest for providing an historical trend in output rather than for the month-to-month movements.

Missing data were also a problem in constructing the weights for each input. The Annual Survey of Manufactures (ASM) has not published regional data for three years—1979, 1980, and 1981. In order to bridge this gap, data for 1978 and 1982 were treated as if they were a single year, except that the value for d became 48 instead of 12. In other words, the growth rate stretched over 48 months rather than 12 months.

Finally, the values for the monthly weights had to be extrapolated from the end of 1984 to the final month, because ASM data beyond 1984 is not yet available. The approach used in this index generally follows the FRB of Atlanta convention. The share weights, \( s^*_{l,t} \) and \( s^*_{b,t} \), were held fixed at their last monthly value. The productivity weights, \( q^*_t \) and \( q^*_b \), however, were allowed to continue to follow the trend set by their growth rates applied to 1984.
Concluding remarks

The MMI is constructed from a common methodology that is the easiest to maintain on a monthly basis and, more importantly, correlates well with the observed annual data of real value added. It is important to emphasize that employment figures and the MMI are the only monthly data currently available for the District's manufacturing sector. The MMI is a more comprehensive barometer of manufacturing activity than is employment. In addition, the MMI provides a direct link to economic activity at the national level through its kinship to the FRB Index.

As new ASM data become available, the MMI will be revised and the extrapolated values will be updated. Future research will be designed to improve the month-to-month accuracy of the MMI and to disaggregate the index into sub-industries and sub-regions that are important in monitoring the District's economy.

References


Technology and manufacturing in the Seventh District

Alenka S. Giese and William A. Testa

State and local policymakers in the Midwest have eased up in their pursuit of the so-called "high-tech" industries, such as telecommunications, semiconductors, computing equipment, aerospace, and instruments. In part, this change of emphasis reflects the fact that high-tech industry growth has leveled off following the spurt of the late 1970s and early 1980s. In addition, because most such industries have remained highly concentrated in their region of origin, it has become clear that high-tech industries are not equally suited to all regions.

With the let-up in high-tech industry-chasing, the more general role of technology in regional growth has become more important to policymakers. They have recognized that technology can be an important feature of many of those industries that are not recognized for their technology intensity. Accordingly, development programs have been established to encourage technology transfer to older manufacturing industries and to encourage those activities of the manufacturing process such as product research and development (R&D) that can potentially revitalize the more traditional industries. And in recognition of the strong locational ties between existing high-tech industries and their home regions, economic development programs have begun to encourage local entrepreneurs to carry scientific findings from the lab to the marketplace in hopes of establishing the next generation of high-tech industries.

This article reviews two aspects of technology relating to economic performance in the Seventh District. First, prospects and performance of the so-called "high-tech" industries are reviewed. Secondly, the technology intensity of the District's traditional industries is assessed as a possible indicator of the District economy's relative strengths.

What are high-tech industries?

High-tech industries are, by now, widely familiar in developed economies. In the United States, these industries gained great renown during the latter 1970s and early 1980s because their growth in output and employment exceeded national averages and was not severely interrupted by the national economic downturns of 1980 and 1981-82. Their role in the revival of the once-depressed New England economy led other traditional manufacturing regions, including the Midwest, to believe that high-tech industries offer a solution to their employment problems also.

Analysts have considered several industry characteristics in formally defining and identifying high-tech industries. One approach has included those industries that produce technologically sophisticated products. Sophisticated products, however, may eventually come to be produced by standard production methods. And, technologically advanced products and standardized products may be grouped under the same product heading under the Standard Industrial Code.

An approach which partly circumvents these difficulties distinguishes industries by the extent that their activities are technology-oriented. Such activities include industrial processes that incorporate emerging technology or that are characterized by significant product research and development (R&D). Following this approach, one practice has been to define high-tech by measuring the percent of an industry's sales or value added that is composed of research and development expenditures. This approach measures directly an industry's most obvious and pervasive technology activity, product innovation.

However, such an approach overlooks the application of emerging technologies to the production process of standardized products. For example, such a definition could conceivably overlook traditional metal-bending industries which may be producing with increasingly automated operations such as Computer Assisted Design/Computer Assisted
### Table 1

Concentration of top twenty high-tech manufacturing industries in Seventh District states

<table>
<thead>
<tr>
<th>Industry</th>
<th>Percent of labor force scientists, engineers, and technicians</th>
<th>Index of employment concentration relative to U.S.—1985</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided missiles, space vehicles, and parts</td>
<td>35.4 .03 n.a. n.a. n.a. n.a. .03 n.a.</td>
<td></td>
</tr>
<tr>
<td>Electronic computing equipment</td>
<td>26.4 .11 .05 .01 .34 .09 .28</td>
<td></td>
</tr>
<tr>
<td>Aircrafts and parts</td>
<td>17.3 .38 .23 1.29 n.a. .34 .28</td>
<td></td>
</tr>
<tr>
<td>Radio, T.V., and communication equipment</td>
<td>16.2 1.01 1.46 2.00 1.17 .13 .32</td>
<td></td>
</tr>
<tr>
<td>Drugs</td>
<td>16.1 1.58 1.30 3.90 1.63 .19</td>
<td></td>
</tr>
<tr>
<td>Industrial and miscellaneous chemicals</td>
<td>15.4 .85 1.13 .49 .28 1.14 .34</td>
<td></td>
</tr>
<tr>
<td>Photographic equipment and supplies</td>
<td>15.3 .28 .80 .17 n.a. 1.95 .46</td>
<td></td>
</tr>
<tr>
<td>Scientific and controlling instruments</td>
<td>14.3 .28 .90 .17 n.a. .82 .96</td>
<td></td>
</tr>
<tr>
<td>Not specified electrical machinery</td>
<td>14.1 1.98 .58 5.12 1.05 1.39 3.50</td>
<td></td>
</tr>
<tr>
<td>Office and accounting machines</td>
<td>13.5 1.05 1.40 .16 n.a. 1.05 .28</td>
<td></td>
</tr>
<tr>
<td>Petroleum refining</td>
<td>12.6 .58 .97 .95 n.a. .32 n.a.</td>
<td></td>
</tr>
<tr>
<td>Electrical machinery equipment n.e.c.</td>
<td>11.3 1.03 1.30 1.43 .40 .43 1.34</td>
<td></td>
</tr>
<tr>
<td>Paints, varnishes, and related products</td>
<td>11.3 1.74 2.37 1.20 .93 1.95 .95</td>
<td></td>
</tr>
<tr>
<td>Ordnance</td>
<td>10.7 .44 n.a. .12 1.79 .05 .71</td>
<td></td>
</tr>
<tr>
<td>Agricultural chemicals</td>
<td>10.7 .44 .78 1.45 2.87 .18 .48</td>
<td></td>
</tr>
<tr>
<td>Plastics, synthetics, and resins</td>
<td>9.6 .44 .38 .40 .46 .67 .22</td>
<td></td>
</tr>
<tr>
<td>Engines and turbines</td>
<td>8.8 2.90 1.54 3.40 2.60 7.68</td>
<td></td>
</tr>
<tr>
<td>Optical and health services supplies</td>
<td>8.7 .74 1.08 1.00 .18 .43 .47</td>
<td></td>
</tr>
<tr>
<td>Soaps and cosmetics</td>
<td>8.0 1.16 1.66 .84 .42 .77 1.38</td>
<td></td>
</tr>
<tr>
<td>Construction and material handling equipment</td>
<td>6.3 2.16 2.99 .75 4.52 1.09 2.30</td>
<td></td>
</tr>
</tbody>
</table>

*A concentration index greater than 1 indicates that the state has a greater percentage of employment in that industry than the U.S. average.

n.a. = not available or not disclosed.


Manufacturing (CAD/CAM) or Flexible Manufacturing Systems (FMS) but which otherwise perform very little internal R&D.

To avoid these problems, defining high-tech industries as those employing high proportions of scientific, engineering, and technical personnel has become a popular method, and the one used here. This occupational criterion is applied by measuring the percent of an industry's workforce employed as scientists, engineers, and technicians (SET) or sometimes scientists and engineers alone (SE). The presence of significant R&D activities within an industry will still be accounted for through this measure by the employment of scientists and engineers who perform such activities. In addition, the occupational criterion is more inclusive of those industries that adopt emerging technologies rather than undertake their own R&D because these industries presumably employ engineering and technical personnel to purchase and operate sophisticated equipment.

In arraying major manufacturing industries by their SET intensity, it is seen that the propensity to employ such personnel is highly skewed towards a few industries including the guided missiles and aerospace, computing equipment, aircraft, communications equipment, and pharmaceuticals industries (Table 1). Even within this industry subgroup, SET intensity falls off quickly. The number one ranked industry—aircraft—employs over one-third of its labor force in these professions while the third-ranked aircraft industry employs approximately 17 percent. Following the highest echelon, SET intensity falls off in a fairly con-
Table 2

High-tech manufacturing employment: Levels and growth

<table>
<thead>
<tr>
<th>Employment</th>
<th>Cumulative percent of total manufacturing employment</th>
<th>Percent growth 1978 to 1985</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>District U.S.</td>
<td>District U.S.</td>
</tr>
<tr>
<td>Guided missiles, space vehicles, and parts</td>
<td>649 173,826</td>
<td>.02 .9</td>
</tr>
<tr>
<td>Electronic computing equipment</td>
<td>6,817 277,433</td>
<td>.22 2.3</td>
</tr>
<tr>
<td>Aircrafts and parts</td>
<td>32,955 636,566</td>
<td>1.22 5.6</td>
</tr>
<tr>
<td>Radio, T.V., and communication equipment</td>
<td>89,766 652,883</td>
<td>3.92 9.0</td>
</tr>
<tr>
<td>Drugs</td>
<td>44,337 206,323</td>
<td>5.22 10.1</td>
</tr>
<tr>
<td>Industrial and miscellaneous chemicals</td>
<td>46,062 397,070</td>
<td>6.62 12.2</td>
</tr>
<tr>
<td>Photographic equipment and supplies</td>
<td>6,383 122,526</td>
<td>6.82 12.8</td>
</tr>
<tr>
<td>Scientific and controlling instruments</td>
<td>43,529 333,830</td>
<td>8.12 14.5</td>
</tr>
<tr>
<td>Not specified electrical machinery</td>
<td>41,785 154,443</td>
<td>9.42 15.3</td>
</tr>
<tr>
<td>Office and accounting machines</td>
<td>8,963 62,810</td>
<td>9.72 15.6</td>
</tr>
<tr>
<td>Petroleum refining</td>
<td>11,124 141,060</td>
<td>10.02 16.3</td>
</tr>
<tr>
<td>Electrical machinery equipment n.e.c.</td>
<td>148,264 1,057,745</td>
<td>14.52 21.8</td>
</tr>
<tr>
<td>Paints, varnishes, and related products</td>
<td>14,880 63,500</td>
<td>14.92 22.1</td>
</tr>
<tr>
<td>Ordnance</td>
<td>4,655 78,094</td>
<td>15.02 22.5</td>
</tr>
<tr>
<td>Agricultural chemicals</td>
<td>7,143 58,800</td>
<td>15.22 22.8</td>
</tr>
<tr>
<td>Plastics, synethetics, and resins</td>
<td>10,373 172,664</td>
<td>15.52 23.7</td>
</tr>
<tr>
<td>Engines and turbines</td>
<td>49,976 125,238</td>
<td>17.02 24.3</td>
</tr>
<tr>
<td>Optical and health services supplies</td>
<td>24,895 247,873</td>
<td>17.82 25.6</td>
</tr>
<tr>
<td>Soaps and cosmetics</td>
<td>22,933 145,179</td>
<td>18.52 26.4</td>
</tr>
<tr>
<td>Construction and material handling equipment</td>
<td>74,335 252,581</td>
<td>21.72 27.7</td>
</tr>
</tbody>
</table>

*Estimates


Continuous fashion. Accordingly, there is no natural cutoff point at which to define the high-tech industries. Any grouping becomes somewhat arbitrary.

