FEDERAL RESERVE BANK OF CLEVELAND

'78

ANNUAL REPORT/ECONOMIC REVIEW

Contents

The *Economic Review* is published quarterly by the Research Department of the Federal Reserve Bank of Cleveland, Post Office Box 6387, Cleveland, Ohio 44101.

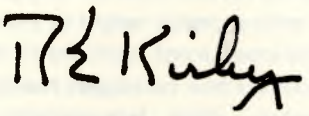
To Member Banks in the Fourth Federal Reserve District:

We are pleased to present the 1978 **Annual Report** *of the Federal Reserve Bank of Cleveland. This year's report traces the income growth and industrial change of the district since 1949.*

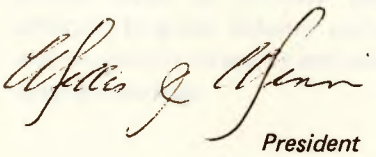
As part of the industrialized Midwest, the Fourth District is largely viewed as a manufacturing economy. National concerns such as rising inflation, oil and energy shortages, threats of recession, and controversies over wage and price controls, combine with local concerns over plant and mill closings and removals of national headquarters to present a picture of uncertainty about the direction of the regional economy. All of these areas indicate that an in-depth study of factors behind the apparent decline of the older industrialized areas is both appropriate and necessary. Remarks about outdated industrial equipment and changing consumer preferences do not provide an adequate explanation of the economy in transition; we must begin to look beyond the facile answers to the nature and causes of this economic change.

The study describes some aspects of the economic change in the Fourth District since World War II. Of particular concern is the nature of the employment growth change that has occurred in the past thirty years. Each industry is examined further to determine the underlying factors that contribute to its performance and relate it to the overall growth of the district. The results of this study show that although the Fourth District has clearly experienced slow growth, even, in some industries, negative growth, the economic environment of the region is far from total collapse. Strengths have also emerged—for example, chemicals and petroleum. Further analysis is necessary, but the study is a first attempt to seek answers to the hard questions concerning regional economic growth. As such, it gives rise to a more balanced view of the Fourth District economy; where it has been and where it is going.

We take this opportunity to thank the member banks, the directors and officers, and the bank personnel for their support which allowed us to meet our commitments for 1978. We look forward to your continued assistance and cooperation in meeting the responsibilities of the bank in the future.



Chairman of the Board



President

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page 10 — The numbers 11 through 99 under **Manufacturing, Durable Goods** should read 1 through 9.

page 13 — In the heading **Structural and Competitive Effects Combined: Selected Ohio Industrued,** substitute **"Industries"** for the final word.

page 21 — In the notation below the table,
e = concentration of private nonagricultural employment in Ohio...should read
e* = concentration of private nonagricultural employment in Ohio...

INCOME GROWTH AND INDUSTRIAL CHANGE IN THE FOURTH DISTRICT

Roger H. Hinderliter
Robert H. Schnorbus

The Fourth District economy is primarily a manufacturing community--a part of the industrial heartland of the United States stretching from the east coast through the Midwest. The region's present economic role as a center of heavy manufacturing evolved over many years. Past industrial expansion created large interrelated complexes in steel, fabricated metals, machinery, and other industries, and placed the District among the highest income producers and largest employers in the nation. However, in the older industrialized regions of the country, including the Fourth District, the economic transition since World War II must be sketched in terms of relatively slower income growth and a relative loss of industry and employment. The resulting loss of income and jobs from recent mill closings in Youngstown, plant closings in Akron, and transfers of headquarters from Cleveland are symptomatic of the trend of post-war economic events in the Fourth District.

Many factors underlie the post-war patterns of income growth and industrial change. Slower growth in the industrialized regions has been attributed to such influences as higher wages, greater unionization of the labor force, more stringent government regulation and taxation, loss of entrepreneurial skills, unfavorable weather, and environmental and social decay.[1] Although the determinants of regional economic activity remain controversial, it is clear that income growth is related to industrial change. Long-run shifts of resources among industries, which alter the industrial composition of regions, are a primary channel through which income growth patterns are shaped. These shifts take place in a historical context. Regions have not developed at equal rates in the past, and regions that are now growing slowly were growing more rapidly 50 or 100 years ago. Long-run tendencies, however, must be expected to narrow discrepancies that have emerged among regions. In terms of income growth patterns, narrower discrepancies result as regional per capita incomes converge to a norm or average set by the national economy.[2]

This report describes the nature of income growth and industrial change in the Fourth District during the post-World War II period. In the next section, income growth patterns are examined for the District states. Personal and per capita income growth in Kentucky, Ohio, Pennsylvania, and West Virginia is compared to national patterns. Per capita income in Kentucky and West Virginia, which were slower to industrialize and move away from agricultural and mineral resource dependence, increased relative to the national average, while per capita income in Ohio and Pennsylvania fell. Following this, the relationship between income growth and industrial change is outlined. Then, industrial change, as measured by employment growth rates, is examined for 31 Ohio industries (or industry groups) which were selected as a case study. General trends of industrial change consistent with Ohio's relatively slow income growth are apparent, but some industries perform counter to the trends. To understand the diversity of industrial change more clearly, growth rates of the selected Ohio industries are broken down to indicate the forces affecting long-run industry performance and to identify strengths and weaknesses among industries.

[1] A discussion of possible determinants of regional economic growth and alternative models for measuring their effects is contained in Harry W. Richardson's, "Empirical Aspects of Regional Growth in the United States," *The Annals of Regional Science* (June 1974).

[2] Convergence over the longer term is a widely accepted hypothesis of regional economic behavior. A good discussion of long-term convergent income growth that highlights the issues involved may be found in Harry W. Richardson's *Regional Economics* (New York: Prager Publishers, 1969), pp. 347-357. The search for convergent growth has been a major theme in many past studies of regional economies. Two important studies that link income growth and industrial change are: Harvey S. Perloff et al., *Regions, Resources and Economic Growth* (Baltimore: The Johns Hopkins Press, 1960); and George H. Borts and Jerome L. Stein, *Economic Growth in a Free Market* (New York: Columbia University Press, 1964).

Post-War Income Growth in Fourth District States

In early periods of economic development, the availability of natural resources heavily influenced the location of economic activity in District states. Such natural advantages as water transportation networks stretching from the Great Lakes and the Ohio River Valley, abundant farm lands, and mineral deposits were important to the formation of early industries. Often, the locating industry was technologically tied to the resource, as with mines and farms, and costs were frequently minimized by locating the industry in the resource area, as with sawmills and iron works. As District states grew, their locational advantages offered favorable profit opportunities that attracted capital from the East and abroad to invest in the transport, processing, and service facilities needed to develop local resources. The exploitation of these resources laid the groundwork for the later formation of heavy manufacturing industries in the nineteenth and early twentieth centuries.[3]

In states such as Ohio and Pennsylvania, where resources were abundant, early economic growth was rapid. Reinforcements through transportation improvements and market expansion sustained this growth for many years. Growth processes, however, involve many elements that influence regional economic activity--investment and employment incentives, product demand and distribution, technological progress, and resource cost and availability. These elements exert long-term influences on the mobility of productive factors (labor and capital), the diffusion of technology, and other equilibrating forces of the market economy that ultimately contribute to a narrowing of regional economic discrepancies. As these discrepancies between states narrow, income patterns tend to converge to an average which is representative of the national economy. By the beginning of the post-World War II period, the cumulative effects of development in Ohio and Pennsylvania had produced relatively high per capita incomes. Kentucky and West Virginia shared in the historical development to some extent but, in general, were slower than their larger neighbors to move away from primary product (land or resource) dependence. The tendency for regional incomes to converge was already apparent, indeed relatively fast growth in Ohio and Pennsylvania probably ended in the 1920's, when their share of personal income relative to the nation as a whole reached a peak.

