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ABSTRACT

EMPLOYMENT SHIFTS AND CITY SIZE: MICHIGAN AND INDIANA, 1950-1963

by Andrew J. Petro

A striking feature of the 1950's was the "metropolitan explosion". This feature produced many human and economic problems for cities, and has brought urban studies to the forefront. It is in the cities that modern development has historically occurred and where changes in economic activity find their incidence.

The economic activity in a city participates as a unit in a system. As such a unit the city is influenced by the national economy and the city's own characteristics. When the system grows, the city can gain or lose economic activity, or gain but at a slower rate than previously. This change presents problems to the city because the change is reflected in the amount of employment, a matter of public concern.

Since the national growth is distributed unevenly among the cities, a city can obtain a growth rate equal or unequal to that of the nation. A shift technique is used to measure this growth or decline. The employment growth in a city could be expected to grow at approximately the same rate as the national employment. Applying this rate to the city employment would give the expected employment in the city if it had grown at the national rate. The actual employment in the city can be greater or less than the expected employment. The difference between the actual and expected employment is the employment shift.

The problems for a city are to determine the causes of the employment shift, regardless of their favorability, and secondly, to determine whether or not the shift is significantly influenced by the city characteristics of size, industrial composition and population.

The shift technique is applied to total employment, to employment by sectors and to industries in the manufacturing sector. Employment data used are the published data by county or counties for selected cities for the period 1950-1963. Standard regression analysis is used to determine the significance of city size and industrial composition on the employment shifts. The analysis indicates that the employment shifts and population size were uncorrelated and that the composition effect had little impact on the employment shifts.

The shift of total employment in Michigan was favorable, that is, the actual employment was greater than the expected employment; the shift was unfavorable for the cities in Indiana. The use of the shift technique indicates that the more significant source of the total shift was the local-factor shift. This local-factor shift is the effect of the locational advantages of the cities. In both states, the local-factor shift swamped the composition shift; the composition shift was generally one-third or less the size of the local-factor shift.

The sector with the largest impact on total employment is the manufacturing sector. The shift was negative for both states; machinery (electrical and non-electrical) and automobile and transportation industries provided the largest negative shifts. This decline came from the negative impact of the local-factor effect. The cities suffered a relative loss of their locational advantages that

was not sufficiently offset by the growth industries within the sector.

It is normally thought that the larger size city is more apt to grow. If city size were significant for the shift, then the shift would diverge sharply for the larger size cities. This divergence did not appear in the analysis.

The use of the shift technique shows that the cause of the employment shift, positive or negative, is the local-factor effect; little impact comes from the composition effect. The relative growth or decline in employment is independent of size and industrial composition.

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by

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER I

INTRODUCTION

Modern regional analysis has focused on many theoretical and practical problems. In response to such problems, its development has been greatly accelerated so that economists today can use many analytic forms, types, and degrees of rigor to solve problems.[1] Within this development, there has been a shift in emphasis from national-regional analysis to the problems of smaller areas. The change in emphasis, however, is not a rejection of the logic of space and activity at a higher level of aggregation, but an acknowledgment that problems exist in these smaller economic units that are linked to form the region or nation. It is this kind of awareness that has brought the analysis of urban problems to the fore-front.[2] This attention to urban problems is coupled with a pragmatic attitude that arose with the changing conditions over the long run, and particularly the immediate past.

The decade of the 1950's saw a national economy become more concerned with the problems of abundance and a high growth rate than with mass unemployment. The change in concern did not, of course, free

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[1] J. Meyer, "Regional Analysis: A Survey", American Economic Review, Vol. LIII, March 1963.

[2] Meyer, ibid., pp. 26-29.

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the nation of any unemployment problems, or problems of other kinds, for example, inflation. However, the elimination of mass unemployment was not the chief concern that it had been in earlier periods.[3] The acceleration of technology and organization along with the capacity and ability to satisfy many wants became an economic fact. The result of the rapid progress was the acceptance of a high growth rate, with high employment as the goal. The acceptance of the goal, and the problems associated with abundance, have continued into the first part of the 1960's.

A striking feature of the period was the so-called "metropolitan explosion". This metropolitan explosion was characterized by a rise in city population at a rate higher than the rate for the nation and by the urbanization of areas surrounding the central city.[4] High birth rates as well as rural migration contributed to the absolute rise in urban population. The striking feature was not the trend, for this was old and continuous, but the fact that it was accelerating. The number of places that had a population of 50,000 or more nearly doubled in that decade.[5] These developments in the 1950's produced both human and economic problems for the cities. The problems, while not purely economic, are in many ways the reflections of

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[3]H. G. Vatter, The U.S. Economy in the 1950's, W. W. Norton & Company, Inc., New York, 1963, pp. 4-5.

[4]Vatter, op. cit., pp. 22-23. R. Vernon, The Changing Economic Function of the Central City, Committee for Economic Development, 1959.

[5]U. S. Bureau of the Census, Population Trends in the U.S. 1900 to 1960, Technical Paper No. 10. U.S. Government Printing Office, Washington, D. C., 1964. Table 1, p. 16.

the changing industrial and commercial activities in general. Indeed, the metropolitan growth reflects both the expansion of population and the economic development of the nation that brought about the astounding rise in productivity and living standard.

The problems associated with "exploding metropolis" have not abated in the early 1960's, and all the necessary measures to deal with them have not been developed.[6] These facts have prompted the suggestion that new analytical tools be fashioned.[7] Certainly, modern analysis will continue to develop new tools and approaches in various and various degrees of rigor. The distinct changes in the 1950's have made the period fruitful for the development of new tools and insights in the analysis of city growth.

This study analyzes metropolitan areas of various sizes for two states over the period of 1950 to 1963. The metropolitan area is used as the unit of aggregation because it is here that modern development has historically occurred. It is also used because it is here that any changes or adjustments in economic activity, whatever their source, have their incidence. As such, the unit has a form of its own as pattern and structure within a system.[8]

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[6]Vatter, op. cit., p. 22.

[7]B. Chinitz, "Contrast in Agglomeration: New York and Pittsburgh", Papers and Proceedings, American Economic Review, Vol. LI, May 1961, p. 279.

[8]R. Vining, "Delimitation of Economic Areas: Statistical Conceptions in the Study of the Spatial Structure of an Economic System", Journal of American Statistical Association, Vol. 48, 1953, p. 52.

The metropolitan unit is affected by two broad forces: the national economy and the city's own characteristics. If the conditions in the nation change, the city is affected because it is a unit in the system. The extent to which the city is favorably or unfavorably affected also depends on the particular make-up of the city: population, size, specialization, industrial composition, etc. As the system grows the city can lose or gain activity and industry, or gain but at a slower rate than it gained previously. This change presents problems to the city because the changes are reflected in the amount of employment, a fact of public concern. As a result many questions arise. Why the change? What is the impact of industrial composition? What about cities of other sizes? What is the effect of population changes? Is the actual employment gain lagging behind the national gain?

In any immediate employment problem of a city, however, the questions take the form of specific statements: "We're too small", "Our structure is too one sided", "We need more people to service", etc. Whether or not these observations are valid is debatable, for if a city is to get a particular share of the system's growth, it does so concurrently with other cities that also have a size, structure and population. The share obtained is a proportion relative to the other cities in the system. Only knowing this proportion is it possible to say whether the actual change, even if positive, is greater or less than what it could have been, how it compares with other cities, and how it compares with the nation. Indeed, it is then that the influence of size, industrial composition and population can be examined.

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A shift technique, which is explained in Chapter II, is used to obtain the relative changes. The shift, by which growth or decline is measured here, is the relative gain or loss in a city's employment as compared with national employment. Through this approach, the cause of the relative changes can be isolated, permitting an analysis of the significance of size, industrial composition and population. The hypotheses in the study are: (1) the shift technique is a useful device to indicate the cause of relative employment changes in cities, and (2) the relative shift in employment is independent of city size and industrial composition.

Chapter II explains the shift technique and evaluates alternative approaches in the analysis of employment changes. Chapter III considers the framework of the problem to be analyzed in the selected cities in Michigan and Indiana, and establishes the theoretical basis for the use of the city as an appropriate unit of analysis. The above hypotheses are examined in Chapters IV, V, VI, VII and VIII by determining the relative employment shifts for total employment, for employment by sectors and by industries within the manufacturing sector. Relationships between the shifts and size, industrial composition and population are then developed through simple regression analysis. The results of the analysis are elaborated in the concluding chapter.

CHAPTER II

APPROACHES TO REGIONAL ECONOMIC ANALYSIS

The great concern with growth has led to a relatively rapid rise in the significance and development of analysis at the regional and subregional levels of activity. In a recent survey article, the surge in importance of regional analysis is described as resulting from a desire for more adequate and analytically useful answers to the economic problems of regions and cities.[1] The growth, or lack of growth, of economic activity has led to the search for the explanations of these changes that have differed widely among the various areas. The explanations are based on the functioning of a general equilibrium system, in which the prices are arrived at through a process of mutual determination. As the data change over time, the general system produces new solutions resulting in changes in the volume and composition of economic activity in the different places.

Modern regional analysis, in seeking explanations, has shifted emphasis away from the problems of business cycles to that of maximization problems, i.e., promoting growth not so much in terms of given current problems, but in terms of possibilities of growth not yet

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[1] J. Meyer, "Regional Analysis: A Survey", American Economic Review, Vol. LIII, March 1963, p. 20.

realized.[2] This pragmatic approach has been integrated in many ways with the developing tools of general economics: multiplier theory, input-output analysis, and/or mathematical programming and the refurbished location theory.[3] This integration has been necessary to link the mass of data and the formulation of programs for the many areas. In consequence, four broad approaches have been developed to organize data to explain changes in economic activity. Each is directed at organizing aggregate data for a given blocked out problem and uses various theoretical tools of general economic analysis.

a. The Export-Base Approach

The export-base approach attempts to explain changes in growth in terms of the degree and influence of the export-base industries of a given city or region.[4] The growth of the given city or region is initiated by the response of the industries within the unit to the increase in demand outside the unit. The result in the unit is an expansion of economic activity through a multiplier process. The approach stresses the key role of exportable commodities and services. The rate of growth will depend on the rate at which the export base expands to meet the increased demand from outside the unit under analysis. Use

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[2] Ibid., p. 26.

[3] Ibid., p. 30.

[4] D. C. North, "Location Theory and Regional Economic Growth", Journal of Political Economy, Vol. 63, June, 1955. R. B. Andrews, "Mechanics of the Urban Base: Historical Development of the Base Concept", Land Economics, Vol. 29, May, 1953; and subsequent articles by R. B. Andrews, Land Economics, Vol. 29, Aug. and Nov., 1953; Vol. 30, Feb., May, Aug., and Nov., 1954; Vol. 31, Feb., May, Aug. and Nov., 1955; Vol. 32, Feb., 1956.

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here is made of the multiplier theory by observing the past activity of the unit relative to the rest of the economy. An empirical multiplier is derived and applied to estimates of the economic base to forecast the volume of economic activity.

The subsequent development of the approach uses more sophisticated multiplier theory, comparative cost techniques, input-output analysis and modern location theory in various forms and combinations.[5] In such analysis, acceptance of the economic base is fundamental. The existence of sharp criticism, which attacks the estimate of the size of the economic base, the refinement of the theoretical structure, and its usefulness for planning purposes,[6] still has not destroyed the clearly useful classification system the approach provides. While it does not provide a functional relationship of the internal and external aspects, this approach does bring to the study of regional growth the clear fact that a city or region's growth is tied to developments in the total economy.

b. The Sectoral Approach

The sectoral approach had its beginning in the empirical work of Clark and Fisher, who emphasize the broad sectors of primary, secondary and tertiary activities.[7] It focuses on internal development

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[5]Meyer, op. cit., pp. 30-35, and literature cited there. A specific example of the combination and techniques is in F. T. Moore and J. W. Petersen, "Regional Analysis: An Inter-industry Model of Utah", Review of Economics and Statistics, Vol. 37, November 1955.

[6]Meyer, op. cit.

[7]C. Clark, The Condition of Economic Progress, London,

through the evolving specialization and degree of functional differentiation of inputs and less on external shifts in demand. The resulting explanation of growth is seen in the dynamic progress of the shifting sectors. When the approach is coupled with location theory, it is used to explain the development stages of a nation or a region.[8] The approach, and its combination with development stages, is useful because of the implications that planning policies and activities can determine the rate of growth and its movement between stages. It is also useful as a framework for aggregation of data and has provided a means of extending the analysis of regions by considering the relationship between the growth of the region and the existence of "growth industries" within the unit.[9] This approach is limited, however, to those problems where a high level of aggregation is desirable and the lack of external functional ties in the internal evolution is insignificant.

c. An Evaluation of Approaches

The third approach, mathematical programming, provides the best conceptual device for the aggregation of data.[10] However, the

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Macmillan, 1940; A. G. B. Fisher, "Capital and the Growth of Knowledge", Economic Journal, Vol. 43, September 1933 and "Production, Primary, Secondary and Tertiary", Economic Record, Vol. 15, June 1939.

