

Chicago Fed Letter

Challenges and prospects for Midwest manufacturing: Report on the 2003–04 Chicago Fed Manufacturing Project

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The Chicago Fed convened a series of conferences in 2003–04 to address the following three questions: What are the long-term underlying trends in manufacturing and have they fundamentally changed in recent years? Second, is the poor performance of recent years a transitory phenomenon? And, third, what are the challenges and prospects for Midwest manufacturing going forward?

View the conference agendas and presentations at www.chicagofed.org/news_and_conferences/conferences_and_events/midwest_manufacturing_project.cfm.

As both the Midwest and U.S. economies continued to struggle during 2003, especially in manufacturing, pointed questions were raised about the continued viability of the U.S. manufacturing sector. U.S. manufacturing employment had peaked long ago, in 1998; manufacturing output had peaked in late 2000 or early 2001. The contrast in performance between the early 2000s and the mid-1990s is striking. At that time, U.S. manufacturing's performance was seen as undergoing gradual change and transition rather than any profound structural decline. And in the Midwest, manufacturing performance had been celebrated for its remarkable turnaround from the early 1980s. In fact, the comeback in Midwest manufacturing appeared to have brought the region's economy to the verge of work force shortage and re-found prosperity. This landscape has changed significantly since then.

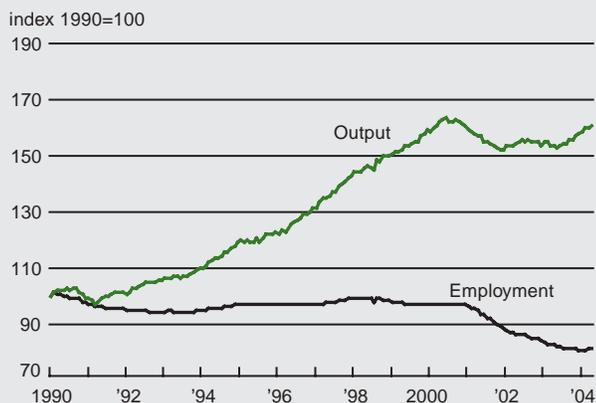
In September 2003, the Federal Reserve Bank of Chicago convened the first in a series of conferences to ask the following three difficult questions about performance of the manufacturing sector nationally and, especially, in the Midwest.¹ First, what are the long-term underlying trends in manufacturing

and have they fundamentally changed in recent years? Second, is the poor performance of recent years a transitory phenomenon—that is, is it the result of a confluence of conditions and events that will eventually dissipate, allowing manufacturing to return to its long-run trend? And, third, what are the challenges and prospects for Midwest manufacturing going forward?

In this report, we summarize the information gathered at these conferences and offer several conclusions—albeit tentative ones. The goals of the project were declared at the outset to be exploratory and informative rather than definitive. It will be several years before we can say with any certainty whether U.S. (and Midwest) manufacturing has fundamentally shifted in direction and structure. This uncertainty is due in some degree to the effects of global recession, the September 11 attacks, the war in Iraq, and other events. Nonetheless, even tentative conclusions may be helpful in shaping the policy alternatives available for manufacturing.

Note that this report represents our interpretation of the issues raised and the information provided, rather than any consensus reached by the conference participants.

1. Manufacturing output and employment



SOURCES: U.S. Department of Commerce, Bureau of Economic Analysis, and U.S. Department of Labor, Bureau of Labor Statistics.

With these caveats in mind, we offer the following summary of the challenges and prospects for manufacturing in the Midwest. The Midwest economy remains highly concentrated in manufacturing relative to the remainder of the U.S. economy. In an earlier “Midwest Assessment” study, we found that manufacturers had set the region’s employment and income on an improved growth path during the late 1980s and early 1990s. Manufacturing performance and the household incomes of midwesterners continue to be closely tied together.

Because the Midwest economy remains concentrated in manufacturing, it has been profoundly affected by the recent softness in U.S. and global manufacturing performance. However, the Midwest is *not* getting left behind as it did during the structural changes of the early 1980s, when much of the nation’s manufacturing embraced high-tech and defense. Now, the Midwest’s manufacturing performance looks much like that of the nation; this bodes well for the region as the nation and the world begin to experience renewed general economic vigor and manufacturing recovery.

For the nation, the recent manufacturing experience does not necessarily reflect a structural decline in manufacturing. Transitory factors, such as slow world economic growth and domestic overstocks in capital goods and production capacity from the 1990s, have weighed heavily on U.S. manufacturing during

the early years of this century. This, too, suggests that the course of Midwest manufacturing will be one of recovery.

Nonetheless, the Midwest region continues to be challenged by the long-term transformation of its out-sized industrial base toward a service- and information-oriented economy. Both the U.S. and Midwest continue to produce more

manufactured goods and more sophisticated products, but they do so with a flat or shrinking manufacturing work force. Although this phenomenon builds a higher standard of living, it places two pressure points on the Midwest relative to growth and prosperity. In particular, the remaining manufacturing firms and industries must remain as healthy and vibrant as possible. At the same time, owing to labor-saving productivity gains in existing manufacturing and a higher job concentration in manufacturing, the Midwest economy must grow into successful service sectors at a more rapid pace than the nation. Otherwise, at a minimum, the region’s growth will tend to lag, with ongoing pressures on wages and business profits.

Is the Midwest prepared to meet the challenges ahead?

Structures, partnerships, and formal institutions for crafting and implementing regional policy responses are lacking. Existing policy proposals tend to fall into five broad categories:

- Federal strategies focused on fair trade issues, health care, and pension reform;
- Cost-reduction strategies focused on state and local tax burden and regulatory reform;
- Value-added strategies geared toward improving manufacturing efficiency through adaptation of technology,

improved education, and better infrastructure;

- Work force strategies aimed at improving the skills of the existing work force; and
- Institutional strategies aimed at increasing the understanding of manufacturing issues among policymakers.

Manufacturing performance

Until 2000, U.S. manufacturing performance had been robust or at least benign since the 1970s—on average, of course. Similarly for the Midwest, until the year 2000, manufacturing had not led the region into recession since the early 1980s. Although there was much upheaval and variation across individual industries and market segments during the 1990s, overall U.S. real output in manufacturing rose rapidly through most of the decade (figure 1). From the beginning of 1990 to the peak during mid-2000, real output climbed 63%, or an annual average of 3.5%, despite a sluggish beginning to the decade with the recession of 1990–91. And unlike many previous U.S. recessions, the 1990–91 episode was not magnified in manufacturing sectors. Rather, to a greater extent than before, imbalances associated with real estate lending and construction, the savings and loan crisis, the defense build-down, and uncertainty over the Gulf War characterized that recessionary period. So, manufacturing fared relatively well during the 1990–91 recession. Peak to trough, manufacturing output declined only 5%, and the level of production had regained its former peak just two years later. Manufacturing employment, too, fell by only 5%, though it remained mostly flat throughout the decade and did not approach its former peak again until early 1998.

The strength and length of the 1990s manufacturing expansion contrast starkly with the 2000–03 period. For the nation, manufacturing output began its descent half a year before the recession of 2001, dropping 7% by the end of 2001. By mid-2004, real manufacturing output remained slightly below its

2. Change in payroll employment (2000:Q4–04:Q2)

	Percent change		Change in jobs ('000s)	
	Manufacturing	Total	Manufacturing	Total
Illinois	-17.5	-4.0	-150.7	-241.9
Indiana	-12.8	-2.3	-83.8	-70.0
Michigan	-20.3	-6.2	-180.8	-288.7
Ohio	-18.0	-4.2	-182.1	-237.1
Wisconsin	-13.3	-0.6	-78.3	-15.8
East North Central	-16.9	-3.9	-675.7	-3.9
Iowa	-12.2	-2.2	-30.7	-33.0
Seventh District	-16.2	-3.6	-524.2	-649.4
U.S.	-16.4	-0.9	-2,811.7	-1,172.7

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics.

peak of four years before. Employment trends were much worse. Payroll employment in manufacturing fell by 8% in 2001 and had lost another 8% by the end of 2003. By this time, on net, payroll employment had fallen three million below its previous peak.

