Where Have All the Factory Jobs Gone—and Why?

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Since 1960, more than one-third of manufacturing jobs have disappeared from the three states in the Third Federal Reserve District—Pennsylvania, New Jersey, and Delaware. In the last 15 years, job losses have accelerated, averaging more than 2 percent a year. Such persistent job losses in a major sector have effectively limited overall job growth in the three states. Clearly, manufacturing does not play as important a role in the region's economy as it once did, and it is not likely to regain its former position.

It is helpful, however, to keep these employment trends in perspective. Despite the loss of manufacturing jobs, the region's manufacturing output has expanded over the past 30 years, although at a much slower pace than that of the nation. Manufacturing's share of output is still higher in the tri-state region than in the nation, but the region's transition from a manufacturing-oriented economy has been quite rapid. Moreover, the transition has been brought about by weaker-than-average growth in the manufacturing sector rather than stronger-than-average growth in the nonmanufacturing sectors.

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Why has the region's manufacturing sector not fared as well as the nation's? Economic studies suggest that shifts in markets and differences in costs are the major factors.

TRENDS IN THE REGION'S MANUFACTURING SECTOR

At one time manufacturing dominated the tri-state economy. Each of the three states had a much larger percentage of employment and output in manufacturing than did the nation as a whole. Even though the region's economy is still more manufacturing oriented than the nation's, the difference between the two has narrowed considerably.

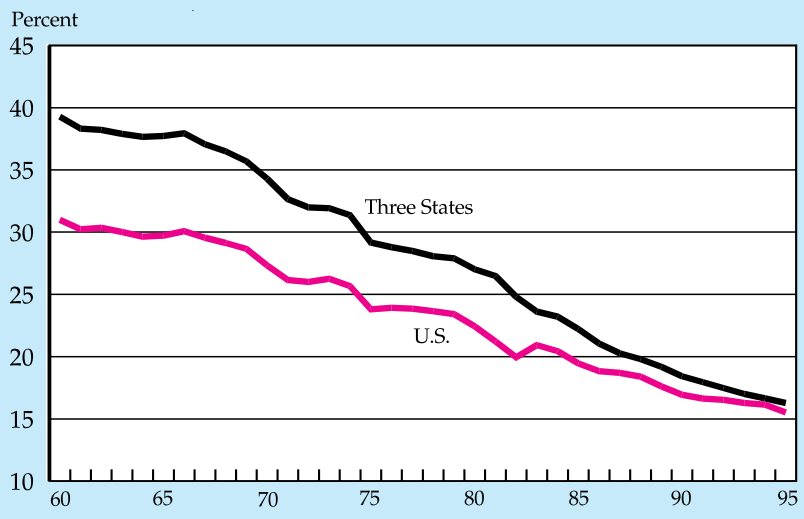
Employment trends highlight the declining importance of manufacturing in the region. In 1960, almost 40 percent of jobs in the three states were in manufacturing, compared to about 30 percent for the nation (Figure 1). Since then, manufacturing's share of employment in the region has dropped by more than half, and it is only slightly higher than manufacturing's share nationwide. In effect, the region's dependence on manufacturing jobs has steadily declined toward the national average. Since 1988, the percentage of manufacturing jobs in New Jersey has even been below the U.S. average. This change in the region's employment profile relative to the nation's is the result of large declines in manufacturing employment in the region (35 percent since 1960) and slight increases at the national level (10 percent since 1960).

Does the 35 percent decline in manufacturing jobs over the past 35 years mean that the number of factories in the region is shrinking 1 percent a year? By no means. While hundreds of factories in the three states have closed in the last three decades, others have opened. The total number of establishments was down less than 10 percent from 1963 to 1992. Today the average plant is producing more with fewer workers.[1]

Measures of manufacturing output show that, with roughly 2000 fewer plants and about 800,000 fewer factory workers, the tri-state region is producing more than it did in the early 1960s. We measure real output in manufactur-

[1]Nationally, manufacturing productivity has increased more than 150 percent since the early 1960s.

FIGURE 1
Manufacturing Employment As Percent of Total Employment

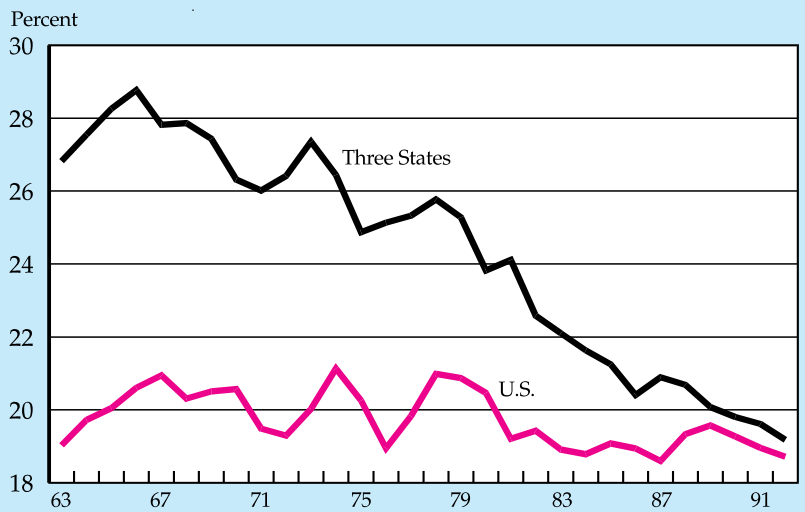


Source: Bureau of Labor Statistics

ing by the value added in the manufacturing process adjusted for any change in prices for manufactured goods. The value added in manufacturing is derived by subtracting the cost of materials, including supplies, electricity, and fuels, and the cost of purchased services from the value of shipments. Measured this way, the region's real manufacturing output has increased more than 40 percent since the early 1960s.

Even though total industrial output has increased, it is still true that the region has undergone a decline in the share of output generated in the manufacturing sector. While real output in manufacturing has remained a relatively constant share of total U.S. output, it has declined from about 29 percent in the region in the mid-1960s to slightly more than 19 percent in the early 1990s (Figure 2).[2] In other states, mostly in the South and the West, the share of total output generated by manufacturing has increased (see the 1989 article by Gerald Carlino). What explains this shift away from manufacturing in the Third District states?

FIGURE 2
Manufacturing Output As Percent of Total Output



Note: Manufacturing output for the three states is the percent of gross state product originating in the manufacturing sector. For the U.S. it is the percent of gross domestic product originating in the manufacturing sector.

Source: Bureau of Economic Analysis

REASONS FOR THE SHIFT

Researchers have used two different methods to examine the regional shifts in manufacturing. Some have surveyed officials at firms that have established new plants, asking them to rank by importance the various factors involved in their location decisions. Others have used the standard statistical technique of regression analysis to identify the factors that best explain regional differences in the number of new plant openings or the growth of manufacturing employment. Both methods have tended to identify a common set of factors that can be grouped into three broad categories: market accessibility, input costs, and governmental costs.

The Pull of Markets. Since manufacturing is essentially the process of converting raw ma-

[2]In Delaware, most of the decline in manufacturing's share of output has occurred since the late 1980s.

terials into products for customers, the best location for a manufacturing facility will depend on the location of the raw materials or suppliers and the location of the customers. In surveys of plant location decisions, executives frequently cite both factors. But they mention accessibility to markets more often than they mention accessibility to raw materials or suppliers. In fact, manufacturing executives have consistently ranked closeness to customers at or near the top of their list of reasons for selecting the site of a new plant.[3]

For some products, such as baked goods or concrete mix, accessibility to the market is a key consideration in determining where to locate production facilities (see the article by Leonard Weiss). Even for products that do not have a short shelf-life or high transportation costs, there may be an advantage to producing close to the customer because the flow of information between the customer and producer improves product design and quality (see the article by Moshe Justman).

Econometric studies have confirmed the survey evidence that proximity to markets is a major factor in the location of manufacturing facilities.[4] And attempts to quantify the "pull of markets" have recognized that it is not just the absolute size of the market that is important but also the extent to which the market is already being served (see the articles by Thomas Plaut and Joseph Pluta; and Frank Goode). Firms are drawn to areas where current supply is not likely to meet future demand.[5] In those studies that adjust for the existing level of manufacturing activity, the size of the market measured in terms of population or income turns out to be a significant factor in the growth of manufacturing employment or the number of new manufacturing firms (see the articles by Plaut and Pluta, Leonard Wheat, and Timothy Bartik, 1989).[6]

The Mideast region has traditionally produced a disproportionate share of the nation's manufacturing output, able to supply not only its own needs but a portion of the rest of the country's as well. The high level of regional supply *relative to the demand* for manufactured goods may help explain why the densely populated states in the Mideast region of the United

[3]See the studies by William Morgan; Michael Kieschnick; Roger Schmenner; Howard Stafford; David Hake, Donald Ploch, and William Fox; and F. J. Calzonetti and Robert Walker

[4]Econometric studies generally do not include any measure of accessibility to raw materials because such measures are not easily attainable or they tend to be specific to individual industries.