[8]A. Losch, "The Nature of Economic Regions", Southern Economic Journal, Vol. 5, July 1939; E. M. Hoover, The Location of Economic Activity, New York, McGraw-Hill, 1948, pp. 187-196.

[9]U.S. Department of Commerce, Regional Trends in the U.S. Economy A Supplement to the Survey of Current Business, Washington, Government Printing Office, 1951.

[10]Meyer, op. cit., p. 36.

approach is plagued by a lack of the data required and the sheer immensity of the inputs of the model to explain economic activity. This approach, as well as the two above, has limited usefulness due to the high degree of aggregation on the one hand, and its limited scope on the other.[11] How each should be applied to a given problem of a region, area or city, is not a rhetorical question or easily resolved. To planners of growth, an approach limited in scope to the internal is relatively useless since the external is also important. The export-base approach generally makes no attempt to specify where the base export goes, or the places from which the inputs of the basic industries are drawn. Assuming the unit versus the rest of the world minimizes the internal structure and develops no functional relationships. This is similar to the sectoral approach that concentrates on the internal evolving specialization and division of labor. Although both approaches allude to internal-external changes, both preclude by assumption any interacting tie between units such that their explanations are more absolute than relative. The programming device is simply too vast and costly to be generally used.

The problems associated with the application of an approach, and the extent of its specific utilization, are indicated by the viewpoints held about analysis in a given context. These viewpoints describe analysis as either an analytically rigorous quantified model at a high level of aggregation (useful for forecasting), or a means of viewing changes in terms of historical and behavioral characteristics.[12]

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[11] Ibid., see sources cited there.

[12] Meyer, op. cit., p. 38.

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There is much blending in these viewpoints that is no doubt a desirable evolution toward an integration conceptually, quantitatively and operationally useful.[13] However, differences do exist and arise in relationship to the particular problems examined.[14]

d. The Shift Technique

The rise in concern for maximizing the possible opportunities makes the shift technique quite useful. It combines the internal and external forces operative on a city or region in a system of cities or regions. The particular unit is gaining or losing relative to other units as its internal characteristics are conducive to a positive or negative change. This approach is a way to describe the redistribution that would have occurred had the unit grown at the U. S. rate. It permits an analysis of the relative changes in the unit relative to other units, and not as an isolated unit versus the rest of the world. This technique allows the internal-external forces to operate and measures the relative growth or decline. Several recent studies have made use of the shift technique at a high level of aggregation.[15] However, at this higher level of aggregation, the relevant economic unit is the city. This has led to conflicting explanations

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[13] W. Isard, Methods of Regional Analysis, New York, Wiley 1960; p. 570.

[14] For example: R. M. Lichtenberg, One-Tenth of a Nation, Cambridge, Harvard University Press, 1960 and B. Harris, P. J. Areas Systems, Penn-Jersey Study Paper No. 14, Philadelphia.

[15] V. R. Fuchs, Changes in the Location of Manufacturing in the U.S. Since 1929, New Haven, Yale University Press 1962; H. S. Perloff, E. S. Dunn, E. E. Lampard, J. F. Muth, Regions, Resources and Economic Growth, Johns Hopkins Press, Baltimore 1960. Lichtenberg, op. cit.

that stem partly from the definitions used, but is more likely the result of taking the highly aggregated unit as the relevant unit for analysis. The shift technique is the approach used in this study, but at the lower level of aggregation of cities where modern development has historically occurred.

The application of the shift technique produces a measure, called the shift, whereby the gain or loss in a city's economic activity is related to the nation's activity.[16] Employment data are used to indicate the activity. It is the nation's increase in employment then, that is the benchmark to which the actual city employment can be compared.

For the period considered, the percentage increase in national employment is applied to the city's total employment in the initial year. This increase added to the initial year's employment would give the expected employment in the terminal year. It is in this sense that the word expected is used throughout the analysis. If the city's employment did grow at the national rate, the expected employment is equal to the actual employment. Since the national growth is not in fact distributed uniformly throughout the nation, the actual employment in a city can be greater or less than its expected employment. For example, Kalamazoo's actual employment in 1963 was 65,200. If employment had grown at the national rate, Kalamazoo's expected employment in 1963 would have been 56,100. The difference between the actual and expected, 9,100, is the net shift for total employment. This

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[16]Adapted from Perloff, et al., pp. 70-71.

measure is not a measure of any kind of physical movement, but a net shift concept determined after these changes have occurred, and can be positive or negative.

The net shift of total employment is the result of two causes. First, the city is competing to attract industry regardless of what is happening nationally. The city may attract more or less employment in a given industry. Whether or not it does depends on the city's locational advantages for the given industry. This is called the local-factor effect. Secondly, the industry growing in the nation may be located in the city, in which case the city's employment also grows. If many such growth industries are located in the city, this composition is conducive to the growth of employment. This is called the composition effect.

Applying the growth rate of each industry in the nation to each industry in the city, instead of total employment, a shift of employment from the effects can be obtained. For example, applying the rate to each industry in the city of Kalamazoo, expected employment in 1963 would have totaled 57,600. This is less than the actual employment of 65,200. The difference, 7,600, is the shift from the local-factor effect and indicates that each industry in fact grew faster than it did in the whole nation. The difference between the shift of total employment, 9,100, and the local-factor shift, 7,600, is the shift due to the composition effect. The composition shift indicates that employment in the growth industries has exceeded the national average. These shifts are in terms of the national forces, the city's locational advantages, and the industry composition, and are relative to shifts in

other cities.

The computation of the shifts is determined on the premise that the sum of the shifts from the composition and local-factor effects equals the net total employment shift.[17] It is possible for the shifts to be positive or negative, and the net shift of total employment is made up of the combinations of the positive and negative local-factor and composition shifts. Either of the effects can produce a shift that more than offsets the other. It is possible for each industry in a city to have a zero shift, i.e., where the actual and expected employment are equal, but total employment can still shift because of the composition effect. The shift technique allows the relative changes to be traced to their sources and reveals patterns of employment among cities. The shifts are computed for the cities and grouped by states.

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[17] See Appendix I

CHAPTER III

A FRAMEWORK FOR THE ANALYSIS OF CITY GROWTH

A metropolitan area is influenced by the national economy and the area's own particular characteristics. This interaction produces different results over time in different places. The places are the cities where the forces may reinforce each other, or offset advantages and disadvantages, so that the dynamic changes may be faster or slower than the actual pace at the national level. The changes are distributed unevenly throughout the system. The cities are an integrated collection of places. It is on this basis of integration, however, that the particular characteristics of a city interact, and obtain their share of national growth.

a. Economic Activity and Employment

Whenever there is an impact from the forces, the industry and economic activity in an area alter accordingly. The most direct indication of the change is reflected in the amount of employment.[1] The volume of economic activity, and its changes, are here measured and analyzed in terms of employment. Alternative concepts which measure activity are value added and real income. The concern here

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[1] V. R. Fuchs, Changes in the Location of Manufacturing in the U.S. Since 1929, New Haven, Yale University Press, 1962, p. 176.

is not with an analysis of welfare, so a measure of real income is not used. Value added provides a significantly different result from employment only in certain kinds of analysis, and in most analysis, particularly at the state level, has been found to give the same results.[2]

The employment data shown in Table 1 indicate employment at various levels of aggregation for the states of Michigan and Indiana. Between 1950 and 1963, the percentage change, compared with the nation, varied with the grouping. Disaggregating the grouped city data would show similar variation. This variation reflects the differential impact of the forces. The importance of the city unit to the state's

TABLE 1

TOTAL EMPLOYMENT, 1950-1963

	1950	1963	% change
United States	59,651,700	67,617,000	13.4
Michigan	2,369,400	2,652,700	11.9
Indiana	1,271,200	1,454,700	14.4
Michigan, minus large SMA*	1,042,800	1,373,300	31.7
Indiana, minus large SMA*	796,300	926,500	16.4
Michigan, selected cities	664,300	843,500	27.0
Indiana, selected cities	766,300	812,500	6.1

Source: Appendix B

*Standard Metropolitan Area

total increase in employment is indicated by progressing to the lower level of aggregation. It is here that any changes or adjustments in

[2]Fuchs, ibid., pp. 43-48, 176. When the finest detailed data was used, different results were obtained that were due to old vs new plants, and/or inventory changes. Ibid., pp. 76-77.

economic activity, whatever the source, have their impact on employment. In both states, the selected cities account for more than fifty percent of the total employment outside the very large metropolitan areas.

b. The Problem

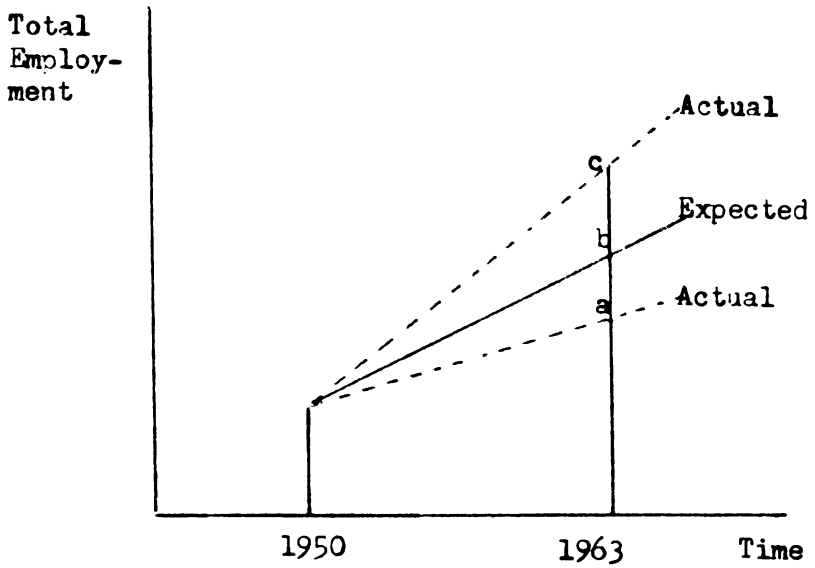
Since the city is a part of the whole system, it can gain or lose economic activity, and accordingly employment, as the system grows. The employment may rise because it gains a greater proportion of an activity (industry or sector) that is growing, or declining, nationally. Employment can also increase because the city has the locational advantages favorable for industry. If both are indeed positive, a city's employment growth may be greater than the nation's. Certainly, if both were negative, the city's employment growth would be less than the nation's. The employment growth in the cities could be expected to grow at the same rate as the nation's employment. However, the expected employment growth may not occur. Consequently, if the national rate is applied to the city's actual employment in the beginning period, the actual employment in the terminal period can be greater or less than the expected. This is summarized in Figure 1.

Over the period of time, the impact of the broad forces may have a favorable or unfavorable impact on the city's employment. This would place the city's employment in the terminal year at point a, b, or c, in Figure 1. Actual employment that is between the points a and c may, however, present employment problems for the city. It may lose employment, or gain, but at a slower rate than desired. If the data of Table 1 are indicative, a breakdown of the data to the city

level would show the variability of employment changes falling somewhere between points a and c.

Figure 1

Actual and Expected Employment Over Time



The fact that the city's employment is between points a and c, means some cities obtained a greater share of the nation's employment growth than their expected employment. This is a redistribution of economic activity and employment among the cities in the system. The extent of the redistribution for a given city is the difference between the actual and expected employment for the period. It is the redistribution that is the shift and expresses the relative participation among the cities of the nation's growth in employment.

The source of the shift will be indicated through the use of the shift technique. Is the shift affected by city size and industrial composition? In Figure 2, the relationship between total employment and

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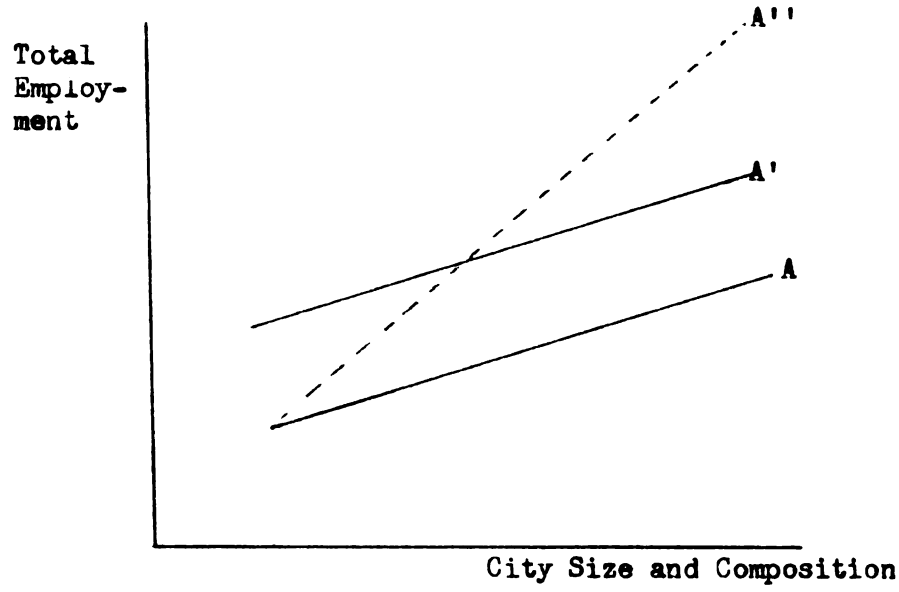
Figure 2

Possible Employment by Size and Structure



size and composition is indicated by curve A. Total employment can increase or decrease for each city size and composition as a result of the shift. That is, curve A can be displaced upward or downward and its slope increased or decreased. If the shift had a positive effect on total employment but was independent of size and composition, curve A' is the appropriate relationship indicating that cities of all sizes and composition increased total employment. However, if size and composition significantly affect the shift, curve A'' is the appropriate relationship, indicating the total employment rises according to city size and composition. The present analysis shows that the shift is not significantly affected by the city size and composition; consequently, curve A' is the appropriate relationship.

