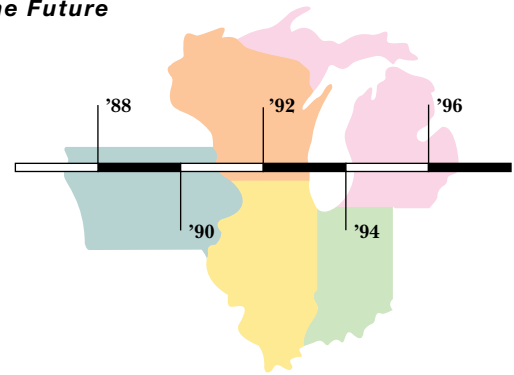


**ASSESSING THE MIDWEST ECONOMY**  
*Looking Back for the Future*

## The Midwest Economy: Structure and Performance

*Second in a series of workshops to be held at the Federal Reserve Bank of Chicago.*

The second workshop as part of the Bank's long-term study of the regional economy was held on February 13, 1996. This workshop focused on the structure and performance of the Midwest economy, particularly with regard to manufacturing which continues to be its dominant industry sector. The first part of the program included a look at the current status of the region's economy, as well at its development in a broad, historical context. Current baseline data were contrasted with longer-term developments and trends to get a better view of what might lie ahead. The second half focused on the manufacturing sector. How is this crucial element of the region's economy being shaped by ongoing structural changes, in an environment where best manufacturing techniques are transferred across borders with apparent ease and amazing speed? What implications have these structural changes for the region's public policy decisions?

## State of the Region

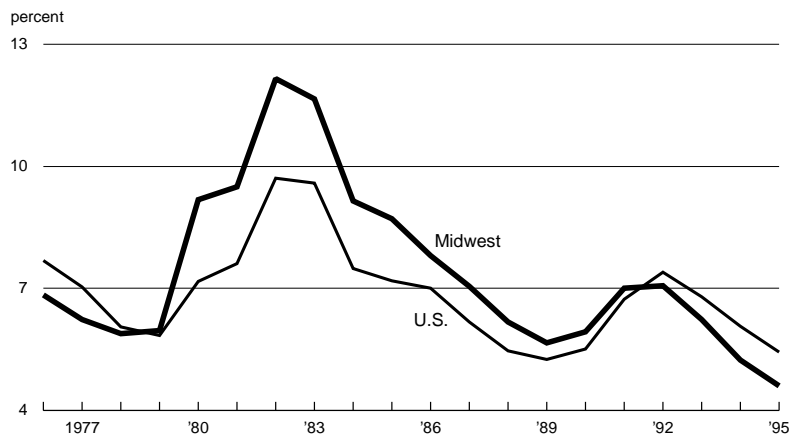
David Allardice, senior vice president and manager of the Detroit Branch of the Federal Reserve Bank of Chicago, presented an overview of the current state of the Midwest region. Manufacturing activity and closely associated services continue to account for a significantly greater share of personal income in the Great Lakes than the nation. While some have made gloomy forecasts for the region, reacting mainly to the severe recession of the early 1980s, the performance of the Midwest in the most recent recession, recovery, and current expansion has been remarkable.

While the Midwest did not escape the recession of the early 1990s, its unemployment rate continued to *improve* relative to the national average from 1989 to 1991, as it had since the early 1980s (see figure 1). In previous recessions, the region's unemployment rate had consistently shown greater deterioration than the nation's.

The region's unemployment rate (on average and in each of its states) has been below the national average in each of the past three years—in Michigan, labor markets are stronger than at any time in the past two decades. Figure 2 shows an index of hiring plans in the Midwest relative to the U.S. Since 1990, the region's hiring plans have outpaced the nation's, and in 1995 the survey of Manpower hiring recorded the largest increase since it was started in 1977.

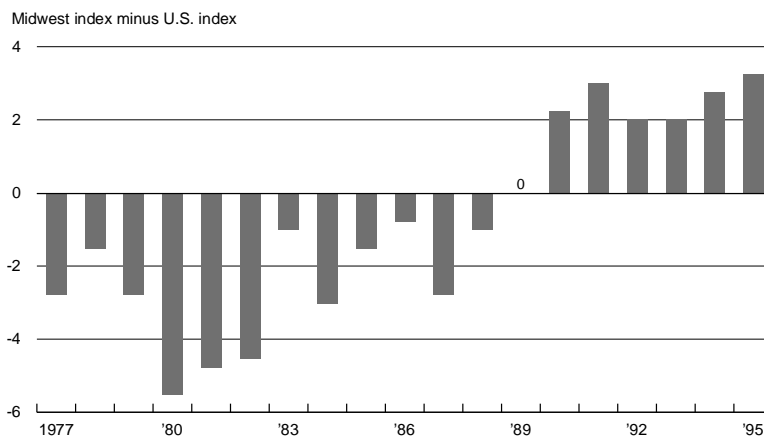
*While the Midwest did not escape the recession of the early 1990s, its unemployment rate continued to improve relative to the national average from 1989 to 1991, as it had since the early 1980s.*

**Figure 1** Unemployment Rates



Sources: Bureau of Labor Statistics and state employment agencies.

**Figure 2** Midwest Hiring Plans, Relative Strength



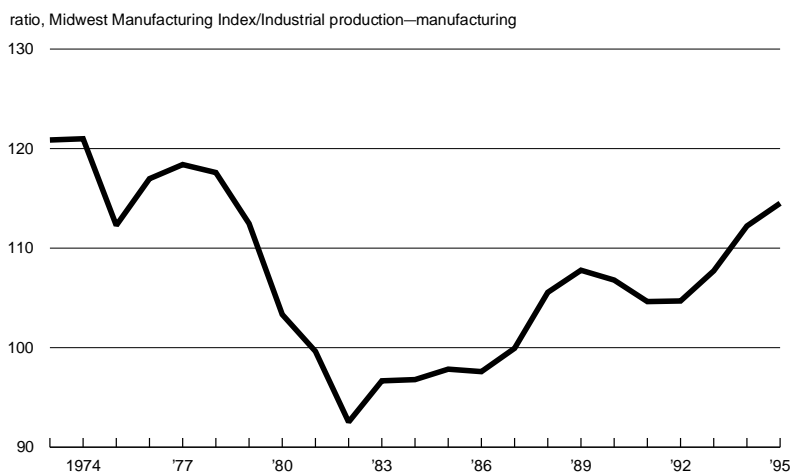
Source: Manpower, Inc., hiring survey.

Housing industry data and indicators of manufacturing output also point to stronger activity in the region than the nation during the 1990–91 recession, with continuing relative strength through the early 1990s (see figure 3).