[5]This realization is also reflected in Kieschnick's survey. He found that, for new firms, access to *growing* markets was the second most often cited reason for choosing a location after access to current customers.

[6]Even as manufacturing has dispersed with population across the country, firms in some industries tend to locate in metropolitan areas with a concentration of similar firms. For example, a 1983 study by Dennis Carlton found that, for fabricated plastics, communications transmitting equipment, and electronic components, the presence of a large concentration of production in those industries served to attract similar firms to take advantage of agglomeration economies. Vernon Henderson has estimated that such agglomeration economies exist in several major industry categories, and Bartik (1985) found evidence of agglomeration economies for manufacturing in general. Gerald Carlino (1985) also produced estimates of significant agglomeration economies resulting from the concentration of manufacturing, but he suggests that agglomeration economies have diminished in recent years in much of the northeastern quadrant of the country, making these areas less attractive to manufacturing firms.

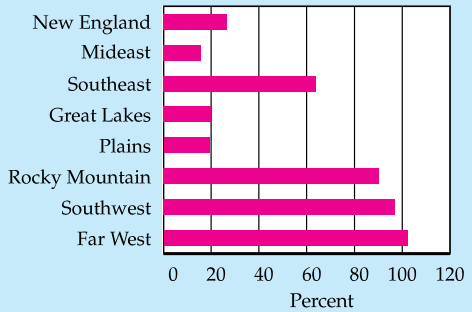
[7]The Mideast is one of the eight economic regions defined by the Bureau of Economic Analysis (BEA) based on the economic interdependence of the states. The Mideast includes New York, New Jersey, Pennsylvania, Delaware, Maryland, and the District of Columbia. The other BEA regions are New England, Great Lakes, Southeast, Plains, Rocky Mountains, Southwest, and Far West. Most of the states in New England and the Great Lakes region have also lost manufacturing share to the rest of the country since the early 1960s.

States, including Pennsylvania, New Jersey, and Delaware, have lost manufacturing share to the rest of the country.[7] Moreover, demand as measured by population is not growing very rapidly in the Mideast. Between 1960 and 1995, the population of the Mideast states grew less than 16 percent, the lowest rate of the eight BEA regions. The neighboring regions of New England and the Great Lakes grew 27 percent and 20 percent, respectively, well below the national average. In contrast, the population in the Southeast, the Southwest, the Mountain States, and the Far West grew more than 60 percent (Figure 3). In short, the markets within easy access of the Third District States have been the slowest growing in the nation. Moreover, population in each of the three states is projected to increase more slowly than in the nation over the next 30 years, and the tri-state region as a whole is projected to grow at only half the national rate.

The tri-state region's earlier disproportionate share of manufacturing also left little room for growth from unmet demand. The percentage of the nation's output produced in each of the three states in 1960 was much higher than each state's share of national population. Today, the states' shares of population and manufacturing output are much more closely matched (Figure 4).[8] The pull of markets alone explains some of the slower-than-average growth of manufacturing output in the Third District.

While market access depends on being close to large population centers like those in the Northeast, that is not the whole story. A firm can have access by being geographically close to a large number of potential customers or by

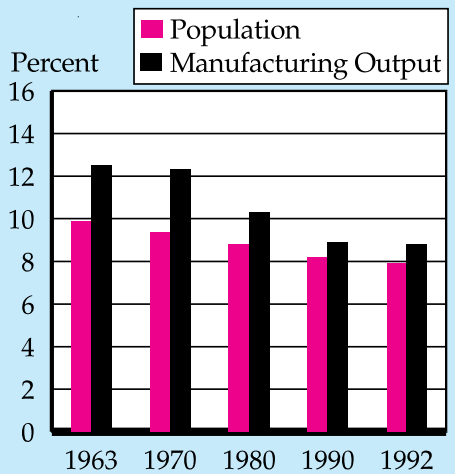
FIGURE 3
Population Growth 1960-95



Source: Bureau of the Census

The data for the Far West exclude Alaska and Hawaii.

FIGURE 4
Three States as Percent of U.S.



A consistent series of real gross state product is available only from 1963 to 1992.

Manufacturing output is gross state product originating in the manufacturing sector in the three states as a percent of gross state product in the manufacturing sector in all 50 states.

Source: Bureau of the Census and Bureau of Economic Analysis

[8]Of course, the relationship between population growth and job growth is not one way. As Gerald Carlino and Edwin Mills have shown, manufacturing job growth stimulates population growth just as population growth stimulates job growth. However, many other factors, such as climate and immigration patterns, also affect population growth independently.

being near a good transportation system that can be used to ship goods to those customers. In several surveys of plant location decisions, a good transportation network is mentioned as a necessary or desirable characteristic (see the studies by Michael Kieschnick; Roger Schmenner; John Hekman; and Howard Stafford). The limited statistical analysis of the importance of highways has tended to confirm the survey responses. Alaeddin Mofidi and Joe Stone found that states with larger increases in highway expenditures had faster manufacturing job growth from 1962 to 1982. And according to one estimate in Timothy Bartik's 1989 study of manufacturing start-ups, highway density is associated with an increase in the number of start-ups in a state. Gerald Carlino and Edwin Mills also found that interstate highway density has been a major factor in the growth of both manufacturing employment and total employment at the county level.[9]

The importance of highways would seem to bode well for manufacturing in the three states of the Third Federal Reserve District and in the Mideast region of the country generally. The Mideast has the highest interstate highway density of any of the eight BEA regions. The New England and Great Lakes regions rank second and third in highway density, and this ranking has remained the same since 1960. But the northeastern portion of the country has been losing some of its advantage in terms of transportation as other regions have added interstate highways at a faster pace. While the miles of interstate highways have increased about two and a half times in the Mideast in the last 35 years, they have increased almost nine times in the Southeast and more than seven times in the Rocky Mountain states. As a result, these other regions are now able to service large regional and national markets much more effectively than they could in 1960.

[9]Higher economic and population growth rates lead to more highway construction as well.

The Cost of Inputs. While markets play a decisive role in plant location, the regional cost of some important inputs also ranks high on the list of major factors in the location decision. The prices of many inputs into the manufacturing process, like grain or steel, are basically the same across the nation except for transportation costs. Wages, energy prices, and land prices, on the other hand, vary considerably by region and by state, and these variations can affect the location of manufacturing plants and the growth of manufacturing jobs in a region.

After the cost of materials, *labor costs* are the largest component of the average plant's operating expenses. It is not surprising, then, that the cost and availability of labor, especially skilled labor, is a major consideration in plant location decisions (see the studies by Kieschnick; Hekman; Stafford; and Calzonetti and Walker). Closely associated with labor costs is the degree of unionization in a state, and surveys indicate that the lack of strong union influence has been a major factor in attracting new plants to the Southeast (see the studies by Hake, Ploch, and Fox and by Calzonetti and Walker).[10]

Econometric studies have confirmed that high direct and indirect labor costs can have a dampening effect on manufacturing growth. Higher manufacturing wages have been shown to reduce the rate at which new plants open (see the articles by Dennis Carlton, 1979; Timothy Bartik, 1985; and Leslie Papke, 1991a) and the

[10]All three states in the Third District have manufacturing unionization rates that are higher than the national average, ranging from 18.7 percent in Delaware to 26.7 percent in Pennsylvania. These rates are considerably higher than those in many southern states; some southern states, such as Florida, Georgia, North and South Carolina, and Texas, have manufacturing unionization rates below 10 percent.