Standard simple regression analysis is used in the development

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of relationships and is applied to the data for all cities in both states and selected cities grouped by states. The data are non-random and the regression is used to indicate directions and implications in the interpretation of patterns. The regression and correlation are not used here to establish the probabilities of the nearness of coefficients to parameters in the universe.[3] There may be no normal universe of cities, and certainly the diversity of growth among cities suggests this, in which case representation and indeed, randomness, are irrelevant.

The period covered is 1949-1963. In setting up the data for this period, a three year average was computed for the initial and terminal years. That is, the initial year, called 1950, consists of an average of 1949, 1950 and 1951; the terminal year, 1963, an average of 1961, 1962 and 1963. This was done to overcome in part the initial-terminal method of measuring that produces variation by the specific year chosen.

c. A System of Cities

The pertinent economic unit here is the city. However, these cities perform relative to other cities in a complex system that is not completely understood. There is an integrated logic of cities in

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[3]The significance of the correlation in the following chapters is computed at the five percent level using the z transformation formula. R. Ferber, Statistical Techniques in Market Research, McGraw-Hill Book Company, New York, 1949, p. 381. The significance test is only an indication of the reliability of the correlation, since the data used are not random.

space according to functions performed. This can be visualized conceptually by placing the cities within a spatial structure. Losch has developed such a scheme where he views the towns or cities as "punctiform agglomerations of non-agricultural locations".[4] They are the physical clusters of activity that arise because of chance, the site of a large industry or the source of a raw material that result in advantages of locating. The towns or clusters are linked together by lines of transport and communications producing a viable interaction in a system of towns.

The towns differ in size depending on the different collections of industries and the comparative economies and diseconomies of scale, localization and urbanization. The simple market surrounding the town is the supply area for the functions performed in the town. Each town in turn is related to the functions of the next larger size town. So visualized, the scheme becomes a hierarchy of central places at the focal points of the various levels by size and differentiation of functions, with a concomitant population. The entire collection of these places forms an "ideal type" of economic landscape consisting of simple market regions surrounding each center of production and consumption in a network of markets comprising a regional system.[5]

Within this system, common centers arise, metropolitan areas, that serve a vast hinterland of smaller size cities and compete with

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[4]A. Losch, The Economics of Location, Yale University Press, New Haven, 1954, p. 68. For a mathematical model, see M. J. Beckman, "City Hierarchies and the Distribution of Size", Economic Development and Cultural Change, Vol. VI, No. 3, 1958.

[5]Losch, ibid., pp. 124-137.

other centers. The size and the functions performed in the outlying environs of a center are a function of distance, production advantages and competition. The scheme is an ideal landscape of the location of points, "punctiform agglomerations", and an extended territory of complementary and reciprocally related activities in an ordered hierarchy of function and size.

In establishing this scheme, Losch has assumed an undifferentiated plain over which raw materials and soil fertility are evenly distributed.[6] Although the system is conceptually useful, the complexity of the scheme is displayed when it is used to describe reality. For then the simple conditions must be altered to accept the fact of an irregular topography and an uneven distribution of resources. These natural differences, in addition to transport cost policies and regional differences in skills,[7] lead to differences in economies and diseconomies of agglomeration with the subsequent effect of giving irregular shapes to areas in the hierarchy. Indeed, this effect also alters the location-function scheme because of the differences of raw material, productivity and accessibility. The entire scheme is influenced by the government, in varying degrees, for administrative purposes and/or control and intervention.[8] The result is the establishment of boundaries that may or may not coincide with the logic of the areas within the economic landscape.

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[6]Losch, op. cit., p. 105.

[7]Losch, op. cit., pp. 139-193.

[8]Losch, op. cit., p. 130 and pp. 196-210.

The Loschian scheme not only conceptualizes a system of cities, but also indicates the relative tie between the city and its surrounding area. The functioning of the unit links the city to the system through its particular size, industrial composition and population. The use of the Loschian scheme, however, must be adjusted according to the form in which data are available. We have no Loschian statistics, just raw data by states, counties and metropolitan areas. Thus, it is central city and the surrounding area that is defined as the city unit used here. The data for this unit are the data for the county or counties that form the metropolitan area. It is only in this form in which the data are available. However, this unit is not to be presumed a unit determined objectively by a unique set of criteria. A boundary for a city could be delimited by alternative procedures, for example, central city, trade areas, newspaper circulation, Federal Reserve districts, etc. Thus, any unit is actually chosen by an arbitrary decision related to the problem at hand. The unit used herehas a conceptual basis and is statistically dictated by the data available.

An analyst has argued that the state may be a more appropriate unit for analysis rather than the city or metropolitan area.[9] This argument is an attempt to replace an arbitrary approach in the selection of a unit with one based on objective criteria. Since the city and the surrounding area can be split by the arbitrary boundary of the state, it should follow that the portion of the multi-state

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[9]V. R. Fuchs, "States or SMA's When Studying the Location of Manufacturing", Southern Economic Journal, Vol. 25, January 1959, pp. 349-355.

city in one state would predict the rest of the area growth better than the state. He rejects this conclusion and argues that the state unit is a better predictor for analytical purposes. However, it is debatable whether his conclusion is objective, since the boundary for the multi-state city is also arbitrary. The geographical direction of growth depends on how the accidental split occurs. That is, a corner of a multi-state city area may grow faster than the rest of the city because the corner may expand in the direction of the empty space.[10] This growth is not tied to the state unit but is part of the functional relationship of the surrounding area to the city. Indeed, the state is not an integrated entity but an arbitrary boundary accidentally encompassing a heterogeneous collection of places of activity. A sharp change in the state's growth of activity could be obtained by excluding such a place of activity. However, this need not affect the remaining units since each performs according to its characteristics within a system.[11]

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[10] Losch, op. cit., pp. 204-205.

[11] R. Vining, "Delimitation of Economic Areas: Statistical Conceptions in the Study of the Spatial Structure of an Economic System", Journal of American Statistical Association, Vol. 48, 1953, p. 52.

CHAPTER IV

EMPLOYMENT SHIFTS AND CITY SIZE

In the analysis of total employment among cities, the actual changes are obviously important. However, a city's actual level of employment depends in part on the particular city's advantages relative to other cities. Consequently, the actual changes do not provide the additional insight that differential changes among cities provide through their relative change. Therefore, the analysis uses the terms of a city's actual and relative expected changes in total employment.

a. Patterns of Employment Changes

Table 1 (Chapter III) gave actual employment data at several levels of aggregation. Table 2 shows the actual and expected employment disaggregated by the selected cities for both states. For all cities, the actual increase in total employment is 225,400 over the 1950 average. The total employment shift is 166,300 (an absolute value), less than the actual increase in employment. The shift indicates the employment distributed differently than in 1950. On the average, 11.6 percent of the jobs in 1950 were redistributed by 1963.

Viewing the data in Table 2 by states shows that the redistribution of employment exhibits different patterns. The actual increase in employment in Indiana is 6 percent of the employment in

TABLE 2

TOTAL EMPLOYMENT AND NET SHIFT, MICHIGAN AND INDIANA
1950-1963

	Total Employment				Expected	Net	Net Shift as % of	
	1950	1963	Change	%	Employment	Shift	Total Shift	1950 Emplmt.
B. Creek	45,500	57,300	11,800	25.9	51,500	+5,800	6.2	12.8
B. City	27,200	29,300	2,100	7.7	30,800	-1,500	1.6	4.0
Ben. Har.	38,900	53,300	14,400	37.0	44,100	+9,200	9.7	23.7
Flint	110,400	133,700	23,300	21.1	125,200	+8,500	9.0	7.7
Gr. Rap.	114,000	135,700	21,700	19.0	129,300	+6,400	6.7	5.6
Jacks.	37,000	43,900	6,900	18.7	42,000	+1,900	2.0	5.3
Kala.	49,500	65,200	15,700	31.7	56,100	+9,200	9.7	18.6
Lans.	70,500	102,900	32,400	46.0	80,000	+22,900	24.2	32.5
Musk.	45,000	51,300	6,300	14.0	51,000	+300	0.3	0.7
Sagin.	55,400	62,500	7,100	12.8	62,800	-300	0.3	0.5
P. Hur.	24,000	29,000	5,000	20.8	27,200	+1,800	2.0	11.7
Ann Arb.	47,000	79,400	32,400	68.9	53,300	+26,100	27.6	55.5
Mich. Totals	664,300	843,500	179,100	27.0	753,300	±94,900	100.0	14.2
Evans.	76,700	73,500	-3,200	-4.2	87,000	-13,500	18.9	17.6
F. Wayne	87,900	97,800	+9,900	11.3	99,700	-1,900	2.7	2.2
Indpls.	290,200	328,900	+38,700	13.3	329,100	-200	0.3	0.1
Muncie	40,000	41,400	+1,400	3.5	45,400	-4,000	5.6	10.0
Anders.	37,000	39,400	+2,400	6.5	42,000	-2,600	3.6	7.0
S. Bend	102,800	86,000	-16,800	-16.3	116,600	-30,600	42.9	29.8
Marion	17,000	21,100	+4,100	24.1	19,300	+1,800	2.5	10.6
T. Haute	43,200	40,800	-2,400	-5.6	49,000	-8,200	11.5	19.0
L. Porte	22,700	24,100	+1,400	6.2	25,700	-1,600	2.2	7.1
Richmd.	22,500	24,100	+1,600	7.1	25,500	-1,400	2.0	6.2
Elkhart	26,300	35,400	+9,100	34.6	29,800	+5,600	7.8	21.3
Ind. Totals	766,300	812,500	46,200	6.1	869,100	±71,400	100.0	9.3
Grand Totals All Cities	1,430,600	1,656,000	225,400	19.9	1,622,400	±166,300		11.6

Source: Appendix B

1950, but 9.3 percent of 1950's jobs were redistributed in 1963. In Michigan, the actual increase in employment is 27 percent, with 14.2 percent of 1950's jobs redistributed. If the redistribution of employment is considered in terms of the direction of the shift, the significance of the pattern becomes clear. In Michigan, 98 percent of the shift is positive; Indiana's is 90 percent negative. The cities in Michigan, in terms of employment grew faster than the nation and Indiana's slower. The cities included here are the major cities (excluding the large standard metropolitan areas) in each state. These cities were a drag on Indiana's growth. In fact, Indiana's actual increase in employment of 14.4 percent (Table 1) must have come from the smaller cities not included in Table 2.[1] The differences exhibited by the data in Table 2 display dissimilar patterns: the cities in Indiana realized a relative loss from the impact of change; Michigan's a relative gain.

b. Population and Employment Shifts

Do the changes in population fit the same pattern? All cities in both states had positive increases in population and in sum exceeded the each state's increase.[2] Regressing total employment and population for the cities shows a high degree of correlation, as shown in Table 3.[3] However, changes in total employment and changes in

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[1]Indicative of this is the fact that the smallest size cities in Table 2 had the largest increase in total employment.

[2]Appendix A.

[3]Linear form $Y = A + BX$ was used with population as the independent variable.

population are not related. The changes in population do not account

TABLE 3

CORRELATION COEFFICIENTS OF TOTAL EMPLOYMENT AND POPULATION FOR SELECTED CITIES IN MICHIGAN AND INDIANA, 1950-63

	r*	r^2
Michigan cities	.960	.922
Indiana cities	.996	.992
All cities (pooled)	.989	.978

*Significant at the 5% level

for the change in total employment, as shown in Table 4.

TABLE 4

CORRELATION COEFFICIENTS OF CHANGES IN TOTAL EMPLOYMENT AND POPULATION FOR SELECTED CITIES IN MICHIGAN AND INDIANA, 1950-63

	r*	r^2
Michigan cities	.532	.283
Indiana cities	.828	.686
All cities (pooled)	.700	.490

*Not significant at the 5% level

The population of the cities is by definition the size of the city. Each city had a net shift in total employment and this shift is independent of the actual changes in population (city size), as indicated

in Table 5.