*Housing industry data and indicators of manufacturing output also point to stronger activity in the region than the nation during the 1990–91 recession, with continuing relative strength through the early 1990s.*

*Productivity improvements, implemented in the region's plants since the early 1980s, have probably played the most important role in the region's revival.*

**Figure 3** Relative Strength in Midwest Industrial Production



Source: Board of Governors of the Federal Reserve System and Federal Reserve Bank of Chicago.

In assessing the state of the region, however, one needs to consider three important external factors that have influenced its fortunes during the last decade: declining real energy prices, important both as an input to the region's industries and as a determinant of demand for its products; declining interest rates, stimulating demand for durable goods; and the declining dollar since the mid-1980s, which has improved the international competitiveness of the region's companies. While these effects are difficult to isolate and quantify with any reasonable degree of precision, Allardice and William Bergman, economist at the Detroit branch of the Federal Reserve Bank of Chicago, argued that productivity improvements, implemented in the region's plants since the early 1980s, have probably played the most important role in the region's revival. They stated that the lessons learned during the harsh recession of the early 1980s are no less important today. Continued focus on efficiency improvement, human capital development, and investment will foster regional performance should important forces external to the region, so favorable today, turn hostile tomorrow.

### Long-Term Trends in Regional Development

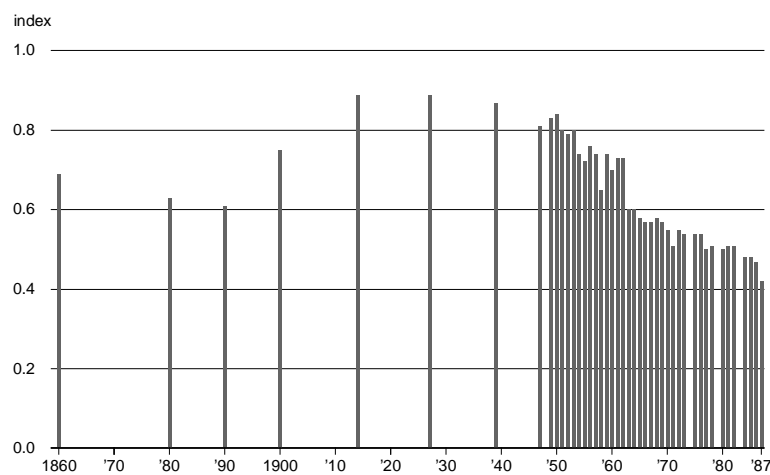
#### Changing Structure of Regions

Following the presentation on the current state of the Midwest economy, the workshop focused on analysis of longer-term trends in the development of regional economies in the U.S. Sukkoo Kim, economics professor at Washington University in St. Louis, presented a historical perspective on the changing structure of U.S. regions. This presentation aimed to provide a framework for evaluating the state of the Midwest economy in the context of an evolving national economy. From 1860 to 1947, as the Midwest (defined by Kim as the East-North-Central census region, encompassing Ohio, Indiana, Illinois, Michigan, and Wisconsin) became the dominant manufacturing region of the U.S., its share of national manufacturing employment rose from 12.7% to 30.2%. In the second half of the twentieth century, however, the Midwest's share of national manufacturing employment began to decline, going from 26.7% to 22.1% between 1967 and 1987.

From 1860 to 1947, the Midwest's share of national manufacturing employment rose from 12.7% to 30.2%. In the second half of the twentieth century, however, the Midwest's share of national manufacturing employment began to decline, going from 26.7% to 22.1% between 1967 and 1987.

The first 30 years or so of the period analyzed were characterized by a rapid increase in integration of the various regions of the U.S. For example, the advent of the railroad and the construction of numerous railroad lines between the 1840s and 1890s dramatically reduced the cost of transportation over land. Railroad mileage in operation increased sharply from 30,626 miles in 1860 to 166,703 miles in 1890. The increase in integration set the stage for specialization within regions. In order to track the various regions over time, Kim calculated an index of regional specialization at various points in time. The index relates industry-specific employment to overall employment for two regions. If it is equal to zero, then the two regions are completely despecialized. Conversely, complete regional specialization corresponds to an index value of 2. An aggregate index is then derived by averaging across the biregional indices.

**Figure 4** Index of Regional Specialization for Manufacturing, 1860–1987



Source: Sukkoo Kim, "Changing Structure of U.S. Regions: A Historical Perspective," paper prepared for the workshop *Structure and Performance*, 1996.

The aggregate index of specialization shown in figure 4 suggests that the extent of regional specialization was about 35% in 1860, 43% in 1927 and 1939, and 23% in 1987. This pattern is found to be robust for each of the biregional comparisons. In general, each region becomes more specialized compared with any other region between 1860 and the turn of the twentieth century and then less specialized toward the second half of the twentieth century.

Kim suggests an explanation of his findings that is based on the effect of scale economies and the availability of resources. As transportation costs fell between 1860 and the turn of the twentieth century, firms adopted large-scale production methods that were intensive in relatively immobile resources and energy sources. The rise in scale and the use of immobile resources caused regions to become more specialized. As factors became increasingly more mobile and as technological innovations favored the development of substitutes, regional resource differences diminished. This trend and a fall in scale economies caused regions to become despecialized between WWII and today.

The data provide little support for a prominent role of external economies. Instead of the spatial concentration one would expect to find for high-tech industries, according to the external economies argument frequently associated with Paul Krugman, Kim's industry-level data show decreasing spatial concentration for high-tech industries such as chemicals and increasing concentration for low-tech industries such as textiles. Accordingly, Kim

*Kim explains the rise and subsequent decline of the Midwest as a manufacturing belt as brought about by changes in the regional comparative advantage of manufacturing in conjunction with sectoral changes in the economy.*

explains the rise and subsequent decline of the Midwest as a manufacturing belt as brought about by changes in the regional comparative advantage of manufacturing in conjunction with sectoral changes in the economy.

The discussion raised several issues relating to the historical economic development of U.S. regions. Charles Leven, economics professor at Washington University, pointed out that the development of regions is affected by the distribution of skills and consumption patterns. In that sense, amenities are expected to influence regional fortunes; therefore, one needs to consider the effect of utility maximizing migration in explaining regional development. In terms of drawing lessons for the future from the observed historical patterns, one needs to keep in mind that the underlying data reflect both short- and long-term cycles, for example driven by the durability of capital as well as the development of technologies, which determine the economic fortunes of regions over time. Finally, Leven cautioned against short memories. While we frequently associate Silicon Valley with the production of computer chips, that industry got started just outside Boston. Similarly, of the hundreds of auto companies that were in operation in the early part of this century, none subsequently moved to Detroit. These are important reality checks we need to put on simplified dependency-type arguments.