[11]The studies by Wheat and Newman did not control for wage rates, so the negative effect of unionization may also reflect the effect of higher wages in more unionized states.

rate at which manufacturing jobs increase in a state (see the paper by Charles de Bartolome and Mark Spiegel). High rates of unionization also seem to reduce the number of new plants and manufacturing job growth (see the articles by Bartik, 1985; Wheat; and Robert Newman).[11]

Several additional studies suggest that high manufacturing wages depress manufacturing investment, job growth, and new firm location, but the effects could not be estimated precisely enough to draw definitive conclusions.[12] This lack of precision may be due, in part, to the fact that there is no adjustment for worker productivity in these studies. We know that manufacturing wage rates vary by industry, so statewide averages will vary simply because of the different mix of industries in the states. Even firms in the same industry can pay higher wages to more highly skilled and more productive workers without raising the cost of producing their products. But no ready measures exist for worker productivity in specific industries at the state level.[13]

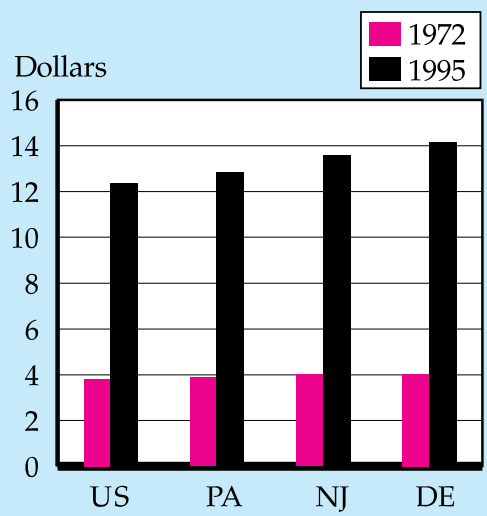
Wages, salaries, and benefits all tend to be higher in the tri-state region than in the nation overall. Wages and salaries constitute more than 70 percent of total compensation. Manufacturing wages in the region have been higher than the national average at least since the early 1970s, and the gap has widened in recent years as many low-wage manufacturing jobs have disappeared from the region. In 1995, the average manufacturing wage was 3.5 percent higher in Pennsylvania than in the nation, 9.6 percent higher in New Jersey, and 14.6 percent higher in Delaware (Figure 5). Wages are higher than the national average in the region in part because a disproportionately large share of the region's manufacturing jobs are in some high-paying industries, such as chemicals. But industry mix alone does not explain the wage differentials between the Third District states and the nation. Hourly wage data are available for 18 categories of manufacturing industries in Pennsylvania and New Jersey, and in each of the two

[12]See the articles by Dennis Carlton, 1983; Michael Wasylenko and Therese McGuire; Bruce Benson and Ronald Johnson; and Timothy Bartik, 1989.

[13]For the limitations of the value-added data from the Census of Manufactures, see the comments by Antonio Ciccone and Robert Hall.

[14]Of the 18 two-digit manufacturing industries in Pennsylvania and New Jersey for which wage data are available, 12 in Pennsylvania and 15 in New Jersey have higher than average wages. In Delaware, hourly wage data are available for only four two-digit manufacturing industries; wages are higher than the national average in two of those industries and lower in the other two. The two-digit designation is a broad classification of industries, as set forth by the Standard Industrial Classification (SIC) of sectors of the U.S. economy.

FIGURE 5
Hourly Wages In Manufacturing



Source: Bureau of Labor Statistics

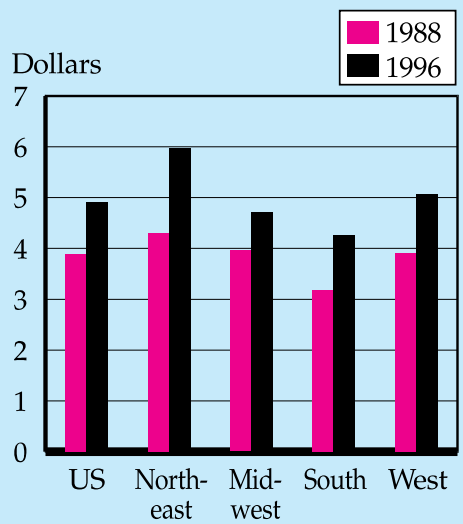
Comparable data for all states are not available prior to 1972.

states, wages are higher than average in two-thirds or more of those industries.[14]

Benefit costs are not available on a state-by-state basis but only for the four major regions of the country — the Northeast, South, Midwest, and West. And hourly benefit costs for all workers in the Northeast exceed those in every other region (Figure 6). Moreover, since the regional data were first collected in 1988, benefit costs in the Northeast have risen faster than in any other region of the country. Of course, many benefit costs, such as pensions and sick leave pay, are tied to wage and salary levels. But even those not so closely tied to wages and salaries, such as health insurance costs, are higher in the Northeast than elsewhere in the country.

These higher wage and benefit costs in the tri-state region could be offset by higher worker productivity. But there are no good measures of labor productivity by state, and the continued movement of manufacturing jobs out of the region suggests that the higher labor costs are not being offset by higher productivity.

FIGURE 6
Benefit Costs Per Hour Worked



Source: Bureau of Labor Statistics

Labor costs are not the only operating expense seriously considered in selecting a site for a new plant. Many manufacturing officials report that they take special note of *energy prices*, especially electricity, in their location decisions (see the studies by Schmenner; Kieschnick; Hekman; and Hake, Ploch, and Fox). These costs can vary widely from state to state and even between markets within a state. And statistical studies of location have found that, at least for some manufacturing industries, high electricity prices or energy costs hamper new plant openings (see the articles by Carlton; Bartik, 1989; and Papke, 1991a).

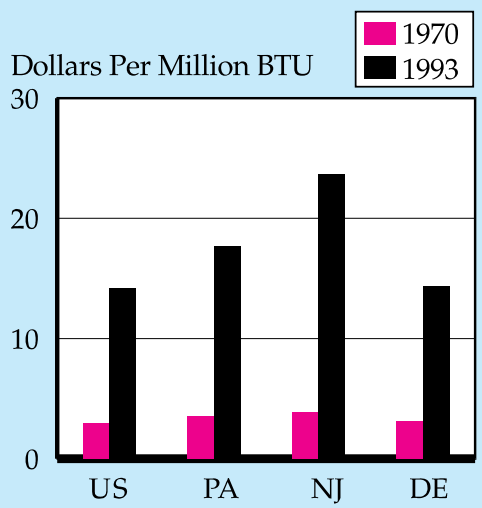
Higher energy costs put the tri-state region at a disadvantage in attracting manufacturing firms. A comparison of industrial electricity prices in the three states of the Third District shows that prices in Pennsylvania are more than 20 percent above the national average, and in New Jersey, they are more than 60 percent above average. Delaware's industrial electricity prices, on the other hand, are only slightly above the national average (Figure 7).[15] Moreover, since 1970, electricity prices in Pennsylvania and New Jersey have risen faster than in the nation as a whole. But some relief may be on the way. In 1996, Pennsylvania enacted legislation to deregulate the market for electric power, and in early 1997, the New Jersey Board of Public Utilities adopted a similar plan to deregulate electricity in that state. The expected long-term effect of this deregulation will be to lower electricity prices in the two states relative to the national average.

A final private-sector cost that is important in the initial location decision for many manufacturers is the *cost of land*. Low land costs appear among the desirable characteristics in a

[15]Natural gas prices are also higher than the national average in all three states.

number of surveys of plant location decisions (see the surveys by Kieschnick; Schmenner; Hekman; Hake, Ploch, and Fox; and Calzonetti and Walker). Few statistical studies of firm location, however, include a measure of land costs because no reliable statewide measures of industrial land prices are available. A few studies have used the price of agricultural land as an indicator of industrial land prices, and these studies indicate that higher land prices do lower the number of new plants or the amount of manufacturing investment in a state (see the articles by Plaut and Pluta and by Papke, 1991a and 1991b). High population density may also be a good indicator of relatively high land costs as the price of land is bid up to accommodate more people (see the article by Alicia Munnell). Both of these surrogate measures—agricultural land prices and population density—suggest that industrial land is more expensive in the Third District states than in the nation as a whole. The price of farmland in the region ranges from almost three times the national average in Pennsylvania to more than nine times the national average in New Jersey. And each of the three states is among the 10 most densely populated in the nation. In fact, New Jersey is the most densely populated state in the country.

FIGURE 7
Industrial Electricity Prices



Source: Department of Energy

Governmental Costs. In the popular press, the most frequently discussed costs of doing business are those imposed by government. These costs include, but are not limited to, taxes. In recent years the cost of regulation has also been cited as a hindrance to manufacturing growth.

Taxes are mentioned by executives in some, but by no means all, surveys about plant location decisions (see the studies by Kieschnick; Hekman; Hake, Ploch, and Fox; and Calzonetti and Walker). Prior to the 1980s, most empirical research found little evidence of significant negative effects of taxes on economic growth (see the article by Bartik, 1992). Results in the empirical literature since the early 1980s have been mixed. Those studies that use as their measure of tax burden total taxes as a percent of personal income or total taxes collected relative to the tax base tend to find a negative effect of taxes on manufacturing employment or investment.[16] By these measures, the Third District states do not appear especially unfriendly to manufacturing. Total state and local taxes as a percent of personal income are somewhat above the national average in New Jersey and below average in Pennsylvania and Delaware (Figure 8a). Over the past three decades, however, total state and local taxes have risen faster in the three states than in the nation generally. In the early 1960s, the ratio of state and local taxes to personal income was lower than the

[16]The articles by Benson and Johnson and by Mofidi and Stone use total taxes as a percent of total income, and the articles by Plaut and Pluta and by Wasylenko and McGuire use taxes collected relative to the tax base.

national average in all three states.