Since 1949, personal income in each of the District states has risen, but the states' combined share of total personal income in the United States has steadily declined from 15.1 percent in 1949 to 12.6 percent in 1977 (**Table 1, section A**). Although Pennsylvania experienced the most severe relative decline, income growth rates in Ohio and West Virginia were also below the national average, thus reducing the income shares of these states. Only Kentucky, with a strong surge of growth between 1963 and 1977, increased its share of personal income over the entire post-war period. Thus, personal income in Ohio and Pennsylvania for 1977 represented about

[3]**The interdependent elements important to economic growth in District states form an interesting but highly detailed economic history. For some elaboration, see: Roger H. Hinderliter, "The Origins of Commercial Banking in the Fourth Federal Reserve District," Federal Reserve Bank of Cleveland,** *Economic Review/Annual Report* **(1976). An illustration of the complexity of growth processes as they appeared to work in District states is provided by railroads. An important source of investment and growth themselves, railroads extended market access for a variety of goods produced in District states. The growing demand for rails directly increased the demand for iron and steel products and was an incentive for assimilating available technology within the primary metals industry. In addition, linkages were extended to such other industries important in District states as machinery and fabricated metal products. See: Peter Temin,** *Causal Factors in American Economic Growth in the Nineteenth Century* **(London: MacMillan Press, 1975), pp. 42-43; and for developments relevant to the District, Louis C. Hunter, "Influence of the Market upon Technique in the Iron Industry in Western Pennsylvania up to 1860,"** *Journal of Economic and Business History* **(I:1928-1929).**

TABLE 1
Income in the District States in the Post-War Period*

	1949		1963		1977	
	(billions) Current $	% of U.S.	(billions) Current $	% of U.S.	(billions) Current $	% of U.S.
A. Total Personal Income						
United States	205.8	--	465.2	--	1,530.8	--
Kentucky	2.7	1.3	5.8	1.2	21.0	1.4
Ohio	11.7	5.7	25.4	5.5	76.6	5.0
Pennsylvania	14.6	7.1	28.2	6.1	84.1	5.5
West Virginia	2.0	1.0	3.3	0.7	10.8	0.7
Fourth District Total	31.0	15.1	62.7	13.5	192.5	12.6
B. Manufacturing Wages and Salaries						
United States	44.6	--	100.6	--	266.3	--
Kentucky	0.4	0.9	1.0	1.0	3.5	1.3
Ohio	3.7	8.3	8.1	8.1	20.6	7.7
Pennsylvania	4.3	9.6	8.0	8.0	18.3	6.9
West Virginia	0.4	0.9	0.8	0.8	1.8	0.7
Fourth District Total	8.8	19.7	17.9	17.9	44.2	16.6
C. Per Capita Personal Income						
United States	1,378	--	2,468	--	7,077	--
Kentucky	943	68	1,863	75	6,050	85
Ohio	1,475	107	2,545	103	7,157	101
Pennsylvania	1,403	102	2,468	100	7,132	101
West Virginia	1,032	75	1,835	74	5,825	82
Fourth District Average	1,342	97	2,384	97	6,900	97

Source: See Appendix

***The Fourth District includes the state of Ohio and 56 counties in western Kentucky, 19 counties in western Pennsylvania and 6 counties in the panhandle of West Virginia. Income data are, however, for complete states.**

The Relationship Between Income Growth and Industrial Change

5.0 and 5.5 percent, respectively, of the U. S. total, down from the 1949 proportions of 5.7 and 7.1 percent. West Virginia's share over the period fell to 0.7 percent from 1.0 percent, while Kentucky's share rose slightly to 1.4 percent in 1977 from 1.3 percent in 1949.

A similar pattern is indicated by manufacturing wage and salary data (**Table 1, section B**). Again, the evidence shows a steady decline in shares in the combined states, with the largest slippage occurring in Pennsylvania. Kentucky clearly benefited from growth in the manufacturing sector. Measured by the manufacturing wage bill, Ohio surpassed Pennsylvania in size, though Ohio's share of U. S. wages and salaries in manufacturing also declined from 1949. West Virginia, unlike Kentucky, did not generate growth through the manufacturing sector.

To the extent that growth of absolute income does not reflect a narrowing of regional economic discrepancies, population movements provide an alternative adjustment. Thus, per capita income is an indicator that captures the propensity for absolute incomes to converge and for populations to shift among regions in search of more rewarding opportunities (**Table 1, section C**). Convergence of per capita incomes is indicated if state-to-national per capita income ratios approach unity. Between 1949 and 1977, both Kentucky and West Virginia approached unity from below, while Ohio and Pennsylvania approached it from above. West Virginia's population was virtually stable over the entire period, thus offsetting its slow growth of absolute income.

Income growth evidence from the District states is fully consistent with the convergence hypothesis of long-term regional economic development. The pattern of per capita income growth over the post-war period shows that all four states have drawn closer to the average per capita income in the national economy. These income growth patterns are linked to changes in the industrial makeup of the states.

Two basic views of industrial change and its impact on regional income growth can be identified. According to one view, a regional economy progresses from a near-subsistence level of economic activity, dependent on production of primary products, to higher standards of living through increased employment in manufacturing and later through shifts into services, finance and related activities. The gradual evolution of the industrial composition of the regional economy raises income through the potential for larger and more rapidly growing markets and a more efficient allocation of resources.[4] Although all regions are expected to pass through the same sequence, regions may differ at any given time in their cumulative development and in their rate of progress through the various stages.

Another view, derived from industrial location theory, emphasizes specialization in production at an early date in a region's development. Specialization implies that a region devotes large amounts of resources toward the production of "export" goods, and the industries that emerge from specialization form an export base which becomes the sustaining force behind long-term growth. Regions differ initially by the amount and quality of their natural resources that support economic activity and by the extent to which those advantages contribute to specialization. Over time, as natural advantages are exploited, specialization in export industries is reinforced by growth of the market for exported goods, additions of infrastructure, and economies of scale in the production of regional exports.[5]

Despite their differing historical perspectives, these two approaches are not mutually exclusive views of regional economic development.[6] Together, they identify key interrelated elements that link relative income growth and measures

[4] In "higher stages" of development, economic activity is more widely diversified and productivity gains are associated with increased labor skills and accumulation of physical capital. Moreover, it is generally true that the potential for market growth is greater in manufacturing and service activities than in agricultural commodities or other primary products. For an expanded treatment of this topic, see: Edgar M. Hoover and Joseph L. Fisher, "Research in Regional Economic Growth," in *Problems in the Study of Economic Growth* (New York: National Bureau of Economic Research, 1949), pp. 180-188.

[5] Gains in regional economic activity are therefore associated with benefits of large scale production. As the industries in which a region is specialized expand, other activities are attracted in support of the export base. Labor and capital growth are thus spread over a broader set of industries. See: Douglass C. North, "Location Theory and Economic Growth," *Journal of Political Economy* (June 1955), pp. 251-256.

[6] For a synthesis of these approaches to regional growth, see: J. C. Stabler, "Exports and Evolution: The Process of Regional Change," *Land Economics* (February 1968).

Industrial Change: Employment Growth Rates of Ohio Industries

of industrial change. In the first view, industrial change is accomplished through internal employment shifts, that is, relative changes in the **distribution** of employment among industries within a region. The rise of manufacturing relative to agriculture and, more recently, shifts to service-type activities typify this distributional change. Such rearrangements are accompanied by more efficient allocation of resources and are thus an important influence on regional income growth.

In the second view, industrial change is accomplished through external employment shifts among regions, that is, through changes in the **concentration** of employment in one region relative to other regions or to the nation as a whole. In a region where particular industries are growing faster (or slower) than is typical for those industries in the national economy, the concentration of employment is rising (or falling). Because large concentrations of employment signify areas of specialization where a region is likely to produce for export as well as for its own consumption, changes in concentration reflect changes in a region's export base and, consequently, changes in the flow of export income.[7]

Income growth is associated with a variety of cumulative effects that alter the distribution or concentration of employment within a region. To illustrate the details of industrial change that underlie the broad patterns of income growth, Ohio, the only state completely enclosed in the Fourth District, is used as a case study.