Charles Bonser, director of the Institute for Development Strategies at Indiana University at Bloomington, wondered about the policy implications of Kim's work. Kim explained that if the type of adjustment mechanisms he finds in his analysis explain U.S. regional growth and specialization, subsidies and policies such as location incentives are inefficient, because it is the regions' respective advantages that will determine the level of specialization. On the other hand, if one believes in a Krugman-type world, characterized by externalities, timely and well-focused subsidies could shift specialization in favor of a region. Leven suggested that local and regional policies ought to concentrate on efforts to grow the economy, not to attract particular plants. The ability of governments to fashion timely and well-focused subsidies is highly dubious.

James Rubenstein, professor of geography at Miami University, noted that in basing the analysis on fairly aggregate SIC data, one misses substantial variations within industries as far as products and markets are concerned. Kim explained that he felt comfortable with the results obtained as he found factor intensities to be similar for the various product categories included at the two-digit SIC-code level. William Oakland, chair of the economics department at Tulane University, warned against discarding Krugman's externality explanation too early. He felt more data analysis was necessary to reach such a strong conclusion.

### **Regional Income Trends**

Fred Giertz, professor of economics at the University of Illinois in Urbana-Champaign, presented data on the development of regional income trends over the last four decades. The issue of convergence of per capita income has been of interest to economists for some time, as it relates to one of the basic premises of economics: the mobility of capital and labor tends to equalize prices across markets. Accordingly, there exists a rather large literature on the subject. Income convergence refers to the phenomenon of per capita differences among regions, for example, states in the United States or countries in the world, diminishing over time. Relative convergence characterizes a situation where low-income areas grow at a faster rate than high-income areas; absolute convergence is said to occur when the incomes of low-income areas increase in absolute amounts more rapidly than in high-income areas. Previous studies generally found income convergence among countries and states, respectively. Giertz's presentation revisited the data for the U.S. (see figure 5).

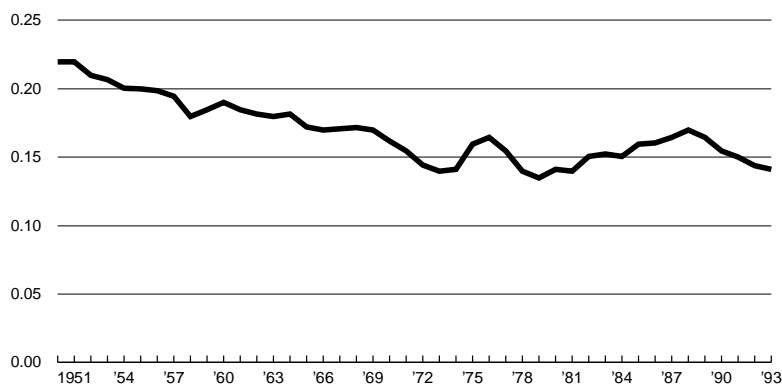
*On the whole, income dispersion across states has declined from 1950 to 1993, but not in a smooth, consistent manner.*

*Explanations for the observed income convergence [include] diminishing returns to capital, relative speed of the diffusion of technology, free trade in goods leading to factor price equality, homogenization of population characteristics, and government policies.*

Figure 5 shows the trend in dispersion of per capita income among the states of the U.S., measured by the Gini coefficient (a coefficient of zero indicates absolute equality of income distribution, a coefficient of 1 absolute inequality). It indicates that, on the whole, income dispersion across states has declined from 1950 to 1993, but not in a smooth, consistent manner. Giertz distinguished four relatively distinct periods. From 1950 to 1973, convergence among states was strong, indicated by the unbroken falling trendline. From 1974 to 1980 dispersion remained relatively constant (aside from the blip from 1974 to 1978, probably the consequence of the large increase in energy prices after the 1973 oil embargo). This was followed by divergence from 1980 to 1988, a period marked by a severe recession and a major restructuring of American industry. Convergence occurred again from 1988 through 1993.

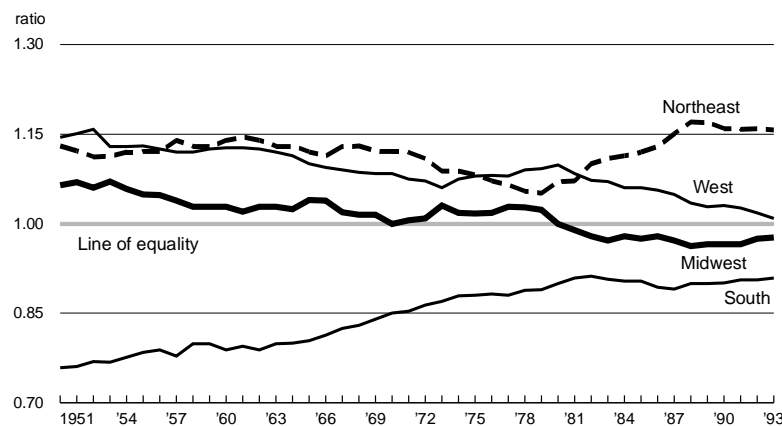
Giertz offered several explanations for the observed income convergence: diminishing returns to capital, relative speed of the diffusion of technology, free trade in goods leading to factor price equality, homogenization of population characteristics, and government policies. In his concluding remarks, Giertz suggested that long-term convergence has taken place among regions and states in the U.S., as well as among states in the Midwest. However, in the last two decades convergence has often been halted or even reversed for short time periods, probably in response to shocks caused by changes in the economy, such as shifts in comparative advantage among regions (see figure 6).

**Figure 5** Dispersion of Per Capita Income among States (Gini Coefficient), 1950–93



Source: Fred Giertz, "Regional Income Trends and Convergence," paper prepared for the workshop *Structure and Performance*, 1996.

**Figure 6** Ratios of Regional Per Capita Income to U.S. Average, 1950–93



Source: Fred Giertz, "Regional Income Trends and Convergence," paper prepared for the workshop *Structure and Performance*, 1996.

Randall Eberts, executive director of the Upjohn Institute, agreed with Giertz's basic point: The long era of regional convergence may have abated around 1970; and the 1980s may have seen a reversal of this trend at least for a few years and for a few regions. This story has also been well documented in the convergence literature. The questions then are, What is the source of this new trend, and What does it suggest for the economic fortunes of the various regions?