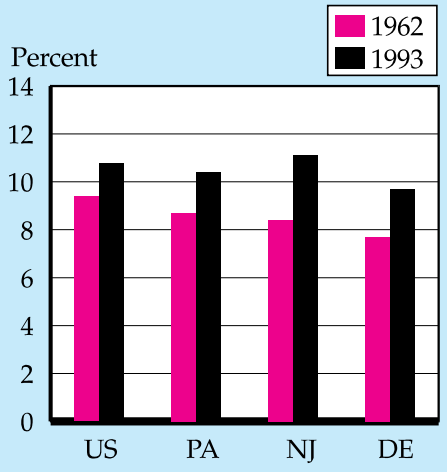
Among the state and local taxes paid directly by business, property taxes comprise the largest share, about 43 percent; sales and corporate income taxes each account for about 14 percent (see the article by William Oakland and William Testa). Several empirical studies have looked at one or more of these business-related taxes to assess their impact on manufacturing in the various states.[17]

Despite the fact that property taxes account for such a large portion of the business tax burden, most empirical studies have found no significant negative relationship between high property taxes and new manufacturing plants or employment growth (see the articles by Carlton, 1983; Plaut and Pluta; Bartik, 1985; and Schmenner, Huber, and Cook). In his 1989 study, however, Bartik did find a negative relationship between high property tax rates and the rate of new-firm formation. Part of the difficulty in finding a significant relationship between property taxes and manufacturing growth at the state level is that property taxes can vary widely within a state. To the extent that high property taxes do hinder growth in the manufacturing sector, New Jersey is particularly vulnerable because property taxes as a percent of personal income are much higher in that state than the national average (Figure 8b). Property taxes as a proportion of personal income have declined in all three states since the early 1960s, but not as much as the national average.

The state corporate income tax rate should presumably have the most direct effect on business start-ups and expansions. Some studies have found the expected negative link between the corporate tax rate and various measures of growth in the manufacturing sector, at least for

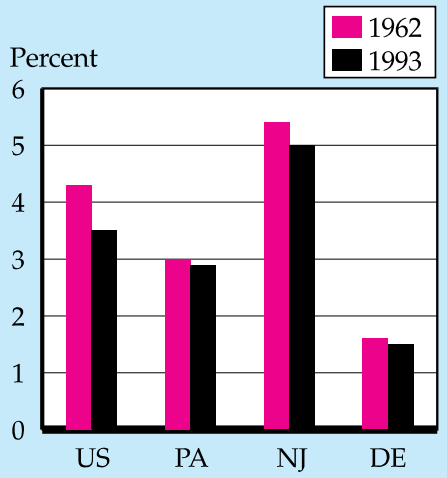
[17]A few recent studies have examined the effect of the sales tax on the manufacturing sector (Plaut and Pluta; Wasylenko and McGuire; and Bartik, 1989). Only Bartik found a statistically significant relationship and in only one of his two specifications.

FIGURE 8a
Total State and Local Taxes As Percent of Income



Source: Bureau of the Census and Bureau of Economic Analysis

FIGURE 8b
Property Taxes As Percent of Income



Source: Bureau of the Census and Bureau of Economic Analysis

some industries (see the articles by Newman; Bartik, 1985 and 1989; and de Bartolome and Spiegel). But a surprising number have not been able to establish a significant relationship (see the articles by Carlton; Plaut and Pluta; Wasylenko and McGuire; and Schmenner, Huber, and Cook). This failure may be due to the fact that the nominal tax rate is not always a good indicator of the effective tax rate. In recent years, the corporate tax rate has been a major concern of public officials in Pennsylvania. Before the rate was lowered in 1994, the state had the highest nominal corporate tax rate in the country (12.25 percent), and it still has one of the highest rates (9.99 percent).[18] As these rates would suggest, Pennsylvania's corporate tax revenues as a percent of gross state product are higher than the national average and higher than the other two states in the District (Figure 8c).

The mixed results from the empirical studies on the effects of specific state and local taxes on manufacturing are surprising in light of the theoretical appeal of the notion that firms avoid locating in high-tax states. Part of the problem in defining the effects of specific taxes is that the interaction among state, local, and federal taxes can produce very different effective tax rates than those stated in the law. Papke addressed this problem by calculating the total effective tax rate on capital for five manufacturing industries in 22 states. She found that, for two of the five industries, high tax rates did deter the formation of new firms, and she concluded not only that effective tax rates vary considerably by industry but also that they have different effects on different industries. According to Papke's calculations, Pennsylvania's effective tax rates on new investment were among the top five for each industry she examined in the 22 states. New Jersey's effective tax rates were near the middle or in the lower half for each industry in the 22 states.[19]

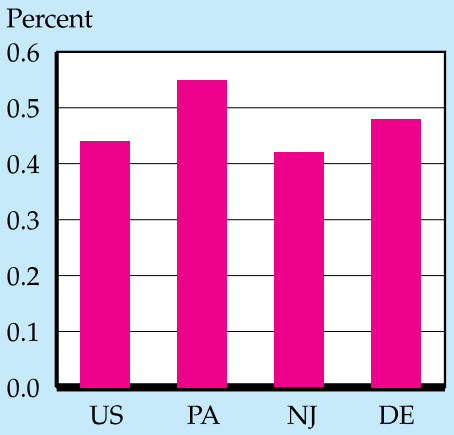
A second factor that may help explain the mixed results about the effect of taxes on manufacturing is that businesses also seem to value some of the public services that taxes pay for. Two recent studies that included public service expenditures in their estimations found that spending on education, health, and public

[18]Because of various provisions of the law, a relatively small proportion of firms (e.g., about 30 percent in 1991) have traditionally paid the tax. See "Business Tax Has Very Few Takers," *Philadelphia Inquirer,* May 1, 1994. The inability to carry forward losses from one tax year to the next, however, increased the burden of Pennsylvania's high corporate tax rate. This provision of the law has also been changed.

[19]Delaware was not included in Papke's sample of states. See Papke 1991a and 1991b.

FIGURE 8c

Corporate Income Tax As Percent of Gross State Product



Source: Bureau of Census and Bureau of Economic Analysis

Taxes are for fiscal year 1992-93.

Gross state product is for calendar year 1992.

safety attracts manufacturing business while welfare spending or transfer payments generally discourage manufacturing growth (see the articles by Bartik, 1989, and Mofidi and Stone). Once the public expenditures were taken into account, these two studies found the expected negative effect for overall taxes (Mofidi and Stone) and for corporate income and property taxes (Bartik, 1989). However, the effect of reducing taxes as an economic development strategy depends on the extent to which specific public services will be affected.

Although not a direct tax, *environmental regulations* impose a cost on many manufacturing industries. Yet when environmental regulations are mentioned in surveys of plant-location decisions, they do not rank high on the list of concerns (see the studies by Schmenner; Kieschnick; Hake, Ploch, and Fox; and Stafford). From his interviews and mail survey, Howard Stafford suggests that the ability to obtain permits in a timely fashion, rather than the cost of pollution abatement, is of primary importance to firms selecting a site for a new plant. Empirical estimates of the effect of environmental regulations on a state's manufacturing sector are limited, but they tend to agree with the survey results. Bartik, in his 1988 article, and Virginia McConnell and Robert Schwab in 1990 found little or no effect from environmental costs on the number of new plant openings in a state. Two later studies have found only modest effects of differential environmental costs on manufacturing employment (see the article by Kevin Duffy-Deno) or manufacturing investment (see the article by Gasper Garofalo and Devinder Malhotra). And some states and localities may be willing to forgo the added manufacturing activity for the health and safety benefits promised by stricter regulations.

WHITHER THE REGION'S MANUFACTURING SECTOR?

The tri-state region has been undergoing a transition from a heavily manufacturing-oriented economy. Except for some fluctuations over business cycles, employment growth since the 1960s has been limited to the nonmanufacturing industries. Moreover, the loss of manufacturing jobs has accelerated in recent years, and the pace of the region's economic transition has picked up.

The region became less competitive than other parts of the country for manufacturing owing to several factors identified in surveys and statistical studies as hindering manufacturing growth. Slower population growth has resulted in a less rapid expansion of markets in the tri-state region than in other parts of the country. Moreover, wages, benefits, and land costs tend to be higher than average in the region. These factors should continue reducing the tri-state region's dependence on manufacturing. Population in the three states is projected to continue to grow slowly, and the higher wages, benefits, and land costs in the region are largely determined by market forces.