It is perhaps because of this arbitrary quality in defining high-tech industry that the findings of many studies are in conflict. Definitions that include a greater number of industries tend not to display the spectacular employment growth rates that are found using less inclusive high-tech groupings. Differences in definition are equally important in comparing the technological orientation of the Midwest to the nation as a whole. Studies using a broader group of industries tend to find the Midwest’s high-tech industry concentration to be close to the nation’s average while others find Midwest concentration below average.

High-tech industry in the Seventh District

Comparing industry concentration in the District with the nation reveals a reason why studies using a more narrow definition often show the Midwest’s economy to be less oriented toward high-tech industries (Table 1). Relatively few District workers are employed in the most technology-intensive industries—aerospace computing equipment, and aircraft. The absence of these industries is also widely evident across individual states in the District, with the exception of a sizable presence of the aircraft industry in Indiana.

When the definition of a high-tech industry is further broadened, the District economy records a significant presence in the communications equipment and the pharmaceuticals industries. The states of Indiana and Illinois strongly contribute to employment in both of these industry sectors, while Iowa is strong in communications equipment and Michigan in pharmaceuticals. Further down the high-tech scale, the District displays above-average employment concentration in the production of electrical machinery and office and computing machinery. However, such high-tech main-
Employment growth in high tech industries vs. other manufacturing industries in the Seventh District

index, 1978 = 100

1978  '79  '80  '81  '82  '83  '84  '85

110
100
90
80
70

stays as scientific and controlling instruments, photographic equipment, ordnance, optical and health supplies, plastics, and industrial chemicals are only moderately represented. Towards the bottom of the high-tech scale, District employment concentration is heavy in industries typically thought of as traditional or mainstay to the Midwest, including the engines and turbine industry and the construction and materials handling industry.

The District’s light concentration at the top of the high-tech spectrum and its heavy concentration at the bottom results in major fluctuations in the District’s concentration of high-tech industries depending on the industries included. For example, in using the top half of industries as defined by SET concentration, the District’s employment concentration lies 26 percent below the nation. However, using the 20 industries shown in Table 1, the District lies only 6 percent below the national average.

Overall, the District economy is best characterized as composed of only a moderate number of high-tech industries, varying with the particular industry definition that is used. Nevertheless, as the eight above-average industry concentration indexes indicate, the District economy maintains significant high-tech industry strengths.

Growth performance

The record of employment growth among the nation’s high-tech industries reveals the elusive nature of the relation between technology intensity and employment growth (Table 2). First, it is quite common to find that employment has declined among individual high-tech industries. This is apparent among both top tier and bottom tier industries. And while overall employment growth is quite robust among the top 10 high-tech industries, the bulk of this employment growth derives from the top 5 industries—aerospace, computing equipment, aircraft, communications, and drugs.

This concentration of growth in the very top cluster of industries, along with the tenuous relation between growth and tech intensity among individual industries, suggests that there is no inherent growth potential in an industry’s technology intensity. The 1978-1985 surge in a single subgroup of tech-intensive industries may have more to do with other factors. Some analysts suggest that strong federal government support, especially from the Department of Defense, is a common denominator behind the remarkable growth of these industries. The growth rate of U.S. defense outlays has outstripped overall GNP growth in every year since 1978. At the same time, the nation’s defensive systems have become increasingly reliant on sophisticated equipment produced by U.S. manufacturers.

The District’s high-tech industries have performed dismally in relation to the national average. Among individual industries, only the electronic computing equipment, the optical-health care supplies and the soaps-cosmetics industries display superior employment growth in the District over the nation. Lagging District growth is especially evident for the upper echelon of high-tech industries. Over the period of study, national employment in the top 10 grew by slightly under 20 percent while the District experienced a decline of 18 percent. The growth record improves in examining the entire top 20 high-tech industries. But within the second tier of industries, it is not that Seventh District performance improves but, rather, that similar rates of decline are exhibited between District industries and their national counterparts.

In perspective, the geography and performance of high-tech industry growth has not favored the Seventh District. The District’s high tech manufacturing industries have performed very similarly to the remainder of its manufacturing base (Figure 1). This suggests
Table 3
Top twenty Seventh District manufacturing industries as ranked by employment concentration—1985

<table>
<thead>
<tr>
<th>Industry</th>
<th>Scientists and engineers</th>
<th>Scientists, engineers and technicians</th>
<th>1985 Region Concentration Index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Proportion in District</td>
<td>Proportion in U.S.</td>
<td>Difference in District</td>
</tr>
<tr>
<td>Motor vehicles and equipment</td>
<td>5.77</td>
<td>4.19</td>
<td>+1.58</td>
</tr>
<tr>
<td>Engines and turbines</td>
<td>5.38</td>
<td>7.01</td>
<td>-1.63</td>
</tr>
<tr>
<td>Metal forgings and stamps</td>
<td>1.71</td>
<td>1.79</td>
<td>-0.09</td>
</tr>
<tr>
<td>Farm machinery and equipment</td>
<td>4.94</td>
<td>4.00</td>
<td>+0.94</td>
</tr>
<tr>
<td>Metalworking machinery</td>
<td>3.38</td>
<td>3.19</td>
<td>+0.19</td>
</tr>
<tr>
<td>Screw machine products</td>
<td>1.42</td>
<td>1.70</td>
<td>-0.28</td>
</tr>
<tr>
<td>Iron and steel foundries</td>
<td>2.27</td>
<td>2.15</td>
<td>+0.12</td>
</tr>
<tr>
<td>Grain mill products</td>
<td>2.39</td>
<td>2.00</td>
<td>+0.39</td>
</tr>
<tr>
<td>Railroad locomotives and equipment</td>
<td>3.95</td>
<td>3.65</td>
<td>+0.30</td>
</tr>
<tr>
<td>Household appliances</td>
<td>3.75</td>
<td>3.24</td>
<td>+0.51</td>
</tr>
<tr>
<td>Construction and material handling equipment</td>
<td>5.81</td>
<td>5.01</td>
<td>+0.81</td>
</tr>
<tr>
<td>Blast furnaces, steelworks, rolling and finishing mills</td>
<td>2.44</td>
<td>2.49</td>
<td>-0.06</td>
</tr>
<tr>
<td>Machinery except electrical n.e.c.</td>
<td>4.08</td>
<td>3.80</td>
<td>+0.28</td>
</tr>
<tr>
<td>Cutlery, handtools, and hardware</td>
<td>2.44</td>
<td>2.14</td>
<td>+0.30</td>
</tr>
<tr>
<td>Paints, varnishes, and related products</td>
<td>5.83</td>
<td>5.26</td>
<td>+0.58</td>
</tr>
<tr>
<td>Miscellaneous fabricated metal products</td>
<td>2.56</td>
<td>2.51</td>
<td>+0.06</td>
</tr>
<tr>
<td>Dairy products</td>
<td>1.26</td>
<td>.93</td>
<td>+.33</td>
</tr>
<tr>
<td>Drugs</td>
<td>10.48</td>
<td>9.10</td>
<td>+1.37</td>
</tr>
<tr>
<td>Rubber and miscellaneous plastics products*</td>
<td>2.06</td>
<td>2.21</td>
<td>-0.15</td>
</tr>
<tr>
<td>Cycles and miscellaneous trans. equipment</td>
<td>4.97</td>
<td>3.00</td>
<td>+1.97</td>
</tr>
</tbody>
</table>

*Excludes tires and inner tubes


that fast-growing high-tech industries have not been isolated from the competitive problems that have affected the region. Although there are a few high-tech industries in which the District economy has excelled, the majority continue to fall behind the nation. Moreover, those industries that have exhibited the strongest growth at the national level are those in which District is not heavily involved.

Technology and mainstay industries

All the attention surrounding high-tech industries has highlighted the importance of the technology input to manufacturing. This importance extends not only to the high-tech firms but also to many industries in which technological activities comprise much smaller shares of total costs.

It has been recognized that each individual industry encompasses a string of activities, each with a varying degree of technological orientation. The "product cycle" theory suggests that an industry evolves through several distinct phases. At its inception, a typical product will tend to be produced with a greater proportion of innovative personnel. This is partly because background research and product development will initially require more scientists, engineers, and technicians. And, preceding the period when mass production can be brought to bear, market demand may be thin so that production occurs in small customized batches requiring skilled personnel. Eventually, as product demand grows and the production process of familiar products becomes routinized, the need for more innovative activities will subside.
The product cycle model of industrial evolution can help to explain regional growth and also help to shape a region's development policies. It is possible that different activities within the same industry are attracted to different locales depending on features such as low labor costs, available labor skills, and access to government and university research institutions. To the extent that these features are clustered within particular regions, identifiable activities (e.g., R&D or routinized branch plant production) within the same industry may be concentrated in different regions. For example, a recent study of the semiconductor, medical instruments, computer programming, and computing equipment industries found that firms headquartered in other regions tended to establish relatively few branch plants in the North Central and Northeast regions. In contrast, both the South and West displayed much higher ratios of branch plants to headquarters. These findings, when generalized across a region's economic base, suggest that a region's comparative advantage can be identified by type of activity, rather than by industry.

What types of activities characterize the Seventh District economy? Could the region be thought of as a seedbed of industrial product innovation, specializing in the more innovative activities of industry product cycles? We have already seen that for upper echelon high-tech industries the District does not appear to be such a seedbed. But, it is possible that the District economy specializes in the technological activities of its more traditional manufacturing industries.