Eberts agreed with the explanation that regional per capita differences may be the result of discrete shocks in which individuals react to the changing short-run fortunes of various regions. For example, Carolyn Sherwood-Call from the Federal Reserve Bank of San Francisco has shown that shocks were much more persistent after 1970 than before and, thus, shocks become more important in explaining changes in dispersion.

Consistent with the hypothesis of adjustments taking place in response to discrete shocks rather than to a long-run equilibrating process, Eberts noted that (a) data show that the key contributor to changes in relative income levels in the 1980s was earnings, and not property income or transfers; (b) the dispersion in wages was due primarily to regional differences in market valuations of worker characteristics rather than shifts in work force characteristics; and (c) locally adjusted wages generally converged throughout the 1980s, when nominal wages and regional cost of living indexes diverged. Furthermore, these adjustments may be competing as firms respond to nominal wages and workers to locally adjusted wages. With households and firms valuing amenities, we may find an equilibrating process that no longer converges when viewed only in terms of wages, but does converge when viewed in "real" terms.

Finally, Eberts noted that if amenities are increasingly important determinants of the adjustment process of per capita income, it is important to understand where the cities of the Midwest stand with respect to consumptive and productive amenities (cities with high-productivity enhancing site characteristics increase the demand for labor, and cities with high-amenity site characteristics increase the supply of labor [see table 1]).

**Table 1** Classification of Cities

High Productivity	Low Productivity	High Amenity	Low Amenity
New York, NY	Tampa, FL	Boston, MA	Cleveland, OH
Newark, NJ	San Antonio, TX	San Diego, CA	Cincinnati, OH
Los Angeles, CA	Salt Lake City, UT	Milwaukee, WI	Pittsburgh, PA
Seattle, WA	New Orleans, LA	Denver, CO	Philadelphia, PA
San Francisco, CA	Columbus, OH	Riverside, CA	Baltimore, MD
Minneapolis, MN	Sacramento, CA	Portland, OR	St. Louis, MO
Anaheim, CA	Phoenix, AZ	Ft. Lauderdale, FL	Indianapolis, IN
Nassau-Suffolk, NY	Kansas City, MO	Miami, FL	Dallas, TX
Chicago, IL			Atlanta, GA
Washington, DC			
San Jose, CA			
Houston, TX			
Detroit, MI			

*Productivity cities are listed from most amenable to least amenable, amenity cities are listed from most productive to least productive.*

Source: Eberts and Beeson, "Identifying Amenity and Productivity Cities Using Wage and Rent Differentials," Federal Reserve Bank of Cleveland, *Economic Review*, Quarter 3, 1987, pp. 16–25.

During the brief discussion, Oakland suggested that one needs to look at both aggregate personal income and relative per capita income measures. Regions are not indifferent to an increase in aggregate personal income, as it can afford greater markets for local firms. John Baldwin, director of the Micro-Economics Analysis Division at Statistics Canada, related some information from Canada, where there is national wage convergence within industries. However, looking across various industries one finds divergence; the wage rate increases where a region and its workers have a comparative advantage. The overall net of these two effects varies by region, but is less interesting than the elements that contribute to it.

### The Role of Interregional Linkages

Geoffrey Hewings, director of the regional economics applications laboratory (REAL) at the University of Illinois at Urbana-Champaign, gave a luncheon presentation on changes in the Midwest economy, specifically, the spatial dimension of interdependence. Hewings suggested that regional growth theory has much to offer in terms of explaining movements of capital and labor, as well as convergence/divergence trends. However, the nature of linkages between firms remains largely unexplored. Hewings presented findings of research on interdependence in regional systems conducted by REAL, a joint venture between the University of Illinois and the Federal Reserve Bank of Chicago. Since 1970 a persistent decline was identified in the level of intra-regional dependence in the Chicago region. Hewings submitted that, as the Chicago region experienced a “hollowing out” with the loss of about 500,000 manufacturing jobs from 1970 to 1990, its interstate trading relationships have gained importance. According to REAL, of the \$140 billion in exports from the Chicagoland region during 1995, \$119 billion went to the rest of the U.S., \$10 billion went to Canada, \$1 billion went to Mexico, and \$10 billion went to the rest of the world. These numbers suggest that linkages among companies in the Midwest represent shipments of goods of around \$200 to \$800 billion annually. The size of these numbers, in combination with the hollowing out mentioned earlier, makes it imperative that we improve our understanding of these interregional linkages.

Hewings noted that within the U.S., the Midwest competes with the Rocky Mountain states and the Southwest. In contrast, a complementary economic relationship is found to exist between the Midwest and the far western and Mid-Atlantic states. Combining that information with the export data, one can see that the economy of the Midwest is directly tied to that of North America, and indirectly to those of Europe and Asia (see table 2).

**Table 2** Foreign Destination Shares of Regional Industrial Production, 1987

U.S. region of production	Foreign Destination Area							
	North America	Central America	South America	Europe	Asia	Oceania*	Africa	All**
Midwest	52.6	5.1	3.0	20.1	15.3	2.3	1.6	100
Mid-Atlantic	25.7	5.5	6.7	31.4	25.5	2.6	2.7	100
New England	23.7	2.9	2.3	39.6	25.6	4.9	1.0	100
Plains	38.8	3.8	2.6	25.9	24.2	3.1	1.6	100
Rocky Mtn.	22.1	4.0	1.3	32.3	36.2	3.4	0.8	100
South Atlantic	15.1	13.8	12.0	30.7	23.7	2.4	2.3	100
South Central	23.2	9.7	6.7	31.8	22.2	2.6	3.9	100
Southwest	11.8	24.3	7.4	23.4	27.1	2.1	3.9	100
West	11.3	5.5	3.4	30.3	44.1	4.0	1.4	100
U.S.	27.3	8.0	5.1	28.0	26.5	3.0	2.1	100

\*Islands in the Pacific, including New Zealand, Australia, and the Malay Archipelago.

\*\*Totals may not add to 100% due to rounding.

Source: U.S. Bureau of the Census, unpublished data.

*As the Chicago region experienced a “hollowing out” with the loss of about 500,000 manufacturing jobs from 1970 to 1990, its interstate trading relationships have gained importance.*



In conclusion, Hewings raised the following questions: How is the pattern of inter-regional linkages evolving? Are there significant interstate flows in services as well as manufactured goods? What are some of the regulatory, tax, and fiscal issues that may be limiting the potential of interstate trade, such as different weight limits on trucks or different state tax regimes? Subsequent discussion by workshop participants concerned the nature and magnitude of interstate trade obstacles and their overall effects. Oakland wondered about the nature of the hollowing-out process and the subsequent increase in interregional relationships. For example, it is possible that a firm leaves the Chicago area but continues to purchase materials from it. That would suggest the need to distinguish linkages at the input and final goods levels.