Some recent policy changes, however, could aid the region's manufacturing sector. Planned deregulation should eventually narrow the gap between energy prices in the region and other parts of the country. Various tax rates have also been lowered in all three states in recent years. But the ultimate effect of these reductions will depend on how other states alter their tax rates. Just as there is no one explanation for the poor performance of the region's manufacturing sector in recent years, no single policy change is likely to reverse the trend. Moreover, policymakers have little or no control over some of the factors that have hindered the region's manufacturing growth.

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Regional Economies: Separating Trends from Cycles

*Gerald Carlino and Keith Sill**

The United States is made up of diverse regions that, although linked, respond differently to changing economic circumstances. Some regions react more strongly than others to nationwide forces, such as changes in monetary and fiscal policies, changes in relative prices, and technological innovations. Typically, the overall fluctuations in income and employment are used to gauge how regions respond during business cycles. One problem with this approach is that it assumes that the long-run trends in regional income or employment are constant.

Recently, many economists have adopted the view that trends also change during business cycles. The failure to remove the variable trends in regional income and employment may result in inaccurate measures of how regions respond during business cycles.

We used a new technique to distinguish business cycles from changes in trend for the eight major regions in the United States as defined by the Bureau of Economic Analysis (BEA). Our findings confirm that business cycles, as measured by the ups and downs in per capita income, do differ across regions. Despite these differences, our approach identifies a core group of regions that display very similar cyclical patterns. Only the Southwest region exhibits a very different cyclical pattern from the rest of the United States.

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TWO VIEWS OF BUSINESS CYCLES

Generally, business cycles are defined as common fluctuations of aggregate economic variables, such as personal income, employment, and output, around their trend values.[1] Until recently, economists held the traditional view that the changes in income and output that occur during business cycles are temporary events. However, many economists now believe that part of the change that occurs during business cycles is permanent.

Traditional View. Over time, a nation's or region's economy grows as its population increases, as firms acquire new plant and equipment, as new methods of production are introduced, and as the stock of human capital increases. This increased availability of resources allows a region's economy to produce more goods and services, resulting in an upward trend in income and output. The traditional view holds that trend growth is constant over time. Thus, over time, income and output move up in a completely predictable way.[2]

But the level of income is not always at its trend but fluctuates around its trend during business cycles. According to the traditional view, all changes in economic activity during the business cycle are temporary. After the national or regional economy recovers from a recession, it returns to the level of income and output that it would have achieved had the recession not occurred. Although recessions create short-run problems, they have no significant long-run effects on the nation or its regions.

New View. Recently, some economists have questioned the traditional view and suggested that some changes during business cycles may not be temporary. In a 1982 paper, Charles Nelson and Charles Plosser showed that some permanent change in output and employment results from unexpected shocks to the economy.[3] According to the new view, any change in income or output can be divided into two parts, the trend component and the cyclical component, neither of which is constant over time.

According to the new view, the trend is variable: economic shocks affect both short-run cycles and long-run trends. Because the trend varies in response to economic shocks, it can be permanently altered by shocks. The change in trend is permanent in that there is no natural mechanism that will return the economy to its previous trend following a shock. The economy would have to experience offsetting shocks for its trend to be unaffected—an unlikely event.

Many economists believe that a substantial fraction of the change in real income during the 1973-75 recession resulted from a change in the long-run trend. However, the 1973-75 recession was unusual in that it was associated with a fourfold increase in the price of oil. Declines in economic activity in recessions not associated with such severe oil-price shocks may have smaller effects on long-run trends. Nonetheless,

[1]The peaks and troughs of national business cycles are dated by the National Bureau of Economic Research (NBER) by considering the comovement in many different economic indicators, such as gross domestic product, industrial production, personal income, sales, employment, and unemployment. By looking at changes in a variety of economic variables, the NBER minimizes the chance of making an erroneous conclusion based on mismeasurement. Unfortunately, many of these indicators are not available on a monthly basis at the regional level. Therefore, it is not possible to date the peaks and troughs of business cycles at the regional level. Attempts have been made to identify business-cycle dates for some states (see the article by Ted Crone).

[2]The traditional view recognizes that trend growth can, and does, change over time. However, the forces that give rise to changes in trend growth are viewed as occurring very infrequently, i.e., at much longer intervals than a typical business cycle. See the paper by John Boschen and Leonard Mills for a more detailed discussion.

[3]Economists use the term shock to refer to unanticipated changes in variables. Examples include unanticipated changes in monetary and fiscal policy, extreme environmental conditions (particularly the weather in agricultural regions), and events that alter the world price of energy.

some portion of these declines may be permanent in that they are unlikely to be offset.

REGIONAL STUDIES BASED ON THE TRADITIONAL VIEW

Studies of regional business-cycle theory and measurement date from the early work of Glenn McLaughlin in 1930 and continue with the work of Rutledge Vining in the 1940s, George Borts in 1960, and Richard Syron in 1978. In 1980, Bruce Domazlicky surveyed much of this literature and concluded that "all of the early authors used fairly simple methodology...and... none of the studies was comprehensive as most were limited to a single state or a few selected cities." In addition, this research contains a notable shortcoming: the authors measure the impact of shocks region by region without accounting for feedback among regions. For example, shocks can directly affect the New England region, but because New England trades with the Mideast region, shocks that directly affect New England affect the Mideast indirectly and vice versa.

Recently, interest in regional business cycles has been renewed, and the authors of these new studies have employed vector autoregression (VAR) techniques. VAR, a statistical technique for examining interactions among variables, is widely used for gathering evidence on business-cycle dynamics. In a regional VAR, the representative variable for each region (e.g., personal income or employment) depends on its own past values as well as past values of the corresponding variable for all the other regions in the model. By considering the system as a whole, rather than one equation at a time, the researcher can trace the effects of a change in a particular region on all other regions. For example, if income growth in New England rises, income growth in all other regions will be affected, since developments in New England will eventually affect other regions. Moreover, after the initial effect, continuing feedback will occur in all other regions, with the subsequent effects becoming smaller and smaller.

Using VAR methods, Carolyn Sherwood-Call and Brian Cromwell have analyzed comovements in economic variables among selected states in the west.[4] Their goal was to explore the extent to which fluctuations in the growth of personal income (Sherwood-Call) and employment growth (Cromwell) in western states are driven by forces specific to a state or by comovement with California. They found that the economy of California has important spillover effects on other western states.[5]

In 1995, Gerald Carlino and Robert DeFina extended the work of Sherwood-Call and Cromwell by analyzing the linkages in per capita income growth among all U.S. regions. Their VAR included eight equations, one for real income growth in each region. For each equation, a region's real income growth depended on past values of its own and the other regions' real income growth. They found that a high degree of comovement exists among the U.S. regions and that the codependence is not limited to regions adjacent to each other.

While the papers by Sherwood-Call, Cromwell, and Carlino and DeFina take into account the interrelations among regions, the analysis in these papers looks at fluctuations in regional growth as opposed to business-cycle differences across regions.

REGIONAL BUSINESS CYCLES: THE NEW VIEW

Sorting Out Trends from Cycles. As discussed earlier, some economists believe that

[4]Comovement, or codependence, refers to fluctuations in national and regional incomes that are correlated and synchronous with each other.

[5]Some studies have focused more narrowly on specific metropolitan areas. A study by Ed Coulson and another by Ed Coulson and Steve Rushen use VAR models of the economies of the Philadelphia (Coulson) and Boston (Coulson and Rushen) metropolitan areas to quantify national, industry-specific, and local influences.

business cycles are fluctuations in aggregate income and output around a trend that grows at a constant rate. (Although there is no universally accepted trend growth rate among economists, many economists believe that the rate for the United States as a whole currently ranges between 2.0 to 2.5 percent per year in real terms, or between 1.0 and 1.5 percent per year in real per capita terms.) Other economists view the economy as one where shocks could affect both the trend and the cyclical component.