One way to go about answering this question is to array the District's mainstay industries alongside region-specific measures of each industry's tech intensity.

The District's top 20 industries as ranked by their employment concentration relative to the U.S. are chosen to represent the District's mainstay manufacturing sector (Table 3). In characterizing their tech intensity, these industries are not found among the highest tier in SET personnel, but neither are they in the lowest. With a few exceptions such as the dairy products and screw machine products industries, the SE and SET labor force share within the District's mainstay industries fall within one standard deviation of the U.S. mean of all manufacturing industries. Moreover, using either the SE or SET measure, a clear majority of these industries can be counted as above the U.S. average. A comparison of the tech intensity of these industries with the tech intensity of their national counterparts reveals that the District tends to specialize in the tech-oriented activities of manufacturing.

That the District's mainstay industries tend to employ greater shares of SET personnel than their national counterparts suggests that these industries have retained their technology-intensive activities in the District. Such facilities are typified by R&D laboratories and early stage developmental production for which a skilled labor force is often crucial. This further suggests that the District maintains a technological edge in many of the industries in which it has a historical and present comparative advantage, perhaps serving as a seedbed for new products from these industries before spinning off routinized production to lower cost locales.

Additional support for the hypothesis that the District's manufacturing economy has become increasingly specialized in technology-oriented activities can be provided by evidence of recent trends in indicators of tech intensity. While trends based on SET personnel cannot be constructed, trends in industrial R&D expenditures within the District provide a very good alternative. Such data are examined against the backdrop of total manufacturing activity which is measured by value added, (the sum of payments for labor, R&D, capital, land, and profits that accrue in the process of manufacturing. The product cycle model of industrial evolution can help to explain regional growth and also help to shape a region's development policies. It is possible that different activities within the same industry are attracted to different locales depending on features such as low labor costs, available labor skills, and access to government and university research institutions. To the extent that these features are clustered within particular regions, identifiable activities (e.g., R&D or routinized branch plant production) within the same industry may be concentrated in different regions. For example, a recent study of the semiconductor, medical instruments, computer programming, and computing equipment industries found that firms headquartered in other regions tended to establish relatively few branch plants in the North Central and Northeast regions. In contrast, both the South and West displayed much higher ratios of branch plants to headquarters. These findings, when generalized across a region's economic base, suggest that a region's comparative advantage can be identified by type of activity, rather than by industry.

What types of activities characterize the Seventh District economy? Could the region be thought of as a seedbed of industrial product innovation, specializing in the more innovative activities of industry product cycles? We have already seen that for upper echelon high-tech industries the District does not appear to be such a seedbed. But, it is possible that the District economy specializes in the technological activities of its more traditional manufacturing industries.

One way to go about answering this question is to array the District's mainstay industries alongside region-specific measures of each industry's tech intensity.

The District's top 20 industries as ranked by their employment concentration relative to the U.S. are chosen to represent the District's mainstay manufacturing sector (Table 3). In characterizing their tech intensity, these industries are not found among the highest tier in SET personnel, but neither are they in the lowest. With a few exceptions such as the dairy products and screw machine products industries, the SE and SET labor force share within the District's mainstay industries fall within one standard deviation of the U.S. mean of all manufacturing industries. Moreover, using either the SE or SET measure, a clear majority of these industries can be counted as above the U.S. average. A comparison of the tech intensity of these industries with the tech intensity of their national counterparts reveals that the District tends to specialize in the tech-oriented activities of manufacturing.

That the District's mainstay industries tend to employ greater shares of SET personnel than their national counterparts suggests that these industries have retained their technology-intensive activities in the District. Such facilities are typified by R&D laboratories and early stage developmental production for which a skilled labor force is often crucial. This further suggests that the District maintains a technological edge in many of the industries in which it has a historical and present comparative advantage, perhaps serving as a seedbed for new products from these industries before spinning off routinized production to lower cost locales.

Additional support for the hypothesis that the District's manufacturing economy has become increasingly specialized in technology-oriented activities can be provided by evidence of recent trends in indicators of tech intensity. While trends based on SET personnel cannot be constructed, trends in industrial R&D expenditures within the District provide a very good alternative. Such data are examined against the backdrop of total manufacturing activity which is measured by value added, (the sum of payments for labor, R&D, capital, land, and profits that accrue in the process of manufacturing.
producing manufactured goods within the District). As such, value added is the best available measure of the region’s overall manufacturing production activity.

Over the past two and one-half decades, the District’s manufacturing sector has gained in R&D intensity relative to the nation (Figure 2). Throughout most of the 1960s and 1970s, the ratio of R&D to value added climbed in the District while the long-term national trend can best be characterized as stagnant or declining. This supports the notion that the District has retained its R&D activities to a greater extent than production activities.

From a policy perspective, the preceding evidence implies that economic development efforts in the District could well consider supporting the infrastructure necessary to attract and retain technologically advanced types of operations which generate product innovations. This is especially so for the District’s traditional industries for which there already a confluence of locational advantages to be found in the region. The region’s traditional manufacturing sector displays some evidence of specialization in technology intensive activities, while the overall R&D intensity of the District’s manufacturing sector has increased both in absolute terms and relative to the nation’s manufacturing base.


Empirical evidence to this effect is reported by Ann Markusen, Peter Hall, and Amy Glasmeier, High-Tech America, Allen & Unwin, Boston, 1986.


This topic is further addressed by Alenka S. Giese and William A. Testa, Measuring Regional High Tech Activity with Occupational Data, Federal Reserve Bank of Chicago, Regional Working Paper 1987/1.

Service sector growth in the Seventh District

Eleanor H. Erdevig

Almost all of the net new jobs created in the United States since World War II have been in the service-producing industries. Growth of service sector jobs has been particularly important in Seventh District states. With increases in productivity, the number of manufacturing jobs has grown very little since World War II. Since 1979, as industries in our northern states have restructured, the number of manufacturing jobs in each of the Seventh Federal Reserve District states—Illinois, Indiana, Iowa, Michigan, and Wisconsin—has actually declined.

An increased recognition of the importance of the service-producing industries has been accompanied by several concerns. Service-producing industries may not generate a flow of income into a region from outside because services may be primarily produced and consumed within an area. Consequently their ability to promote growth in an area may be limited. Furthermore, some service sector jobs are low-paying, and the growing number of service jobs may mean that the quality of jobs and the level of incomes is declining. In addition, research on employment growth in the service-producing industries has been hampered by a weakness in government statistics, particularly on the rapidly growing information-processing services and on an apparent trend toward the use of independent companies for business services that had been previously performed in-house.

This article looks at the major service industries nationally and in Seventh District states and discusses some of the concerns that have accompanied the growth in employment in the service-producing industries.

What is the service sector?

The service sector is generally defined to include government services and the private service-producing industries. The major private service industries are transportation, communications, and public utilities; retail and wholesale trade; finance, insurance, and real estate; and personal and business services. This article focuses primarily on these private service industries.

Government statistics on employment in the private service industries have generally been weak. The major source of long-run and current employment data for the service industries nationally and for states and metropolitan areas has been the Bureau of Labor Statistics (BLS). This source has been used primarily in this report for the analysis of long-run trends.

Unfortunately very little detail exists in the BLS data for the individual industries within the major groups of private service industries. Furthermore, data on some industries are available for some but not for other states and areas. So it is difficult to compare employment performance over time in the individual industries among the different states and areas.

More employment detail for the service industries is available in the County Business Patterns data (CBP) published by the Bureau of the Census. Data are published for the nation, states, and individual counties. The data, however, are available only annually and then with about a two-year lag. These data have been used in this article for the information presented on individual industries.

The industry detail in the CBP is classified by the Standard Industrial Classification system (SIC), which classifies establishments by the type of activity in which they are primarily engaged. The SIC system emphasizes manufacturing industries. Additional SIC codes are expected to recognize the growing importance of the service industries and, in particular, the new information-processing industries that are part of business services.

Additional information on certain of the service-producing industries is also available as part of the Economic Censuses which are conducted every five years by the Bureau of the Census (on the years ending in "2" and "7").

Eleanor Erdevig is a regional economist at the Federal Reserve Bank of Chicago.
These are published with about a two-year lag and include the Census of Service Industries, the Census of Retail Trade, and the Census of Wholesale Trade.

Importance of service industries

Manufacturing industries are generally considered the economic base of a region because they produce products which are sold outside the region and thereby generate a flow of income into the area. The service industries are considered secondary or support industries to manufacturing, that generate few or no "products" that are sold outside the region. Consequently most economic development efforts have been directed toward preserving and expanding the manufacturing economic base of an area rather than assisting the growth of service industries.

As the importance of the employment growth in the service industries was recognized, a limited amount of research has been devoted to the extent to which service industries sell services outside a local region and thereby generate a flow of income into the area. Identification of those industries that sell a significant amount of services outside a local area would make them candidates for possible economic development assistance.1

The research shows that many local service firms serve not only local markets but national markets, and, in many cases, international markets. Limited data are available on the extent to which services produced within a region are sold nationally, but more comprehensive data are available on the extent to which services are a component of international trade.

Services make a major contribution to international trade. In 1986, exports of service-producing industries represented 39.8 percent of the dollar value of all United States exports. During the same period 26.0 percent of all imports were services. According to the Department of Commerce, major services involved in international trade include advertising, accounting, architecture and engineering, banking and financial services, education and training, employment services, health care, franchising, insurance, consulting of all kinds, leasing, transportation, computer services, and communications. A recent report by the Congressional Office of Technology Assessment, however, suggests that service exports account for very few jobs in this country because U.S.-based service companies do more business overseas through foreign affiliates than they do through direct exporting.2

Research on interstate trade in services complements the findings of the role of services in international trade. Three studies, on the service economies of New England, Minnesota, and Washington, agreed that services are traded across state lines and that the jobs provided by these traded services are substantial.3 Furthermore, they found that the value added to the local economy from many of these service industries is equal to or greater than that of manufacturers. Beyers in his study of the State of Washington found that for all the surveyed services (excluding wholesale and retail trade), 39 percent of all sales revenue came from sales outside the state. In addition, he concluded that exports are increasing as a share of the sales of service businesses, that in his sample small firms were just as likely as large firms to have export sales, that most service exporting firms are young and had local startups, and that his results were likely to be duplicated in other metropolitan areas.

Long-run service sector growth

During the post-World War II period, manufacturing output has remained a relatively constant proportion of our gross domestic product, except for the fluctuations of business cycles. Since 1948, gross domestic product in constant dollars has grown at a compound annual rate of 3.2 percent. At the same time, manufacturing output has also grown at an annual rate of 3.2 percent. As a result, manufacturing output was 22 percent of gross domestic output in 1948 and also in 1985 (see Figure 1).