### Focus Manufacturing: Aspects and Implications of Structural Change

#### Application of Lean Manufacturing

In addition to the importance of interregional trade, the implementation of best manufacturing practices may have helped revitalize Midwest manufacturing. Thomas Klier, senior economist at the Federal Reserve Bank of Chicago, focused the participants' attention on a more recent phenomenon, that is, the arrival of lean manufacturing technologies. Is there a connection between the revival of Midwest manufacturing and the application of the new manufacturing techniques?

Lean manufacturing refers to a production system that gained widespread attention in the early 1980s. It combines aspects of both craft and mass production, ranging from teamwork on the shop floor, emphasis on low inventory, and flexible production equipment, to close relationships with suppliers. We are all quite familiar with the changes the U.S. auto industry experienced after implementing lean manufacturing techniques in its plants and management approach. But to what extent is that experience characteristic of manufacturing in general?

Two large-scale studies help shed some light on this issue. Both Statistics Canada (in 1988) and the U.S. Census Bureau (1988 and 1993) administered surveys of manufacturing technologies in order to measure the extent and type of advanced manufacturing technologies used in their respective country's manufacturing plants. Both surveys showed the following: the application of advanced manufacturing technologies was found to be widespread across plants and industries, typically with multiple technologies applied per establishment. Larger plants were found to adopt the technologies surveyed more rapidly than smaller plants; and the age of the plant did not affect the implementation of these technologies (see table 3). These results indicate that advanced manufacturing techniques are reshaping manufacturing on a broad scale.

*Lean manufacturing combines aspects of both craft and mass production, ranging from teamwork on the shop floor, emphasis on low inventory, and flexible production equipment, to close relationships with suppliers.*

**Table 3** Application of Flexible Manufacturing Cells (FMCs) by Employment Size and Age of Plant

Plant Employment	% of Plants Using FMCs	Age of Plant	% of Plants Using FMCs
20-99	7.6	< 5 yrs.	13.4
100-499	21.4	5-15	13.3
500+	40.4	16-30	13.4
		> 30	15.2

*Percentages do not add up to 100% as "% of plants using FMCs" is only one of the categories per plant size and plant age, respectively.*

Source: U.S. Department of Commerce, Bureau of the Census, "Current Industrial Reports," *Manufacturing Technology: Prevalence and Plans for Use*, 1993, tables 4D and 4E.

*It was found that plants that used advanced manufacturing technology experienced increases in market share relative to non-users (this effect was especially prominent for those plants adopting several combinations of technologies) in relative labor productivity and in relative wage rate.*

*The recent location trends in the U.S. auto industry represent a fundamental reversal of Henry Ford's legacy: Assembly plants have returned to the Midwest, whereas parts plants are less likely to be located there.*

Klier suggested that surveys alone may not capture the entire process of technical diffusion. By relying on purely quantitative measures in assessing the effect of lean manufacturing technologies, we may miss crucial linkages of this production system. For example, a recent study administered by the National Association of Manufacturers suggests that computer aided design is a precursor technology to computer numerically controlled machines and computer aided manufacturing.

In addition, it may be helpful to understand the returns from new technology in the context of the management and goals of an entire plant. The issues are complex. Management must first decide what the goal of implementing lean manufacturing should be: improved product, production, or process flexibility. Second, management must decide how to set rewards and incentives that are related to achieving that objective. For example, a practice of continuing to reward workers for maximum capacity utilization and output per hour may work well in a plant that is trying to achieve economies of scale, but in the context of striving for improved flexibility, appropriate management incentives might be reduced changeover and/or lead times, and increased process range.

Baldwin added first-hand information on the issue of technology adoption. By linking the results of the survey on manufacturing technology to longitudinal census data, he and his colleagues were able to track the technology adoption of specific establishments over time. It was found that plants that used advanced manufacturing technology experienced increases in market share relative to non-users (this effect was especially prominent for those plants adopting several combinations of technologies) in relative labor productivity and in relative wage rate. In that sense the survey suggests a Schumpeter story: Establishments that innovate do better in the marketplace.

Baldwin emphasized the need to improve technology adoption in small plants. He suggested, as a first step, assessing the regional effects of technology adoption by looking at plant size distribution across regions. In combination with the differences in technology adoption for small versus large plants, this information could foretell regional fortunes.

Baldwin reiterated the relevance of organizational and management issues in the context of technology implementation and adoption. According to a survey of plant managers by Statistics Canada, difficulties related to organizational change ranked highest among impediments to technical acquisition, even above issues such as skill shortages and labor training needs.

During the ensuing discussion, a competing interpretation of the "Schumpeter story" found in the Statistics Canada data was suggested: It is the successful firms that can afford to innovate. In rebuttal, Baldwin related that the evidence from the longitudinal data does not seem to favor such an interpretation. The data strongly suggest that firm success after technology implementation is observed regardless of the initial position of the firm.

### **Emerging Geography of the Auto Industry**

In examining the changing focus and location of the U.S. auto industry, Rubenstein considered changes in technology, industry organization, and transportation costs. He pointed out that the recent location trends in the U.S. auto industry represent a fundamental reversal of Henry Ford's legacy: Assembly plants have returned to the Midwest, whereas parts plants are less likely to be located there.

The costs of distributing the final product to the customer have always been important in deciding the location of auto assembly plants. Henry Ford opened far-flung branch assembly plants to produce identical Model T cars close to the population centers outside the Midwest, thus reversing the trend of locating assembly plants in the heart of the country. According to his rationale, it was cheaper to ship parts to branch assembly plants than to ship finished automobiles all across the country from a centrally located assembly plant.

*The automotive parts industry has also restructured: Many parts once made in-house are now being made by independent suppliers; the number of companies that supply parts directly to car producers—known as tier one suppliers—has been cut in half; and car producers are reducing inventory in their final assembly plants by demanding just-in-time delivery of large modules from tier one suppliers.*

Soon, both General Motors and Chrysler emulated that strategy. For example, GM produced Chevrolets in ten different assembly plants during the 1950s. However, by the 1960s the proliferation of car and truck models began to change the conditions that made that location strategy an optimal one. The number of different car and truck models sold in the U.S. increased five-fold, from 30 in 1955 to 142 in 1989, while sales only doubled from about 8 million units to about 16 million in 1989. With reduced output per individual model, the entire output would best be produced at one plant only and, consequently, the geographic argument for an interior location became compelling; that way the company can minimize the cost of distributing the output to a national market. As a result, during the past 16 years auto producers have opened assembly plants in the interior, especially along the I-65/I-75 corridor, and closed coastal plants (see table 4).