In a 1996 working paper, we took the latter view and examined the degree of cyclical and long-run comovement present in regional per capita income. We used per capita personal income rather than total income to control for differences in population growth among regions. In our study, we used quarterly data on real per capita personal income from 1948-93. A newly developed technique called common features analysis is used to look at the degree of short-run, or cyclical, and long-run, or trend, comovement among the eight regions defined by the BEA (see Appendix A for a breakdown of the regions).[6]

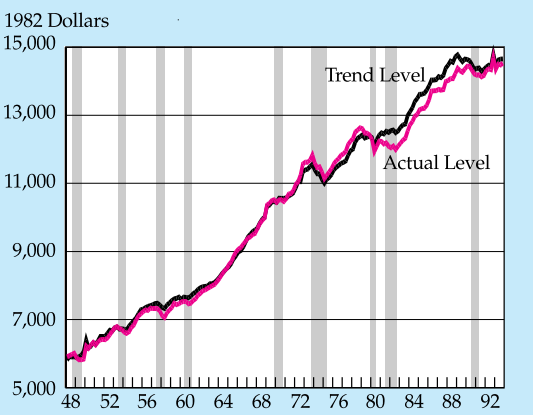
The percent change in the actual levels of regional real per capita incomes is broken down into estimated percent changes for both the trend and cyclical components for each of the nine postwar recessions (see Appendix B). The 1957-58 recession is an example in which both the cyclical and trend components generally declined for all regions. For instance, the decline in real per capita income of 3.7 percent in the Mideast region during the 1957-58 recession consists of a drop of 2.5 percent in the cyclical component and of 1.2 percent in the trend. But in some downturns, such as the 1948-49 recession, the trend components rose, which served to lessen the magnitude of the negative cyclical movement in real per capita incomes.

The trend and cycle components for the nation are weighted averages of trend and cycle estimates at the regional level. The regions' share of national real personal income are used as weights.[7] Figure 1 shows the actual level of real per capita income (black line) for the na-

[6]The common trends/common cycles approach is developed in papers by Farshid Vahid and Robert Engle, Robert Engle and Sharon Kozicki, and Robert Engle and João Issler. The common trends/common cycles approach assumes that the data under analysis are nonstationary and, therefore, contain stochastic trends. In a 1996 working paper, we tested regional per capita income data and found evidence for stochastic trends consistent with the new view that shocks to income can have permanent effects. In fact, we find that regional per capita incomes share common stochastic trends, called cointegration. Thus, over the long run, the growth paths of regional per capita incomes tend not to drift too far apart. In the short run, regional per capita incomes can and do diverge. However, our analysis finds similarities in this divergence, which are called common cycles.

[7]The trend and cyclical components for the nation were also computed as unweighted averages of the regional trend and cyclical estimates. We found very little differences between the weighted and unweighted versions. We used the weighted average versions in this article.

FIGURE 1
Actual and Trend Levels Of Real Per Capita Income
United States



tion and the estimated trend (color line). The deep recession of 1973-75 illustrates the potentially permanent effect of business-cycle fluctuations on real per capita income. Following the traditional view, we can imagine extending the trend line for the nation between 1948 and 1973 out to 1993. The permanent effect of the 1973-75 recession can now be seen. The level of per capita real personal income never returns to its earlier path after the 1973-75 recession. That is, for all future dates, the level of per capita income is below the level that would have been achieved had the 1973-75 recession not occurred.

The 1973-75 recession is of interest for several reasons. First, it was the most severe recession of the postwar period. With the exception of the Far West region, declines in real per capita income were larger in the 1973-75 recession than those in any other postwar recession. At the national level, real per capita income fell 6 percent during the 1973-75 recession, two-thirds greater than the drop of 3.6 percent in the 1957-58 recession, the second largest downturn of the postwar period. Second, a comparison of the trend and cyclical components indicates that the effects of the 1973-75 recession led to permanent declines in trend growth for all regions (details are in Appendix B). Like those for the nation, our estimates indicate that following the 1973-75 recession, per capita personal incomes at the regional level never returned to earlier trends.

Differences in Volatility of Cycles Across Regions. One measure used by economists to assess the severity of business-cycle fluctuations is volatility—the extent of the ups and downs in per capita income caused by business cycles. Using standard deviations we have summarized differences in the volatility of cycles across regions (Figure 2).[8] The first column reports the standard deviation of the regional cyclical components for 1948-93. The data reveal considerable differences among regions in the volatility of the cyclical components. For example, the cyclical component in the most volatile region (Great Lakes) is more than six times as great as that in the least volatile region (Far West). Business cycles in the New England, Mideast, Great Lakes, Plains, and Rocky Mountain regions tend to be more volatile than national cycles. The cyclical component in the Southeast, Southwest, and Far West regions tends to be less volatile than that of national cycles.

With the exception of the Rocky Mountain and Far West regions, the volatility of the cyclical component of regional per capita income dramatically increased after 1972. Specifically, volatility increased at least 50 percent in the New England, Great Lakes, Southeast, and

FIGURE 2
Volatility of Regional Business Cycles For Selected Years*

Region	1948-93	1948-72	1973-93
New England	2.0%	1.4%	2.5%
Mideast	2.8	2.0	3.3
Great Lakes	3.8	2.6	4.6
Plains	3.1	2.9	3.2
Southeast	1.3	0.8	1.6
Southwest	1.5	1.2	1.8
Rocky Mountain	2.0	2.1	1.8
Far West	0.6	0.6	0.6
United States	1.8	1.2	2.1

*Standard deviation of business-cycle component of quarterly per capita income

[8]The standard deviation is the positive square root of the variance and is commonly used to express dispersion. The variance is the mean squared deviation from the expected value. Recall that the trend in each region's per capita income has been removed so that the standard deviation of the detrended series measures the volatility of a region's business cycle.

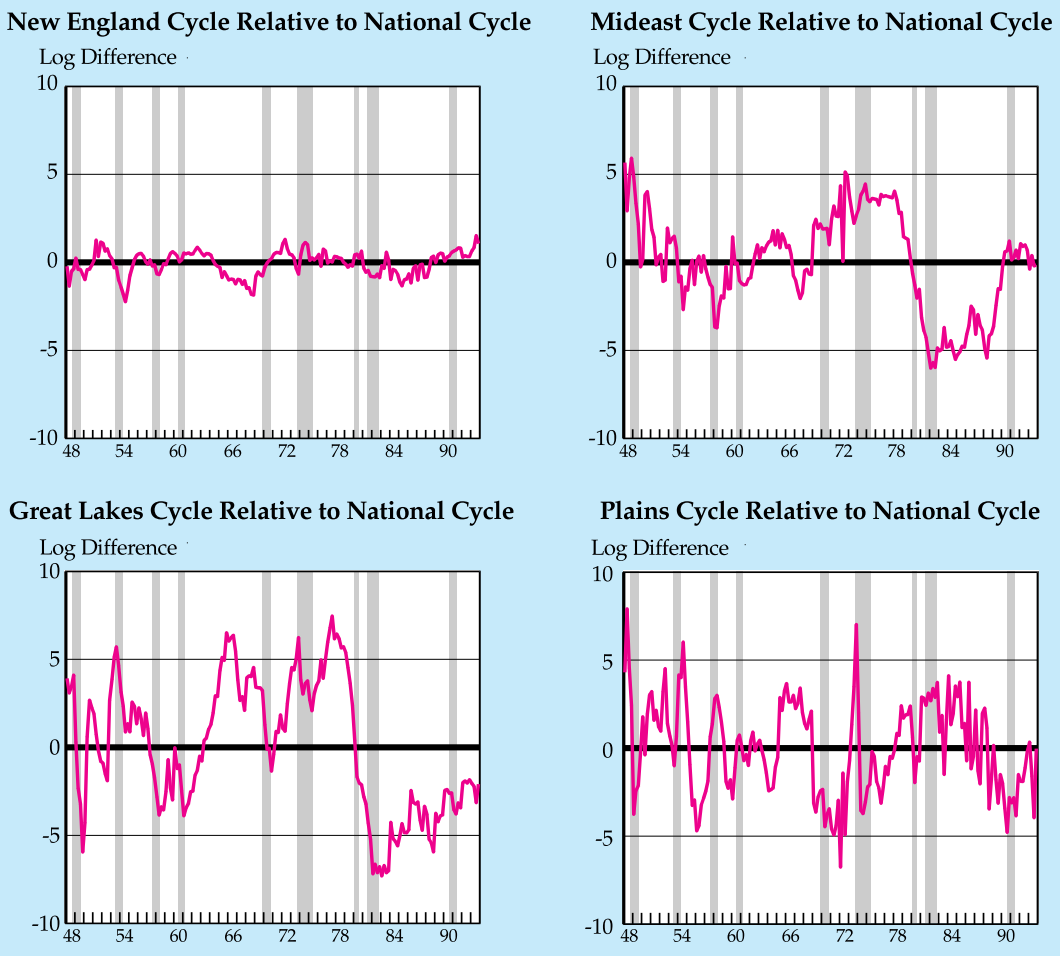
Southwest regions.[9] The increase in volatility after 1972 may be related to the adverse impact of the oil-price shock of 1979 and the back-to-back recessions of 1980-81 and 1981-82. In general, the largest cyclical declines in regional real per capita income occurred during this period.