In the Midwest, manufacturing has also fared badly, and the resulting impact on the Midwest economy has been acute. That is because the Midwest economy has sustained its historic concentration in manufacturing, so that the proportionate downturn in the sector (versus services) became a disproportionate downturn for the region's economy. Led by manufacturing, total payroll job losses across all sectors in the Midwest fell by 3.6% over the period, compared with 0.9% for the U.S. overall (figure 2).

The Midwest states—Illinois, Indiana, Michigan, Ohio, and Wisconsin—are among the most heavily concentrated in manufacturing (figure 3). Though manufacturing activity has been shifting west and especially southward, Indiana, Wisconsin, and Michigan still rank among the top five nationally in manufacturing output concentration. A ranking of the nation's top ten would also include neighboring Iowa. Iowa's relative economic concentration in manufacturing has been growing significantly since the 1970s, while Indiana, Ohio, Michigan, and Wisconsin have maintained their status (figure 4). Illinois's concentration in manufacturing has been declining, as the Chicago area has shed production activity in favor of business, transportation, and distribution services, though many of these services

are ultimately sold or otherwise linked to manufacturing firms in surrounding states.

As measured by the share of personal income derived from the sector, durable goods

manufacturing is over three-quarters more concentrated in the region than the nation (figure 4), especially in basic industrial equipment and the automotive industry. The auto industry by itself is almost eight times more concentrated in the Midwest than in the remainder of the U.S. On the other end of the spectrum, computer and electronic components are not well represented. In terms of nondurable manufacturing, the Midwest is 25% more concentrated than the nation—heavily represented in food processing, furniture, chemicals, and paper; while textiles and apparel factor much less into the region's industrial composition.

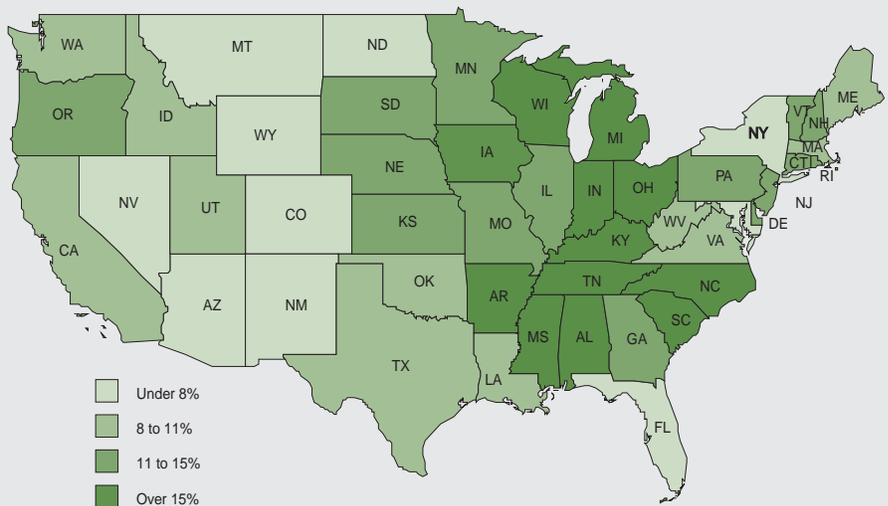
Against the backdrop of the good times that the region enjoyed over the 1990s

and the difficult early years of the current decade, we ask the following questions: What are the region's manufacturing prospects; and have manufacturing trends shifted permanently?

Why is manufacturing shrinking?

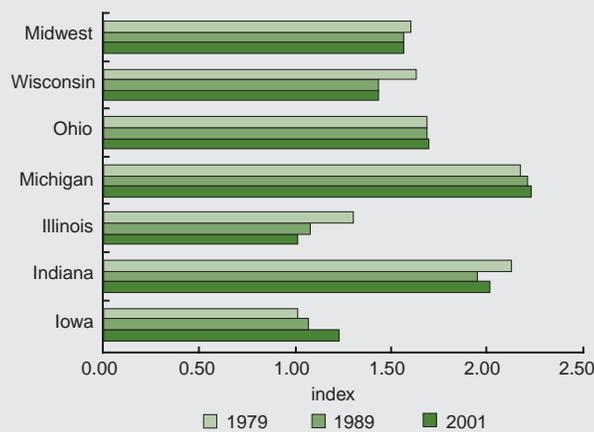
The issue of whether a structural break in the direction of overall manufacturing has taken place early in this new millennium is difficult to settle because of several overlapping and coincident changes taking place in the economy. Among the most important of these changes, manufacturing companies have been outpacing services in productivity gains, thereby contributing to a shrinking share of activity represented by manufacturing—especially manufacturing jobs—in the overall U.S. economy. A secondary effect of the rising productivity in manufacturing has been to dampen the overall economic activity and income growth in the regions that have heavy concentrations of manufacturing. Though real manufacturing output is rising, softer prices and enhanced productivity are limiting paychecks and other income accruing in manufacturing regions. A further complication concerns the organizational structure and internal processes of U.S. manufacturing companies. Many of these companies have continued to

3. Manufacturing as a percentage of total employment



SOURCE: U.S. Department of Labor, Bureau of Labor Statistics.

4. Manufacturing concentration vs. U.S.



SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis.

evolve organizationally and operationally in ways that make it increasingly difficult to distinguish manufacturing from service sector production. Finally, of course, U.S. manufacturing is recovering from the effects of a worldwide economic slowdown that lowered demand for manufacturing products.

Among these crosscurrents, strong productivity gains within manufacturing companies have surely been the most dominant and durable in the U.S. Since 1950, nonfarm output per hour of work has been rising by about 2% per year, while manufacturing output alone has been rising even faster—at a rate of 2.8%.² Using statistical methods that take into account improvements in product quality and changing product features, the output of manufacturing companies is reported to continue to run far ahead of prices. That is to say, prices per standardized unit of output have generally been falling across most manufactured goods. Because household consumption and sales do *not* respond sharply to falling prices and rising incomes, we expect to observe a falling share of manufacturing activity in the U.S. economy. Similarly, the consumption share of U.S. agricultural commodities has generally fallen over most of U.S. history in tandem with strong productivity gains (and falling prices). In overall manufacturing, there has been a rising secular demand for some categories of durable goods—especially autos and

consumer electronics. This demand has acted as a counterweight to the overall shrinkage of manufactured goods in household budgets as prices have fallen, even as the consumption share of other goods such as clothing has fallen.³ As another offset, consumer service industries also purchase manufactured goods, most of which in turn, become embedded in consumer services.

Nonetheless, the share of nominal gross domestic product (GDP) arising from manufacturing production fell from a high of 32% in the early 1940s to approximately 13% in 2003. All the while, due to rising productivity, year to year “real” output growth in manufacturing has met or exceeded that of the remainder of the economy. This apparent paradox arises because we are producing more goods with less effort, freeing much of our work force to concentrate on producing services.