**Table 4** Distribution of Auto Assembly Plants over Time, by Region

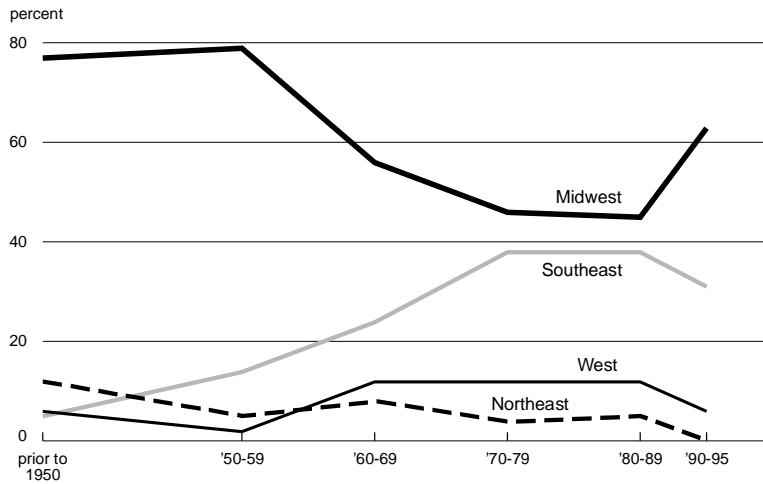
Region	Status of Plant			
	Open in 1979	Closed 1979–96	Open 1979–96	Open in '96
Midwest	27	9	13	31
Southeast	6	1	8	13
West	15	6	1	10
Northeast	9	5	0	4
<b>Total</b>	<b>57</b>	<b>21</b>	<b>22</b>	<b>58</b>
I-65/I-75 corridor	27	8	20	39
Other	30	13	2	19

Source: Adapted from James Rubenstein, "The Evolving Geography of Production: Is Manufacturing Activity Moving Out of the Midwest? Evidence from the Auto Industry," paper prepared for the workshop *Structure and Performance*, 1996.

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Rubenstein provided information on the locational characteristics of 881 plants that manufacture components for new vehicles. The data represent plants of the 150 largest auto supplier companies in North America, as identified by *Automotive News*, the industry's principal trade paper. Rubenstein found that 65% of these component plants are located in the Midwest, with Michigan being home to the largest number of plants (234). For the 647 plants whose opening dates could be identified, Rubenstein traced out the geographic distribution over time (see figure 7). He found that the trend to locate in the Southeast has been underway since the 1960s. The recent increase in locations in the Midwest represents too few observations to draw strong conclusions.

**Figure 7** Auto Supplier Plants by Region and Start-Up Date



Source: Adapted from James Rubenstein, "The Evolving Geography of Production: Is Manufacturing Activity Moving Out of the Midwest? Evidence from the Auto Industry," paper prepared for the workshop *Structure and Performance*, 1996.

Rubenstein also detected some effects of plant ownership and product type on the location choice of his sample plants. The drift to the Southeast has been sustained in recent years less by the relocation of U.S.-owned suppliers than by the arrival of a large number of foreign companies (see table 5). Within the Midwest, new facilities are less likely to locate in the Detroit area and more likely to be in southwestern Michigan, northeastern Indiana, and western Ohio. Regional distribution of plants varied widely according to type of product or system. High-value-added components requiring highly skilled workers, such as engines and brakes, are most likely to remain in the Midwest. In contrast, the Southeast has a higher percentage of factories making bulky, low-value-added components, such as tires, although in some cases Southeast or coastal location was extended to components based on "stand-alone" new technology, such as air bags and air conditioners.

**Table 5** Auto Supplier Plants by Region and Ownership

Region	Ownership status			
	Big 3 subsidiary	Independent U.S.-owned	Foreign-owned	All
Midwest	80%	54%	41%	56%
Southeast	9	27	40	27
West	4	12	9	10
Northeast	7	7	9	7
Number of plants in sample	129	603	149	881

Source: Adapted from James Rubenstein, "The Evolving Geography of Production: Is Manufacturing Activity Moving Out of the Midwest? Evidence from the Auto Industry," paper prepared for the workshop *Structure and Performance*, 1996.

*One can say that the Midwest (and its southern extension) has a location advantage when the final product is bulky, generally one plant produces that product, there is a national market, and inputs are easily shipped.*

*The Midwest economy is uniquely positioned to adapt its manufacturing sector to high-performance manufacturing and to other leading edge technologies as the best U.S., European, and Japanese manufacturers all have a presence in this region.*

Daniel Knudsen, professor of geography at Indiana University, suggested viewing the locational shifts in the larger context of the socioeconomic environment. Specifically, he argued that three different types of a new production system are currently emerging: the “neo-Fordist” system, typified by the U.S. auto industry; lean production, which is associated with the Toyota corporation in Japan, and the system of flexible specialization, mostly found in Europe. Knudsen’s main point was that lean manufacturing does not provide us with a blueprint for manufacturing in general; rather these different concepts are applicable at certain plant sizes in specific regions and cultures.

Donald Smith, director of the Center for Economic Development at Carnegie Mellon University, asked how the location strategies for U.S. parts plants compare to the tight supplier complexes one finds in Japan, as well as for Japanese transplants in the U.S. Rubenstein stated that the current restructuring tends to favor the large tier one suppliers. Large companies, in turn, can decide to locate their production operations relatively independently because they are more like equals to the large auto assembler companies.

With regard to assembly plant location, Rubenstein explained that because of the importance of transportation costs, auto assemblers now think of the auto region as the area between Chicago and Michigan, reaching south all the way to Tennessee, an area that does not necessarily coincide with any of the traditional boundaries of U.S regional economic analysis. However, the recognition of this “auto region” does not preclude competition between states in that region to attract a new assembly plant. More generally, one can say that the Midwest (and its southern extension) has a location advantage when the final product is bulky, generally one plant produces that product, there is a national market, and inputs are easily shipped. Peter Eisinger, director of the La Follette Institute of Public Affairs at the University of Wisconsin, wondered why Daimler Benz had recently decided to locate in Alabama rather than in the auto region defined above. Rubenstein replied that the generous package of location incentives provided by the state of Alabama probably more than compensated for the higher transportation costs to serve the U.S. market from the Alabama plant.