In addition, we looked at the cyclical component of each region *relative* to the national cycle (Figure 3). If the amplitude and timing of a region's cycles are similar to those of national cycles, the relative graph should be close to zero over time. With the exception of the New En-

[9]Volatility of the cyclical component fell in the Rocky Mountain region and was unchanged in the Far West after 1972.

FIGURE 3

Relative Regional Cycles*



*Graphs show the logarithm of the ratio of cyclical components of per capita income in the region to the cyclical components in the nation

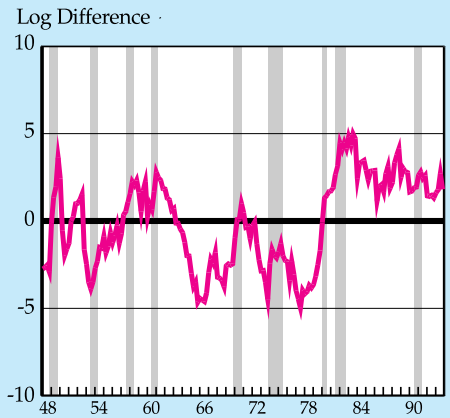
gland region, the graphs show a great deal of divergence from the national cyclical pattern. This divergence supports the view that not all regional economies are related to the national economy in the same way. The finding that the New England region diverges little from the national pattern during postwar cycles suggests that most of the differences between the actual performance of the New England region and the nation are driven by permanent differences in their long-term growth rates.

Similarities of Cycles Across Regions. In spite of the differences in the volatility of cycles across regions, we find a high degree of correlation among the cyclical components for many regions (Figure 4). Four of the eight regions

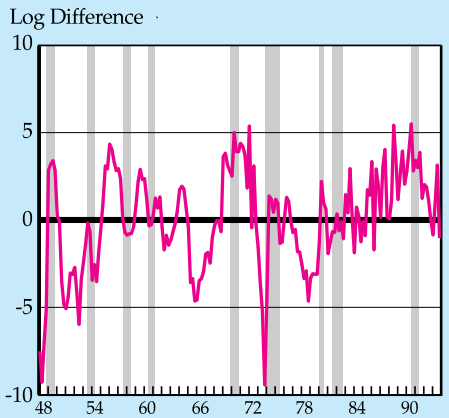
FIGURE 3 (continued)

Relative Regional Cycles*

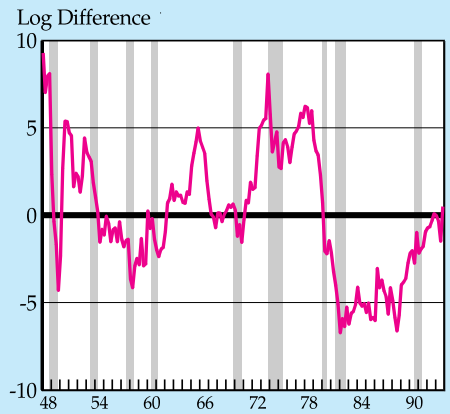
Southeast Cycle Relative to National Cycle



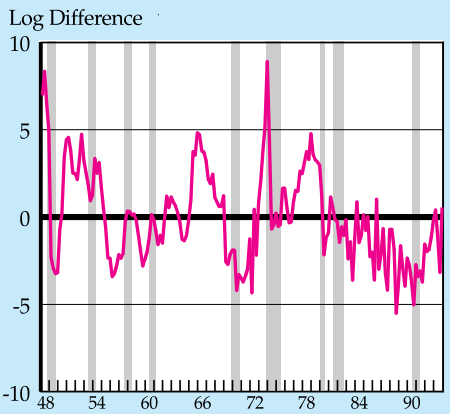
Southwest Cycle Relative to National Cycle



Rocky Mountain Cycle Relative to National Cycle



Far West Cycle Relative to National Cycle



*Graphs show the logarithm of the ratio of cyclical components of per capita income in the region to the cyclical components in the nation

FIGURE 4

Simple Correlations Among the Regional Cyclical Components

1948 - 93

	US	New England	Mideast	Great Lakes	Plains	Southeast	Southwest	Rocky Mt.
New England	0.9386							
Mideast	0.9333	0.9426						
Great Lakes	0.9606	0.8823	0.8183					
Plains	0.7265	0.5679	0.6103	0.6529				
Southeast	0.9600	0.8952	0.8239	0.9991	0.6320			
Southwest	-0.8933	-0.9694	-0.8686	-0.8393	-0.6469	-0.8517		
Rocky Mt.	0.5950	0.7215	0.6898	0.4274	0.6428	0.4377	-0.8218	
Far West	0.6877	0.6612	0.6935	0.7194	0.0639	0.7283	-0.4685	0.0011

(New England, Mideast, Great Lakes, and Southeast) have pairwise correlations that in every instance are greater than .80.[10] Moreover, the cyclical components in these four regions are highly correlated with the national cyclical component. The degree of correlation increases from about .93 for both the New England and Mideast regions to about .96 for both the Great Lakes and Southeast regions.

There is a moderate amount of correlation between the Plains and Rocky Mountain regions (correlation coefficient of .64). There is essentially no correlation of the Far West region with the Plains or Rocky Mountain regions.

The data also reveal a negative correlation between the Southwest region and the nation and all other regions as well. The negative correlation is probably related to James Hamilton's finding that all but one of the previous eight national recessions were preceded by an oil-price shock and that the fortunes of the energy-producing Southwest region are often opposite to those of the energy-consuming regions.

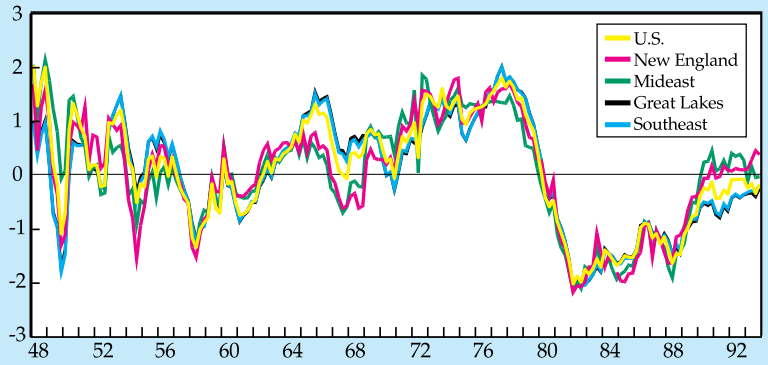
Finally, to control for differences in the amplitude of regional cycles and to provide an understanding of the commonality of the timing and duration of regional cycles, each region's cyclical component is divided by its standard deviation.[11] Figure 5 presents the standardized cyclical component of the regions along with the standardized cyclical component for the nation. Panel A shows the regions that have highly codependent cycles. We refer to this grouping as the core region. Not surprisingly, this grouping consists of the same four regions (New England, Mideast, Great Lakes, and Southeast) whose cyclical components were found to be highly correlated. While some differences still remain in the amplitude of the regional cycles, these regions appear to be similar with respect to turning points and the dura-

[10]The correlation coefficient measures the degree of association between two regions. It takes on values between -1 and +1. For example, a correlation coefficient of unity indicates perfect positive correlations between two regions, while a coefficient of negative one indicates perfect negative correlation. A correlation coefficient of zero indicates no association between regions. A relatively high correlation coefficient, such as .8 or .9, indicates a strong association between regions.

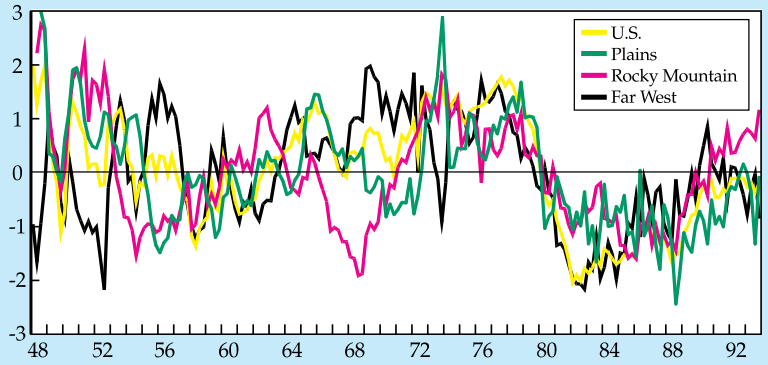
[11]Dividing each region's cyclical component by its standard deviation does not change the general cyclical pattern; it simply makes it easier to compare the commonality of turning points and the commonality in duration of regional cycles.