Service output, on the other hand, grew at an annual rate of 3.6 percent between 1948 and 1985. Consequently, it represented 67 percent of gross domestic output in 1985 compared to 58 percent in 1948. The increase in service sector output as a proportion of total output has come from declines in the proportion of output from the agriculture, mining, and construction sectors.

Although manufacturing output has been increasing at about the same rate as the gross domestic product, most of the increase has been
the result of increases in productivity. Manufacturing employment has increased only slightly in absolute terms during the 37-year period (see Figure 2). Only 3 million more people, including the self-employed, worked in manufacturing in 1985 than in 1948. Consequently, manufacturing employment represented 19 percent of total employment in 1985 compared to 27 percent in 1948.

The increase in services output has been the result of both increases in productivity and increases in employment. Between 1948 and 1985, while services output was increasing at an annual rate of 3.6 percent, employment increased at a rate of 2.4 percent. During this period the number of jobs in the service industries more than doubled with an increase of 43 million jobs.

**Services employment growth in the Seventh District**

All of the net employment growth in the Seventh District since World War II has been in services. Employment in the goods-producing industries in the District, on the other hand, has actually declined over the same period.
While Seventh District employment in private and government services has been increasing, manufacturing employment has declined since WWII.

The losses in manufacturing employment in the Seventh District states have been particularly severe since 1979. All of the states have incurred net losses and the decline for the District as a whole was 776,000 jobs or 19.3 percent. The sharpest decline has been in Illinois with a loss of 346,000 manufacturing jobs or 27 percent. Iowa also incurred substantial losses as its serious problems in agriculture affected agriculture-related manufacturing employment.

As manufacturing employment has declined in District states, employment in both government and private services has been steadily increasing (see Figure 3). The result is that in 1986 there were 1.3 million more jobs in government services and 4.4 million more jobs in private services than in 1948. Although employment growth in private services slowed following 1979 during the two recessionary periods of the early eighties, growth has resumed with the recovery since the trough at the end of 1982.

All of the District states have been beneficiaries of the employment growth in private services (see Figure 4). The fastest rate of growth has occurred in Wisconsin both over the long-run and since 1979, followed closely by the rates of growth in Michigan and Indiana. Illinois has scored the largest net gains in terms of the absolute number of jobs but, because of its larger base, has a smaller percentage gain. Growth in private services employment in Iowa has been slow during the eighties largely because of its dependence on agriculture.

Growth has varied widely in the Seventh District among the major industries within the service-producing sector (see Figure 5). Personal and business services have shown the fastest growth with 2.2 million additional jobs, or half the service-producing jobs added during the post-World War II period. Employment in finance, insurance, and real estate has also shown good growth. Wholesale and retail trade, a large sector, has added 1.6 million jobs, about 38 percent of the net gain in private service employment. Overall employment in the

Among Seventh District states, Wisconsin has had the fastest rate of employment growth in private services.

The most rapidly growing sector in private services employment in the Seventh District is personal and business services.
transportation, communications, and utilities sector has declined slightly during the post-World War II period although individual industries have shown good growth.

**Employment growth in trade**

Trade, including both wholesale and retail, is the largest of the service-producing sectors (see Figure 6). It currently represents 42 percent of private service employment or 3.3 million jobs in Seventh District states. About one-fourth of trade employment is wholesale and the other three-fourths retail, both nationally and in District states.

In the period since World War II, trade employment in Seventh District states has been growing more slowly than nationally (see Figure 7). During this time trade employment doubled in the District but increased just over two and a half times in the United States. The difference in growth rates has been most pronounced since 1979; trade employment is up just five percent in District states compared to 18 percent nationally.

Long-run trends in trade employment have been considered to be associated with population growth. This was true nationally and in the Seventh District until the early 1960s. Since that time trade employment has been growing more rapidly than population.

Variations from the predicted trend in trade employment based on population are more prevalent than might be expected. Such deviations appear to be caused by three factors,
Figure 8
Variations from a predicted trend in national trade employment based on population are more prevalent than might be expected.

Figure 9
Employment growth in wholesale trade has been comparable to that in retail trade in the U.S. and in the Seventh District.

namely, the age distribution of the population, differential employment growth rates among the various wholesale and retail trade industries, and the effects of business cycles.

The long-run effects of the age distribution of the population on trade employment growth become evident when trade employment is predicted based on total population. According to Figure 8, trade employment was growing much more slowly than population would have predicted between 1948 and the early 1960s. This was during the baby boom when the proportion of the population under age 17 was increasing more rapidly than the remainder of the population. After the early 1960s, as birth rates declined and the baby boom matured, trade employment grew more rapidly than the increase in population would have predicted. This rate difference is continuing through the 1980s.

Differences in employment growth rates among the various wholesale and retail trade industries also contribute to the deviations from trend predicted by population growth. Since 1976 the growth rate for aggregate employment in the wholesale industries has been comparable to that for retail industries in Seventh District states and nationally (see Figure 9). But within the wholesale and retail industries, different employment patterns emerge.

Employment in wholesale durables trade reflects a much more cyclical pattern than that in wholesale nondurables (see Figure 10). In the Seventh District, employment in wholesale durables reached a peak in 1979 before falling sharply with the recession to a yearly low in 1983 only slightly above the 1976 level. In 1984 it remained well below the 1979 peak. Employment in wholesale nondurables also reached a peak in 1979 and has remained relatively flat.

Nationally, the cyclical decline for wholesale durables trade employment was less

Figure 10
Employment in wholesale durables trade reflects a more cyclical pattern than that in wholesale nondurables trade.
sharp and the recovery stronger. National employment in wholesale nondurables has continued to grow since 1979, although at a noticeably slower rate than earlier.

Machinery, equipment, and supplies is an important segment of wholesale durables trade employment. In 1984 it represented two-fifths of wholesale durables trade employment both in the Seventh District and nationally. Employment registered above average growth nationally and in all of the Seventh District states except Iowa between 1976 and 1984. In Iowa such employment declined four percent in response to the problems in agriculture and its effects on the sale of farm machinery.

Employment in motor vehicles and automotive equipment ranges from 13 percent in Illinois to 19 percent in Indiana and 20 percent in Michigan, compared to 15 percent nationally, of all wholesale durables trade employment. Employment growth in Seventh District states has been well above the national average in Michigan and Wisconsin but both Indiana and Iowa showed declines in employment between 1976 and 1984.

The most rapidly growing segment of wholesale durables trade employment has been electrical equipment. Employment growth has been more rapid nationally than in Seventh District states.

The largest proportion of the employment in wholesale nondurables trade is in groceries and related products. It currently represents one-third of wholesale nondurables trade employment both nationally and in Seventh District states. Employment growth has been above the overall rate for wholesale nondurables trade both nationally and in Seventh District states with the strongest growth in Iowa, Michigan, and Wisconsin.

Among the wholesale nondurables trade industries, the strongest rates of growth were in chemicals and allied products and in paper and paper products. This is true both nationally and in Seventh District states.

Trends in retail trade employment indicate the growth of food store sales and increased patronage of restaurants. Employment growth rates in both industries have been more rapid than the increase in population since 1976.

In retail trade, eating and drinking places are the most important source of employment. Currently, employment at eating and drinking places is one-third of all retail trade employment nationally and about the same in Seventh District states. They also have the highest rate of employment growth of all retail trade industries. Between 1976 and 1984 the increase in employment at eating and drinking places in Seventh District states ranged from 21 percent in Illinois to 37 percent in Indiana compared to 47 percent nationally.

The second most important source of retail trade employment are food stores. Employment growth, the second highest rate in retail trade, was 29 percent in the United States compared to between three percent in Michigan and 21 percent in Iowa.

Employment growth in personal and business services

The personal and business services sector is the most rapidly growing of the service-producing sectors and is approaching the trade sector in size. Currently it represents 39 percent of private service employment in the Seventh District, or about 3.0 million jobs.

Characteristics of the individual industries vary widely within the category. Personal services are generally considered to include health and social services, educational services, personal care services, automotive services, miscellaneous repair services, and entertainment and recreation including motion pictures, commercial sports, and museums and botanical and zoological gardens. Business services include, in addition to general business services, legal, engineering, architectural, research, and accounting services, membership organizations, and hotel services. The differentiation between personal and business services is not precise and there is an obvious overlap between personal and business services in industries such as hotel, legal, and automotive services.

The largest proportion of the personal and business services employment in Seventh District states and nationally is in health services (see Figure 11). In 1986 health services employment represented one-third of all personal and business services employment in Seventh District states. It includes employment at hospitals, health professional offices, outpatient facilities, and nursing homes.

Growth in employment in the health care industries reflects the efforts to contain hospital care costs and the trend toward the provision
of outpatient health care. Between 1976 and 1984 nationally and in all of the Seventh District states the rates of employment growth were higher at health professional offices, nursing and health-related personal care facilities, and outpatient care facilities than at hospitals. As a result, employment in these three industries in 1984 represented 46 percent of health services employment compared to 41 percent in 1976. At the same time, the proportion of health services employment at hospitals declined from 55 percent to 50 percent.

Employment in general business services is the most rapidly growing area of services employment (see Figure 12). It includes personnel supply services, building services, computer and data processing services, mailing, reproduction, stenographic services, and public relations and advertising.

Some of the indicated increase in employment in these business services apparently represents the increased use of independent companies for the provision of services which were formerly performed by in-house employees. Although the employees may have been performing the same duties, for example, building cleaning services, when they were employed in-house, they would have been classified according to the primary function of the establishment, e.g., manufacturing. When the same services are performed for the building by an independent contractor whose primary function is providing building services for clients, the employment is classified as building services employment. Unfortunately, data are not available to identify decreases in employment at establishments which actually represent the transfer of employment with similar duties from one classification of primary industry to another.

The largest contributor to the above average growth in employment in business services is a group of miscellaneous business services dominated by management, consulting, and public relations services, security services, and equipment rental and leasing services. The miscellaneous group contributed 30 percent of the net increase in overall employment in business services in Seventh District states between 1976 and 1984 and 40 percent nationally.

The most rapidly growing of these miscellaneous industries is equipment rental and leasing services followed by management, consulting, and public relations services.
Business services is the most rapidly growing area of services employment in the U.S. and Seventh District.

In the industry is undercounted in comparison to earlier data.

The most rapidly growing of the business service industries both nationally and in Seventh District states is computer and data processing services. It contributed 29 percent of the net increase in business services employment in the District and 17 percent nationally.