### **How Can the Region Stay Competitive in the New Environment?**

The workshop concluded with the presentation of four different views on public policy options to address issues related to the changes in manufacturing. Smith referred to work that he and Richard Florida had done in conjunction with the Council of Great Lakes Governors on high-performance manufacturing, a system of production organization that maximizes information flows both within companies and in their dealings with suppliers. This approach to manufacturing was brought to the Midwest by Japanese auto transplants. Today the Midwest economy is uniquely positioned to adapt its manufacturing sector to high-performance manufacturing and to other leading edge technologies as the best U.S., European, and Japanese manufacturers all have a presence in this region.

Smith emphasized the following policy recommendations: (a) It is important to reduce the size of barriers to trade, transport, and migration across the region; (b) technology networks and alliances are important vehicles for implementing new manufacturing techniques; (c) the Midwest needs to address its lack of entrepreneurship relative to other regions; and (d) the aging labor force in midwestern plants could signal looming labor and skill shortages.

Robert Sheets, director of research and development of business and industry services at Northern Illinois University, presented his views on major challenges and policy options in work force development. He made four main points with respect to state and local investment in work force training. First, in light of changing work-place requirements, it is necessary to expand and improve the basic skills of front-line workers. Second, he suggested that training and skill-upgrading should move from a school-based system to one

*Training and skill-upgrading should move from a school-based system to one that is workplace-based, which would require expanded performance support systems within companies, as well as industry-based consortia for small and medium-sized companies.*

*Among the advantages of the Midwest as a manufacturing location are: skilled and trainable work force, low energy and land costs, existing agglomeration of manufacturing, and easy access to domestic markets.*

*Economic theory suggests that the firm has very little incentive to provide training in general skills to its workers; rather it will provide training in firm-specific skills.*

that is workplace-based, which would require expanded performance support systems within companies, as well as industry-based consortia for small and medium-sized companies. Third, the shift in demand for education associated with the growth of adult upgrading and retraining markets and alternative models for developing the work force, such as industry supplier networks, calls for improvements in the competitiveness of the education and training industry. Fourth, Sheets mentioned the need to improve the access of low-income workers to workplace- and technology-based training, for example, through non-profit community-based organizations.

Kerry Suttan, regional economist at the Northeast-Midwest Institute, presented a summary of the Institute's recent work on federal policies to foster the manufacturing sector. Among the advantages of the Midwest as a manufacturing location are: skilled and trainable work force, low energy and land costs, existing agglomeration of manufacturing, and easy access to domestic markets. Among the disadvantages, Suttan listed: old industrial infrastructure, reliance on capital intensive industries, aging work force, high regulatory compliance, and poor air transport access. His policy suggestions included the provision of an extension network for retooling, school-to-work initiatives, financial incentives for capital intensive industries, information technologies, and an increase in air transportation.

Oakland reacted to the policy suggestions put forward by the three other panel members. In the past, remedies to the aforementioned problems have repeatedly proven difficult for governments to address. Accordingly, Oakland was critical of the lack of specific proposals. For example, on the issue of education at the firm level, economic theory suggests that the firm has very little incentive to provide training in general skills to its workers; rather it will provide training in firm-specific skills. Meanwhile, government subsidies to firms to provide general training or government-run programs have often been ineffectual. Oakland also suggested that some of the school-to-work problems stem from too strong of an emphasis on higher education. The problem might be substantially corrected by universities being more selective, and at the same time having vocational alternatives available to young people. Similarly, if possible, vocational education should be structured so as to add prestige and value for those who pursue it.

Finally, commenting on the need for economic development in general terms, Oakland argued that in order to justify the use of public monies to subsidize economic development, the existence of externalities or market failure must first be shown. It then needs to be demonstrated how a particular public policy program would alleviate the externality problem in a cost-effective way. Oakland suggested focusing on the big picture—by improving investment incentives, modernizing the education system, and taking a revisionist look at existing regulation.

During the discussion, Sheets related that he has found that companies do perform a large amount of general skills training, for example, improving upon third-grade reading levels by means of on-the-job training. With the changes in production systems now underway, companies must also deal with changing skill requirements. Eberts referred to complaints by employers about the lack of skilled workers, as well as community colleges not providing enough skilled labor (the fourth workshop of the Midwest assessment, to be held May 15, will specifically deal with work force issues).

Michael Moskow, president of the Federal Reserve Bank of Chicago, raised the issue of income distribution. What do we know about the impact of the new manufacturing technologies on income and earnings distribution? How do the cyclical movements of the economy affect income distribution? Smith cited Pittsburgh, where the percentage of employment in manufacturing has fallen from over 30% in the 1970s to a current level of below 10%, which significantly widened income disparities. Eberts commented that areas with higher-than-average income disparities are not faring as well during the current expansion.

Jean Allard, president of the Metropolitan Planning Council, argued that it is very important to ask if urban areas are becoming less economically viable because they are more severely affected by the loss of high-income jobs (see the summary of the first workshop, which focused on the issues affecting metropolitan areas in the Midwest).

### Summing Up

This workshop addressed the issues currently challenging the continued vitality of the Midwest economy. The opening presentation, which discussed the Midwest's extraordinary performance versus the nation during the last few years, set the stage for a deeper analysis of the region's economic structure. How much of this recent success is due to factors external to the region, how much to business and policy decisions, and what are the challenges the region needs to prepare for in order to stay competitive and economically viable?

A long-term analysis of the development of regions in the U.S. economy stressed changing comparative advantages as the driving factor in regional specialization trends. Data analysis suggests that the region's loss of manufacturing has bottomed out. Some evidence of restructuring in manufacturing relates to the development of interregional linkages among the region's plants and firms. While currently we know little about the structure of these linkages, research indicates that the fortunes of the Midwest depend primarily on the fortunes of the North American economy and indirectly on developments in Europe and Asia.

Regional income differences (especially those related to wages) have largely converged over the course of this century. After the negative shocks to the Midwest region (and its income) during 1979–1982, regional income has stabilized as manufacturing has rebounded. Changing regional differences in amenity values seem to be a (largely unobserved) reason for the lack of full convergence in nominal wages. Productivity differences accompanied by cost-of-living adjustments may also explain why remaining regional income disparities may be more apparent than real. Furthermore, regional income differences appear to be jolted away from approximate convergence in response to shocks in energy prices and short-term hikes in returns to certain occupational categories and skills. Indeed, the issue of widened income gaps among the haves and have-nots has supplanted geographic income disparities during the 1990s.