Such gains in productivity and falling prices of manufactured goods translate into rising standards of living for U.S. individuals and households. Since 1940, real household incomes have risen on average 88% in the U.S.; even the oft-maligned real hourly wage in goods-producing industries has risen 23% (on average) since 1964. Of course, averages belie some often-significant differences across income groups, skill levels, and geographic regions. Over the past 25 years, for example, relative wages have been rising more rapidly on average for workers with college degrees than for those without.

And differences across geographic regions have also shifted. Generally, income has risen more rapidly in the formerly agriculture-dependent but recently industrializing southern regions than in the traditional industrial Northeast and Midwest. In addition to its eroding influence on relative incomes,

the secular fall in manufacturing as a share of economic activity has also contributed to lagging population growth in the Northeast and Midwest.

All of these changes confuse the narrower issue of whether the manufacturing downturn beginning in 2000 represented a “structural break with the past,” or is just part of the ongoing, generally beneficial, evolution of the U.S. economy.

Moreover, organizational changes in manufacturing companies have also confused the issue, as manufacturing companies have outsourced or divested service activities that were formerly performed within their organizations. We commonly but mistakenly think of manufacturing as production activity alone. The Department of Commerce—the source of most of our primary measures of aggregate manufacturing activity—defines manufacturing to be the mechanical or chemical transformation into new products, as well as assembly of component parts or products. Such activities are usually carried on in plants, factories or mills using power-driven machines or material handling equipment.⁴ However, manufacturing companies also commonly engage in service activities in the process of ultimately putting their manufactured products out the door. Such service activities include maintenance of machinery, accounting, management, marketing, legal and back office work, logistics, transportation, sales, customer assistance, and research and development (R&D), among others. Over time, the direct payrolls of manufacturing companies have shifted toward employees in service occupations, whether due to greater labor-saving efficiencies and/or to the changing nature of the particular manufacturing products we consume.

We can observe these shifts, albeit imperfectly, from employment data collected by the U.S. Department of Labor, which subdivides payroll workers of manufacturing establishments into “production” versus “nonproduction” classifications.⁵ This classification is not a pure reflection of employment by type of activity but

rather reflects worker characteristics such as “hourly” versus “salaried” and others. Thus, a manager of a production activity might be classified as “nonproduction,” while certain types of clerical or maintenance occupations might be classified as “production.” Still, subdividing employment by this classification generally reflects the tendencies toward more managerial and white-collar skilled occupations and away from production line jobs. In 1950, there were six production workers for every single nonproduction worker employed by manufacturing companies. This ratio had fallen to 2.4 production workers as of 2003.

Even while manufacturing companies are themselves becoming more service oriented, they also continue to outsource service activities such as janitorial, research, and accounting. This leads to overstatement of the actual declines in manufacturing output and employment, because activities and “value added” formerly counted as performed by manufacturing companies are now attributed to firms in the service sector. Comparing the U.S. Census Bureau’s accounting of value added by manufacturers (which includes services purchased by manufacturers) with the estimate constructed by the Bureau of Economic Analysis (BEA) (which does *not* include purchased services), gives us a sense of the importance of this trend.⁶ The data indicate that manufacturing companies purchased \$0.16 on “outside” services for every \$1 of manufacturing product in 1958, but they spend \$0.30 on such purchased services today, amounting to \$453 billion. The estimated share for the Midwest region is slightly more (\$0.33 in every \$1 for 2000 for a total of \$114 billion).

Another part of the outsourcing trend is evident in the growth of the temporary help supply (service) industry. Though still a small share of the labor force (2.7% of total U.S. payroll employment in 2003), the percentage of temporary workers has doubled since 1990. Some estimates put the number of temporary workers in manufacturing at one million by the end of the 1990s; and anecdotal evidence suggests that during 2000–03, before the current manufacturing recovery began

in earnest, manufacturing firms were more inclined to use temporary workers than to fill permanent positions. This “hidden” part of the work force contributes to mismeasurement of the U.S. manufacturing sector.⁷

Structural change

Evidence from the labor market

If we accept that the above trends are part of the long-term evolution of the manufacturing sector, next we ask whether there is anything in the recent recession and recovery that suggests a structural change? The depth and length of the manufacturing downturn took many by surprise and tended to bolster the view that a structural break had taken place—that break being the accelerated erosion of manufacturing activity in the U.S. economy. From the middle of 2000 through the end of 2001, real output in manufacturing dropped by 7%. The sector also was slow to emerge from the downturn, beginning to recover markedly only in mid-2003. U.S. manufacturing output has just now regained its pre-recession level.

Over the course of the decline, the manufacturing sector lost three million jobs. Actually, U.S. manufacturing payroll employment last peaked during the first half of 1998, at 17.6 million and was edging downward before the recession of 2001. Manufacturing employment did not bottom out until the first quarter of 2004 (at 14.3 million). More surprisingly, the sector experienced greater net job losses *after* the recession of 2001 than it did during the recession.

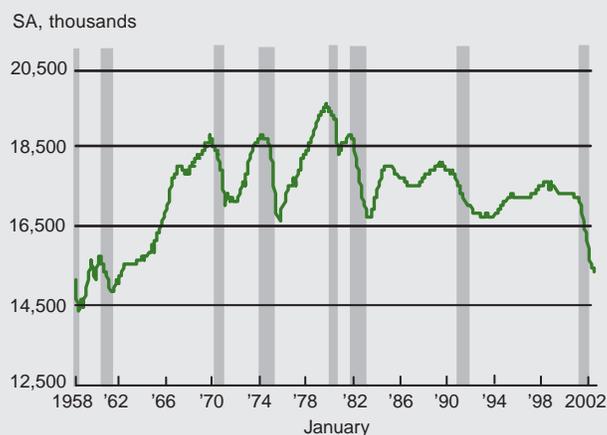
The persistence of the slide added to the perception of structural change. For example, Erica Groshen of the Federal Reserve Bank of New York argues that structural change has contributed to (or has surely accompanied) the economy’s weak

performance in generating net job growth.⁸ She defines “structural job losses” broadly as a situation where workers are required to switch firms, industries, skills, or location to regain employment. As aggregate evidence, Groshen has correlated each individual industry’s employment growth during the official recessionary period of March 2001 to November 2001 with the subsequent recovery period of November 2001 to January 2004. She finds that those industries that suffered steep rates of decline during the recent recession tended to continue these declines during the recovery period. Further, this pattern of correlation contrasts markedly with earlier recession/recovery experiences, when industries that experienced cyclical job losses during the formal recession tended to reverse those losses during the recovery.

Is this evidence of a structural break with the past? A look at the historical performance of U.S. manufacturing suggests that persistent net job losses that outlast the formal period of national recession are not actually that unusual (as shown in figure 5). In fact, if we look at the previous recession of 1990–91, we find that manufacturing employment peaked early in 1989 and did not bottom out until late 1992.

A more comprehensive way of looking at the data is to examine trends in employment *shares* rather than levels.

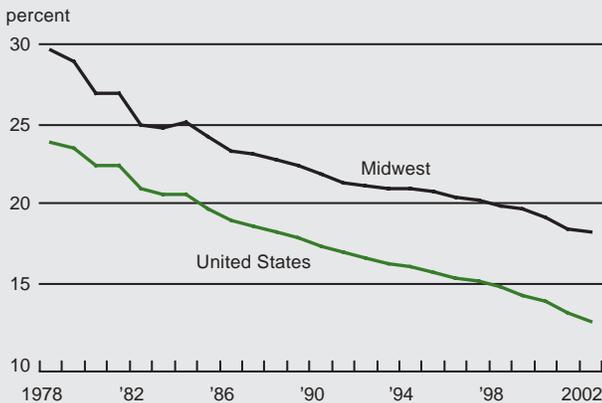
5. All employees: Manufacturing



NOTE: Shaded bars indicate National Bureau of Economic Research designated recessions.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics.