All of the Seventh District states enjoyed substantial rates of increase in employment in computer and data processing services, but the strongest rate of increase in employment was in Illinois. Employment in this industry increased almost six-fold in Illinois between 1976 and 1984 and the increase represented 47 percent of the net increase in business services employment in the state. Indiana also had an above national average rate of increase during this period.

Employment growth in finance, insurance, and real estate

Finance, insurance, and real estate (F.I.R.E.) is the smallest of the service-producing sectors in Seventh District states. Currently, ten percent of private service employment or 798.5 thousand jobs are in this group in Seventh District states. Employment in the F.I.R.E. group is approximately 48 percent in finance, 37 percent in insurance, and 15 percent in real estate.

Long-run trends in F.I.R.E. employment compared to the national average vary among the Seventh District states (see Figure 13). Since 1948 F.I.R.E. employment growth in Wisconsin has been consistently above the national average. Indiana and Michigan also showed a better performance than the United States until 1979 when employment reached a cyclical peak. Employment in these two states then declined slightly until 1983 before resuming growth. Both Iowa and Illinois have experienced growth rates below the national average over the long term, with Illinois showing a larger decline during the recession in the early eighties and a sharper increase than Iowa since then.

Differences in employment growth in the individual industries of the F.I.R.E. group have been the major source of the variations in performance among the Seventh District states.

In Wisconsin, both the finance and insurance sectors have contributed to the strength
in F.I.R.E. employment relative to the national average in the last decade. The finance sector includes primarily banking, other credit agencies such as savings and loan associations and credit unions, and securities and commodities investment services. The rates of employment growth at financial institutions between 1976 and 1984 were similar to that of the U.S. Only in the real estate industry was there very little increase in employment in Wisconsin.

Of particular importance in Wisconsin has been the employment growth in the insurance industry, especially at insurance carriers. The insurance industry contributed 44 percent of the net new F.I.R.E. jobs in Wisconsin between 1976 and 1984.

Employment growth in the insurance industry was also unusually strong in Iowa between 1976 and 1984. The major source of this strength was the increase in jobs at insurance carriers where employment rose 39 percent, or at a rate two and a half times the national average. Consequently, about one-half of the net new F.I.R.E. jobs in Iowa during this period were in the insurance industry.

The balance of the growth in F.I.R.E. employment in Iowa was primarily in the finance sector. The strongest growth was at financial institutions other than commercial banks, primarily savings and loan institutions and credit unions. Employment growth in real estate in Iowa was weak compared to the national average.

The recent growth in F.I.R.E. employment in Illinois has been dominated by growth in the finance sector, primarily at financial institutions and in securities and commodities investment services. Between 1976 and 1984, about 72 percent of the net growth in F.I.R.E. jobs was in the finance sector. The balance was almost all in the insurance industry. Employment in real estate has fluctuated with the business cycle and in 1984 was only slightly above the 1976 level.

The strongest growth in employment at financial institutions in Illinois between 1976 and 1984 was in commercial banking and at savings and loan institutions. Employment in commercial banking increased 24 percent in Illinois during this period and employment at savings and loan associations increased 51 percent. This compares to national average increases of 26 percent and 76 percent, respectively.

Among the Seventh District states, Illinois is the most important in securities and commodities investment services. These services include the exchanges and the brokers and dealers in securities and commodities. Between 1976 and 1984 such employment increased 93 percent in the state compared to 92 percent nationally.

Employment growth in transportation, communications, and public utilities

Transportation, communications, and public utilities (T.C.U.) is the smallest of the four major private service sectors in Seventh District states. In 1986 it included 682.6 thousands jobs or about nine percent of private service employment.

Over the long run, T.C.U. employment growth in Seventh District states has not been comparable to the national average. Since the end of World War II, the nation’s T.C.U. employment has increased by about 1.1 million or about 26 percent. During the same period in Seventh District states, T.C.U. employment has declined by about 15,000 jobs or about 2.2 percent. The poorer performance relative to the national average began about 1958 with employment subsequently falling more during recessionary periods and failing to recover at national rates during recovery periods. Some of the decline in District states is due to a transfer of employment from the private sector to government agencies, particularly in local transportation.
Although overall employment in the transportation, communications, and public utilities sector declined slightly over the long run, the experience in the Seventh District among individual industries has been mixed in recent years (see Figure 14).

The transportation industries are the largest segment of the T.C.U. sector, representing about half of the employment in the sector both nationally and in Seventh District states. The major groups of transportation industries are local and interurban passenger transit, trucking and warehousing, air transportation, and transportation services. Five-eighths of the employment in transportation industries in Seventh District states is in trucking and warehousing and one-seventh in air transportation.

Among the Seventh District states, Illinois is clearly a transportation center. The proportions of employment in local and interurban passenger transit, trucking and warehousing, air transportation, and transportation services are all above the national average. Illinois is a transportation center, the proportions of employment in local and interurban passenger transit and trucking and warehousing are above the national average, and in Indiana and Iowa, only employment in trucking and warehousing.

Of the transportation industries, trucking and warehousing has been an important source of employment growth nationally since 1976 but its contribution has varied among Seventh District states. Wisconsin is the only state where the overall rate of employment growth in trucking and warehousing has approached the national average. In Illinois and Michigan, employment in trucking and warehousing declined on balance.

The continued expansion of air transportation has made this industry an important contributor to transportation and therefore service employment growth. Air transportation is particularly important in Illinois where its proportion of employment is 21 percent above the national average. Other states in the District have a relatively small proportion of their employment in air transportation but above average employment growth rates since 1976, particularly in Indiana and Wisconsin, are making air transportation an increasingly important source of employment in these states.

Transportation services has been the fastest growing industry in the transportation segment and represents about ten percent of all transportation employment. About two-thirds of transportation services employment is in the arrangement of transportation.

Private employment in local and interurban passenger transit declined about one-third in the aggregate in Seventh District states between 1976 and 1984. Currently it represents about 11 percent of total transportation employment. Although all of the states registered decreases, the sharpest loss was in Illinois where total employment decreased by one-half. It appears that much of the decrease was actually a shift in employment from the private to the government sector as the Regional Transportation Authority took over the provision of local transportation services in northeastern Illinois.

Another industry to register employment decline both nationally and in the Seventh District was taxicabs. Again it appears
that this may be a result of the characteristics of the data. County Business Patterns data do not include the self-employed and when taxicab drivers lease cabs rather than work for the taxicab company they are considered self-employed and no longer included in the data.

Employment in the communications industries represents about one-fourth of the total employment in the T.C.U. sector both nationally and in Seventh District states. The communications industries include telephone and telegraph communications, radio and television broadcasting, and miscellaneous communications services. Although overall employment in the communications industries rose 14 percent nationally between 1976 and 1984, communications employment declined about two percent in Seventh District states.

Telephone communications dominates the communications industry as a source of employment although its importance has been declining, particularly in recent years. In 1984 employment in the telephone industry represented 72 percent of all employment in the communications industry both nationally and on average in Seventh District states. Above average decreases in employment in the telephone industry in Seventh District states were the major contributor to the failure of Seventh District states to register gains in employment in the communications industries comparable to the national average.

As employment in the telephone industry has declined, important gains in employment have been made recently in other forms of communications, particularly radio and television broadcasting. Currently, it accounts for about one-sixth of all communications employment both nationally and locally.

The category of communications employment with the highest rate of growth is a miscellaneous group of industries generally involving new technological developments. Nationally between 1976 and 1984, employment in this group rose to about three and a half times its level in 1976. Although data must be estimated because of disclosure problems, Seventh District states also registered high rates of growth in employment in this miscellaneous group, particularly Illinois.

The strongest growth in employment in the T.C.U. sector between 1976 and 1984 has been in the utilities industries. The utilities industries provide primarily electricity and gas production and distribution, water supply, and sanitary services. All of the District states participated in the growth.

Although a small portion of employment in utilities, the fastest growth between 1976 and 1984 has been in the private provision of sanitary services. This appears to be related to increased environmental concerns and the expanded use of private contractors for the handling of waste.

**Outlook for the service sector**

Both long-term and recent trends in employment indicate that the service sector will continue to increase in importance in our economy. Seventh District states are participating in that employment growth.

With the increased recognition of the importance of the service sector to the economic growth of an area, more detailed industry data and research are needed. Particularly important is information on the potential contributions of the individual industries to an area’s economic development.

Based on the available data, the contribution of the service industries to employment growth in the Seventh District may be ranked in the following order: personal services; retail trade; wholesale trade; transportation, communications, and utilities; business services; and finance, insurance, and real estate.

---


Agricultural production in the Seventh Federal Reserve District is overwhelmingly concentrated on the production of feed and livestock products. Five commodities—corn, soybeans, hogs, cattle and milk—account for almost 90 percent of the marketing receipts of District farmers. Thus, the forces that have influenced supply and demand for these commodities since the 1970s have controlled the fortunes of the District's agricultural sector.

This period encompasses the economic boom of the 1970s that saw U.S. agriculture become inextricably connected to international commodity markets. During the boom, resources were drawn to the production of export commodities and away from other traditional uses. It was a period of rapid expansion in agriculture, and was accompanied by a sharp increase in debt to fund land purchases and the highly capital intensive production processes that characterize the U.S. agricultural sector.

The experience of the 1980s, however, has been far different. A drastic decline in exports of crops important to the District, combined with a severe financial squeeze on highly leveraged farm operators, fostered a series of wrenching adjustments in the agricultural sector. For many the period of adjustment is not ended, but there are growing indications that the long decline in the fortunes of the District's agricultural sector may be ending. However, these indications point to a period of stabilization in agriculture and not to a return to the rapid growth of the previous decade.

The rise in corn and soybean output during the 1970s was spurred by an increase in the demand for these commodities. Domestic utilization of corn increased by 30 percent while soybean use rose 45 percent. Corn used for feeding livestock and poultry, which accounts for the bulk of domestic corn demand, rose by a fourth during the period. The number of cattle on feed held at high levels through most of the decade, as did hog inventories. Domestic use of corn for food, seed, and industrial purposes, although only a small component of total demand, jumped more than 75 percent between 1970 and 1980. Much of this increase came from the development of markets for high fructose corn syrup and grain alcohol production for industrial and fuel uses.

Although the increase in domestic utilization was substantial, the major impetus for the expansion of corn and soybean output came from the burgeoning world demand for U.S. grains and feeds. Overall, United States agricultural exports rose at an unprecedented annual rate of 8 percent during the 1970s. (see Figure 1). During that period the U.S. share of world coarse grain trade grew from about 40 percent to more than 70 percent. Corn exports, the principal component of the nation's coarse grain exports, grew at an annual compound rate of almost 16 percent. Soybean exports grew at a rate in excess of 6 percent per year and consistently held a world market share of about 80 percent. Combined with strong domestic demand, these increases in exports ushered in a boom period for Midwest grain farmers.