TABLE 5

CORRELATION COEFFICIENTS OF TOTAL EMPLOYMENT SHIFT AND CHANGE IN POPULATION FOR SELECTED CITIES IN MICHIGAN AND INDIANA, 1950-63

	r*	r^2
Michigan cities	.209	.023
Indiana cities	.123	.015
All cities (pooled)	.201	.040

*Not significant at the 5% level

If the cities' population had grown at the same rate as the population in the nation, each city would have had a negative or positive shift in population, similarly derived as the employment shift.[4] Shifts in total employment and population are not highly correlated. The pattern of population shifts does not match the pattern of total employment shifts when the data is disaggregated at the city level. This is contrary to the findings when the total data on employment and population shifts at the state level are used.[5] The city is an independent economic unit among many such units and its reaction need

[4] Population shift data is in Appendix A.

[5] H. S. Perloff, E. S. Dunn, E. E. Lampard, J. F. Muth, Regions, Resources and Economic Growth, John Hopkins Press, Baltimore 1960, p. 296. The unit of analysis in this study is the state. Accordingly the employment and population shifts so derived do not consider the variation within the state.

not follow the general pattern of the state. In fact, none of the components of the total employment shift, the local-factor and composition shifts, are highly correlated with the population shift.[6] This is shown in Table 6. The fact that it is not correlated to any high degree simply indicates the fact that the cities react independently of population shifts, not only in terms of total employment shifts, but also in terms of shifts due to the industry composition and location advantages.

TABLE 6

CORRELATION COEFFICIENTS OF EMPLOYMENT AND POPULATION SHIFTS FOR SELECTED CITIES IN MICHIGAN AND INDIANA, 1950-63

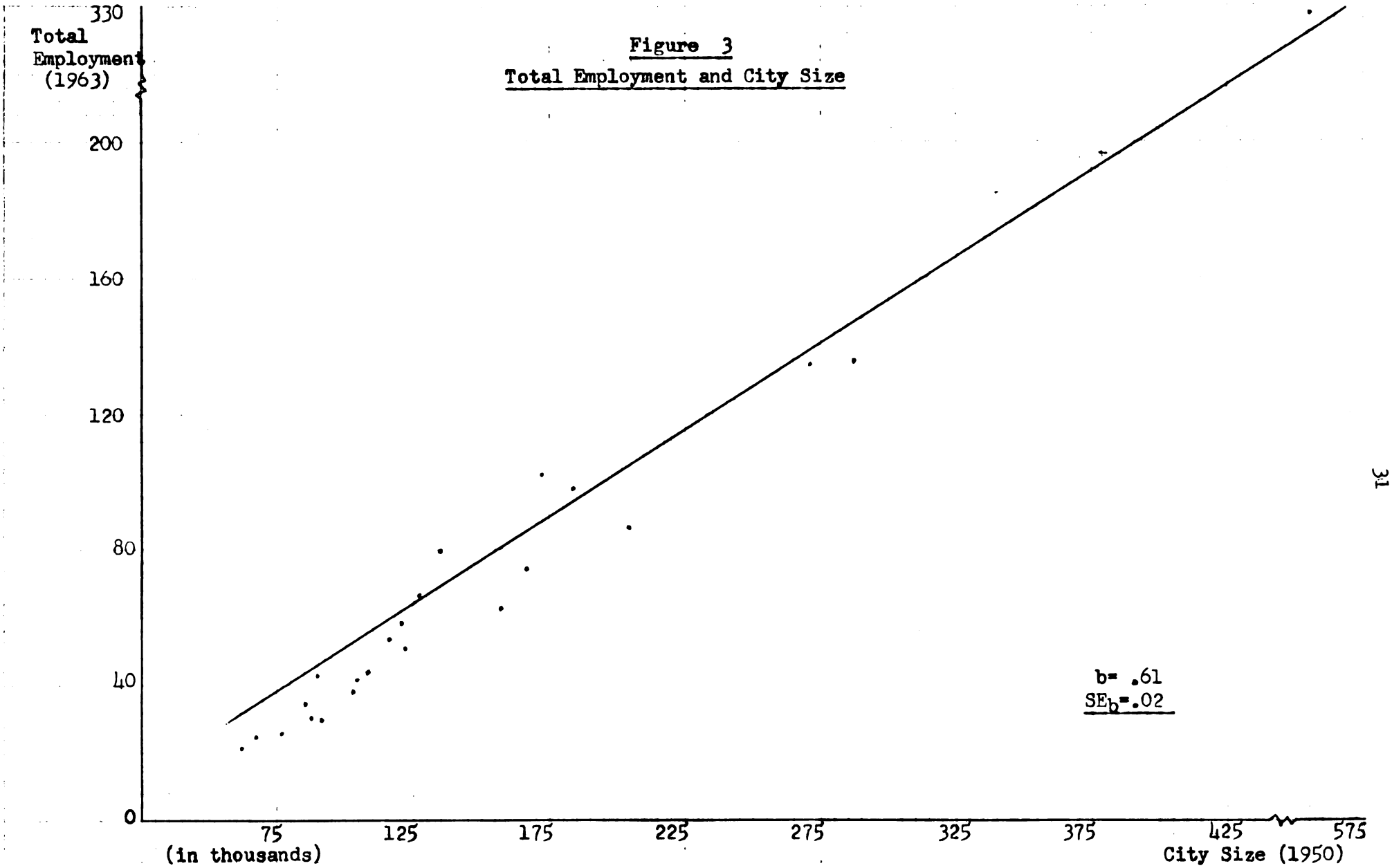
	r*	r^2
Tot. Empl.: Population		
Michigan cities	.190	.036
Indiana cities	.413	.171
All cities (pooled)	.395	.156
Loc.-Factor: Population		
Michigan cities	.226	.051
Indiana cities	.112	.013
All cities (pooled)	.275	.076
Composition: Population		
Michigan cities	-.142	.020
Indiana cities	.816	.666
All cities (pooled)	.465	.216

*Not significant at the 5% level

[6] If the population shifts are used to measure changes in

Figure 3

Total Employment and City Size



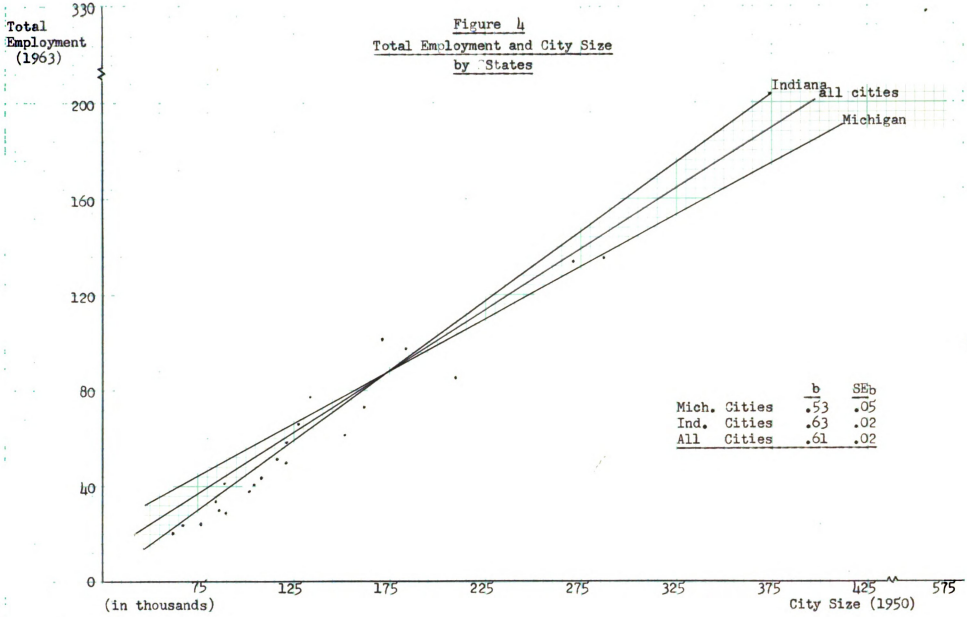


Figure 4
Total Employment and City Size
by States
Total Employment (1963)
330
200
160
120
80
40
0
Indiana
All cities
Michigan
b SEb
Mich. Cities .53 .05
Ind. Cities .63 .02
All Cities .61 .02
75
125
175
225
275
325
375
425
575
(in thousands)
City Size (1950)

The population (city size) is definitely related to total employment for no other reason than that the possible employment is bounded by the population size. According to the definition of the city unit used here (county or counties that form the area), commuting workers do not significantly alter the size of the available work force. Commuters would pose a difficulty if the city and its population were defined by a geographical "ring", of say ten miles, about a central core. In that case, however, the city unit is delimited by alternative techniques. Figure 3 shows that a one percent rise in population (city size) is associated with a 60 percent rise in total employment. When the data are grouped by states, the regression is twisted up or down from the pooled regression, indicating some variability between the states (Figure 4). The regression is a good fit with very little curvature and a small error (2%) of the slope. However, the data are of total employment and population and are static. What is important over time is the change and redistribution. Tables 4, 5, and 6 indicated that changes in population do not account for the change in total employment, or, that it is dependent on the changes in city size. In terms of the employment shift, change in size had no significant impact. To obtain additional information on changes and redistributions, the total employment concept must be broken down into its components. This is done in the next chapter by industry sectors.

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demand, then change in demand is not significant for the shifts.

CHAPTER V

INDUSTRY EMPLOYMENT AND CITY SIZE

The shifts that have occurred over the period worked on individual industries within some structure and list of advantages. Prior to the analysis of these shifts, it is useful to see what the industry patterns are in terms of actual changes by sectors. The analysis of patterns will provide an insight into the stability and distribution of employment over the period, and also indicate the comparative usefulness of the shift analysis. The employment patterns by sectors for the initial and terminal years show several interesting facets. This chapter is concerned with the analysis of the patterns, relative to city size of employment by industry sector.

a. Sector Employment Patterns

Table 7 gives employment data by sectors for all cities selected in the two states. The actual employment in 1963 is distributed over the sectors as was that of 1950. The growth by sectors over this period is stable and according to the existing relative pattern of industry. This is indicated graphically in Figure 5 for all cities. The diversification of industry is quite consistent over the period.

However, the absolute change as a percent of 1950 employment

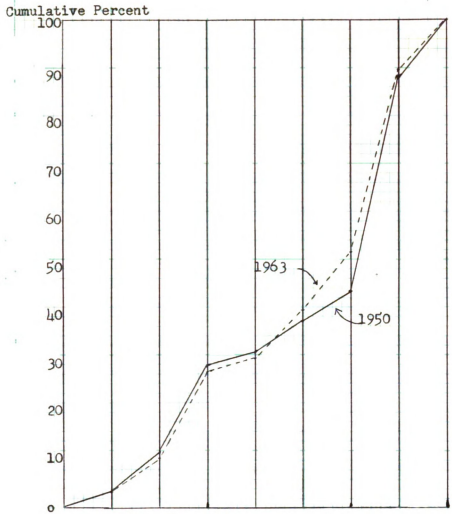
TABLE 7

EMPLOYMENT CHANGES BY INDUSTRY SECTORS:
MICHIGAN AND INDIANA, 1950-1963

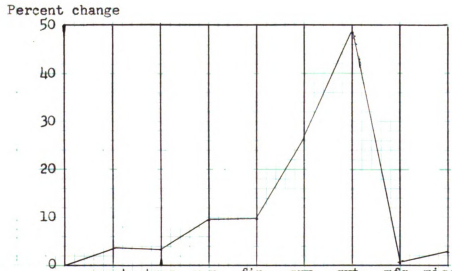
Sector	(1) Total Employment 1950	(2) %	(3) 1963	(4) %	(5) Absolute Change	(6) (5)÷(1)	(7) (5)÷Total Change
Construction	50,800	3.6	59,600	3.6	8,800	17.3	3.9
Trans. Com.	79,900	5.6	87,400	5.7	7,500	9.4	3.3
Whol-Retail	266,400	18.6	286,700	17.3	20,300	7.6	9.0
Fin. Ins.	38,800	2.7	60,400	3.6	21,600	55.7	9.6
Services	97,200	6.8	159,000	9.6	61,800	63.6	27.4
Government	85,500	6.0	195,100	11.8	109,600	128.2	48.6
Manufacturing	637,100	44.5	639,000	38.6	1,900	0.3	.08
Misc.*	174,900	12.2	168,800	10.2	-6,100	-3.5	-2.7
Totals	1,430,600	100.0	1,656,000	100.0	225,400	15.8	100.0

*Includes mining and other data undisclosed.

Source: Appendix B.



A. Distribution of Employment by Industry, All Cities, 1950-1963



B. Distribution of Employment Change by Industry, All Cities, 1950-63

Figure 5

(column 6), indicates that two sectors were growing at a relatively faster rate. The two sectors, Services and Government, far exceed the change in employment of all other sectors and constitute about 76 percent of the actual increase in total employment (column 7). Finance-Insurance and the Wholesale-Retail sectors have also contributed, but less significantly to the total changes. The changes in these four sectors were the sources of about 95 percent of the total actual change in employment. Part b of Figure 5 indicates clearly the impact of the growth of these sectors. The manufacturing sector had the least impact, a change in employment of less than one percent. The miscellaneous sector is a residual and is not considered further in the analysis.[1]

The changes in the sectors for the cities in both states are somewhat different than the changes in the national equivalents. For the period 1950-1963, agricultural and mining employment continued to decline in the nation.[2] The manufacturing sector continued to maintain a stable proportion of total non-agricultural employment. Transportation-Communication sector employment had declined steadily over the period, whereas, the Wholesale-Retail, Finance-Insurance and Construction sectors remained relatively stable. The Government and Services sectors continued their rapid rise into the sixties.[3]

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[1]As a residual, it includes a small number of mining and agriculture employment of little importance for shifts in cities. It also includes undisclosed employment data.