By 1949, more than 6 percent of the nation's private nonagricultural jobs were located in Ohio (see **Appendix, Table A-1**). The distribution of employment was almost evenly split between manufacturing and nonmanufacturing activities, but it was in manufacturing that large concentrations of employment and important areas of specialization had developed. The rubber industry provided about 3 percent of Ohio jobs, a smaller distribution than several other manufacturing and nonmanufacturing industries in the state, but more than 25 percent of all U. S. rubber industry jobs were located in Ohio. Thus, in 1949, Ohio was specialized to a high degree in rubber. A high degree of specialization also existed in stone/clay/glass, primary and fabricated metals, nonelectrical machinery and electrical equipment; all with employment concentrations exceeding 10 percent. Other manufacturing industries--furniture, transportation equipment, paper and printing/publishing--though less prominent, were also constituents of the export base. With the exception of railroads, no specialization in nonmanufacturing had developed.

If employment in all Ohio industries grew at the same rate as employment in the national economy, the distribution and concentration of employment would not change. Like the Red Queen in *Through the Looking Glass*, each Ohio industry must grow at the rate set by the national average of all industries just to maintain relative employment positions. Faster (or slower) growth implies a relative shift of jobs toward (or away from) Ohio and changes industrial composition in the state. Of course, few industries exactly match national growth.

Deviations from the national average may be associated with two types of events. First, some industries in Ohio and elsewhere may participate in a general flow toward or away from the output of those industries. These "structural" effects relate to changes in the supply and demand mix in the national economy that affects industries differently. On the supply side, changing technology could benefit some industries relative to all others, while on the demand side, something as simple as changing consumer tastes could unevenly affect industry growth prospects. Structural effects thus pull Ohio industries along in the wake of national economic movements and, in the process, alter the distribution of employment in the state.

Secondly, deviations from the national average rate of employment growth are produced by different growth rates in Ohio industries relative to the same industries located elsewhere. These "competitive" effects relate to such factors as

[7] **A region that is relatively large, like Ohio and Pennsylvania among Fourth District states, will generally have large concentrations of employment in many industries simply because of absolute size. Whether these concentrations are significant in an export-generating sense is another matter. Measures of specialization are therefore evaluated against a standard of "self-sufficiency" to determine export capacity. It is assumed that in any industry a self-sufficient region will have a concentration of employment equal to the proportional size of the region in the national economy and export industries will exceed this standard.**

differences in production costs, the ability to assimilate available technology, and local market demand. The primary metals industry, for example, could expand faster (or slower) in Ohio than primary metals in the nation and the state's economy would therefore be better (or worse) off as a result of its relative own industry growth, regardless of the overall condition of metals. Competitive effects thus measure regional differences in individual industries' performance, and, in their simplest form, alter both the distribution and concentration of employment.

Viewed in this manner, employment growth rates in Ohio industries contain three pieces of information--the performance of an industry relative to the national standard, and the structural component and competitive component of that performance.[8] Individually, the structural and competitive components may be either positive or negative. However, if observed growth in any industry is just equal to national growth, the structural and competitive components must sum to zero. If an industry is growing faster than the national rate, structural and competitive components must sum to a positive number, while adjusted growth less than the national rate requires a negative sum (see **Inset**).

Employment growth rates of Ohio industries are shown in **Chart 1** (see pp. 10-11) for two post-war subperiods, 1949-1963 and 1963-1977.[9] The rate of growth of total (U. S.) private nonagricultural employment during these periods is taken as the national growth component and serves as the standard of comparison for Ohio industries. The strength of an industry's growth relative to the national standard is indicated by the position of an industry relative to the dotted diagonal lines (135 degree), three of which are labeled in **Chart 1** for reference. Industries on any common diagonal (e.g., paper and printing/publishing in 1949-1963, or services and bituminous coal mining in 1963-1977) have the same growth rate. The structural component is measured by the vertical distance from the origin and the competitive component by the horizontal distance. Thus, for example, industries located in the upper right-hand quadrant of the Chart are characterized by a faster growth rate than the national economy, and both the structural and competitive components make positive contributions to the performance.

The 31 Ohio industries that are plotted on **Chart 1** fall into three classifications: about an equal number in each subperiod matched or surpassed the national growth rate; experienced zero or negative growth; and fell onto the middle ground between zero growth and the expansion rate of the national economy. As would probably be expected, the economic problems that Ohio encountered after World War II do not appear as a uniform decline in industrial capability. Some industries have accomplished much in terms of expanding employment opportunities. In 1949-1963, for example, banking, other finance, and transportation equipment were especially robust growth industries, and in 1963-1977, services and bituminous coal mining were prominent growth industries.

[8] **This analysis, referred to as "shift/share," is descriptive rather than determinative, but it does present a comparative framework for measuring industry performance. The technique adopted in this study is the classical form introduced by Perloff, et al., *Regions, Resources and Economic Growth*. In this form, competitive components are gross effects in the sense that they alter both the distribution and concentration of employment. Extensions of the analysis proposed by J. M. Esteban-Marguillas, "A Reinterpretation of Shift/Share Analysis," *Regional and Urban Economics* (August 1972) and examined further by Henry W. Herzog, Jr. and Richard J. Olsen, "Shift-Share Analysis Revisited: The Allocation Effect and the Stability of Regional Structures," *Journal of Regional Science* (December 1977), suggest "normalization procedures" that would reduce competitive effects to a net impact on concentration. Because the separate net effects on distribution and concentration are less important here than the overall compositional changes, the simple framework was adopted.**

[9] **The value of any growth rate depends on the base selected for computing the percentage change. The values shown in Chart 1 and used hereafter are an average of rates computed from the initial period and rates computed from the terminal period.**

INSET
A Technique of Regional Industry Analysis

The employment growth rate of any industry in a region can be decomposed into three parts: the national growth component, the structural component and the competitive component.

The **national growth component** is the rate of growth in total (U. S.) employment. This captures the influence of the larger economy and serves as the standard of comparison.

The **structural component** is the rate of employment growth for an industry in the nation as a whole, minus the national growth component. This captures the influence of shifts within the national economy (e.g., from manufacturing industries to nonmanufacturing industries).

The **competitive component** is the difference between the rate of employment growth in a region's industry and the growth for that industry in the nation as a whole. This captures the extent to which a regional industry enjoys an advantage (or suffers a disadvantage) relative to the same industry outside the region, thus experiencing faster (or slower) growth than is characteristic of the industry in general.

Algebraically, an observed rate of employment growth in any industry within a region (g_i) may be represented as an identity-- the sum of the national growth component (g_n), structural component (g_s), and competitive component (g_c):

$$g_i = g_n + g_s + g_c$$

To focus on the contributions of the structural and competitive components of industry growth, the identity may be slightly rearranged:

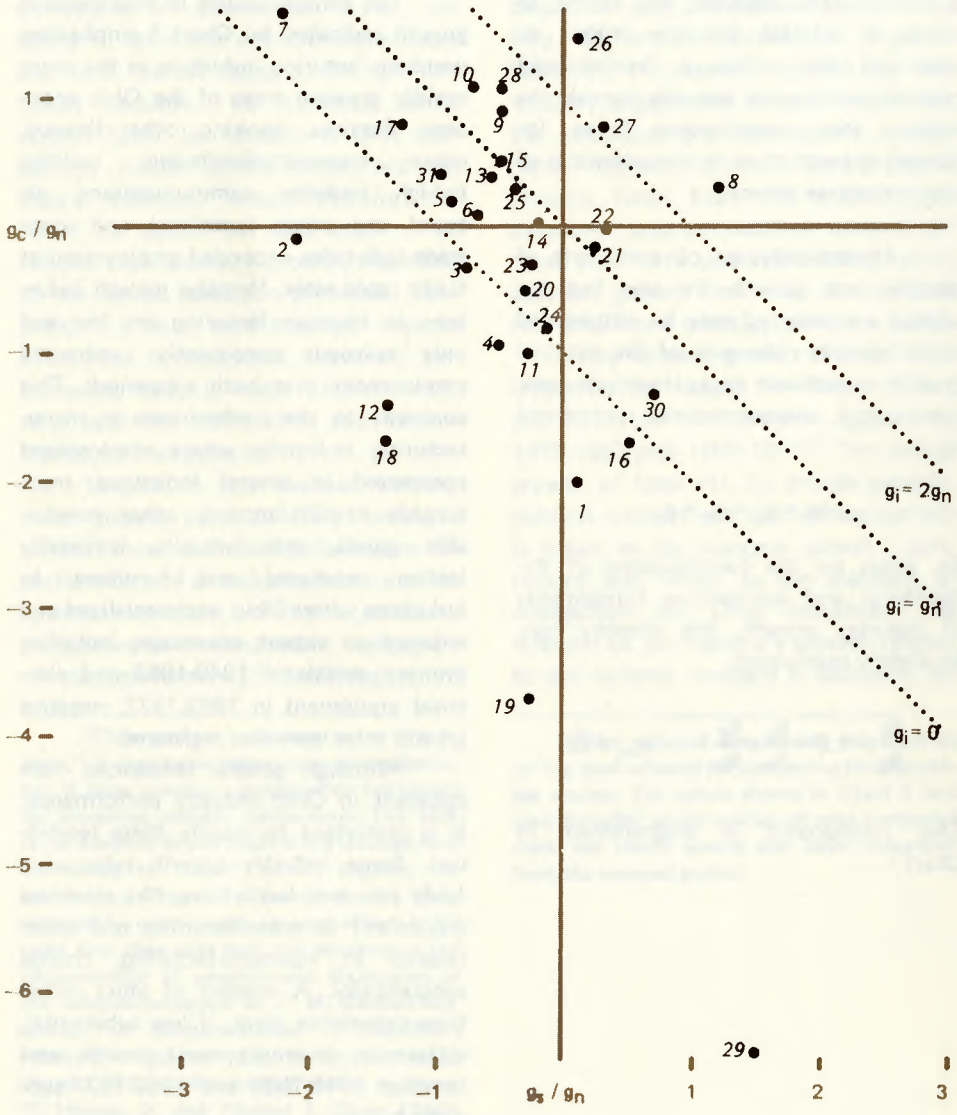
$$\frac{g_i}{g_n} - 1.0 = \frac{g_s}{g_n} + \frac{g_c}{g_n} \qquad (g_n > 0)$$

This relationship is diagrammed in Chart 1.

The general course of employment growth indicated by **Chart 1** emphasizes nonmanufacturing industries as the more rapidly growing areas of the Ohio economy. Services, banking, other finance, other transportation/public utilities (which includes communications, air travel and other functions) and some trade industries expanded employment at fairly rapid rates. Negative growth industries in nonmanufacturing are few and only railroads consistently contracted employment over both subperiods. This contrasts to the performance in manufacturing industries where employment contracted in several industries, most notably textiles/apparel, other nondurable goods, manufacturing (primarily leather products) and furniture. In industries where Ohio was specialized and enjoyed an export advantage, including primary metals in 1949-1963 and electrical equipment in 1963-1977, negative growth rates were also registered.

Although general tendencies are apparent in Ohio industry performance, it is important to qualify these tendencies. Some industry growth rates were fairly constant but others, like electrical equipment in manufacturing and other finance in nonmanufacturing, change substantially. A number of other industries experience clear, if less substantial, differences in employment growth rates between 1949-1963 and 1963-1977 subperiods.

CHART 1
Industry Growth Rates in Ohio



1949–1963
g_n = 1.62 % per year

Manufacturing

Durable Goods

11. Lumber/wood products
22. Furniture
33. Stone/clay/glass
44. Primary metals
55. Fabricated metals
66. Nonelectrical machinery
77. Electrical equipment/supplies
88. Transportation equipment
99. Instruments
10. Other durable goods

Nondurable Goods

11. Food
12. Textile/apparel
13. Paper
14. Printing/publishing
15. Chemicals
16. Petroleum
17. Rubber
18. Other nondurable goods

Nonmanufacturing

Transportation/Public Utilities

19. Railroads
20. Electricity/gas/sanitary services
21. Other transportation/public utilities

Trade

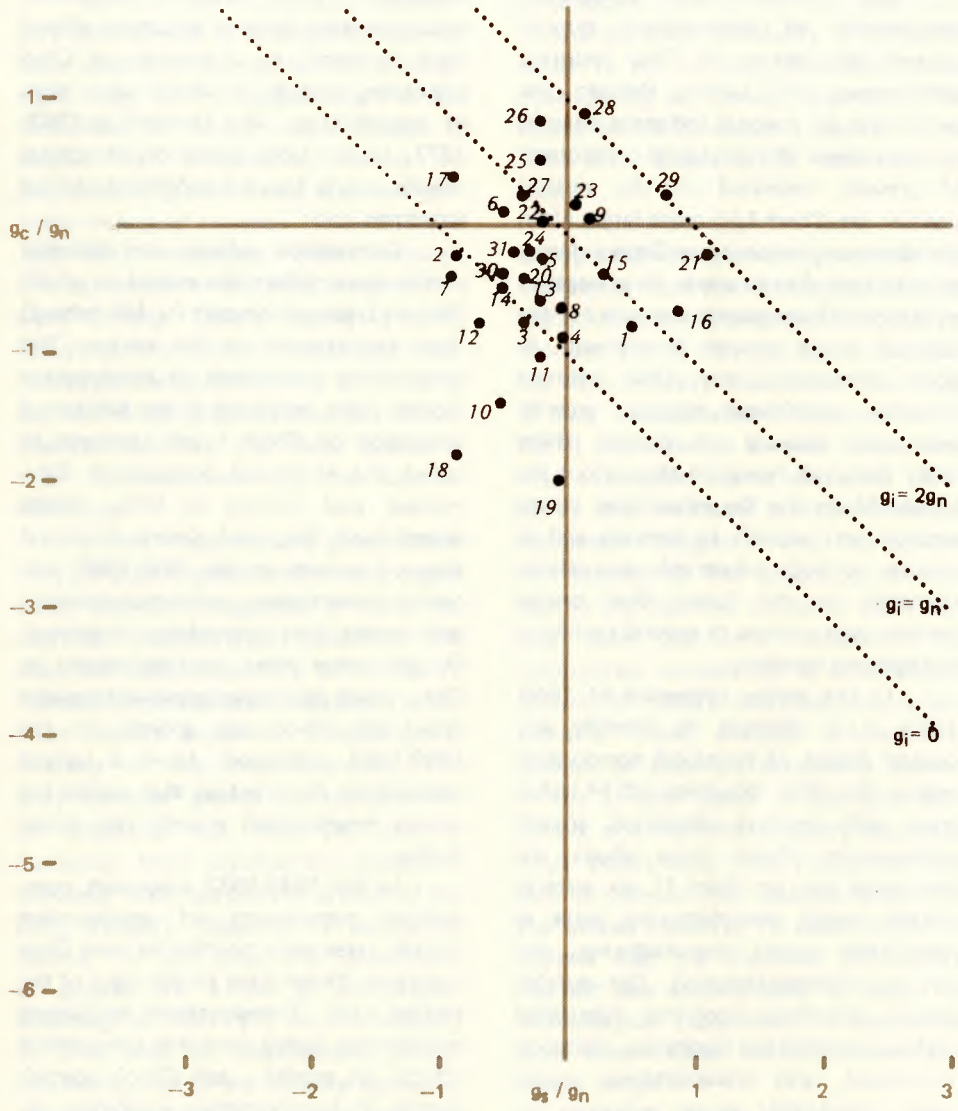
22. Wholesale
23. General merchandise retail
24. Apparel retail
25. Other retail

Finance/Services

26. Banking
27. Other finance
28. Services

Mining/Construction

29. Bituminous coal mining
30. Other mining
31. Construction



1963–1977
g_n = 2.50 % per year

Key:

g_i = Industry growth rates
g_n = National growth component
g_s = Structural component
g_c = Competitive component

$$\frac{g_i}{g_n} - 1.0 = \frac{g_s}{g_n} + \frac{g_c}{g_n}$$

Source: See Appendix

Structural and Competitive Components of Ohio Industry Growth

The structural and competitive components of employment growth expand the picture of Ohio industry performance and further sharpen the perspective on regional industrial change. In some cases, the structural component of growth, indicated by the vertical position on **Chart 1**, is quite large, often the dominant influence on Ohio industry performance. For example, large negative structural effects clearly account for the lack of overall growth in railroads. In both subperiods, the Ohio railroad industry experienced negative growth, essentially because of general shifts away from rail transport throughout the United States. On the other hand, strong employment growth in banking and in services in both subperiods was related primarily to the forces that caused banking and services to expand rapidly in the national economy.