6. Manufacturing share of total employment



SOURCE: U.S. Department of Labor, Bureau of Labor Statistics.

This approach has the advantage of normalizing the data across periods in which overall underlying work force and national output exhibit varying trend growth. This approach reveals that a very longstanding trend in the U.S. is for the manufacturing sector's *share* of total payroll jobs to fall proportionately each year (figure 6). During a general economic downturn, this loss temporarily tends to accelerate; sometimes, though not always, manufacturing regains share during the economic recovery stage of the business cycle, before settling back to its long-term average decline of 2%.

Chicago Fed economist Ellen Rissman has taken the analysis of employment shares several steps further.⁹ Rather than using the officially declared recessions, Rissman (re)bases the observed national business cycle to an employment-based cycle. In examining the behavior of manufacturing's employment share in recent years, she finds little if anything unusual in the sector's behavior relative to the remainder of the labor market.

This analysis of employment data suggests that the secular trends in manufacturing have not changed fundamentally. Still, the industry's deep and extended downturn has imposed significant dislocation costs on large numbers of manufacturing workers. For this reason, further research is being conducted to determine whether and the extent to which manufacturing workers may be

more severely dislocated by recent upheavals. Mark Schweitzer of the Federal Reserve Bank of Cleveland reports that since 1999 the fraction of laid-off manufacturing workers who are employed the following year has significantly declined, while the share of former manufacturing workers who report themselves as unemployed has climbed sharply.

¹⁰ But to conclusively settle the structural change question, researchers will need firmer and more extended sets of data with which to compare work force experiences over time as well as to point the way toward possible work force interventions for dislocated manufacturing workers.

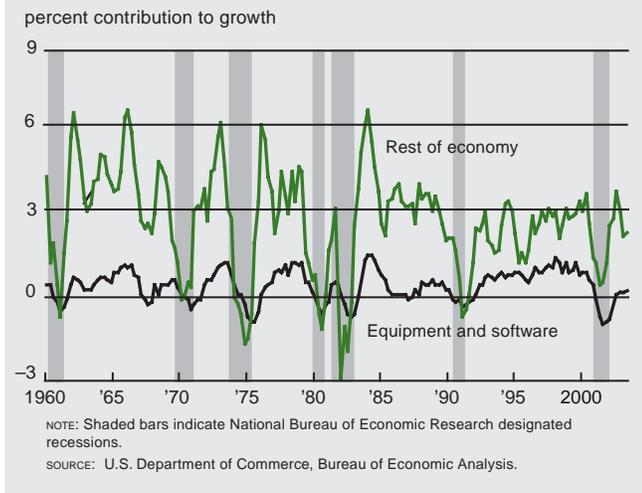
Meanwhile, evidence from the nonmanufacturing labor market shows strong parallels to manufacturing, which argues against the manufacturing-specific structural break interpretation of recent events. Across the economy, payroll job growth has been weak in relation to output growth. Labor market economists have offered many tentative theories to explain this trend. One such theory is that the advent of internet screening and application processes and temporary staffing agencies has made it much easier for firms to add workers only as they are required.¹¹ As a result, firms don't need to hire in anticipation of future staffing needs, as they once did. Alternatively, some analysts suggest that the rising costs of taking on new employees, associated with the rising costs of health care and other benefits, are encouraging firms to further delay their plans to add workers. In addition, some argue that uncertainty about the future direction of the U.S. economy is increasing firms' reluctance to add to payroll, especially so long as excess production capacity and productivity enhancements allow them to boost output without hiring.

Understanding the decline in manufacturing output

If declining manufacturing employment is not unusual in relation to the business cycle, why then has the cycle itself been so painful; why has manufacturing output decline been so deep and extended over the past several years? A major reason is that the 2001 recession and its aftermath were marked by weak or declining investment spending by businesses located in the United States to a greater extent than in most recessions. One contributing factor to weak investment was an over-accumulation in the nation's capital stock in the period leading up to the recession. For most of the 1990s, real investment in equipment and software grew at rates of 10% to 15% annually, a rate unparalleled over the previous four decades. This expansion contributed 1.0 percentage points to 1.5 percentage points to overall economic growth during that period—at times accounting for more than one-half of the nation's overall average GDP growth. The ultimate deceleration of this spending was precipitous, beginning in mid-2000, and contributed significantly to the 2001 recession.

How unusual was this investment run-up and subsequent falloff? If we examine each U.S. recession since 1960 (see shaded bars in figure 7), we find that it was only in the 2001 recession that the investment sector was the sole part of the economy to dip into negative territory.¹² At the same time, the other sectors of the economy continued to contribute positively to economic growth. Strong growth during the late 1990s—often above the long-run sustainable growth rate—added to investment demand as the business sector struggled to add capacity to keep up with surging demand. In addition, perceived extraordinary investment opportunities in high-tech industries gave rise to strong investment demand for producing manufactured goods. Some special circumstances also contributed to an accelerated buildup in some components of capital stock, notably the millennium date change, which motivated an accelerated overhaul and replacement of software (and hardware) systems throughout the world.

7. Investment and economic growth



Following the initial adjustment to over-investment, investment spending remained extraordinarily weak, only beginning to regain forward momentum in 2003. Though the overall economy began to grow at the end of 2001, events such as September 11, corporate governance irregularities, and the imminent conflict in Iraq all acted to dampen investor sentiment and to create a climate of investor uncertainty. As these influences subside, the pace of investment is reviving. Falling relative prices for computing equipment and technological advances have motivated investment in information-processing goods. And revived consumer spending on services is helping to encourage investment by these industries. The manufacturing sector's output has been growing rapidly, which is ultimately expected to contribute to revived investment in basic business equipment and structures as existing manufacturing capacity becomes strained.

For the Midwest, there is a marked dichotomy in the current investment revival; investment in high-tech goods is strong, while investment in basic industrial goods and equipment is weaker. Explanations for this pattern are that capacity utilization of the nation's factory base remains slack; there has not yet been an extended period of overall growth that will ignite renewed investment for factory capacity. At the same time, technological goods and equipment typically depreciate and become

(consistent with tepid net additions to the work force). In any event, this pattern of renewed investment has contributed to a slower pace of economic revival in the industrial Midwest, with its concentration in basic equipment rather than high-tech capital goods.¹³

Effects of globalization

Recent developments in the global economy have led many to argue that structural change is taking place, as U.S. manufacturing production continues to move overseas. Such conclusions are often based on recent observations of the U.S. balance of trade account, which measures exports and imports of goods and services.¹⁴ Coincident with recent weakness in manufacturing employment and output, the U.S. has been running record or near-record deficits in its balance of trade with the rest of the world, meaning that the value of goods and services we import far exceeds that of our exports. In particular, trade deficits with China have surged, and now account for approximately one-quarter of the overall U.S. trade deficit with the world. And while such deficits have expanded, Asian nations—particularly Japan—have intervened in international currency markets in support of the U.S. dollar, presumably as protection for home production and exports during their own unsteady economic recoveries. Such actions have added to the impression that an artificially supported

dollar has spurred imports to and impeded exports from the U.S. In particular, China's policy of a nonconvertible currency and fixed exchange rate has been identified by some as a culprit in sagging U.S. manufacturing activity.¹⁵ At the same time, some observers believe that a weakening of trade barriers in traded goods sectors such as manufacturing has contributed to "job flight" from the U.S. overseas. Much of the expansion of the U.S. deficit with China has developed in the years following China's entry to the World Trade Organization (and its most-favored-nation status) in 2001.