[2]H. G. Vatter, The U. S. Economy in the 1950's, W. W. Norton & Company, Inc., New York, 1963, pp. 60-61.

[3]Survey of Current Business, Annual Review Number, U. S. Department of Commerce, January 1964, S-12.

However, in the selected cities of both states, the only decline, as a proportion of the total employment, was in the Manufacturing and Wholesale-Retail sectors (Table 7). And unlike the national sector, City Transportation-Communication sectors realized a slight increase in their proportion, and Construction remained the same. So while the pattern of industry employment exhibits stability during the period, the patterns of each city sector are unlike that of the equivalent national sector.

b. City Size and Sector Total Employment Shifts

Employment by industry sector regressed against city size (population, 1950) is highly correlated, as indicated in Table 8.

TABLE 8

REGRESSION AND CORRELATION COEFFICIENT OF SECTOR EMPLOYMENT AND CITY SIZE FOR SELECTED CITIES IN MICHIGAN AND INDIANA

	r*		r^2		b	
	1950	1963	1950	1963	1950	1963
Construction	.950	.969	.903	.939	.022 (.002)	.020 (.001)
Transportation & Com.	.927	.934	.859	.872	.042 (.004)	.029 (.002)
Wholesale-Retail	.962	.965	.964	.931	.112 (.005)	.093 (.006)
Finance and Ins.	.946	.921	.895	.848	.024 (.002)	.028 (.003)
Services	.950	.974	.903	.949	.044 (.003)	.047 (.002)
Government	.892	.782	.796	.612	.043 (.005)	.058 (.010)
Manufacturing	.969	.973	.939	.947	.199 (.011)	.150 (.008)

*Significant at the 5% level

This was the case in both 1950 and 1963.[4] The only sharp change between 1950 and 1963 occurs in the government sector. This change is due partly to the way the data of government employment is reported.[5] The fact that capital cities are included among the selected cities also distorts the relationship somewhat because of concentration.

The regression coefficients shown in Table 8 show them to be small for all sectors. The slopes are shallow and show small shifts between the periods for all sectors. Two sectors, wholesale-retail and manufacturing, did shift much more than the other sectors. The downward shift of the regression between the periods indicates that activities in both sectors arennot strictly tied to the city-size (population). The redistribution of employment out of these sectors accounts for this change.[6] The overall result is a downward twist of the regression for the sectors over the period. And although it has shifted downward, the change is not much different than that for 1950.

Considering the city data grouped by states gives the same picture as indicated in Table 8. Table 9 shows that the regression coefficient for the manufacturing sector in both states is lower in 1963. However, as will be indicated later, the changes in this sector are not similar.

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[4]Correlations were also high using the state as the unit. Perloff, et al., op. cit., p. 296.

[5]In Indiana, employment in education is reported in the total government figure, whereas in Michigan it is included in the Service sector.

[6]This aspect is taken up in the next chapter.

TABLE 9

REGRESSION AND CORRELATION COEFFICIENTS OF SECTOR EMPLOYMENT AND CITY SIZE FOR SELECTED CITIES BY STATES

	r		b	
	1950	1963	1950	1963
Michigan				
Construction	.779	.883	.014	.016
			(.003)	(.003)
Transportation & Com.	.863	.786	.022	.016
			(.004)	(.004)
Wholesale-Retail	.955	.933	.093	.062
			(.009)	(.008)
Finance and Ins.	.864	.814	.013	.011
			(.003)	(.003)
Services	.900	.935	.026	.036
			(.004)	(.004)
Government	.423	.273	.011	.025
			(.007)	(.030)
Manufacturing	.955	.959	.223	.183
			(.022)	(.017)
Indiana				
Construction	.993	.993	.024	.021
			(.001)	(.001)
Transportation & Com.	.986	.982	.047	.033
			(.003)	(.002)
Wholesale-Retail	.996	.994	.117	.101
			(.004)	(.004)
Finance and Ins.	.987	.995	.026	.033
			(.001)	(.001)
Services	.995	.990	.048	.050
			(.003)	(.004)
Government	.981	.982	.050	.067
			(.003)	(.004)
Manufacturing	.979	.990	.193	.141
			(.013)	(.007)

The changes in actual employment by sectors are not, however, related to the change in city size (population). The only exception, as shown in Table 10, is the service sector which should be expected to rise concurrently with changes in city size. But the value of the

TABLE 10

REGRESSION AND CORRELATION COEFFICIENTS OF CHANGES IN INDUSTRY EMPLOYMENT AND CITY SIZE FOR SELECTED CITIES IN MICHIGAN & INDIANA

	r	b	r^2
Construction	.699	.015 (.003)	.489
Transportation & Comm.	.197	.006 (.007)	.039
Wholesale-Retail	.621	.028 (.008)	.386
Finance and Ins.	.774	.036 (.006)	.599
Services	.886*	.058 (.007)	.785
Government	.364	.064 (.036)	.133
Manufacturing	.117	.019 (.035)	.014

*Significant at the 5% level

slope for this sector is small as is for all sectors. Table 10 indicates that changes in actual employment are not accounted for by changes in city size.

Table 11 shows the same data grouped by states, a grouping which gives the same picture of the changes in actual employment. The change in actual employment is not accounted for by the change in city size considering the changes by states. In Table 11, as in Table 10, the r^2 values are low, except in the Services sector for both states

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TABLE 11

REGRESSION AND CORRELATION COEFFICIENTS OF CHANGES IN INDUSTRY EMPLOYMENT AND CITY SIZE FOR SELECTED CITIES, 1950-1963

	Michigan			Indiana		
	r	r^2	b	r	r^2	b
Construction	.669	.448	.019 (.007)	.834	.696	.012 (.003)
Transportation & Com.	.016	.001	.001 (.006)	.611	.373	.014 (.006)
Wholesale-Retail	.045	.002	.001 (.010)	.859	.738	.043 (.008)
Finance-Ins.	.424	.180	.006 (.004)	.969*	.966	.052 (.004)
Service	.885*	.783	.059 (.010)	.920*	.842	.055 (.008)
Government	.215	.046	.059 (.090)	.949*	.901	.053 (.006)
Manufacturing	.697	.486	.073 (.020)	.078	.006	.014 (.060)

*Significant at the 5% level

and Services, Finance-Insurance, and Government in Indiana. The Service sector employment should change with city size (population). However, the Government sector is distorted by data reporting, as indicated above. It would not provide any additional information to correct for this distortion since the r^2 value for the Service sector is already high and the Government sector is not the most important for employment. It would seem that the Finance-Insurance sector depends on size, although its regression coefficient, like all sectors, is low. The relationship is more clearly seen in terms of the relative shift. The sector's position is relatively the same if little or no shift occurred, either positive or negative. As will be seen

later, the shift was small.

The stability exhibited in Figure 3a above, is also present when the changes in actual employment are considered. The profile of changes by sectors for the largest and smallest cities is shown in Figure 6. It does not diverge significantly from the pattern of Figure 5. There are movements around the general pattern which are attributable to the variability of changes amont the cities. Table 12 indicates the variability of the cities by the mean and mean deviation. The cities, considered individually, would have a profile

TABLE 12

MEAN AND MEAN DEVIATIONS OF CHANGES IN EMPLOYMENT BY SECTORS, 1950-1963

	Mean	Mean Deviation
Construction	31.7	19.1
Transportation & Com.	45.1	32.9
Wholesale-Retail	11.6	16.2
Finance-Ins.	59.3	24.9
Service	78.4	43.4
Government	132.6	97.9
Manufacturing	14.8	10.2

Source: Appendix B

moving up or down around an established profile for employment by sectors in all cities.

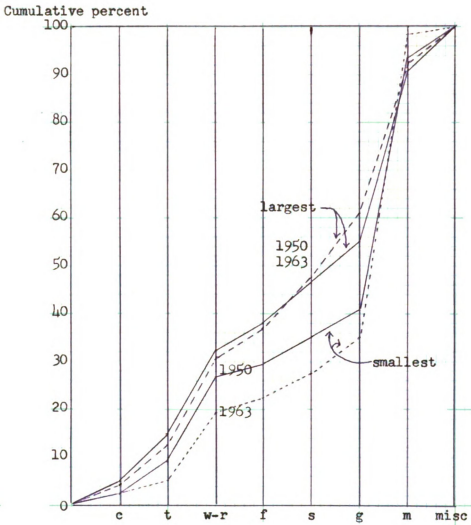

Figure 6

Distribution of Employment by Industry Sectors Grouped by Largest and Smallest Size Cities, 1950-63

The distribution of employment by sectors in 1963 is quite similar to that in 1950, showing much variability among cities but no sharp divergences from the patterns. The city operates as a unit in a system of units and industry employment adjusts through shifts. While the profile of distribution of employment, and changes by sectors shows a relatively stable pattern, the comparison of the actual and expected employment is of greater interest and more important in the determination of a city's relative share of the nation's growth.

CHAPTER VI

SHIFTS IN INDUSTRY EMPLOYMENT

a. Sector Shift Patterns

The pattern of actual distribution of employment by sectors in Michigan and Indiana in 1963 is similar to the distribution expected if the sectors had grown at the national rate. Table 13 and Figure 7 indicate that the early distribution of industry employment does have an influence on the actual, as well as the expected, distribution for the limited future period considered here. The shift pattern by sectors is similar to the shift pattern for total employment. The average shift of total employment, as a percent of 1950 employment, is 11.6 percent, with a range of 0.1 to 32.5 percent.[1] The average shift by sectors is 16.1 percent, with a range of 4.4 to 33.9 percent. For industries, the shift pattern is similar to the shift pattern for total employment. Hence, the closeness of the profile in Figure 5 between the expected and the actual.

However, for each particular industry sector, the net shift exhibits an entirely different pattern. This is indicated in column 10 of Table 13, where the net shift by sector is expressed as a percent of the absolute change in employment. Obviously, the various

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[1] In Table 2, above.

TABLE 13

EMPLOYMENT SHIFTS BY INDUSTRY SECTORS: MICHIGAN AND INDIANA, 1950-63

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Total Employment									Net Shift as Percent of	
Sectors	1950	%	1963	%	Absolute Change	%	Expected Employment	%	Total Net Shift	Absolute Change	1950 Employment
onstruction	50,800	3.6	59,600	3.6	8,800	17.3	62,200	3.8	-2,600	29.6	4.4
rans., Com.	79,900	5.6	87,400	5.3	7,500	9.4	76,500	4.7	+10,900	145.3	12.5
hol.-Retail	266,400	18.6	286,700	17.3	20,300	7.6	308,800	18.8	-22,100	108.9	7.7
in.-Ins.	38,800	2.7	60,400	3.6	21,600	55.7	56,600	3.4	+3,800	17.6	6.3
ervices	97,200	6.8	159,000	9.6	61,800	63.6	142,400	8.7	+16,600	26.9	10.4
overnment	85,500	6.0	195,100	11.8	109,600	128.2	128,900	7.8	+66,200	60.4	33.9
anufacturing	637,100	44.5	639,000	38.6	1,900	0.3	724,400	44.0	-85,400	4,500	13.4
isc.*	174,900	12.2	168,800	10.2	-6,100	-3.5	145,900	8.8	+22,900	3,750	13.6
Totals	1,430,600	100.0	1,656,000	100.0	225,400	15.8	1,645,700		±230,600	102.3	16.1

Includes mining and other data undisclosed.

ource: Appendix B.

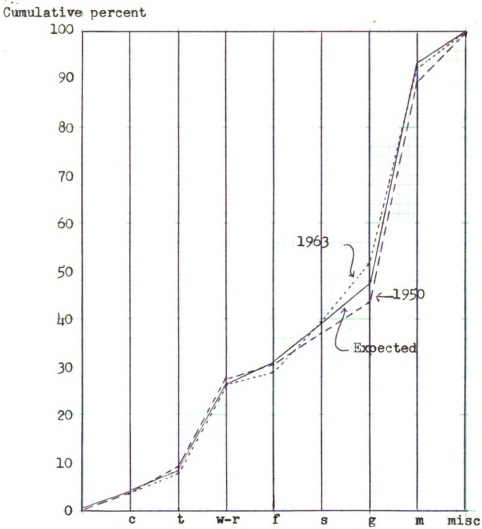

Figure 7

Distribution of Employment by Industry; Actual and Expected

sectors have entirely different growth rates. The range of the absolute change is 0.3 percent in manufacturing to 128.2 percent in the government sector. Only three sectors, construction, wholesale-retail and manufacturing, had negative net shifts, i.e., grew at a lower rate than the national sector rate.