In the Midwest, the performance of manufacturing continues to be central to the issue of income growth. There is ample evidence for the widespread application and implementation of so-called advanced manufacturing technologies. However, to fully comprehend the nature of this adjustment process, the region needs to integrate critical elements of management-labor relations and strategic planning. A geographic analysis of the auto industry, the largest industry in the region, exemplified how multifaceted and complex the adjustments to new technologies can be. While assembly plants are returning to the heart of the country, parts plants are opening in both the Midwest and Southeast, their location being influenced by factors such as plant ownership and type of output produced.

It is apparent that little is known on how the adjustment to new manufacturing technologies plays out on the regional level. It seems a regional breakdown of available data and comparisons with similar regions in Europe and Japan are necessary to improve our understanding. The adjustment processes and ensuing structural changes observed in manufacturing raised several policy-related issues: the need for retraining and upgrading of skills and the means by which that training could best be delivered; as well as the appropriate scope for state and local economic development policies.

*Regional income differences (especially those related to wages) have largely converged over the course of this century.*

*In the Midwest, the performance of manufacturing continues to be central to the issue of income growth.*

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## About the Workshop

Correspondence related to the February 13 workshop should be directed to conference convenor Thomas H. Klier, senior economist in the Research Department at the Federal Reserve Bank of Chicago. Participants in the workshop included the following:

**Linda Aguilar**  
Federal Reserve Bank  
of Chicago

**Jean Allard**  
Metropolitan Planning  
Council

**David Allardice\***  
Federal Reserve Bank  
of Chicago

**John Baldwin\***  
Statistics Canada

**George Beattie**  
Chicago Manufacturing  
Center

**Gary Benjamin**  
Federal Reserve Bank  
of Chicago

**William Bergman**  
Federal Reserve Bank  
of Chicago

**Richard Bingham**  
Cleveland State University

**Charles Bonser**  
Indiana University  
at Bloomington

**Natalie Davila**  
Chicago Manufacturing  
Center

**Randall Eberts\***  
Upjohn Institute

**Peter Eisinger**  
University of Wisconsin-  
Madison

**Ed Field**  
The Economist

**Fred Giertz\***  
University of Illinois at  
Urbana-Champaign

**Donald Hanson**  
Argonne National  
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**Thomas Klier\***  
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**Daniel Knudsen\***  
Indiana University

**George Kuper**  
Council of Great Lakes  
Industries

**Charles Leven\***  
Washington University

**Richard Mattoon**  
Federal Reserve Bank  
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**David Merriman**  
Loyola University

**Michael Moskow\***  
Federal Reserve Bank  
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**William Oakland\***  
Tulane University

**Howard Roth**  
Bank of America

**James Rubenstein\***  
Miami University

**Robert Sheets\***  
Northern Illinois University

**Mike Singer**  
Federal Reserve Bank  
of Chicago

**Donald Smith\***  
Carnegie Mellon University

**William Strauss**  
Federal Reserve Bank  
of Chicago

**Daniel Sullivan**  
Federal Reserve Bank  
of Chicago

**Kerry Suttent\***  
Northeast-Midwest Institute

**William Testa**  
Federal Reserve Bank  
of Chicago

**Stephen Thorp**  
Great Lakes Commission

**David Wolfe**  
University of Toronto

*\*Presenter, discussant,  
or moderator*

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## Workshop Agenda

The workshop “The Midwest Economy: Structure and Performance” was held on February 13, 1996 at the Federal Reserve Bank of Chicago, 230 S. LaSalle St., Chicago, IL 60604.

I. 9:15 a.m.

Welcome and Opening Remarks

**Presenter:** *Michael Moskow*, Federal Reserve Bank of Chicago

II. 9:30 a.m.

### State of the Region

Overview of the Region’s Economic Performance

**Presenters:** *David Allardice/William Bergman*, Federal Reserve Bank of Chicago

III. 10:00 a.m. - 12:00 p.m.

### Session 1: Where Do We Go from Here?

Changing Structure of U.S. Regions:  
A Historical Perspective

**Presenter:** *Sukkoo Kim*, Washington University

Regional Income Trends and Convergence

**Presenter:** *Fred Giertz*, University of Illinois at Urbana-Champaign

#### Respondents:

*Charles Leven*, Washington University  
*Randall Eberts*, Upjohn Institute

IV. 12:00 - 1:30 p.m. Lunch

The Transformation of the Midwest Economy

**Speaker:** *Geoffrey Hewings*, REAL

V. 1:30 - 3:30 p.m.

### Session 2: Structural Change? Arrival of Lean Production

Structural Change and Technology in the Manufacturing Sector

**Presenter:** *Thomas Klier*, Federal Reserve Bank of Chicago

The Evolving Geography of Production:  
Is Manufacturing Activity Moving Out of the Midwest? Evidence from the Auto Industry

**Presenter:** *James Rubenstein*, Miami University

#### Respondents:

*John Baldwin*, Statistics Canada  
*Daniel Knudsen*, Indiana University

VI. 3:30 p.m. Coffee Break

VII. 3:45 - 5:00 p.m.

### Panel on Public Policy Options

How Can the Region Stay Competitive in the New Environment?

#### Panelists:

*Donald Smith*, Carnegie Mellon University  
*Robert Sheets*, Northern Illinois University  
*Kerry Suttan*, Northeast-Midwest Institute  
*William Oakland*, Tulane University

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## About the Project

The Federal Reserve Bank of Chicago is undertaking an extensive analysis of the Midwest economy. The goal of the project is to understand the Midwest's turnaround in economic performance since the early 1980s. In the Seventh Federal Reserve District—which includes Iowa and large portions of Illinois, Indiana, Michigan, and Wisconsin—unemployment rates are, at the time of this writing, lower than at any time since the 1977–78 period, as well as being below the national average.

The Midwest project will involve a series of workshops and research studies which will be carried out by Federal Reserve analysts and other researchers from the region. An advisory board representing a cross-section of Midwest leaders will provide guidance for the project (see back page). Workshops scheduled for 1996 will consider (1) the economic performance of the broad Midwest economy and the transformation of its manufacturing industries; (2) the rural economy of the Midwest; (3) labor force training and education; (4) global linkages with the region's economy; and (5) tax, spending, and regulatory influences on regional performance. The findings of the workshops will be communicated through a series of publications and broad public forums. The project will conclude with a conference and publication toward the end of 1996.

At the Bank, the “Assessing the Midwest Economy” project is being conducted through a cooperative effort of the Office of the President, Michael H. Moskow, president; Research Department, William C. Hunter, senior vice president and director of research; and Community and Information Services, Nancy M. Goodman, senior vice president.

Inquiries should be directed to William A. Testa, senior economist and assistant vice president, Research Department, or James Holland, public affairs officer.

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