In the earlier subperiod of 1949-1963, it is difficult to identify any general model of structural components among the Ohio industries. Of 14 industries with positive structural growth components (those lying above the horizontal axis on **Chart 1**), six were in durable goods manufacturing, three in nondurable goods manufacturing, and five in nonmanufacturing. The durable goods industries included fabricated metals, nonelectrical machinery, electrical equipment, and transportation equipment; nondurable goods industries included rubber. All of these industries were among the areas of Ohio's export specialization in 1949. In the earlier subperiod, then, national economic events working through structural effects were favorable to a number of Ohio industries, several of which were areas of specialization. This changed in 1963-1977. In the later subperiod, structural effects clearly favored nonmanufacturing industries.

Competitive effects on industry performance reflect the extent to which Ohio industries outpaced (or fell behind) their counterparts in the nation. The competitive component of employment growth rates, measured in the horizontal dimension on **Chart 1**, can reinforce or offset the structural component. Bituminous coal mining in Ohio, which experienced the most severe structural drag on growth in the 1949-1963 subperiod, nevertheless performed considerably better than coal mining in general. On the other hand, textiles/apparel in Ohio, which also experienced unfavorable structural effects on growth in the 1949-1963 subperiod, faced a serious competitive disadvantage that pulled the overall employment growth rate down further.

In the 1949-1963 subperiod, competitive components of employment growth rates were positive in nine Ohio industries (those lying to the right of the vertical axis). Transportation equipment experienced highly favorable competitive effects on growth and Ohio's specialization in transportation equipment increased as a result of expansion in the earlier post-war subperiod. Another important industry that grew faster in Ohio than in the nation was petroleum. Several nonmanufacturing industries, banking and other finance among them, experienced modest positive competitive effects on growth. No industry in which Ohio enjoyed a high degree of specialization at the beginning of the subperiod had a competitive advantage. Negative competitive growth rate components were largest for electrical equipment and rubber, but stone/clay/glass, primary and fabricated metals, and nonelectrical machinery in Ohio all expanded employment more slowly than these industries did in the nation.

In 1963-1977, eight industries grew faster in Ohio than in the nation as a whole. Several industries with positive competitive components of growth in the earlier subperiod retained or even improved their competitive advantage. These included bituminous coal mining, other transportation/public utilities, and petroleum. Chemicals emerged as a relatively strong industry in Ohio, as did instruments. In nonmanufacturing, services and general merchandise retail trade had positive, though relatively small, competitive components of growth. On balance, it was again true in 1963-1977 that few Ohio industries expanded employment faster than their national counterparts, and no industry of specialization did so. Transportation equipment lost its competitive edge--the Ohio industry expanded no faster than transportation equipment in general. Even so, some areas of strength were apparent; Ohio chemicals and petroleum were notable growth centers in the later subperiod, as was the collection of industries in other transportation/public utilities.

Structural and Competitive Effects Combined: Selected Ohio Industrued

Structural and competitive components of employment growth are indicators of Ohio industry performance. These growth rate components imply changes in the distribution and concentration of employment and are related to state income growth. Although the forces underlying industrial change are more difficult to specify, the growth rate components are suggestive evidence of where to look for the key determinants of industry performance. At this level of analysis, judgments on performance retain a highly speculative quality.

Even so, two basic observations from the analysis can be emphasized. To a greater extent than either overall employment growth rates or the structural component of these rates, the competitive component in Ohio industries underscores the state's economic problems in the post-war period. Few Ohio industries, whether manufacturing or nonmanufacturing, experienced favorable competitive effects on growth. Moreover, employment growth rates and their structural and competitive components shift over time. To extend these observations, a subset of industries is examined further, and, for emphasis, growth rates and their components are compressed into a single diagram (see **Chart 2** pp.14-15).

Shifts in the structural and competitive components of employment growth rates emphasize the structural rearrangement away from manufacturing that has intensified in recent years (**Chart 2, section A**). Competitive effects on employment growth rates, however, generally improved between 1949-1963 and 1963-1977. As already noted, chemicals and petroleum in the 1960's and 1970's were among Ohio's fastest growing industries. The driving force behind these industries' performance is to be found to a greater extent in production and market characteristics of the local industries than in charactistics of the national economy.

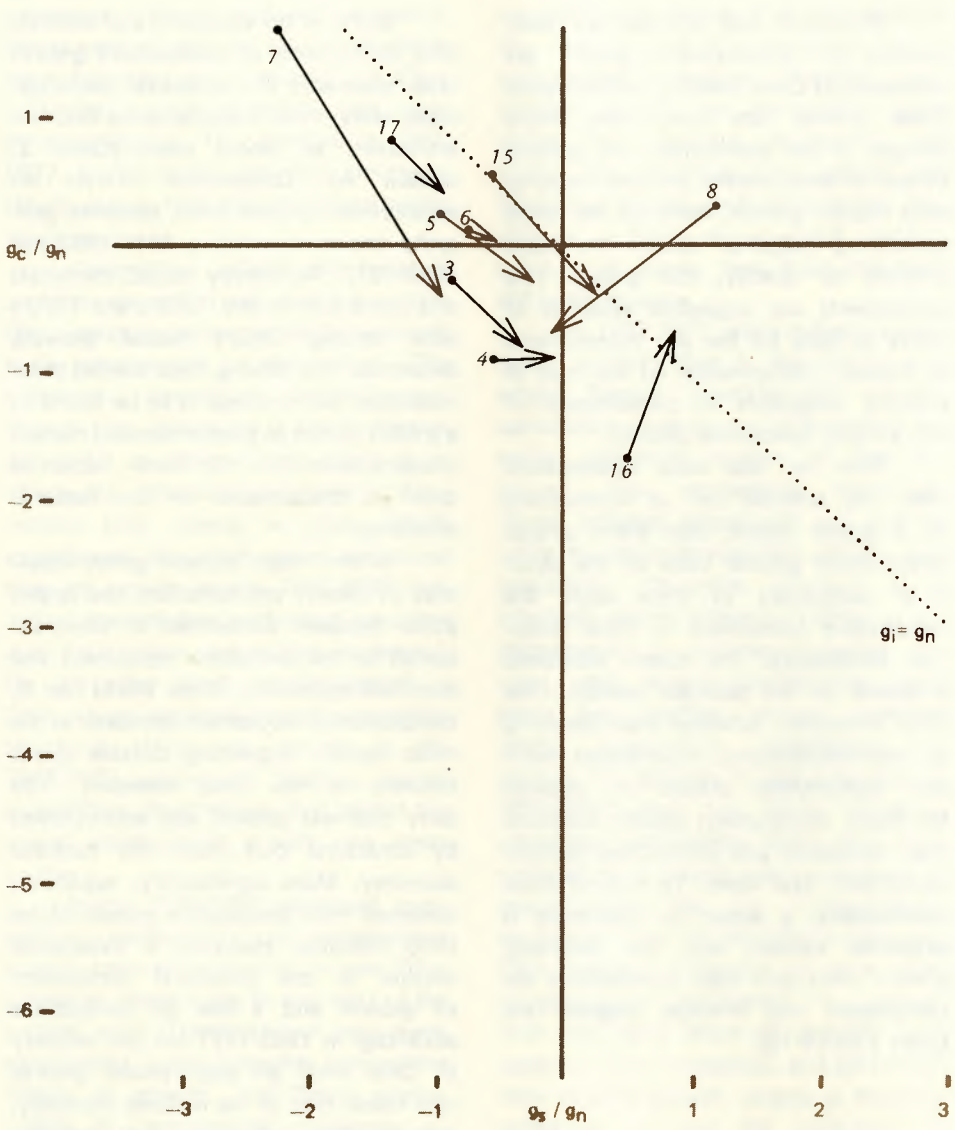
In the major durable goods industries of export specialization, the largest shifts between subperiods in Ohio occurred in transportation equipment and electrical equipment. After World War II, transportation equipment appeared as the most rapidly expanding durable goods industry in the Ohio economy. The early post-war growth was accompanied by structural pull from the national economy. More significantly, expansion stemmed from competitive growth of the Ohio industry. However, a substantial decline in the structural component of growth and a loss of competitive advantage in 1963-1977 left the industry in Ohio with an employment growth rate below that of the national economy. Automobiles and auto parts are the largest product lines in the Ohio industry and post-war developments are likely to be associated with factors influencing the automobile markets. In the later subperiod increased popularity of imported autos is an obvious structural factor contributing to slower expansion. The source of the competitive decline in the 1963-1977 subperiod, is however, less clear.