The data on sector employment shifts disaggregated by states exhibits the same profile of distribution as the actual and the expected. However, there is greater variability in the shifts expressed as percent of the absolute change and of 1950 employment. This should be the case since the units within the states have reacted differently. Only two sectors in the selected cities in the state of Michigan failed to grow at the same rate as these sectors in the nation. Only two sectors in the selected cities in Indiana grew at a rate faster than the nation's sectors. This is shown in Table 14, column 9, by the signs of the net shifts. The expected employment by sectors in those cities in Michigan is less than the actual employment product of the average actual growth of 27 percent. The expected employment by sectors in the cities in Indiana is greater than the actual employment, a product of Indiana's average actual growth of 8 percent, which is a little more than one-half that of the nation's.

b. Sector Local-Factor and Composition Effects

The shift data in Tables 13 and 14 are developed by expressing the expected employment by sector as they would have been if the sector had grown at the nation's growth rate. The expected total

TABLE 14

EMPLOYMENT SHIFTS OF INDUSTRY SECTORS BY STATES, 1950-1963

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
ate of chigan City	Total Employment									Net Shift as Percent of	
ctors	1950	%	1963	%	Absolute Change	%	Expected Employment	%	Net Shift	Absolute Change	1950 Employment
onstruction	22,100	3.3	30,000	3.6	7,900	35.7	27,100	3.5	+2,900	36.7	13.1
rans., Com.	27,900	4.2	40,800	4.8	22,900	44.4	26,700	3.4	+14,100	50.5	50.5
ıol.-Retail	123,700	18.6	131,600	15.6	7,900	6.4	143,400	18.3	-11,800	149.4	9.5
in.-Ins.	15,000	2.3	22,100	2.6	7,100	47.3	21,900	2.8	+200	2.8	1.3
ervices	38,200	5.8	79,300	9.4	41,100	107.6	56,000	7.2	+23,300	56.7	61.0
overnment	34,800	5.2	116,000	13.8	81,200	233.3	52,500	6.7	+63,500	78.2	182.5
anufacturing	307,800	46.3	328,500	38.9	20,700	6.7	350,000	44.7	-21,700	103.9	7.0
isc.*	94,800	14.3	95,200	11.3	400	0.4	105,500	13.4	-10,300	2575.0	10.9
Totals	664,300	100.0	843,500	100.0	+179,100	27.0	783,100	100.0	±147,600		
ndiana											
onstruction	28,700	3.7	29,600	3.6	900	3.1	35,200	3.9	-5,600	622.2	19.5
rans., Com.	52,000	6.8	46,600	5.7	-5,400	10.4	49,800	5.5	-3,200	59.3	6.2
hol.-Retail	142,700	18.6	155,100	19.1	12,400	8.7	164,200	18.1	-9,100	73.4	6.4
in.-Ins.	23,800	3.1	38,300	4.7	14,500	60.9	32,700	3.6	+5,600	38.6	23.5
ervices	59,000	7.7	79,700	9.8	20,700	3.5	86,400	9.5	-6,700	32.4	11.4
overnment	50,700	6.6	79,100	9.7	29,400	58.0	76,500	8.4	+2,600	8.8	5.1
anufacturing	329,300	43.0	310,500	38.2	-18,800	5.7	374,400	41.2	-63,900	339.9	19.4
isc.*	80,100	10.5	73,600	9.1	-6,500	8.1	89,200	9.8	-15,600	240.0	19.5
Totals	766,300	100.0	812,500	100.0	+ 46,200		908,400	100.0	±112,300		

urce: Appendix B.

employment of Table 2, Chapter IV, is based on the amount of employment that would have developed if total employment had grown at the nation's rate. The shift technique is applied in these tables at two levels of aggregation; total and sector employment. Differences appear when the shift data are compared. They differ because of the impact of either national forces and/or the characteristics of the city. The particular industry within the city may gain employment because of the local advantages relative to other cities, even though the nation's growth may have been less. This difference shows the impact of the local-factor effect, the relative attractiveness of this particular city. In addition, an industry in the city may be growing because that industry is growing nationally and happens to be part of the industry composition of the city and is growing faster than the nation. This is the composition effect. The two effects produce the differences in the shift data indicated in Tables 13, 14 and 2.

Data on employment shifts in these tables are summarized in Table 15 for all of the selected cities. The total net shift is the

TABLE 15

TOTAL NET EMPLOYMENT SHIFT FOR SECTORS FROM LOCAL-FACTOR AND COMPOSITION EFFECTS FOR SELECTED CITIES MICHIGAN AND INDIANA, 1950-1963

Total net shift	+33,900
Net Local-factor shift	+ 6,200
Net composition shift	+27,700

Source: Appendix D

difference between the actual and expected employment in total employment. For all cities the shift is positive; total employment grew at a faster rate than it grew in the nation. The net local-factor shift is the difference between the actual and expected employment in each sector if each sector had grown at the rate the national sector grew. However, the local-factor shift in employment is less than the net total shift. This difference is due to the fact that each industry sector in the cities grew faster than the national average, a difference which shows the composition effect. The composition of industry was such that the cities gained a greater proportion of the industry nationally growing. For all cities, the shift in employment was positive and produced by the relatively advantageous characteristics of the cities and the presence of nationally growing industries in these cities.

c. Shift Patterns by States

Since only Mining and Transportation sectors had declined nationally,[2] the cities in this study gained a proportion of growth industries (other cities had relative losses) and at the same time were a positive attraction for the location of industry. However, the size of the net shift in employment due to the local-factor and composition effects is quite small. This accounts for the stability of industry distribution regardless of whether it is the actual or the expected being considered, as was shown in Figure 5. But when

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[2] See Appendix B. Mining is excluded in the analysis.

the shift data are grouped by states, (Table 13), the net shifts exhibit divergent patterns corresponding to the variability in the growth within the states.[3]

Table 16 shows the shift data for the selected cities grouped by states. It indicates the source of the net total shift. The local-factor shift is a significant source of the net total shift in employment for both states, but a source of both positive and negative shifts. The strong upward shift from the local-factor effect is bolstered by

TABLE 16

TOTAL NET EMPLOYMENT SHIFT FOR SECTORS FROM LOCAL-FACTOR AND COMPOSITION EFFECTS FOR SELECTED CITIES 1950-63

	Michigan	Indiana	Total
Total net shift	+90,200	-56,300	+33,900
Net local-factor shift	+82,000	-75,800	+ 6,200
Net composition shift	+ 8,200	+19,500	+27,700

Source: Appendix D

the positive shift of the composition effect in Michigan. Whereas, the upward shift in the composition effect was not sufficient to offset the strong downward impact of the local-factor shift in Indiana. The divergence of the patterns of the net shifts is the consequence of the combined effects of the relative advantages and industry-mix of the

[3] As indicated above, p. 42.

cities.

Column 9 of Table 13 shows the positive and negative shifts for the cities by sectors. In Michigan, the positive shift in the sectors was sufficiently strong to offset the negative shifts in Wholesale-Retail and Manufacturing employment. But the positive shifts in Finance-Insurance and Government were insufficient to offset the negative shifts of all the other sectors in Indiana. When the shift data on Table 13 is considered individually by cities, the total, local-factor and composition shifts vary from city to city without a common pattern.[4] Correlating the shifts to city size, with size as the independent variable,[5] indicates no relationship between total and local-factor shifts for the selected cities in either state.[6] However, Table 17 shows that the composition shift is related to size but only

TABLE 17

CORRELATION COEFFICIENTS OF NET SHIFTS AND CITY SIZE, 1950-63

	Michigan		Indiana		All Cities	
	r	r^2	r	r^2	r	r^2
Total net shift	.204	.042	.100	.010	.016	.001
Net local-factor shift	.220	.048	.438	.192	.198	.039
Net composition shift	.028	.001	.948*	.899	.766	.587

*Significant at the 5% level.

[4] Appendix D.

[5] City size in 1950.

[6] See footnote 3, page 20.

for cities in Indiana. The composition net shift in Indiana was positive and related to city size, but insufficient to offset the local-factor shift, which was negative. This is the impact of the national forces and shifted positively with size. The small coefficient for the local-factor shift, in Indiana, indicates that the cities were relatively unattractive for the location of industry.

The small coefficient for the composition shift in Michigan conforms to the results of Table 16, that the composition of industry as such had comparatively little effect on the total shift and is not accounted for by city size. The low coefficient for the local-factor shift means that the city size was of minor influence on the attractiveness of these cities for the location of industry. Industry located in the selected cities in Michigan but not because of city size.

Correlating the shifts with changes in city size, Table 18, gives results differing little from those in Table 17. The composition

TABLE 18

CORRELATION COEFFICIENTS OF SHIFTS AND CHANGES IN CITY SIZE FOR SELECTED CITIES, 1950-1963

	Michigan		Indiana		All Cities	
	r	r^2	r	r^2	r	r^2
Total net shift	.209	.044	.123	.015	.201	.040
Net local-factor shift	.238	.057	.221	.049	.040	.002
Net composition shift	.096	.009	.948*	.899	.650	.423

*Significant at the 5% level

effect is the result of national supply and demand conditions as they

affect the employment sectors.

d. Employment Shifts and City Size

The pattern of total employment shift, all sectors combined, indicates that the relative change in employment is independent of city size and industry composition. The analysis here shows that the patterns diverge when the selected cities are grouped by states. In Michigan, where the shift was favorable, the actual total employment is greater than the expected. It is just the opposite for the cities in Indiana. The diverging patterns are primarily the result of the relative change in locational advantages, the local-factor effect, and show very little impact from the composition effect.

The regression equations of the actual and expected employment for the selected cities in Michigan,

$$\text{Actual:} \quad X_1 = -9259 + .532X_2$$
$$\text{Expected:} \quad X_1 = -12667 + .505X_2$$

(where X_1 is employment; X_2 is city size) show that the slopes vary little as city size is increased. This is also indicated in the regression equations for the selected cities in Indiana,

$$\text{Actual:} \quad X_1 = -22661 + .625X_2$$
$$\text{Expected:} \quad X_1 = -18550 + .632X_2$$

(The regression equations indicated as Actual are relationships using the actual employment data for the cities of both states. The regression equations indicated as Expected are relationships using the employment data of the cities if the employment had grown at the

national rate. What is important for the analysis here is the relationship of employment and city size, not the estimated X_1 determined by the equation.) If city size and industrial composition had a significant impact, the actual and expected employment should diverge sharply. The small differences between the slopes, for both states, show the regression lines of actual and expected employment to be almost parallel. City size and industry composition had no significant impact on the shifts.

Grouping the selected cities by size and state does not alter the diverging pattern of the actual and expected employment. This is shown in Figure 8. The actual employment growth varies among the cities in both states. But size as such was not an important factor as indicated by the opposite patterns of actual rates in Figure 8. Among the selected cities, the smaller and intermediate size cities did not all grow faster than the larger cities. A rapid actual growth is not directly dependent on size, but is the result of differential locational advantages of the various size cities.

Total employment in the cities is divided among the various industry sectors. The volume of employment in the sectors is the development relative to the economic determinants in that place: resources, technology, population and institutions. The city's particular configuration presents a structure in terms of its relative specialization. If the structure fits the national trends, the sectors grow. The proportion of the impact of the determinants requires detailed data not available at the city level of aggregation.