Josh Bivens of the Economic Policy Institute¹⁶ finds that the downward pressure on employment caused by surging manufacturing productivity was mitigated by rising domestic demand over the period 1998 to 2003. His estimates further suggest that this leaves residual changes in international trade accounting for an estimated 59% of the decline in manufacturing jobs since 1998. Yet, even if taken at face value, such shifts and swings in the international accounts do not necessarily indicate a fundamental structural break with the past, because international influences themselves are often transitory. Currency swings and differences in cyclically related economic growth among nations (which in turn drive own-nation imports) often turn out to be temporary. For example, the slowing of U.S. exports abroad coincided with a slowing of world economic growth during the late 1990s following the Asian and Russian currency crises. The pace of global economic expansion decelerated from 4.2% in 1997 to 2.5% in 1998, while recovering to only 3.0% in 1999.¹⁷ In response, U.S. exports abroad flattened out in the latter 1990s, even while surging U.S. economic growth continued to expand U.S. imports.

Such volatile rates of economic growth in different geographical areas usually dominate other factors affecting swings in national exports and imports, such as swings in exchange rates and changes in trade agreements. In the late 1990s, a strong dollar and weakening of foreign currencies such as the yen and euro

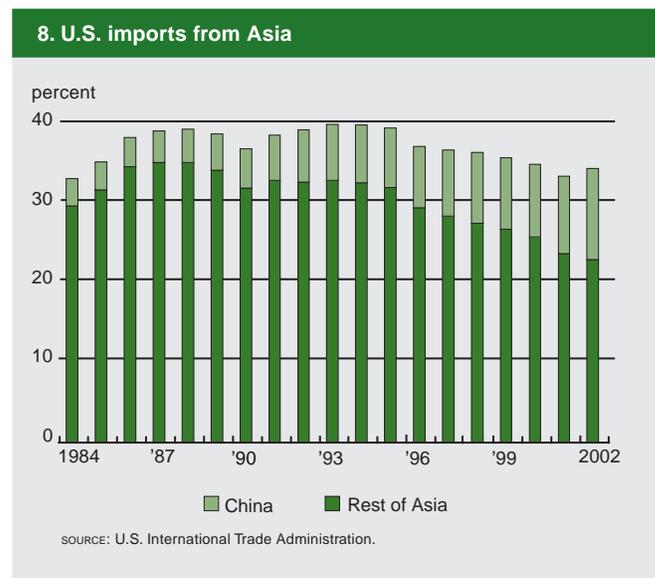
Such volatile rates of economic growth in different geographical areas usually dominate other factors affecting swings in national exports and imports, such as swings in exchange rates and changes in trade agreements. In the late 1990s, a strong dollar and weakening of foreign currencies such as the yen and euro

did serve to accentuate the relative growth forces that widened the U.S. balance of trade. And subsequently, the falling trade-weighted value of the dollar from its peak in 2002 did add some tailwind to U.S. production via its effects on export growth. However, the confluence of various forces makes it uncertain how much of the decline in Midwest and U.S. manufacturing, and the recent recovery, are actually due to changes in the exchange rate of the dollar. The U.S. continued to be the world's engine of growth over the past two years, and this has surely contributed to its rising imports. As the rest of the world economy has begun to revive, so have U.S. exports.

Aside from growth disparities and currency movements, what else might we identify as a global market source of structural change for American manufacturing? The obvious candidates are shifts in the terms of trade (and comparative advantage) that reflect underlying cost and competitiveness conditions of national production. For example, low-wage, low-skill production activities have long been shifting abroad out of high-wage, high-skill nations such as the U.S. However, these forces of change have been ongoing in an evolutionary fashion over many decades rather than anything revolutionary of late and so do not imply a structural break with the past. J. Bradford Jensen of the Institute for International Economics examines the role of international trade in the reallocation of U.S. manufacturing within and across industries from 1977 to 1997.¹⁸ In particular, Jensen focuses on imports into the U.S. from countries characterized by low average wages in their manufacturing sectors. These low-wage countries, which include China, India, Egypt, and many small nations on the African continent, have wage levels of 5% or less of the average U.S. wage. He finds that imports from this cohort grew from 2% of U.S. imports in 1972 to 15% of imports by 2002. Jensen also demonstrates that the survival of U.S. manufacturing plants and output and employment growth are negatively associated with the share of U.S. imports sourced from the world's lowest-wage countries.

Such patterns suggest a steady pattern of shifting comparative advantage in low-skill production jobs around the world. Over the past 50 years, the American consumer has enjoyed increasingly lower prices for many traded goods as their production has shifted abroad. In understanding the evolutionary nature of this process, we note that in turn, nations such as Germany, Japan, Korea, Singapore, and Taiwan have first been the domicile of this type of production and later, as their economies have developed, ceded it to lower-wage, less-developed countries. And in the process, low standards of living eventually give way to rising wages internally. India and China have already begun moving in this direction.

The rapid rise of China over the past 15 years and the yawning 25% bilateral imbalance of trade with the U.S. give the appearance of a more rapid evolutionary shift than the past. But this outward statistical evidence is somewhat misleading. Bilateral trade flows are not strong indicators of fundamental imbalance for two reasons. First, because many trade flows are triangular across many nations of the world, a simple nation versus nation imbalance means little. Second, as an indicator, a bilateral trade imbalance has become even more deficient in recent years. That is because production of any individual product seldom takes place in a single country, but is rather disaggregated into many separate components whose production locations are distributed across nations according to specific national specializations and cost of production advantages. This deconstruction is often termed "vertical specialization," referring to vertical dismembering into separate and locationally distinct production processes.¹⁹ Unfortunately, statistics on trade flows do not record this reality,



but rather record and re-record (i.e., double-count) components of a final good several times over as it flows across national boundaries. In the case of China, its vast work force and low wages have encouraged Asian producers domiciled in Japan and Taiwan and elsewhere to selectively move stages of their production process to China. For this reason, when we see China's sharply rising and vast exports to the U.S., we are seeing goods coming to the U.S. that would have formerly been exported directly from other nations; and at the same time, much of the imported good's value was indeed created in other Asian countries and ultimately shipped to the U.S. following a way-station in mainland China. Indeed, the share of U.S. imports sourced from Asia as a whole has remained steady or slightly declined (figure 8).

China is too big to rely on export-led growth to develop its economy, but rather must develop internally if it is to raise its standard of living.²⁰ The most expedient way to do this is to allow Japanese, European, and U.S. firms into the Chinese mainland to produce products for China's domestic markets. Further, this will mean imports of both capital and capital goods into China to equip factories and businesses. Midwest manufacturing can aim to meet this challenge by exporting the most sophisticated capital equipment to Chinese

factories, hospitals, and service businesses.