Electrical equipment experienced a strong structural pull on growth during the earlier post-war subperiod, perhaps attributable to the electronics boom after the war. If this was the cause, however, the Ohio industry was on the periphery; it may have benefited from spill-overs, but it expanded at a much slower rate than the industry as a whole. In 1963-1977, the structural pull on electrical equipment dissipated and the growth rate relative to the expansion of total jobs in the national economy fell. However, there was some increase in the competitive component of employment growth in Ohio's electrical equipment industry. Thus, although employment growth in electrical equipment slowed in the United States in the later subperiod, and the Ohio industry expanded more slowly still, Ohio producers were able to improve their position relative to the overall industry. To some extent, it appears that the improved competitive position was accomplished by acquiring technological capabilities in electronics areas where Ohio industries were bypassed earlier.

CHART 2
Changes in Industry Growth Rates: 1949-1963 to 1963-1977

A. Manufacturing

3. Stone/clay/glass
4. Primary metals
5. Fabricated metals
6. Nonelectrical machinery
7. Electrical equipment/supplies
8. Transportation equipment
15. Chemicals
16. Petroleum
17. Rubber



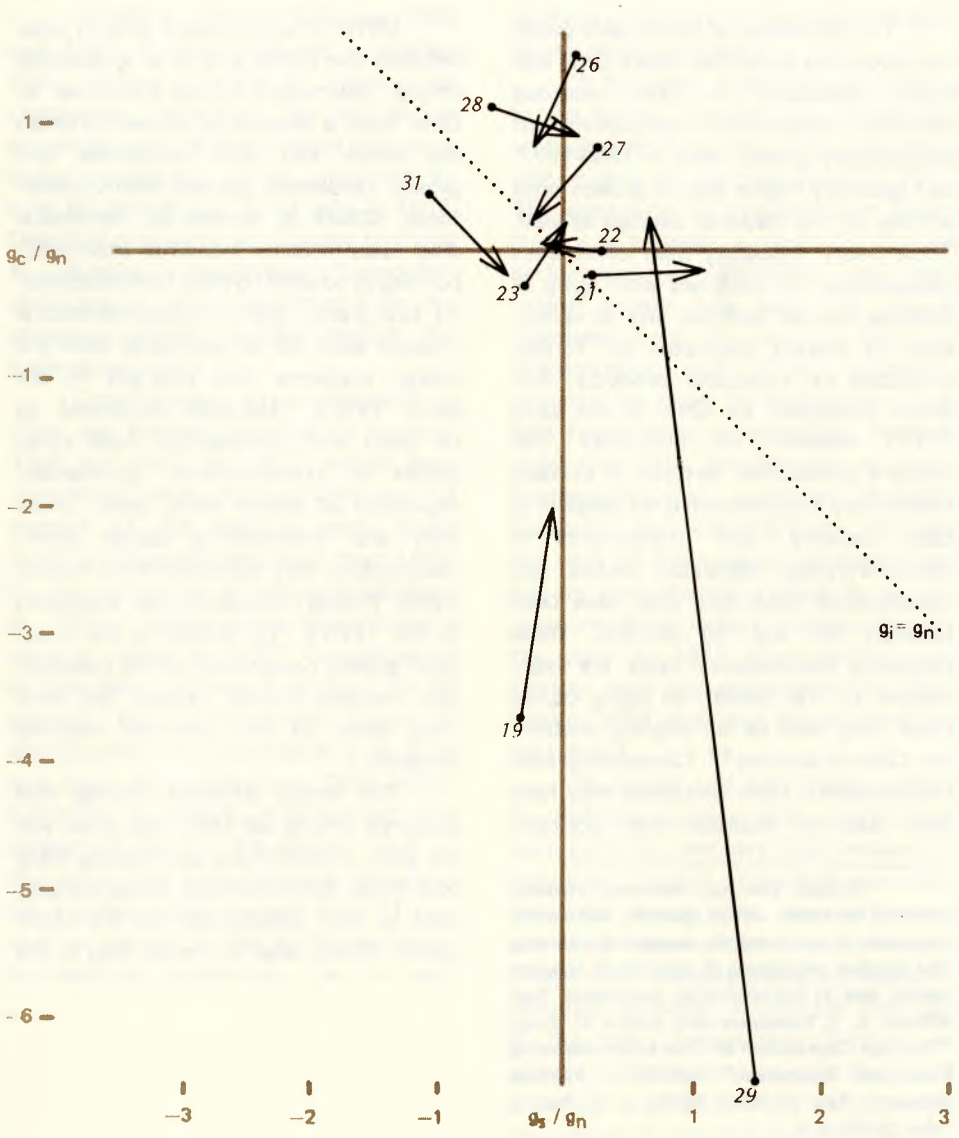
Key:

1949–1963 growth rate → **1963–1977 growth rate**

Source: See Appendix

B. Nonmanufacturing

19. Railroads
21. Other transportation/public utilities
22. Wholesale trade
23. General merchandising retail trade
26. Banking
27. Other finance
28. Services
29. Bituminous coal mining
31. Construction



The remainder of the durable goods manufacturing industries where Ohio was highly specialized in 1949 recorded improved competitive components of employment growth rates in 1963-1977, and generally higher overall growth rates relative to the national average as well. These heavy industries have often been characterized as burdened with aging or obsolete capital facilities and as vulnerable to market incursion by foreign producers or substitute products. Evidence developed for Ohio in the early 1970's suggests the possibility that obsolete productive facilities in primary metals may have exceeded 40 percent of total capacity, and obsolescence in stone/clay/glass, fabricated metals, and nonelectrical machinery may have been between 20 and 30 percent. These estimated obsolescence rates are high, relative to the nation; an aging capital stock may well be an ongoing problem for Ohio industries.[10] Considering such circumstances, Ohio industries may have done well to improve their position.

Shifts in employment growth rates between the earlier and later subperiods among nonmanufacturing industries in Ohio form a diversified pattern between the earlier and later subperiods, and general tendencies are less readily identifiable (**Chart 2, section B**). Structural drag eases in some industries (railroads), but begins to affect others (construction). At first glance, many of these structural changes seem to be associated with the energy problems that emerged in the early 1970's. Railroads continued to be faced with competition from other modes of transportation, government regulation of freight rates, labor problems and deteriorating capital stock; nevertheless, they benefited from heavier traffic through increased coal shipments in the 1970's. The decline in the structural growth component of the construction industry reflects, in part, the withering away of the interstate highway program.