The local-factor effect is the result of location advantages:

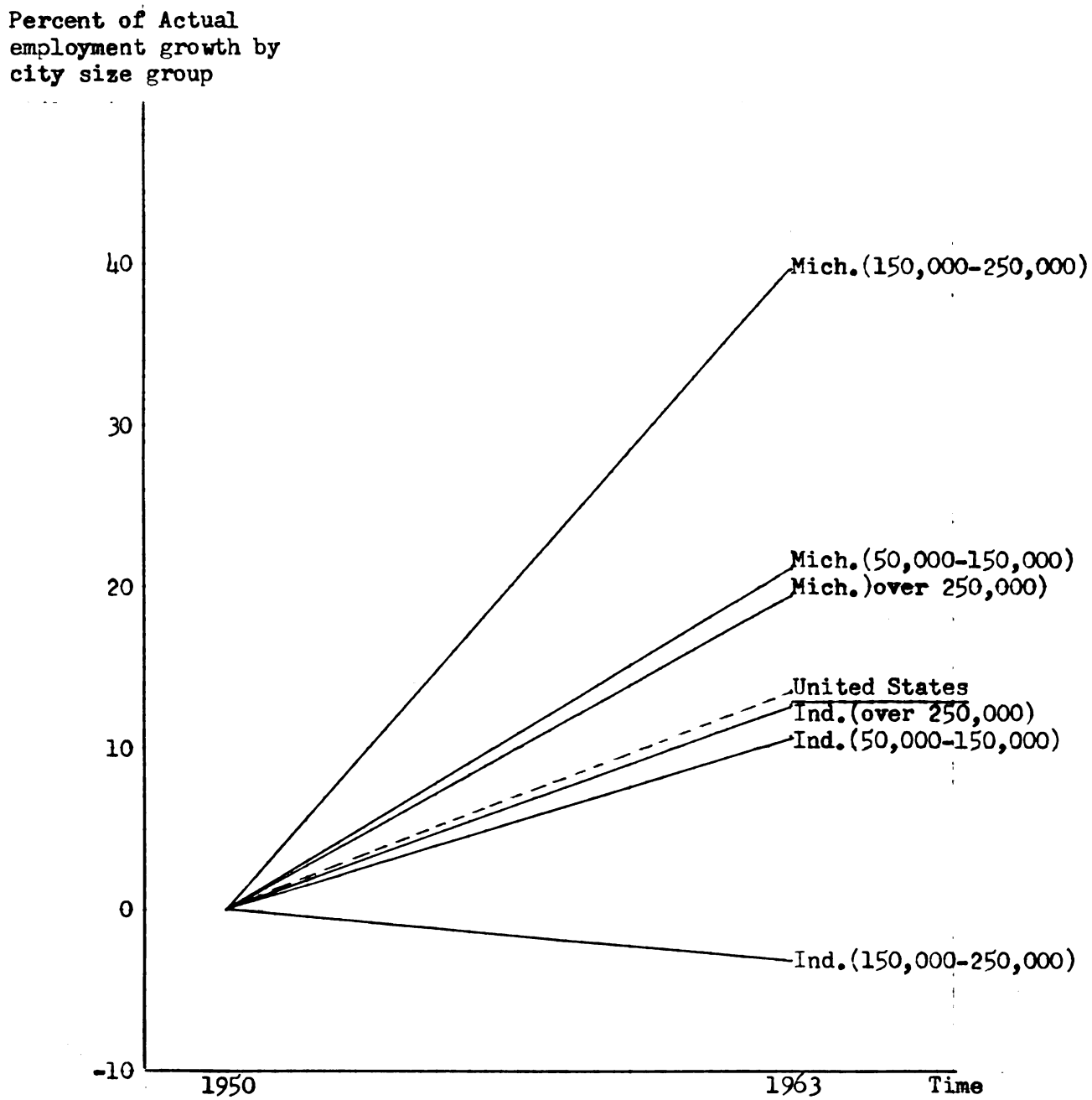

Figure 8

Actual and Expected Employment Growth by Size Group

internal economies of input sources; external economies of industry regional concentration or metropolitan agglomeration; industry internal economies of scale and changes in markets and transport costs. Given the locational advantages, the employment shifts are essentially dependent on the inputs and outputs at relative locations. However, the analysis of inputs and outputs in any given city, or its sector, requires detailed data. These data are not available for either industries or sectors at the city level.

However, employment data are available for industries within the manufacturing sector, although not complete. Even so, these data are important because of the importance of the manufacturing sector in both states. The manufacturing sector approaches forty percent of total employment for the state totals, as well as for each city. Obviously, any change in this sector has a significant impact on total employment, regardless of the reported data. Indeed, Table 13 indicated that the manufacturing sector is the chief source of the negative shift. The reported data on the breakdown of this sector are analyzed in the next chapter.

CHAPTER VII

THE MANUFACTURING SECTOR SHIFTS

Manufacturing employment in the two states averages 38.6 percent of total employment in 1963, a decline from 44.5 percent in 1950. But while it is the most important employment sector, it had the least actual increase in employment of all sectors, less than one percent. In terms of the expected employment, the manufacturing sector had the largest negative shift (Table 12). This shift is 14 percent of the manufacturing employment in the initial period when the sector accounted for 44.5 percent of total employment. The negative shift more than offsets the large positive shifts of both the service and government sectors. Not only is the manufacturing sector important for total employment, but its outward shift is a significant depressing force on the overall employment.

a. Actual and Expected Employment

Table 19 gives the actual and expected employment for all selected cities combined. The sector is broken down by standard industrial classification at the 2-digit level. The net shift for the manufacturing sector, column 8, for both states is 85,600 and negative. In total, the shift is 13.4 percent of the 1950 employment. This percent indicates the number of 1950 jobs that were redistributed in 1963. If all industries in this sector had grown at the national rate,

TABLE 19

RELATIVE EMPLOYMENT SHIFTS IN MANUFACTURING,
ALL CITIES 1950-1963

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Total Employment								Net Shift as Percent of	
Mfg. 2-Digit*	1950	%	1963	%	Absolute Change	% 1950	Expected Employment	Net Shift	Absolute Change	1950 Employment
20	47,700	7.5	49,800	7.8	+2,100	4.4	55,500	-5,700	271.4	11.9
22-3	12,100	1.9	11,800	1.8	-300	2.5	11,100	+700	233.3	5.8
23	2,800	.4	2,000	.3	-800	28.6	3,100	-1,100	137.5	39.3
24	5,600	.9	4,400	.7	-1,200	21.4	4,300	+100	8.3	1.8
25	21,000	3.3	19,300	3.0	-1,700	8.1	23,800	-4,500	264.7	21.4
26	21,500	3.4	20,600	3.2	-900	4.2	27,100	-5,500	733.3	30.7
26-7	12,400	2.0	13,700	2.1	+1,300	10.5	12,000	+1,700	130.8	13.7
27	10,400	1.6	11,100	1.7	+700	6.7	8,200	+2,900	428.6	28.8
28	12,500	2.0	13,300	2.1	+800	6.4	14,800	-1,500	187.5	12.0
28-9	6,100	1.0	7,500	1.2	+1,400	23.0	6,600	+900	64.3	14.8
30	8,700	1.4	9,300	1.5	+600	6.9	14,300	-5,000	833.3	57.4
32	5,200	.8	5,600	.9	+400	7.7	6,200	-600	150.0	11.5
33	41,300	6.5	43,700	6.8	+2,400	5.8	41,200	+2,500	104.2	6.1
34	55,800	8.8	57,200	9.0	+1,400	2.5	64,300	-7,100	507.1	12.7
35	75,600	11.9	71,000	11.1	-4,600	6.2	77,100	-6,100	132.6	8.1
35-6	13,500	2.1	8,700	1.4	-4,800	35.6	18,000	-9,300	193.8	68.9
36	56,900	8.9	64,400	10.1	+7,500	13.2	108,000	-43,600	581.3	76.6
371	111,600	17.5	110,800	17.3	-800	.7	106,900	+3,900	487.5	3.5
37	191,900	30.1	182,800	28.6	-9,100	4.7	231,200	-48,400	531.9	25.2
Misc.	36,100	5.7	42,800	6.7	+6,700	18.6	40,100	+2,700	38.3	7.2
Totals	637,100	100.0	639,000	100.0	+1,900	.3	724,400	-85,600	4,494.9	13.4

See Appendix C for SIC 2-digit descriptions.

85,600 more would have been employed. Column 10 shows the industry shift as a percent of 1950 employment and identifies the 2-digit industry. The industries that produced the largest negative shift, in all cities, were machinery (electric and non-electric) and automobile and transportation equipment (SIC 35-6 and 37). Since the positive shifts which did occur were small, the net shift in manufacturing far outweighs the actual increase in employment (totals, columns 5 and 8).

Grouping the manufacturing shift data by states shows that the patterns for the selected cities in each state diverge from each other. Table 20 indicates that the impact of the manufacturing shift in Indiana is almost three times that in Michigan, although both move in the same direction. Expressing the net shift as a percent of 1950 employment, Indiana's shift is 19.4 percent compared to Michigan's 7.1 percent, as shown in column 10, Tables 21 and 22.

TABLE 20

NET SHIFTS IN MANUFACTURING EMPLOYMENT FOR SELECTED CITIES BY STATES, 1950-63

Michigan	Indiana	All Cities
-21,700	-63,900	-85,600

Source: Table 13.

b. Shift Patterns

The actual and expected employment of Tables 21 and 22 plotted in Figures 9 and 10 clearly indicate the divergence between the profiles when the data is grouped by states. The actual employment is

TABLE 21

RELATIVE EMPLOYMENT SHIFTS IN MANUFACTURING,
SELECTED CITIES IN INDIANA, 1950-1963

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Total Employment								Net Shift as Percent of	
Mfg. 2-digit*	1950	%	1963	%	Absolute Change	1950 %	Expected Employment	Net Shift	Absolute Change	1950 Employment
20	30,400	9.2	28,000	9.0	-2,400	-7.9	35,300	-7,300	304.2	24.0
22-3	8,300	2.5	6,700	2.2	-1,600	-19.3	7,600	-900	56.3	10.8
23	2,800	.9	2,000	.6	-800	-28.6	3,000	-1,000	125.0	35.7
24	2,600	.8	2,100	.7	-500	-19.2	2,000	100	20.0	3.8
25	8,200	2.5	8,600	2.8	400	4.8	9,300	-700	175.0	8.5
26	6,200	1.9	6,000	1.6	-1,200	-19.4	7,800	-1,800	150.0	29.0
26-7	12,400	3.8	13,700	4.2	1,300	10.5	12,100	-1,600	30.8	3.2
27	4,400	1.0	4,600	.8	200	4.6	3,600	1,000	500.0	22.7
28	12,500	3.8	13,300	4.3	800	6.4	14,400	-1,100	137.5	8.8
30	8,700	3.0	9,300	3.0	600	7.0	14,300	-5,000	833.3	57.5
32	5,200	1.6	5,600	1.8	400	7.7	6,100	-500	125.0	9.6
33	14,700	4.5	14,300	4.6	-400	-2.7	14,700	-400	100.0	2.7
34	22,500	6.8	24,700	8.0	2,200	9.8	26,100	-1,400	63.6	6.2
35	36,800	11.2	30,500	9.8	-6,300	-17.1	37,400	-6,900	109.5	18.8
35-6	13,500	4.1	8,700	2.8	-4,800	-35.6	18,000	-9,300	193.8	68.9
36	45,000	13.7	46,800	15.1	1,800	4.0	85,000	-38,200	2,122.2	84.9
37	78,200	23.8	68,800	22.2	-9,400	-12.0	93,700	-24,900	264.8	31.8
Misc.	25,600	5.5	27,300	6.4	1,900	7.4	28,300	-1,000	52.6	3.9
Totals	329,300	100.0	310,500	100.0	-18,800	-5.7	373,400	-63,900	3,398.9	19.4

See Appendix C for SIC 2-digit descriptions.

TABLE 22

RELATIVE EMPLOYMENT SHIFTS IN MANUFACTURING,
SELECTED CITIES IN MICHIGAN, 1950-1963

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Total Employment								Net Shift as Percent of	
Mfg. 2-digit*	1950	%	1963	%	Absolute Change	1950 %	Expected Employment	Net Shift	Absolute Change	1950 Employment
20	17,300	5.6	21,800	6.6	4,500	26.0	20,300	1,500	37.8	9.8
22-3	3,800	1.2	5,100	1.6	1,300	34.2	3,700	1,400	107.7	36.8
24	3,000	1.0	2,100	.7	-700	-23.3	2,400	-300	42.9	10.0
25	12,700	4.2	9,700	3.3	-2,100	-16.4	14,300	-4,600	219.0	36.2
26	15,300	5.0	15,300	4.7	0	19.6	18,500	-3,300	0	21.6
27	7,100	2.3	8,600	2.6	1,500	21.1	5,800	2,800	186.6	39.4
28-9	6,100	2.0	7,500	2.3	1,400	23.0	6,400	1,100	78.6	18.0
33	26,500	8.6	29,400	9.0	2,900	10.5	26,500	2,900	100.0	10.6
34	33,300	10.8	32,500	9.9	-800	-2.4	38,300	-5,800	725.0	17.4
35	38,800	12.6	40,500	12.3	1,700	4.4	39,900	600	35.3	1.6
36	11,900	3.9	17,600	5.4	5,700	47.9	22,700	-5,100	89.5	42.9
37	113,700	36.9	114,000	34.7	300	2.6	134,900	-20,900	696.6	18.4
371	111,600	36.3	110,800	33.7	-800	-.7	106,900	3,900	4875.0	3.5
Misc.	18,100	5.9	22,900	7.0	4,800	26.5	20,100	2,800	58.3	15.5
Totals	307,800	100.0	328,500	100.0	20,700	6.7	350,200	-21,700	104.8	7.1

See Appendix C for SIC 2-digit descriptions.