FIGURE 5

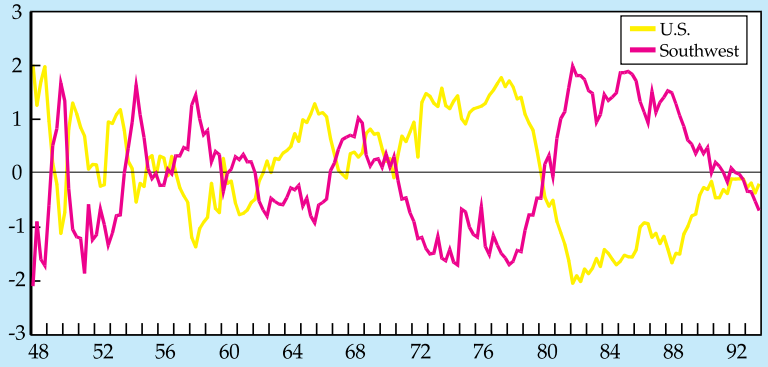
Panel A: Standardized Cyclical Component*



Panel B: Standardized Cyclical Component*



Panel C: Standardized Cyclical Component*



* Logarithm of a region's cycle divided by its standard deviation

tion of their cycles.

Panel B presents the standardized cyclical component for the Plains, Rocky Mountain, and Far West regions, where there is considerably less codependence of the cycles than among the core group. In addition, the timing of cycles also appears to differ for these regions relative to one another and relative to the nation.

Panel C shows the standardized cyclical component for the Southwest region. Cycles in this region are mostly the mirror image of national cycles. Per capita income in the Southwest appears to be countercyclical, moving in the opposite direction of national per capita income (up in national contractions, down in national expansions).

CONCLUSION

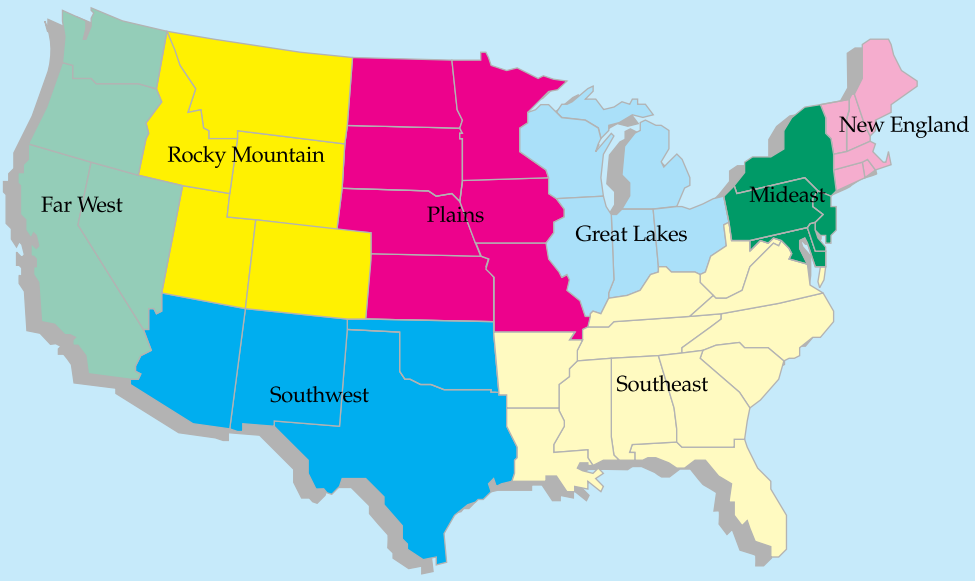
The national economy is a composite of diverse regional subeconomies. Similarly, national business cycles are amalgams of regional cycles. When we consider only national aggregates such as GDP, national income, employment, and in-

dustrial production, a large amount of detail about regional cycles is lost. This loss of regional detail may be unimportant if the divergence of regional cycles from national cycles is small, but often it is large. Large differences in business cycles across regions can make it difficult for national policymakers to bring about satisfactory outcomes in all parts of the country. Attempts at stimulating the economy during national recessions, for example, may lead to tight labor markets in some regions while others lag behind.

We used a new technique to distinguish business cycles from changes in trend. Business cycles as identified by this new technique show considerable divergence across regions. Our analysis reveals considerable differences in the volatility of regional cycles. Allowing for those differences, we find a great deal of comovement in the cyclical response of the core region (New England, Mideast, Great Lakes, and Southeast) and the nation. We find some evidence of comovement among the Plains, Rocky Mountain, and Far West regions and the nation, but to a much lesser extent than in the core. Finally, the cyclical response of the Southwest region is strongly negatively correlated with that of all the other regions and the nation.

In the 1980s, the terms "rolling recovery" and "bi-coastal recession" entered the business vocabulary. These terms suggest that the timing and perhaps the magnitude of ups and downs in economic activity vary across regions. The findings reported in this article not only support the view that business cycles differ across regions but point out that these differences have been present not just since the 1980s but rather for the entire postwar period. Nonetheless, there is enough commonality in their cyclical responses to identify a core group of regions.

APPENDIX A
Definitions of Regions



APPENDIX B
Percent Change in per Capita Income For the Postwar Recessions

Recessions	New England	Mideast	Great Lakes	Plains	South-east	South-west	Rocky Mt.	Far West	US
ACTUAL INCOME									
4Q48-4Q49	-1.3	-2.1	-6.9	-8.9	-2.7	7.5	-3.3	0.5	-2.9
3Q53-2Q54	-2.7	-2.0	-5.2	2.1	-2.6	0.5	-2.7	-1.8	-2.2
3Q57-2Q58	-3.3	-3.7	-6.0	-0.4	-1.8	-3.6	-4.4	-3.8	-3.6
2Q60-1Q61	0.5	-0.4	-2.2	0.7	-0.5	-0.6	0.0	0.0	-0.6
4Q69-4Q70	-0.5	-0.1	-3.1	-0.4	1.7	1.7	2.9	-1.5	-0.5
4Q73-1Q75	-5.7	-4.1	-7.2	-13.1	-6.7	-3.8	-7.1	-3.4	-6.0
1Q80-3Q80	-0.7	-0.9	-3.0	-2.8	-1.1	-0.8	-2.5	-1.6	-1.6
3Q81-4Q82	1.6	1.5	-2.4	0.4	-1.3	-1.9	-1.1	-1.8	-0.8
3Q90-1Q91	-1.5	-1.3	-1.3	0.6	-0.5	-0.3	1.4	-1.7	-0.9
TREND COMPONENT									
4Q48-4Q49	4.5	4.1	3.4	0.0	0.8	2.3	2.6	0.7	2.5
3Q53-2Q54	0.8	0.3	-0.3	-0.6	-0.8	-2.1	-1.3	-1.0	-0.4
3Q57-2Q58	-1.2	-1.2	-2.6	-0.3	-0.6	-5.1	-3.4	-3.2	-2.1
2Q60-1Q61	1.4	0.7	0.3	0.6	0.4	-1.0	-0.6	0.5	0.4
4Q69-4Q70	-0.0	1.1	0.5	1.8	2.9	1.6	1.7	-1.0	0.9
4Q73-1Q75	-5.5	-5.0	-4.5	-4.8	-5.9	-5.2	-4.5	-4.5	-5.0
1Q80-3Q80	0.6	0.5	-0.4	-0.3	-0.3	-2.1	-1.1	-1.6	-0.5
3Q81-4Q82	2.9	2.1	0.5	-0.3	-0.3	-2.8	-1.4	-1.4	0.1
3Q90-1Q91	-1.5	-0.8	-0.7	-0.5	-0.3	0.2	0.1	-1.3	-0.7
CYCLICAL COMPONENT									
4Q48-4Q49	-5.8	-6.2	-10.4	-8.9	-3.5	5.2	-5.9	-0.2	-5.5
3Q53-2Q54	-3.4	-2.3	-4.9	2.7	-1.8	2.6	-1.3	-0.8	-1.9
3Q57-2Q58	-2.2	-2.5	-3.4	-0.1	-1.2	1.5	-1.0	-0.6	-1.7
2Q60-1Q61	-0.9	-1.1	-2.5	0.1	-0.8	0.4	0.6	-0.5	-1.0
4Q69-4Q70	-0.5	-1.2	-3.6	-2.2	-1.1	0.1	1.2	-0.5	-1.5
4Q73-1Q75	-0.2	0.9	-2.7	-8.3	-0.8	1.4	-2.6	1.2	-1.0
1Q80-3Q80	-1.3	-1.4	-2.6	-2.5	-0.9	1.2	-1.4	-0.0	-1.1
3Q81-4Q82	-1.2	-0.6	-2.9	0.7	-1.0	0.9	0.2	-0.4	-0.8
3Q90-1Q91	0.0	-0.5	-0.6	1.1	-0.2	-0.5	1.3	-0.4	-0.2

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