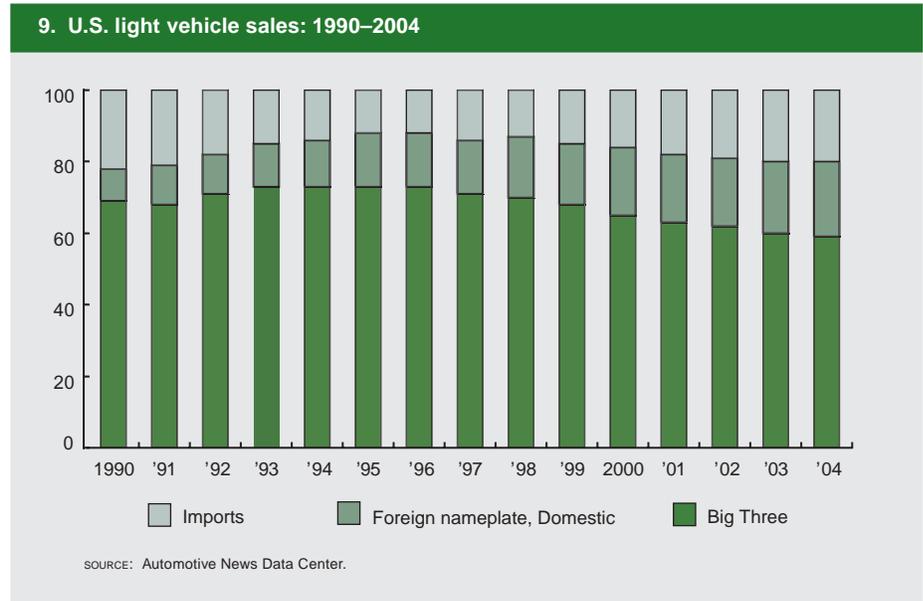
Admittedly, many Midwest manufacturers, especially those lacking global scope and sufficient depth to adjust easily, are experiencing competitive import pressure from facilities located in China. But pressures are keenly felt in many instances because general manufacturing market conditions have remained soft. On average, the Midwest's mainstay industries are somewhat less exposed to import competition than the nation's.²¹

Regional developments

Another way in which structural change (and structural breaks) can take place is through geographic shifts, movement, or migration in the location of industrial activity. Recent shifts from the Midwest have occurred as cost conditions have changed and markets have moved elsewhere. In some instances, entirely new industries, such as aerospace and micro-electronics, have arisen in regions largely outside of the Midwest. Though industries in micro-electronics and computing, software, biotech, and aerospace originated in the manufacturing belt of the Northeast and Midwest, rapid growth and investment during the 1980s and 1990s took place elsewhere. High-technology industries have distinctly favored western states such as Texas, Arizona, and California. In the early 1980s, defense-oriented manufacturing favored such regions, while the Midwest was also experiencing unfavorable terms of trade with the rest of the world for its capital goods exports—although the region reclaimed some lost share in the latter half of the 1980s and in the 1990s.

Auto industry shifts

Currently, a shift of the domestic automotive industry away from the upper Midwest toward the mid-South poses the most likely structural threat to the region's economy. The automotive industry—both automotive parts production and assembly operations—is geographically concentrated in the Midwest, and the industry's large size and broad scope make its performance and location critical to the continued stability of the manufacturing sector here. The exact



size of the industry is difficult to determine because of the extensive and organizationally dis-integrated supply chains that feed into final assembly of autos and trucks. Long chains of parts suppliers provide glass, rubber, steel, chemicals, paints, technology, fasteners, and many fabricated parts to auto assemblers (and to each other) throughout the Midwest. Many of these plants simultaneously supply non-automotive parts and services as well. In the Great Lakes states of Illinois, Indiana, Michigan, Ohio, and Wisconsin, it is estimated that approximately one in six manufacturing jobs can be accounted for by automotive production (and this measure excluded related production of basic inputs to automotive such as fasteners, steel, paint, etc.). In Michigan, 36% of manufacturing employment is in automotive, while in Indiana and Ohio, the share is 15% to 16%.²² Within 400 miles of Detroit (one day's drive), 58% of the nation's assembly plants can be found, along with 84% of those major supplier plants owned by auto assembly companies ("captives"), and two-thirds of the major non-captive "tier one" supplier plants.²³

Until recently, new automotive investment had been assisting the Great Lakes states to rebuild their national position in manufacturing output and employment. Even though the locus of foreign nameplate investment in the U.S. by Nissan and Toyota was skewed somewhat

southward toward the mid-section of the country, an offsetting trend was the pull of domestic auto assembly operations from coastal locations back toward the nation's midsection—including the Midwest. Along with some significant foreign direct investment in Ohio (by Honda) and in Indiana (by Toyota and Isuzu), a reconcentration of the Big Three's domestic operations had boosted the region's automotive share.

However, this trend appears to have largely played out. Despite the use of sizable sales incentives to spark vehicle sales, the Big Three auto producers have continued to lose market share to foreign nameplates (i.e., vehicles manufactured in the U.S. by foreign companies, as well as foreign nameplate vehicles imported to the U.S.). The Big Three's share of motor vehicle sales fell from 72.4% in 1986 to less than 60% in 2004 (figure 9).

The domestic assembly plants continue to be heavily concentrated in the traditional auto production states in the Midwest. However, the assembly plants of foreign producers are concentrated in the southern end of the auto corridor, notably Tennessee and Kentucky (about 20% of all light vehicle assembly plants, half of which are foreign producers). Automotive supplier plants are also gravitating southward toward the assembly plants because they generally want to be within a day's drive

(about 400 miles) of their customers. By one account, southern states now host 33% of major auto parts plants.²⁴

Has the geographic shift accelerated in recent years? Market share of the Big Three has been declining since the mid-1990s. Before that time, innovative models helped to support their market share. Since then, foreign nameplates have introduced many such vehicle models themselves, so that competition for market share has sharpened markedly. However, the market share trend may yet reverse itself. By 2007, the domestic automakers will reportedly have introduced 100 new models.²⁵

What do current trends suggest? Until recently, strong auto sales may have masked the importance of the shift southward in production. With the economic expansion shifting somewhat from consumer expenditure toward general investment spending, the geographic impact is becoming more apparent. Owing to its sharp concentration in automotive, for example, Michigan's unemployment stood stubbornly a full percentage point above the nation's in mid-2004. Moreover, high inventories and low sales were inducing production pullbacks by major domestic auto makers during the final two quarters of the year. If intra-industry competition continues to erode the Big Three's market share, and if sales continue to stagnate, losses in assembly and supplier jobs will likely be disproportionately concentrated in the Midwest.²⁶

Policy responses for the Midwest

The sharp contraction in manufacturing employment associated with the 2001 recession led to a number of studies (listed in the appendix) aimed at developing policies to improve manufacturing's fortunes (figure 10). In the broadest sense the studies tended to focus on two strategies. First was identifying cost differentials faced by domestic manufacturers and what policies could ameliorate those costs. Second was productivity enhancement, aimed at either process or product innovation. For state, local, and regional policy, the most

10. Examples of proposed manufacturing policies

Value-added strategies

- Increase technical assistance programs aimed at increasing manufacturing productivity, in particular helping with process innovation and technology transfer.
- Promote and maintain supportive public infrastructure.
- Promote venture capital formation.

Work force/education strategies

- Increase federal funding for flexible job training.
- Establish a high school and technical education partnership initiative.
- Establish personal reemployment accounts.
- Improve services for displaced workers.
- Develop a training and education curriculum in the context of industry standards and employer requirements.
- Encourage skill certification.

Raising visibility of manufacturing issues

- Create government advocates for manufacturing issues both within the U.S. Department of Commerce and across other agencies.
- Create mechanisms to coordinate federal, state, and local policy for manufacturing.
- Conduct public education and outreach to inform the public about the role of manufacturing in the U.S. economy.

Federal policies

- Improve international trade conditions, including preventing currency manipulation, enforcement of World Trade Organization rulings, protecting intellectual property rights, eliminating non-tariff barriers, and improving market access.
- Increase federal support for the Manufacturing Extension Program.
- Develop policies to contain health care and pension costs.
- Diversify energy supply and improve reliability.