The largest structural change that occurred among all Ohio industries was the shift in bituminous coal mining. Ohio coal mines were relatively strong competitors in both subperiods, but the elimination of the large structural drag in the 1963-1977 subperiod, especially from 1972 on, transformed the industry's employment growth prospects. The importance of exogenous situation shocks to industries is most apparent in coal mining. The energy crisis benefited coal mining even if it did not benefit the economy in general. The developments in coal also suggest the possibility of interdependence among the structural and competitive forces that affect industrial change. Ohio mines enjoyed a larger competitive edge in the depressed markets of 1949-1963 than in the more buoyant setting of the later subperiod. As coal's importance as an energy source grew, even marginal facilities presumably shared in the gains.

Of course not all structural changes are the effects of sudden shocks that quickly change industry behavior. Indeed, most such changes are long-term movements that affect industries gradually. Perhaps the most widely recognized aspect of long-run industrial change is the post-war shift into service-type activities. Banking, other finance services and some trade industries were growth centers in the post-war economy of Ohio as well as throughout the nation. Structural effects were the dominant influences on their growth rates and it is likely that labor intensive production processes were im-

[10]Rubber also had estimated obsolete facilities in excess of 20 percent, but so did chemicals, a more rapidly expanding industry. The smallest proportion (6 percent) of obsolete capital was in transportation equipment. See: Wilford L. L'Esperance and Arthur E. King, "The Age Distribution of Ohio's Manufacturing Plant and Equipment," *Bulletin of Business Research*, Part I (April 1975), p. 4; Part II (May 1975), p. 4.

portant determinants of these industries' growth.[11] However, competitive components of growth rates have been relatively small in the Ohio industries. The competitive component became positive in services and in general merchandise retail trade in the 1963-1977 subperiod, but it became negative in banking and other finance. Thus, although Ohio participated in the general movement toward services, finance, and trade, it did not develop any consistent advantage in these individual industries.

Service-type activities, at least to some extent, are anchored to the local market, and competitive advantages that would contribute to more rapid expansion of Ohio industries may be difficult to develop independent of this market. Other transportation/public utilities in Ohio (which includes a number of activities), is an exception. The competitive component of growth in this industry group increased substantially in the 1963-1977 subperiod. Unfortunately, it cannot be determined where the strength lies. Trucking/warehousing and communications, the largest members of the industry group, appeared to expand in Ohio at about the same rate as in the nation as a whole, but information is very sketchy and further analysis is necessary.

[11] In a detailed study of the service industry, Fuchs concluded that relatively slow increases in output/labor ratios were instrumental in the growth process (i.e., a given expansion of service output seems to require more labor than does manufacturing output). See: Victor R. Fuchs, *The Service Economy* (New York: National Bureau of Economic Research, 1968),pp. 3-5.

Industrial change between 1949 and 1977 in Ohio produced a substantially different industrial composition (**Appendix, Table A-1**). The distribution of employment shifted toward nonmanufacturing activities, which accounted for over 60 percent of Ohio's jobs in 1977. Distributional gains were largely confined to industries in the trade and finance/services groups, which benefited from the structural effects working through the national economy.

Concentration of employment in Ohio also changed significantly between 1949 and 1977. By 1977, private nonagricultural employment in Ohio was 5.3 percent of the nation's total, down nearly a full percentage point from 1949. In the industries of high specialization in 1949, employment concentrations were all lower by 1977. Concentration in electrical equipment declined by 55 percent, and the measured degree of specialization was reduced as a result of this large shift away from Ohio manufacturers. In rubber, employment concentration fell by 44 percent and in the other key manufacturing industries the relative decline ranged from 11 percent in primary metals to 28 percent in nonelectrical machinery. Yet, in each of these industries, Ohio retained a high degree of specialization.

A few Ohio industries ran counter to the trend. Transportation equipment strengthened, and here Ohio developed a high degree of specialization by 1977. The expansion in transportation equipment was, however, a result of the strong performance in 1949-1963, and more recent growth has been less robust. Chemicals held its own in terms of concentration and Ohio's petroleum industry increased its employment concentration fairly substantially between 1949 and 1977. Employment in Ohio's nonmanufacturing industries generally increased, but concentration remained low and, in most cases, decreased. Coal mining strengthened sufficiently to develop moderate export specialization for the state by 1977. Ohio banking and services were less concentrated in 1977 than in 1949, and other finance remained unchanged.

Structural and competitive effects on industry employment growth have been complex, and vary from industry to industry. General observations about industrial change that emphasize only structural developments, such as the switch from manufacturing to nonmanufacturing activities, at best tell only part of the story. Competitive effects on regional industries are equally important and must also be carefully considered in an analysis of industrial performance.

Industrial change has not been uniform over time. In the case of Ohio industries, both structural and competitive components of industry growth rates generally shifted between the subperiods for which they were examined. In particular, competitive disadvantages, measured by relatively slower growth in Ohio industries, were often reduced in the faster-paced economy of the later subperiod. In Ohio, this was especially true for manufacturing industries. One reason may be that the long-term growth process leaves a residual amount of marginal capacity which, in a fast-moving economy, can be brought into production.

The image of the Fourth District economy, and in particular, the State of Ohio, is that of a region in relative economic decline. In a sense, evidence presented in this study confirms that image. The evidence suggests, however, that the nature of the regional economic transition is often misinterpreted. Convergence to a national standard is clearly indicated by post-World War II income patterns in District states, but convergence does not mean a collapse of the regional economy. There are, of course, burdens associated with any economic transition. In a state like Ohio, these may seem to be great because both the distribution and concentration of employment have been gradually adjusting away from the manufacturing industries where the highest degree of specialization had historically developed. However, specialization in heavy manufacturing was determined early in Ohio's economic development and will continue to be its economic foundation in the future. Further research of the factors determining the structural and competitive components of growth rates in these specialized industries will provide valuable insights into the ongoing growth process of the Fourth District.

Data Appendix

Data Sources

The income and employment data developed for this study were compiled from the following sources:

Table 1

U. S. Department of Commerce, Bureau of Economic Analysis (*Local Area Personal Income*)

U. S. Department of Commerce, Bureau of the Census (*Current Population Reports,* Series P-25)

Chart 1, Chart 2, Appendix Table A-1

U. S. Department of Labor, Bureau of Labor Stastistics (*Employment and Earnings*)

Ohio Bureau of Employment Services (*Employment, Hours and Earnings in Ohio*)

Industry Definitions

The analysis of employment growth rates utilized establishment survey employment data for Ohio and the nation at three periods in time: 1949,1963, and 1977. The three years were selected to yield comparable time intervals for the analysis and to provide cyclically similar points that minimize short-term impacts on employment levels. To focus on industrial composition in the private sector, government employment was subtracted from nonagricultural employment to obtain a measure of total employment for the study.

With the exception of the miscellaneous "other" categories, which are balancing groups in each aggregate sector, two-digit SIC's were selected as the appropriate level of industry disaggregation. In part, this was dictated by data availability and by the method of analysis itself. A preferred industrial breakdown would perhaps correspond more closely to specific markets or product lines, but such delineations are seldom attained, even at higher SIC classification levels. Further, in shift/share analysis the results seem to depend on the level of industrial aggregation of the data. As the number of industrial categories is broken down more finely, eventually reaching an individual firm or plant definition, the competitive component will tend to vanish.[12] Even though they represent a larger collection of products under a single classification than might be desirable, two-digit SIC's appear to be a reasonable empirical compromise.

Revisions and Adjustments to the Data

The income data (Table 1) were revised extensively at the source in1974, but no attempt has been made in this study to adjust for the revision back to 1949. Prior to 1974, the Bureau of Economic Analysis computed its estimates of "Personal Income and Components" on a **place of residence** basis. In 1974, the method of compiling personal income figures was changed to a **place of work** basis in order to provide a proxy for industry output at the state level. Because of backdating, the revision was available for 1963 as well as 1977; but the old series was used for 1949.