As the leading corn and soybean producers, farmers in District states responded to the growing demand in world grain and oilseed markets by greatly expanding output. By the early 1980s, corn acreage harvested in District states had jumped about 28 percent from the decade earlier level, with large increases recorded in every District state. Moreover, impressive gains in per acre yields boosted output even more, resulting in District-wide production in the early 1980s almost 60 percent above the levels of ten years earlier.

Soybean production in the District registered substantial gains as well. Acreage harvested increased about 43 percent during the 1970s, while soybean production increased by more than 64 percent. Once again, increases were recorded throughout the District, with the major producing states, Illinois, Indiana, and Iowa, recording increases of a third to a half over early 1970s levels.

Peter J. Heffernan is an agricultural economist at the Federal Reserve Bank of Chicago.
The shift in resources toward corn and soybean production is reflected in the more intensive use of cropland in the District. Cropland under cultivation in District states increased almost 7 percent between 1974 and 1982. During that period, idled cropland acres dropped almost 13 percent. However, the most substantial shift occurred in cropland used for grazing purposes. By 1982, the number of acres of cropland used as pasture in the District states had dropped almost 36 percent from eight years earlier.

This shift toward crop production to supply an expanding world market contributed further to a reduction in the importance of livestock production that had been occurring for some time in most areas of the District. After accounting for almost two-thirds of total cash receipts in the mid 1960s, livestock marketings had fallen to less than half of the total receipts generated by District farmers by 1980. Only Iowa and Wisconsin were generating more receipts from livestock marketings than crop marketings among the District states at the end of the 1970s.

Much of the falloff in livestock marketing receipts in the District was accounted for by the decline of the cattle feeding industry. By 1980, cattle feeding in the District was down about a fourth from 10 years earlier. The plains states of Texas, Kansas, Nebraska, and Colorado experienced substantial gains in cattle feeding, replacing the District as the premier cattle feeding area and accounting for almost 47 percent of the cattle in feedlots at the end of 1980.

Hog production in District states largely followed the national trend during the 1970s, although some reduction in the share of year-end inventories of hogs and pigs accounted for by the five states did occur. In the mid 1960s, District states accounted for more than half of the nation’s inventories of hogs and pigs, with Iowa alone accounting for a fourth of the total. By the end of 1980, however, inventories of hogs and pigs on farms in District states increased about 17 percent, while the U.S. inventory jumped about 28 percent. As a result, the District’s share of total inventories slipped slightly to 46 percent, although Iowa retained its dominant position within the industry with 25 percent of the inventory of hogs and pigs.

The shift in resources toward crop production is also evident in milk production trends among District states. In 1980, milk output in the five-state region was down 2.5 percent from the level of the mid 1960s, compared to a 3.5 percent gain in production nationwide. The largest grain producers in the District, Illinois, Indiana, and Iowa, saw milk production decline by 25 to 34 percent during the period. The importance of dairy production in the region, therefore, was maintained by a 19 percent increase by Wisconsin dairy farmers.

The boom of the 1970s brought rising farm income and a rapid escalation in farmland values throughout the Midwest. Farmland in District states registered more than a four-fold increase in value during the decade of the 1970s (see Figure 2). However, the rapid increase in values was accompanied by a substantial increase in the amount of debt held by District farmers.

The rise in debt was particularly rapid in the second half of the 1970s, as farmers scrambled to acquire additional land and expand their operations to meet what many perceived as a permanent increase in demand. Between 1974 and 1979, the proportion of farm operators with debt in the District jumped from about 42 percent to more than 63 percent. In comparison, 54 percent of farm operators nationwide had outstanding debt in 1979. Moreover, the average amount outstanding to these indebted farmers doubled between 1974 and 1979. As a result, total debt outstanding to farm operators in District states underwent a three-fold increase in the five-year period.
The huge increase in debt contributed further to already escalating production expenses. While higher oil prices triggered significantly higher farm expenses in the 1970s, mortgage and nonreal estate debt interest expenses boosted expenses further. By 1979, interest expenses among District states had jumped more than 150 percent from the 1974 level, and continued to rise sharply into the early 1980s. Despite the increases in interest and other expenses during the 1970s, however, farm income remained strong. Real net farm income in the District, an inflation-adjusted measure of the value of a given year’s production whether it is sold, fed to livestock, or held in inventory, averaged more than 11 percent higher in the 1970s than during the previous decade.

The boom period for agriculture which characterized the 1970s ended abruptly in the early 1980s. Exports, which had fueled the expansion of production dropped off sharply, pressuring prices and income lower. Moreover, the huge expansion of debt in the late 1970s was compounded by the sharp escalation of interest rates in 1980. By 1982, interest expenses among District farmers had climbed to more than $4.8 billion, 67 percent above the high 1979 level. As a result, many of the District’s highly leveraged farm operators were experiencing severe financial stress.

The drop in U.S. agricultural exports in the 1980s is the result of a combination of forces. The worldwide recession of the early 1980s had a devastating effect on U.S. agricultural exports. Stalled economic growth limited export demand and persistent debt problems and foreign exchange shortages in many regions of the world further dampened demand. In addition, increased production and exports by countries other than the United States contributed to mounting competitive pressures.

The success that other exporting countries enjoyed in competing with U.S. agricultural exports in recent years is attributable to a number of factors. Among these are increased production and export subsidy policies in many exporting nations. In addition, U.S. domestic agricultural and macroeconomic policies inadvertently enhanced the export opportunities of other nations and limited the cost of their subsidy programs.

Nonrecourse price-support loans from the Commodity Credit Corporation (CCC), which are the cornerstone of U.S. agricultural price stabilizing policies, had a major effect on trade patterns. Under these programs, producers can pledge commodities as collateral for a specified amount of loan per bushel, referred to as the loan rate. Farmers then have the option of repaying the loan in cash or by forfeiting ownership of the commodities pledged as collateral. The latter option is typically used when the loan rate exceeds market prices. Therefore, the loan rate can act as a floor under the market price of the supported commodity.

Following the inflation of the 1970s, farm price supports in the United States were designed to rise annually to cover anticipated increases in production costs. But, increased world production pressured prices lower, leaving loan rates well above market clearing prices and resulting in disastrous consequences for U.S. agricultural exports. Rather than being directed toward export channels to satisfy demand at the prevailing world price, U.S. commodities moved under loan and into inventories. The void this movement created was then filled by competing exporters. The situation was further exacerbated by domestic macroeconomic policies that contributed to the rising exchange value of the dollar, making U.S. commodities more expensive in terms of other countries’ currencies.

Because of the dominant role played by the United States in world agricultural trade, the U.S. policy of removing commodities from market channels to maintain price supports, in combination with the appreciating value of the
dollar, formed a protective umbrella over world markets, allowing prices elsewhere to rise. That had the dual effect of encouraging additional production abroad and discouraging consumption. Moreover, the generally higher level of world prices fostered by U.S. policies reduced the cost of subsidies paid by some countries disposing of their own surplus production in world markets.

The result of these forces, along with generally favorable growing conditions in most areas of the world, was a substantial increase in output throughout much of the world. By the mid 1980s, coarse grain production in countries other than the United States had increased 14 percent since the end of the 1970s and soybean output was about a third higher than it had been five years earlier. The increases occurred in both major importing and exporting countries, and resulted in much greater competition for shrinking agricultural trade markets. In 1980, U.S. coarse grain exports accounted for about two-thirds of world trade. By 1986, U.S. coarse grain exports had dropped by 49 percent and accounted for little more than a third of world trade in coarse grains. Soybean exports hit a low in 1985 that was more than third below the 1982 peak, with world market share over the period falling from about 86 percent to 65 percent.

Despite the falloff in exports of major District commodities, production continued to expand. With price and income support payments insulating farmers from the effects of lower exports, producers responded with record corn crops in 1981 and 1982 and near-record soybean output. Crop inventories, particularly of corn, began to build to burdensome levels. To alleviate this problem, the government instituted the Payment in Kind Program (PIK) in 1983, which paid farmers in commodities to reduce their acreage of grains and cotton.

District farmers producing corn and other feed grains participated heavily in the program, sharply reducing acreage. Corn acreage harvested dropped 27 percent from a year earlier, but a severe drought further trimmed District corn production to about half the previous year’s level. The drought also curtailed soybean production in District states, dropping it by about a fourth from the 1982 level.

The PIK program, combined with the drought, boosted feed grain prices sharply, transferring the financial stress that had been experienced by grain farmers to livestock producers. High feed costs accentuated the decline of cattle feeding in the District and severely squeezed the operating margins of all livestock enterprises. By the end of 1986, the number of cattle on feed in District states had dropped another 32 percent from the 1980 level, compared to a 6 percent drop nationwide. Low and negative operating margins for hog producers following the PIK- and drought-reduced feed grain crop of 1983 contributed to a 15 percent decline of hog inventories in Seventh District states in 1985 compared to five years earlier.

Declining marketing receipts and mounting expenses pressured both income and land values in the 1980s. Despite a huge increase in government expenditures for price supports and related programs, which have averaged more than $12 billion a year in the 1980s compared to $3 billion in the previous decade, net farm income declined. Among District states, inflation-adjusted net farm income in the first half of the 1980s averaged less than half the level of the 1970s. The declines were most pronounced in Illinois, Indiana, and Iowa, ranging from almost 60 percent to more than 70 percent lower than the previous decade. By comparison, inflation-adjusted net farm income nationwide in the first half of the 1980s averaged 39 percent lower than in the 1970s.

The steep decline in net farm income and expectations of continuing declines precipitated a huge reduction in District farmland values. By the end of 1986, farmland values across the District had plummeted to about half of their 1981 peak. Adjusted for inflation the decline was about 60 percent from the peak. As a result of the drop, the wealth that had accumulated to farmland owners during the 1970s was completely eroded. The drop in net worth undermined the financial positions of all producers, and for some it resulted in insolvency.

The mounting financial pressures of the 1980s contributed to a decline in farm numbers. Nationwide, the number of farms dropped 9 percent between 1980 and 1986. The number of farms in District states declined by a somewhat larger proportion, falling 11.5 percent over the seven-year period. By far the largest proportional drop in farm numbers among District states occurred in Illinois, where there were almost 19 percent fewer farms in 1986 than at the beginning of the decade.
The declines in farm numbers during the 1980s extend a downturn that has been in progress since the 1930s. The 11.5 percent drop during the first seven years of the 1980s about equals the decline registered in the 1970s, but it is far short of the steep 20 percent to 30 percent declines registered in the 1960s and 1950s.