Cost-reduction policies

- Examine state business tax structure, particularly related to capital formation.
- Study changes to depreciation, the effect of the alternative minimum tax, research credits, and incentives to increase U.S. savings rate.
- Bring U.S. statutory tax rates in line with those of competitor nations.
- Create a cost-benefit review for any new regulatory program.
- Legal reform, including limiting industrial liability, class action suits, and asbestos litigation.

appropriate strategies would appear to focus on examining the *local* costs borne by manufacturers (in particular, whether state-local tax structures tend to discourage capital formation), while also emphasizing work force development and training programs that meet the needs of local industries. In addition, the role of supportive infrastructure is key. For example, the efficiency of the transportation infrastructure is critical in supporting the shipment of manufacturing goods that are increasingly time-sensitive. Importantly, emerging competitors such as China often still lag the U.S. in the ease and facility of moving materials and final goods to where they are needed.

Not surprisingly (given the U.S.'s relatively high standard of living), many of the cost disadvantages identified in the studies reflect labor and benefit costs. In particular, rising health insurance costs and legacy costs related to pension plans are seen as contributing to unit labor costs that undermine the competitiveness of U.S. firms. Unfair trade practices, including intellectual property

right infringement, tariffs, and unfair currency exchange rates are also identified as burdens facing U.S. companies. In addition, some regulatory requirements, particularly related to different standards for environmental compliance contribute to higher domestic costs for doing business. For the most part, these issues are most effectively dealt with through federal policies.

At the state and local level, work force strategies appear particularly popular with policymakers. The rationale is that as firms produce more sophisticated (and higher value-added) manufacturing products using more sophisticated production methods, workers' skills must grow in tandem. The criticism of many work force programs has been a tendency to avoid rigorous evaluations of programs and a failure to design programs that are aligned with employer needs.

One advantage that state and local policymakers have in designing policy is that they are the closest to local firms and have a better understanding of the drivers of the local economy. A disadvantage

is in their small scale and frequent inability to gather global information as it affects the local economy and its companies. For one, state and local economic development resources are limited. Even well-designed state and local programs often lack the scope and scale to broadly influence industry performance. In choosing among potential policy alternatives, one guideline is to identify market failures and fashion policies to correct the failures. Why is it that some firms do not seem to gain from trade? Examples of market failures may include inefficiencies in distributing information about new markets and technologies, the inability of firms to profitably conduct necessary research and development without the benefits spilling over to competitors, insufficient or ineffective worker training in the public sector, as well as undeveloped capital markets.

Understanding the differences in regional industry structure and comparative advantage is also important. For example, a study of Pennsylvania manufacturers by Ned Hill of Cleveland State University found that Pennsylvania had a concentration of firms that produced lower-value-added products that were particularly susceptible to import competition. Policymakers may find it useful to have such specific knowledge of firm conditions to act effectively, if for no other reason than to offer dislocation assistance to workers and towns. More proactive policy attempts to replace jobs and industries are perilous. Efforts to try and attract the “next big thing” in economic development should usually be avoided. States and regions facing declines in mature industries such as manufacturing have often tried (and failed) to attract high-technology firms. Andrew Reamer of Andrew Reamer and Associates demonstrates that technological innovation tends to be geographically concentrated in large metropolitan areas and does not represent a particularly viable strategy for many local economic development efforts. For example, only 19% of U.S. metropolitan areas specialize in technology development as measured by patenting activity. The largest metropolitan

areas are responsible for 66% of all patents and 43% of jobs related to technology development. Such generalizations concerning geography and success may be helpful in fashioning development programs and government services that fit local advantages. But policymakers also need to understand their local industry structure. For example, when a local economy is able to capture a high-tech industry segment such as R&D, it often fails to receive the attendant benefits (i.e., jobs and income) of the commercialization of the innovation. In a global economy, commercial production still largely occurs at the lowest cost site.

Coordination of efforts among policymakers is also important. In Illinois, an effort is underway to develop a shared manufacturing strategy by the state’s manufacturing association and a prominent labor organization. And on an institutional level, federal, state, and local policies need to be more closely aligned to ensure that actions taken by one level of government are not contradicted by policies implemented by other governmental entities. For example in tax policy, the purported benefits that are anticipated through special tax treatment, such as accelerated depreciation and investment credits, can be muted if state policymakers de-couple their tax structures from the federal tax base.

Policy initiatives that would improve manufacturing fortunes include encouraging a higher level of domestic savings (for investment), supporting public investment in research and development and public infrastructure, as well as promoting a better educated and more flexible work force.

Manufacturers can also adopt internal policies that will improve their competitiveness. For example, the Illinois Tooling and Manufacturing Association has identified several marketing and targeting strategies to help its members. These include marketing strategies, such as diversifying a firm’s customer base and reducing reliance on a single large customer. In addition, firms can develop a brand that helps identify the

special process or equipment that they use, which in turn allows them to differentiate themselves in the market. Firms can also seek strategic alliances with U.S. or foreign partners.

Targeting industries that are likely to remain strong in North America is another important strategy. Firms in target industries have several common characteristics. In particular, they tend to produce highly engineered products that require capital-intensive and high-skilled labor production. These products are assembled from high-value-added components, have technologically advanced applications, and require tight engineering tolerances. An example of such an industry would be medical equipment. The advantage to serving this type of industry is that active service support and maintenance are required by customers. Such industries require complex communication among engineers and product managers and need suppliers that are active partners. They also tend to have products that need to be frequently revised to remain competitive. This allows local suppliers to participate in both current and future product development.

Conclusion

What are the barriers and challenges to implementing policies that are appropriate and helpful to manufacturing in the Midwest? First and foremost, knowledge, understanding, and attendant education are *not* effectively marshaled about manufacturing in a way that galvanizes people and organizations to action. As this report shows, manufacturing and the Midwest enjoy a deep and enduring relationship. The Midwest’s primary challenge is to foster manufacturing, while at the same time helping its economy to evolve toward higher paying service activities.

That an adequate amount of research is *not* conducted nationally, regionally, nor by any individual institution is somewhat understandable, given the geographic breadth and far-flung interconnections of manufacturing activities in the region. Accordingly, greater cooperation is needed between state and local governments across the region,

and conversations among the region's governments should begin to take place so that mutually beneficial policies can be developed. This is all the more compelling because manufacturing production and related operations are arrayed across state and local boundaries. For many manufactured products, the supplier relationships in the production process involve various plants and offices located up to hundreds of miles apart and sometimes strung together by a patchwork network of transportation and communication. Indeed, in the Midwest, the productive whole is more than the sum of the parts. It is the collocation of such facilities in the region that makes its products competitive on world markets. To support and develop these manufacturing "clusters," the individual locations must act in concert to plan and maintain supporting infrastructures, such as road and rail networks, along with work force training and skills certification, and perhaps some forms of technical assistance and R&D.

This report contributes to our understanding of Midwest manufacturing just as the region is emerging from its most difficult economic period since the early 1980s. While much of the analysis here is preliminary, precisely because Midwest manufacturing's difficulties are so very recent, this research offers useful insights to the region's policymakers as they plan for a future in which manufacturing will remain a vibrant part of the Midwest economy.

Appendix—Studies

Bartik, Timothy, 2003, "Thoughts on American manufacturing decline and revitalization," W.E. Upjohn Institute, working paper, No. 03-96.

Bernard, Andrew B., J. Bradford Jensen, and Peter K. Schott, 2002, "Survival of the best fit: Exposure to low-wage countries and the (uneven) growth of U.S. manufacturing plants," National Bureau of Economic Research, working paper, No. 9170.

Campa, Jose, and Linda S. Goldberg, 1997, "The evolving external orientation of manufacturing industries: Evidence

from four countries," National Bureau of Economic Research, working paper, No. 5919.

Center for Labor and Community Research, 2003, "The state of Illinois manufacturing," study prepared for the Illinois Manufacturers' Association, Chicago, December.