The employment data were comparable except for SIC classification in 1977. The national employment data for 1949, 1963 and 1977 were derived from the same source and therefore used the same SIC classifications. Ohio data for 1949 and 1963 were comparable to the national data. In 1977, Ohio revised its industry groupings to conform with the 1972 SIC classifications. In order to modify the 1977 Ohio data to conform with the national data, an overlap ratio to adjust for differences between the 1967 and 1972 SIC classifications was constructed using the following formula:

Overlap Ratio equals:

$$\frac{\text{January 1976 Ohio employment (1967 SIC)}}{\text{January 1976 Ohio employment (1972 SIC)}}$$

This overlap ratio was computed for each industry grouping and multiplied by that grouping's 1977 employment average to derive an annual figure in 1967 SIC terms.

Industrial Composition 1949 and 1977

Industrial composition in Ohio is tabulated for 1949 and 1977 in Table A-1.

[12] **See, especially: David B. Houston, "The Shift and Share Analysis of Regional Growth: A Critique," *Southern Economic Journal* (April 1967), pp. 579-580. A firm or plant definition of "industry" or "sector" would, of course, be quite different from a market or product line definition. Although disaggregation along firm or plant lines would ultimately result in uniqueness between a region and the nation, and hence in a vanishing competitive component, it is not at all clear that such dissaggregation is a meaningful proposition.**

TABLE A-1
Industrial Composition in Ohio
1949 and 1977†

	1949			1977		
	Distribution	Concentration	Specialization	Distribution	Concentration	Specialization
Private Nonagricultural Employment	--	6.2	--	--	5.3	--
Manufacturing	48.7	7.9	--	37.1	6.8	--
Durable Goods	33.5	10.4	--	26.2	8.1	--
1. Lumber/wood products	0.5	1.5	HNS	0.3	1.8	HNS
2. Furniture	1.0	7.5	MS	0.5	3.5	MNS
3. Stone/clay/glass	2.9	13.4	HS	1.8	10.0	HS
4. Primary metals	7.5	15.5	HS	4.6	13.7	HS
5. Fabricated metals	5.4	14.2	HS	4.4	10.9	HS
6. Nonelectrical machinery	6.7	13.3	HS	5.9	9.6	HS
7. Electrical equipment/supplies	4.7	12.6	HS	3.1	5.7	MS
8. Transportation equipment	3.5	6.7	MS	4.3	8.5	HS
9. Instruments	0.4	3.9	MNS	0.6	3.8	MNS
10. Other durable goods	0.9	5.2	MNS	0.6	3.8	MNS
Nondurable Goods	15.2	5.2	--	10.9	4.8	--
11. Food	3.8	4.9	MNS	2.1	4.3	MNS
12. Textile/apparel	1.8	1.8	HNS	0.7	1.1	HNS
13. Paper	1.3	7.0	MS	1.1	5.6	MS
14. Printing/publishing	2.2	7.0	MS	1.7	5.6	MS
15. Chemicals	1.6	6.1	MNS	1.8	6.1	MS
16. Petroleum	0.4	4.3	MNS	0.4	6.5	MS
17. Rubber	3.3	27.8	HS	2.9	15.5	HS
18. Other nondurable goods	0.7	3.5	MNS	0.2	2.0	HNS

	1949			1977		
	Distribution	Concentration	Specialization	Distribution	Concentration	Specialization
Nonmanufacturing	51.2	5.1	--	62.8	4.7	--
Transportation/Public Utilities	7.8	4.6	--	6.0	4.6	--
19. Railroads	3.9	6.6	MS	0.9	6.2	MS
20. Electricity/gas/sanitary services	1.3	5.8	MNS	1.0	4.9	MNS
21. Other transportation/public utilities	2.6	3.0	HNS	4.0	4.3	MNS
Trade	21.7	5.4	--	25.6	5.0	--
22. Wholesale	4.9	4.5	MNS	5.8	4.7	MNS
23. General merchandise retail	3.7	5.9	MNS	4.1	5.7	MS
24. Apparel retail	1.2	5.0	MNS	1.0	4.2	MNS
25. Other retail	11.9	5.8	MNS	14.7	5.0	MNS
Finance/Services	15.3	5.0	--	26.4	4.7	--
26. Banking	0.7	4.1	MNS	1.5	3.9	MNS
27. Other finance	2.6	4.2	MNS	3.7	4.2	MNS
28. Services	12.0	5.3	MNS	21.2	4.9	MNS
Mining/Construction	6.4	4.8	--	4.8	3.8	--
29. Bituminous coal mining	0.8	4.8	MNS	0.4	7.4	MS
30. Other mining	0.4	1.8	HNS	0.3	1.8	HNS
31. Construction	5.2	5.6	MNS	4.1	3.8	MNS

†*Distribution* is the percentage of Ohio employment in each industry.
Concentration is the percentage of U.S. employment in each industry located in Ohio.
Specialization is measured by comparing the concentration of industry employment in Ohio to concentration of total employment in Ohio:

Let e = concentration of employment in individual Ohio industries
e = concentration of private nonagricultural employment in Ohio (the proportional size of the Ohio economy)

Then
HS = High Specialization: $e/e^* > 1.5$
HNS = High Nonspecialization: $e/e^* < 0.5$
MS = Moderate Specialization: $1.0 < e/e^* < 1.5$
MNS = Moderate Nonspecialization: $0.5 < e/e^* < 1.0$

Comparison of Earnings and Expenses

	1978	1977
Total Current Earnings	$ 694,814,242	$ 564,269,128
Net Expenses	41,962,628	40,378,337
Current Net Earnings	652,851,614	523,890,791
Additions to Current Net Earnings:		
All Other	25,033	1,026,394
Total Additions	25,033	1,026,394
Deductions from Current Net Earnings:		
Loss on Sales of U.S. Government Securities (Net)	10,852,014	4,185,456
Loss on Foreign Exchange Transactions (Net)	42,982,973	12,589,053
All Other	58,019	48,584
Total Deductions	53,893,006	16,823,093
Net Deductions	53,867,973	15,796,699
Assessment for Expenses of Board of Governors	4,522,400	4,057,700
Net Earnings before Payments to U.S. Treasury	$ 594,461,241	$ 504,036,392
Dividends Paid	$ 5,408,170	$ 5,142,729
Payments to U.S. Treasury (Interest on F.R. Notes)	584,291,421	496,089,263
Transferred to Surplus	4,761,650	2,804,400
Total	$ 594,461,241	$ 504,036,392

Comparative Statement of Condition

ASSETS	Dec. 29, 1978	Dec. 30, 1977
Gold Certificate Reserves	$ 921,035,900	$ 933,870,100
Special Drawing Rights Certificates	112,000,000	107,000,000
Coin	32,976,197	39,702,072
Loans to Member Banks	31,050,000	1,550,000
Federal Agency Obligations - Bought Outright	657,107,398	669,970,000
U.S. Government Securities:		
Bills	3,508,654,478	3,478,894,000
Notes	4,565,303,131	4,227,966,000
Bonds	1,037,381,316	740,668,000
Total U.S. Government Securities	9,111,338,925	8,447,528,000
Total Loans and Securities	9,799,496,323	9,119,048,000
Cash Items in Process of Collection	808,062,973	460,882,397
Bank Premises	23,137,140	22,825,499
Other Assets	298,083,638	140,423,451
Interdistrict Settlement Account	(437,629,820)	(41,750,722)
Total Assets	$ 11,557,162,351	$ 10,782,000,797
LIABILITIES		
Federal Reserve Notes	$ 8,551,157,177	$ 7,986,742,657
Deposits:		
Member Bank - Reserve Accounts	1,797,890,606	1,649,739,882
U.S. Treasurer - General Account	388,312,886	450,724,792
Foreign	17,229,500	23,710,200
Other Deposits	35,640,685	43,822,984
Total Deposits	2,239,073,677	2,167,997,858
Deferred Availability Cash Items	445,532,329	361,023,439
Other Liabilities	137,838,568	92,199,543
Total Liabilities	$ 11,373,601,751	$ 10,607,963,497
CAPITAL ACCOUNTS		
Capital Paid in	91,780,300	87,018,650
Surplus	91,780,300	87,018,650
Total Liabilities and Capital Accounts	$ 11,557,162,351	$ 10,782,000,797

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