Through attrition and efforts to restructure balance sheets and streamline operations, farmers have been adjusting to the economic realities of the 1980s. Although farm debt continued to expand through 1983, it has declined steadily since that time. By the end of 1985, outstanding farm debt among the District states (excluding price support loans from the CCC) had dropped almost 11 percent from the 1983 peak. With farm debt nationwide registering a further 8 percent decline last year, it is likely that outstandings among District farmers continued to fall as well.

The sharp declines in debt, along with generally lower interest rates, have contributed to lower production expenses. Paced by a 16 percent decline in interest expenses between 1982 and 1985, total production expenses of District farmers fell by more than 6 percent over the period. Although data for individual states is not available, farm expenses nationwide fell sharply again last year, suggesting even further declines among District states. The decline in expenses largely reflects lower interest charges, and declines in input use and their prices have also been important factors.

Lower production expenses and greatly improved returns to livestock producers over the last two years along with large government payments have contributed to improving prospects for a recovery in the farm sector. With the District states benefiting from government feed grain programs and strong cattle, hog, and dairy returns, while continuing to cut production expenses, continued improvement is likely.

Further encouraging signs for District farmers are evident in export trends. Although soybean exports continue to be pressured by stiff competition from Southern Hemisphere producers, a substantial rebound in corn and feed grain exports has occurred this year. Coarse grain exports in the current year are expected to increase almost a fourth from the dismal level of a year ago, and are projected to increase an additional 9 percent next year.

The improved outlook for grain exports is attributable to several factors. Production setbacks in some regions of the world along with greater use of export subsidies by the United States have contributed to the recent recovery of exports. In addition the lower exchange value of the dollar and important changes in commodity price support programs have greatly improved the overall price-competitiveness of U.S. grains in world markets. Although lower loan rates mandated by the 1985 farm legislation lowered prices, the introduction of generic PIK certificates have further improved the competitiveness of U.S. grain. The certificates, issued in lieu of cash for government program payments, can be exchanged for commodities owned by the CCC or used to redeem commodities pledged as collateral for CCC price support loans. Use of the certificates has channelled additional grain, mostly corn, into commercial markets rather than into storage. The resulting increase in free supplies has pressured market prices lower, effectively circumventing the loan rate price floor. The lower feed grain prices have benefited domestic livestock producers and stimulated export sales.

The recent trends suggest that the long recession in agriculture may have ended, and that some stability may have come to the District's agricultural sector. Additional support is provided by stable farmland values in the District during the first half of 1987. Further moderating of expenses, additional improvement in exports, and continued high government support payments through the remainder of the decade could set the stage for a recovery in the District's agricultural sector. However, the recovery is likely to be characterized by slow steady improvement rather than the rapid gains of the 1970s.
Economic development efforts in the Seventh District

David R. Allardice and Alenka S. Giese

For the most part, individual states are limited in their ability to influence their economic prospects. National monetary and fiscal policies may offset state-level programs designed to stimulate employment growth. Shifting markets and foreign competition can also undercut state efforts to lean against the winds of change. But, while their impacts may be limited, economic development efforts in recent years have been a top priority for most states. The increased attention devoted to state economic development is primarily due to two factors. First, the back-to-back recessions in the early 1980s severely affected states dependent upon manufacturing, causing great concern among state officials. Second, the federal government has been gradually lessening its role in state development programs. Thus, states have had to fill in the gaps and find new sources of funds.

This study highlights the major features of the Seventh District states’ economic development approaches but does not attempt to evaluate their impact. Such an assessment is not yet appropriate. First, none of the programs cited is more than five years old. Second, no common source exists from which to evaluate the extent to which program recommendations may have been adopted and if adopted what impact they have had. Also, few state-level studies have been done to provide the basis for such an analysis. Last, many of the recommendations made in development studies are vague and lack sufficient specificity upon which to conduct an evaluation.

The programs

During the first half of the 1980s, all five Seventh District states published development programs and initiatives. For purposes of comparison, one study from each of the five District states has been identified as reflecting the approach adopted by the various states. These studies, listed below, have given rise to economic development efforts that tend to be long term in scope and customized to each state’s unique economic and demographic characteristics.

Indiana: In Step With the Future... Indiana’s Strategic Economic Development Plan (1984).

Numerous approaches have been adopted by the Seventh District states to help them better understand the performance of their economies and to develop programs in response to the problems they perceive. Some of the states (Illinois, for example) have relied on a more “traditional” state-sponsored approach to analysis, goal setting, and programs. Others (Wisconsin, for example) have adopted approaches that incorporate aspects of private sector strategic planning and have developed goals and programs that draw on both the public and private sectors.

While each state is different, the findings of the strategic and other economic development studies reviewed reveal that the more industrialized states (Illinois, Indiana, Michigan, and Wisconsin) of the Seventh District share similar economic structures and, thus, similar economic strengths and weaknesses. Consequently, strategies presented to address these problems have certain common characteristics. Though details vary across states, the economic development initiatives set forth revolve to a

David R. Allardice is a vice president and assistant director of research and Alenka S. Giese is an associate economist at the Federal Reserve Bank of Chicago.
large extent around revitalizing the manufacturing sector, which has not only been the District’s strongest economic sector historically, but also tends to produce goods that are high in value-added content.

**Individual state goals and targets**

Michigan’s strategic plan, *Path to Prosperity*, was designed to be a research-based, objective analysis of Michigan’s economy which addresses the causes behind its decline. The study, conducted primarily by researchers at Michigan universities and businesses, recommended that policy makers orient their efforts towards resuscitating the state’s historically strong industries—automobiles and auto parts. This approach differed from earlier studies that had called for Michigan to diversify its economy. To regain a competitive position, the report recommends that industries should employ the locally available pool of skilled labor and incorporate advanced technology into their manufacturing processes. Outside of the durable goods sector, *Path to Prosperity* calls on the state to promote its forest products and food processing industries, which were viewed as having growth potential. In the area of high technology, biotechnology was considered to have potential in relation to improving productivity in agriculture and forestry.

Drawing on individuals from both the public and private sector, the Wisconsin Strategic Development Commission (WSDC) devoted 18 months to developing a strategic plan for the state. Similar to *Path to Prosperity*, The Final Report of the WSDC determined that the state’s economic future depends upon the strength of its manufacturing sector.

*The Final Report* recognized that further declines in existing industries were inevitable and that large amounts of scarce public and private resources should not be devoted to preventing the unpreventable. The study recognized that a state has only limited abilities to affect many areas. Thus, *The Final Report* recommended focusing policies and programs on the state’s existing industries that are its basic strengths. The report found promise in emerging industries, small business, and entrepreneurship. In addition, the WSOC felt that the service sector would continue to expand. In the view of the WSOC, the service sector would account for an increasing share of employment but would tend to generate lower income jobs and smaller value-added components than manufacturing.

Heavy specialization in agricultural and agriculture-related industries has made Iowa’s economy vulnerable to swings in agricultural conditions. During the 1970s this specialization acted as a stimulus to Iowa’s economy—adding jobs and income. However, during the 1980s, Iowa’s agricultural specialization has become a detriment to growth.1

In response to the problems affecting the state, a study entitled *Rebuilding Iowa’s Economy: A Comprehensive State Economic Development Plan* was prepared for the Iowa Legislature. The plan recognized that Iowa’s economy would not miraculously rebound, given the domestic and worldwide agricultural outlook. The plan recommended two approaches to the problem: diversification of the state’s economy and the organization of economic development activities on an in-state regional basis.

The plan recommended diversification in both the agricultural and nonagricultural sectors. While the study recognized that farmers were not likely to move away from the state’s two traditional crops—corn and soybeans—it noted that there might be entrepreneurial gaps that could broaden the agricultural base.

For the nonagricultural sector, among other things, the plan called for a program of import substitution, in which in-state products would be substituted for out-of-state products purchased by Iowa businesses. Strengths were identified in the fields of technology-oriented agronomy, laser applications, biotechnology, and “tech-based industries” (those using technologically advanced equipment).

Indiana’s strategic economic development plan, *In Step with the Future*, identified five industries—primary metals, fabricated metals, electrical machinery, nonelectrical machinery, and transportation equipment—as dominating the state’s economy. While benefiting from their central location, the state’s dominant industries have been affected by increasing competition and structural change. The report identified the greatest opportunities in expansion of existing firms and the integration of advanced technology into the production process. Such transfers of technology might be facilitated by the establishment of technology transfer centers and closer cooperation between universities and industry.
Illinois' approach to economic development is a broad-based expenditure program. Entitled Build Illinois, the program allocates public monies for infrastructure improvements, large-business attraction efforts, and small business loans. This program reflects a more traditional approach to state economic development efforts.

Common themes

Contained within these five studies are three basic themes: recruit new firms, maintain existing firms, and create new businesses and enterprises. These are clearly not mutually exclusive activities. Different mixes of these activities produce different policies and sometimes internal inconsistencies.

The policies suggested in the five studies reflect a movement away from limited industrial recruitment programs ("smokestack chasing") toward a wider selection of programs designed to deal with particular circumstances. Increasingly, more emphasis is now placed on encouraging existing in-state businesses. This should be welcomed by the state’s business community which frequently argues that industrial recruitment financed by subsidies and tax exemptions is being conducted at its expense with little or no evidence of net benefits to the state.

Another reason for the decreased emphasis on industrial recruitment is that studies on firm location decision-making have cast doubts on the long-run effectiveness of state efforts to attract businesses by offering them tax and financing incentives. First, it has been found that during a year only a small percentage of all businesses (and even a smaller percentage of the jobs) relocate. Second, the decision by General Motors, for example, to locate its Saturn plant in Tennessee suggests that incentives may not be necessary if the state can provide an attractive business climate overall.

Despite the potential pitfalls, industrial recruitment is still undertaken by states in the Seventh District. For example, while Illinois has stated that "job retention is more important than attracting out-of-state firms," the state has vigorously pursued auto plants and has allocated several millions to business attraction efforts under its Build Illinois Large Business Development program. Michigan similarly promised subsidies to Mazda in the form of lower taxes, worker training, and infrastructure investments in an effort to convince the company to locate its automobile assembly plant in Flat Rock, Michigan.

The 1980s have seen the emergence of both technology recruitment and technology application as development policies. Technology recruitment is a form of industrial recruitment applied to "high tech" industries, which have been sought for their reputed high growth, high wage, and nonpolluting characteristics. Based on the apparent successes in California, Massachusetts, and North Carolina, states sought to attract high-tech firms as a new base for their economy. However, such opportunities are limited, and thus the states have become intensely competitive whenever large projects arise. For example, both Michigan and Illinois are currently striving to attract the multibillion dollar Superconducting Super Collider particle research facility to their states.