Congressional Research Service, 2003, "Manufacturing output, productivity, and employment: implications for U.S. policy," Washington, DC, December.

Council of Economic Advisors, 2004, "The manufacturing sector," *Economic Report of the President 2004*, chapter 2.

Deloitte, 2004, "Manufacturing Pennsylvania's Future: Regional strategies that build from current strengths and address competitive challenges," 2004.

_____, 2003, "U.S. manufacturing: The engine for growth in a global economy," Manufacturers Alliance/MAPI, New York, report.

Dietz, Richard, 2004, "Restructuring in the manufacturing workforce: New York State and the nation," *The Regional Economy*, Federal Reserve Bank of New York, Winter.

Doyle, Jim, The Hon., 2003, "Wisconsin Manufacturing Summit," speech, October 8.

Duesterberg, Thomas J., 2003, *U.S. Manufacturing: The Engine for Growth in a Global Economy*, Westport, CT: Praeger.

Goldberg, Linda S., and Keith Crockett, 1998, "The dollar and U.S. manufacturing," *Current Issues in Economics and Finance*, Federal Reserve Bank of New York, Vol. 4, No. 12, pp. 1–8.

Granholt, Jennifer, The Hon. 2003, "Manufacturing matters in Michigan—Consensus from the summit," speech.

Hill, Edward W. (Ned), 2001, "Ohio's competitive advantage: Manufacturing productivity," Cleveland State University College of Urban Affairs, paper.

Johnson, David S., and John M. Rogers, and Lucilla Tan, 2001, "A century of family budgets in the United States," *Monthly Labor Review*, May, pp. 28–45.

Mankiw, N. Gregory, 2003, "The manufacturing sector," remarks delivered at Exchequer Club, December 17, available at www.whitehouse.gov/cea/.

National Association of Manufacturers/Manufacturers Alliance, 2003 "How structural costs imposed on U.S. manufacturers harm workers and threaten competitiveness," report, December.

Nichols, Donald A., 2004, "Midwest manufacturing and the dollar," paper presented at the Federal Reserve Bank of Chicago, September 30.

Reamer, Andrew, & Associates, 2003, "Technology transfer and commercialization: Their role in economic development," Economic Development Administration, report.

Tassey, Gregory, 2002, "R&D and long-term competitiveness: Manufacturing's central role in a knowledge-based economy," U.S. Department of Commerce, National Institute of Standards and Technology, planning report, No. 01-02, February.

U.S. Department of Commerce, "2004, *Manufacturing in America: A Comprehensive Strategy to Address the Challenges to U.S. Manufacturers*," Washington, DC, January.

Zimmerman, Fred, and Dave Beal, 2002, *Manufacturing Works*, Chicago: Dearborn Trade Publishing.

¹ We define Midwest here as the states of Illinois, Indiana, Michigan, Ohio, and Wisconsin. As appropriate in this article, we also refer to the Seventh Federal Reserve District, comprising Illinois, Indiana, Iowa, Michigan, and Wisconsin.

² See remarks by N. Gregory Mankiw, Council of Economic Advisors, December 17, 2003. Mark Schweitzer of the Federal Reserve Bank of Cleveland cautions that the variation in productivity (and employment) growth among particular manufacturing industries is profoundly skewed. For example, the average pace of manufacturing productivity growth shrinks to a pace that is closer to that of services if two stellar manufacturing performers are excluded—semiconductor equipment and computer and peripheral equipment (presentation April 27, 2004, at Federal Reserve Bank of Chicago).

³ David S. Johnson, John M. Rogers, and Lucilla Tan, 2001, "A century of family budgets in the United States," *Monthly Labor Review*, Vol. 124, No. 5, and Eva Jacobs and Stephanie Shipp, 1990, "How

- family spending has changed in the U.S.,” *Monthly Labor Review*, Vol. 113, No. 3.
- ⁴ U.S. Department of Commerce, 1982, “Subject series,” *Census of Manufactures*, Washington, DC: Government Printing Office, p. X.
- ⁵ U.S. Department of Labor, Bureau of Labor Statistics, “Employment and earnings,” program data, No. BLS790.
- ⁶ There are also some (minor) differences in treatment and definition due to depreciation and taxation.
- ⁷ See conference presentation by William A. Testa, 2004, Federal Reserve Bank of Chicago, April 27.
- ⁸ Erica Groshen and Simon Potter, 2003, “Has structural change contributed to a jobless recovery?,” *Current Issues in Economics and Finance*, Federal Reserve Bank of New York, Vol. 9, No. 8. Importantly, Groshen cites the job losses during the period that were “permanent” rather than “temporary” as having increased in comparison to past recessions. Temporary job losses are recorded by the Bureau of Labor statistics as “temporary layoff subject to recall” versus job elimination.
- ⁹ See conference presentation by Ellen Rissman, 2004, Federal Reserve Bank of Chicago, April 27.
- ¹⁰ Mark Schweitzer, 2004, presentation at conference, Federal Reserve Bank of Chicago, April 27.
- ¹¹ See Dan Aaronson, Ellen R. Rissman, and Daniel G. Sullivan, 2004, “Assessing the jobless recovery,” *Economic Perspectives*, Federal Reserve Bank of Chicago, Second Quarter, pp. 2–20.
- ¹² See conference presentation by Spencer Krane, 2003, Federal Reserve Bank of Chicago, September 30.
- ¹³ During the second half of 2004, several Midwest industries were experiencing growth: steel, farm machinery and equipment, heavy trucks, and mining machinery.
- ¹⁴ See Jack L. Hervey and Loula Merkel, 2000, “A record current account deficit: Causes and implications,” *Economic Perspectives*, Federal Reserve Bank of Chicago, Vol. 24, Fourth Quarter, pp 2–13.
- ¹⁵ See C. Fred Bergsten and John Williamson, 2004, *Dollar Adjustment: How Far? Against What?*, Washington, DC: Institute for International Economics, November.
- ¹⁶ See Josh Bivens, 2004, “Shifting blame for manufacturing job loss: Effect of rising trade deficit shouldn’t be ignored,” *Economic Policy Institute*, briefing paper, No. 149, April 8.
- ¹⁷ See IMF, *World Economic Outlook*, various issues.
- ¹⁸ See J. Bradford Jensen, 2003, “Survival of the best fit: Exposure to low-wage countries and the (uneven) growth of U.S. manufacturing plants,” International Institute for Economics, working paper, No. 03-3, May.
- ¹⁹ See David Hummels, Dana Rapoport, and Kei-Mu Yi, 1998, “Vertical specialization and the changing nature of world trade,” *Economic Policy Review*, Federal Reserve Bank of New York, June, Vol. 79.
- ²⁰ Donald Nichols, 2003, “Manufacturing and the dollar,” paper presented at the Federal Reserve Bank of Chicago, November 30.
- ²¹ See Jay Liao, William Testa, and Alexei Zelenev, 2003, “Midwest trade with China,” *Chicago Fed Letter*, November, No. 196.
- ²² As measured by each state’s gross state product, Kentucky now rivals Indiana and Ohio with respect to automotive production as a share of state product.
- ²³ Thomas Klier, presentation on November 3, 2003, Detroit, as summarized in “Challenges to the U.S. auto industry,” *Chicago Fed Letter*, March 2004, No. 200a.
- ²⁴ See James Rubenstein discussion, *ibid.*, p. 3.
- ²⁵ Sean McAlinden, *ibid.*, p. 3.
- ²⁶ See Thomas H. Klier, 2005, “Caution ahead—Challenges to the Midwest’s role in the auto industry,” *Chicago Fed Letter*, February, No. 211.

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