Initial optimism has been tempered by the realization that the "high tech" sector will account for only a small percentage of future jobs. In The Final Report, high-tech employment was forecast to account for only about 6.5 to 6.8 percent of Wisconsin's total employment by 1995.

While high-tech industries have a role to play in future economic growth and job creation, the key point stressed in the studies is the application of technological advancements to traditional industries in order to advance production processes and product innovation. The implementation of robotics, automated processes, and computer-aided design and manufacturing (CAD/CAM) offers industries a means to decrease unit labor costs, increase their productivity, and thus boost sagging competitiveness.

With "smokestack and high tech chasing" reduced in priority, District state economic development policy-makers have turned more of their attention to supporting indigenous companies and fostering the growth of entrepreneurs and small business-creation strategies. All five states in the Seventh District have some type of small business development focus within their economic development programs. This emphasis on firm creation is attributable to several factors. First, small business has come to be viewed as a major job generator. This view is most frequently associated with research undertaken by David Birch
of the Massachusetts Institute of Technology. Birch found that small businesses (firms with less than 100 employees) were the source of 82 percent of all the jobs created between 1969 and 1977. While these findings have been challenged by later studies, the consensus remains that small businesses account for over half of all new jobs created. Second, small businesses are considered a source of entrepreneurial talent and innovation that can stimulate the implementation and dissemination of technology.

The changing role of state government

The tools available to state government to pursue the economic development objectives cited above can be divided into two categories. The first is composed of the traditional instruments such as: taxes, fiscal incentives, regulations, education, and job training. In addition to these traditional approaches to stimulating the economy, some innovative programs have been developed such as strategic funds and business incubators. It is through these novel approaches that the state's role in economic growth has changed dramatically.

Among the traditional tools, the items scrutinized the most are state taxes (personal, property, and business). Even though tax reform, incentives, and abatements are often used as a state government tool to promote economic development their effectiveness has been widely challenged. Michigan's Path to Prosperity points out that there was little evidence that state tax and other financial incentives were a powerful or cost-effective tool for reversing Michigan’s decline and expanding its economic base. The Final Report of the WSDC cites the results of a tax study, conducted by the Wisconsin Department of Revenue, which shows no strong relationship between state and local taxes and economic growth. Another conclusion shared by these two studies was that tax abatements (e.g. property tax relief) are ineffective and negatively affect businesses not receiving such subsidies.

While these findings suggest that tax policies play only a limited role in business attraction, tax levels and changes do send signals about the attitudes of the state governments toward business. The study by the Wisconsin Department of Revenue revealed that all five of the District States had introduced legislation to decrease the tax burden on industry. Taxes being eliminated in some states include sales and use taxes on industrial equipment, machinery, and computer equipment; taxes on inventory; and unitary taxation on multinational corporations.

Another way to reduce business costs and to expand employment is through the creation of enterprise zones. Illinois, Indiana, and Iowa have enacted legislation for the establishment of such zones. The primary purpose of the enterprise zones is to foster economic development in depressed, particularly urban, areas by offering incentives to industries that locate there. The incentives offered may include investment tax credits, job creation grants, income tax credits to encourage job creation, and sales tax exemptions.

Worker’s compensation (WC) and unemployment insurance (UI) have also been targets of state development efforts. Since WC and UI costs are comparatively high in four of the Seventh District States (the exception is Indiana), state governments have taken steps toward reform. Michigan’s Task Force for a Long-Term Economic Strategy highlighted Michigan’s WC costs as above average. In response, the state government has worked, since 1982, to reduce total WC costs and opened up the insurance system to competition.

State-controlled business costs have not been the only focus of recent state economic development efforts. State-provided services have also been evaluated, services such as education, which had previously not been integrated into development initiatives. Job training and retraining programs are now viewed as part of the states’ overall economic development strategies—not just an educational issue. Seventh District states have actively established programs to expand or up-grade work skills in reaction to the growing number of dislocated workers caused by the shrinking of the manufacturing base. Programs introduced include: customized training to match the needs of a specific company and start-up programs which satisfy short-term labor needs.

The innovative state development programs share similar goals with the traditional programs such as lessening external business costs but have applied novel instruments to achieve them. In addition, they have focused on particular segments of the economy such as
entrepreneurs and start-up companies rather than all sectors.

To assist entrepreneurs, some of the programs offer technical assistance such as Indiana’s Institute for New Business Ventures and Illinois’ Technology Commercialization Centers. State governments have also become active in providing business counseling through small business development centers (SBDCs). Counseling programs are an attempt to combat failure due to lack of expertise. Studies of small business failures have shown that the majority of failures are caused by mismanagement. In some instances states also provide specialized services catering to entrepreneurs. Wisconsin has been active in creating programs that fill technical needs. Its SBDC program has become a multi-faceted program providing technical assistance that meets the needs of the entrepreneur and innovator.

While the entrepreneur’s technical needs are the target of many state programs, the financial needs of the entrepreneur remain a critical factor. Entrepreneurs often face capital constraints because of the lack of access to national sources of equity and debt financing. They thus have difficulty in commercializing their ideas. As state governments have become aware of the special needs of the entrepreneur, they have introduced programs to improve the innovator’s access to financing.

Until recently, state government assistance for project funding was limited to more traditional means, such as industrial revenue bond financing. Financial assistance has been expanded to include the increased availability of pre-venture capital and venture capital financing for small start-up companies. For example, in 1985 Michigan established The Michigan Strategic Fund (MSF). The MSF was designed to use small amounts of public resources to generate large amounts of private lending to Michigan’s small and medium-size companies.

States have also examined their public pension funds as a potential source of long-term debt and equity financing. Michigan has taken legislative action to free up public pension funds for investment in small innovative businesses. The legislation, enacted in 1982, allows up to five percent of the assets of public pension funds to be invested in small, qualified businesses or venture capital firms. Illinois passed a finance bill in 1983 allowing monies to be borrowed from the Public Pension Fund, as a guarantee on business loans made by private lenders.

The establishment of business incubators is another attempt to ease capital constraints and to facilitate business development. The objective of such programs is not direct financing but rather an attempt to decrease small business start-up and overhead costs. Business incubators are facilities where the tenants pay below-market rents, share central services (e.g., secretarial and financial consulting) and in several cases have access to seed capital. By lowering overhead costs and facilitating the development of management skills, incubators attempt to help their tenants through the crucial start-up period. The average lease periods (about 18 months) are sufficient to allow most small businesses to establish themselves and their clientele. A secondary benefit arising from incubators is the potential for maximization of entrepreneurial creativity through the interaction between the incubator’s diverse tenants.

The wave of cooperative efforts

A major trend is noted toward the formation of coalitions between the state government, universities, labor, and businesses. Most frequently the public sector has been responsible for bringing these groups together. For example, Illinois Inc. brings together the state government, private businesses, and organized labor in order to pool their resources and promote Illinois through advertisements in national publications.

In recent years, more public/private efforts have been initiated by the private sector. Utility companies, for example, have become major players in development efforts. These companies have a vested interest in their state’s economy, since the growth of the utility is linked to the growth or decline of its client base.

In addition to public-private coalitions, business-university cooperative efforts have grown significantly. The primary motive behind these efforts is to accelerate the transfer of technology from the lab to the marketplace, and increase research and development efforts. Most of these programs offer technical assistance through technology service centers (e.g., Indiana) or innovation centers (e.g., Iowa).
These centers couple the scientific and technical expertise of university faculty with the needs of the business community. Some of the programs provide financial incentives as well—contingent upon the project being a joint effort between a business and an institute of higher education (e.g., Illinois Business Innovation Fund and Wisconsin’s Technology Development Fund).

International trade—export promotion and reverse investment

International trade is being incorporated into many state economic development plans. Initially the focus was on export promotion, with the state playing a role similar to that of an export trading company. Recently, however, programs have been added to deal with reverse investment. Trade promotion and development offices in the District have become increasingly active in this area. State legislatures have formed committees to deal with foreign trade issues and have become more generous with appropriations to the state trade departments.

Three examples of innovative programs illustrate the growing importance of foreign trade. In Indiana, a Japanese Language Program sponsored by Indiana University and Purdue University has been introduced. This program provides children of Japanese nationals working in central Indiana with classes taught in Japanese that prepare them for their return to the Japanese school system. In Iowa, the Foreign Student Contact Program arranges meetings between businesses and foreign students attending Iowa colleges and universities. The students are able to provide information on subjects ranging from their country’s culture to business ethics. Finally, Wisconsin has developed a program under which foreign student graduates from its universities can act as “honorary commercial attachés” in their native country to help find markets for Wisconsin products.

Conclusion

State-level economic development efforts have proliferated in the District during the 1980s. These efforts have evolved from merely responding to changing economic circumstances to taking an active role in determining the course of the local economy. The resulting strategies and programs reflect the underlying uniqueness of the five states’ economies. Reviewing studies from each of the District states reveals development themes relating to recruitment, retention, and creation of new businesses.

There is no reason to conclude that the role of the states in economic development will be less in the future. In fact, there is every reason to think the opposite. States should develop a larger role as they expand their development role beyond traditional recruitment activities.

The programs that evolve will be based on longer term strategies and a better understanding of the state economies. As such, more emphasis will have to be placed on the costs and benefits of programs’ priorities among competing programs, and coordination of programs and institutions to achieve the desired result.

Lastly, programs and institutions must be flexible, and responsive to change. Those that have outlived their useful lives must be replaced by newer, more flexible, and responsive entities. These changes must anticipate and not merely respond to changes in the underlying private sector.

The states cannot alter the forces that affect their economies. They can, however, take advantage of opportunities that arise.

4 See, for example, John Rees, “Government Policy and Industrial Location in the United States,” U.S. Congress, Joint Economic Committee Special Study on Economic Change, December, 1980.
Call for papers

The 24th Annual
Conference on Bank Structure and Competition
Chicago, Illinois, May 11-13, 1988

The Federal Reserve Bank of Chicago will hold its 24th annual Conference on Bank Structure and Competition in Chicago, Illinois, May 11-13, 1988. The Conference provides a forum for the exchange of ideas among academics, regulators, and industry participants with a strong interest in public policy toward the financial services industry. The 1988 conference will examine in detail recent proposals for restructuring the financial system to expand the powers of commercial banks and alter the scope of the federal safety net. However, papers on other issues in financial structure and regulation are also welcome. Completed papers or abstracts should be submitted by December 18, 1987. Send two copies of the paper or abstract to Larry Mote, Program Chairman, Research Department, Federal Reserve Bank of Chicago, P.O. Box 834, Chicago, Illinois 60690-0834.