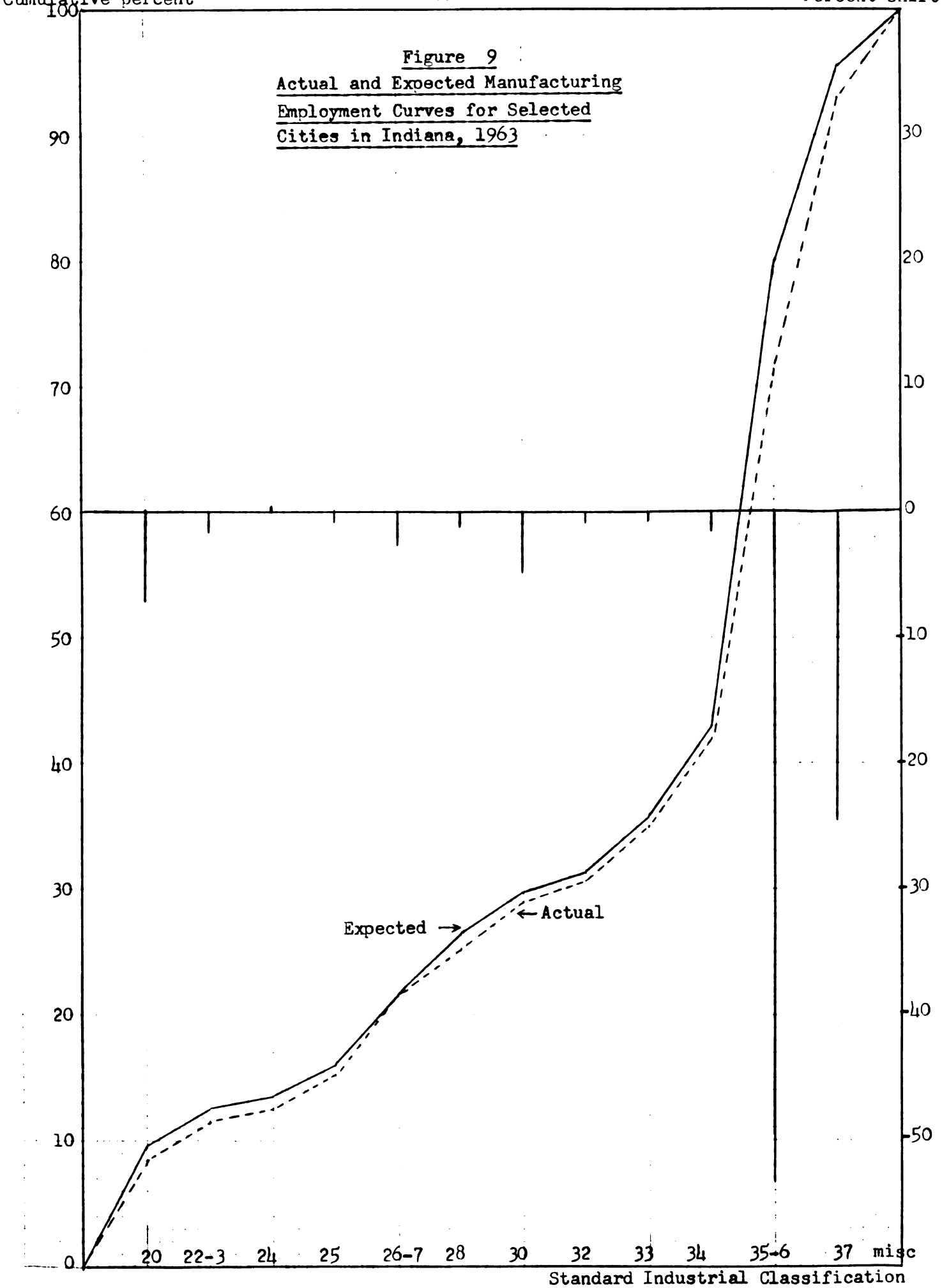

Figure 9
Actual and Expected Manufacturing Employment Curves for Selected Cities in Indiana, 1963

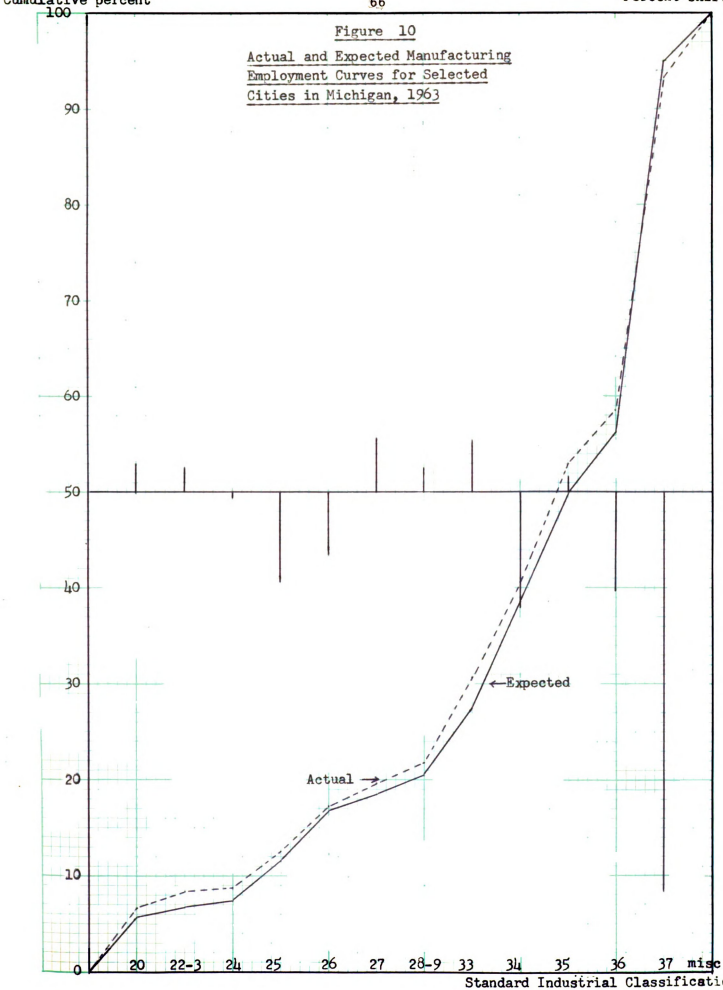

Figure 10

Actual and Expected Manufacturing Employment Curves for Selected Cities in Michigan, 1963

below the expected employment in those cities in Indiana; Michigan employment is above. The curves in the figures show the composition of manufacturing industry, i.e., the 2-digit make-up of the sector. It is also indicative of the degree of diversification within the sector. A forty-five degree line would show perfect diversification.[1] For the limited time period considered here, it would appear that the selected cities in Michigan have gained, while those in Indiana have lost.

The shift by 2-digit SIC is also plotted in Figures 9 and 10. It is drawn in terms of each industry's shift as a percentage of the total absolute shift.[2] It is plotted from a zero shift according to the vertical scale on the right. It specifically identifies those industries that did and did not grow at the national rate, and were the sources for the actual profiles in the figures. All industries in Indiana except one had negative shifts; lumber products experienced a small positive shift. The 2-digit source of the total shift is in machinery and automobile-transportation, with a larger shift in machinery. This shift was sufficient to move the cumulative profile of the sector downward. The negative shifts in Michigan were mainly in automobile-transportation equipment, bot to some degree in four others, SIC 25, 26, 34 and 36.[3] Since the cities in Michigan did not have an

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[1]Adapted from A. Rodgers, "Some Aspects of Industrial Diversification in the U.S.", Papers and Proceedings, Regional Science Association, Vol. 1, 1955.

[2]The miscellaneous category is ignored.

[3]Each 2-digit SIC is identified in Appendix C.

across the sector negative shift, the positive shifts offset the negative to such a degree that the cumulative profile of the sector moved upward. Certainly, the degree of diversification is in part a result of the impact of relative shifts.

c. The Shift and City Diversification

The difference between the expected and actual employment in the sector is the net shift. In Tables 20, 21, and 22, the national growth rate is applied to each specific industry in the manufacturing sector to obtain the expected employment. Subtracting the expected from the actual gives a shift for each 2-digit industry. This is the shift plotted in Figures 9 and 10 on the right vertical scale of the box, and is obtained from column 8 of the tables. Since the local-factor effect is much greater than the composition effect,[4] the movements of the profiles are primarily the result of the advantages, or lack of advantages, for the location of industry. The fact of whether these selected cities in the states are more or less diversified is dependent on the attractiveness for the location of industry. This is, however, not in absolute terms but relative to all other places that also have a matrix of advantages. National demand conditions, the composition effect, are less of an influence.

The criticism that a decline in the relative importance of the dominant industry makes the city more diversified is relevant for a static system and forecasting of diversification.[5] However, in

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[4]The components of the total net shift is given in Table 23 of the next chapter.

[5]B. Chinitz, "Contrasts in Agglomeration: New York and

terms of the shift technique, the dominant industry or industries are in fact dominant in part because of the city's locational advantages. But this is in relative terms, for certainly if it were less advantageous to locate it would be irrational for the industry to do so. For any given moment in time, the pattern of diversification is settled. Obviously, manipulating industry percentages of the total will alter the relative position in the make-up of the city, and the diversification is changed. But over time the dynamic context, in which the city participates, operates in the present conditions and diversification pattern and in the process changes it. The city may gain or lose employment as the general system generates the next solution in a continuous line. And the city may indeed become more or less diversified as its opportunities open and close with relative fluctuations in the general system.

This does not preclude the fact that in a detailed analysis of any specific city's problems the use of the shift technique will supply answers. Obviously, any devised program of growth must consider causes for each degree of diversification. But the shift technique permits an analysis not only of what the actual employment is, but which particular industry had the shift. If the source of the shift is the local-factor effect, the city's problem is one of relative attractiveness. Indeed, the interindustry influences that Chinitz speaks of are relevant; they are the inputs and outputs in

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Pittsburgh", American Economic Review, Papers and Proceedings, Vol. LI, May, 1961, p. 281.

the general system.[6] However, the influence of any matrix of industry is in competition with other matrices and must be so considered.

[6] Ibid., p. 283.

CHAPTER VIII

MANUFACTURING SHIFTS AND CITY SIZE

The manufacturing profiles of Figures 9 and 10 may be moved up or down, or twisted over some range. Since the difference between the expected and the actual is the net shift, the components, the local-factor and composition shift, will move up or down and change within the 2-digit industries. The patterns of the shift and its components, and their relationship to the selected cities are the topics of this chapter.

a. Comparative Shift Patterns

In terms of the total net shift of manufacturing employment, the patterns for the states' selected cities move in the same direction but with a different impact. The composition of manufacturing in Indiana was more responsive to national forces than in Michigan. The composition shift in the cities in Indiana had a greater offsetting influence on the local-factor shift than did the composition shift in Michigan. In either case, though, it was insufficient to reduce the total net shift to zero. This shift data are summarized in Table 23. The data indicate that the cities in both states had comparative losses in manufacturing. This loss conforms with the patterns established at the state level for the East North Central division of

the nation.[1] However, the degree of the impact is neither the same by states, as Table 23 suggests, nor by cities within the states.[2] The cities in both states compare less favorably, in terms of locational

TABLE 23

COMPONENTS OF THE MANUFACTURING NET SHIFT FOR SELECTED CITIES, 1950-1963

	Michigan	Indiana	All Cities
Total net shift	-21,700	-63,900	-85,600
Local-factor shift	-27,000	-99,700	-126,700
Composition shift	+ 5,300	+35,800	+41,100

Source: Tables 20, 21 and 22.

advantages, to all other cities, and in Indiana less favorably than in Michigan. And this unfavorable shift was not offset by the growth industries within the manufacturing sector.

b. Shifts and City Size

The shifts that occurred developed in cities of varying sizes. However, the sizes do not account for the shifts, positive or negative. Indeed, the changes in the city sizes, and by definition population, give the same conclusion. This conclusion is indicated by the r^2 values in Table 24.[3] While the city size and their changes do not

[1] V. R. Fuchs, Changes in the Location of Manufacturing in the U.S. Since 1929, New Haven, Yale University Press, 1962, p. 189.

[2] See Appendix E for components of the net shift by cities.

[3] The shifts are regressed against city size of 1950.

determine the shifts, the negative coefficients do indicate that the shifts become smaller as the size increases. In all instances, the value of the slope is very small and negative only in the regression of total and local-factor shifts. Changing the city size over the period does not alter the shallowness of the slopes, as indicated in Table 24.

The regression for the pooled data of all the selected cities is almost flat and in line with the r^2 values. This regression is not significantly altered by grouping the pooled data by states, for 1950 size or their changes. And this is the case for the positive and negative slopes. The manufacturing shifts are not dependent on size.

c. Shifts and Manufacturing Earnings

The manufacturing sector earnings did rise in the selected cities for the period.[4] However, this rise had no significant influence either on actual employment changes or employment shifts. Indeed, the actual change in manufacturing employment was not very responsive to changes in earnings. The regression of changes in manufacturing employment and changes in earnings per week indicates a small slope and does not account for the actual change in employment for this sector.[5] The changes in earnings do not appreciably determine either the changes in city size (population), or total

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[4]Earnings here are the gross weekly earnings in the manufacturing sector. Appendix C.

[5]The r^2 value is .017. See Appendix H.

TABLE 24

REGRESSION AND CORREIATION COEFFICIENTS: MANUFACTURING SHIFTS AND SIZE FOR SELECTED CITIES IN MICHIGAN AND INDIANA, 1950-1963

		Michigan			Indiana			All Cities		
		r*	r^2	b	r*	r^2	b	r*	r^2	b
Manufacturing Shift:	City size, 1950	-.326	.106	-.01	-.618	.382	-.04	-.557	.310	-.04
:	Change, size, 1950-63	-.087	.008	-.01	-.435	.189	-.10	-.310	.096	-.06
Local-Factor Shift :	City size, 1950	-.411	.169	-.01	-.714	.510	-.06	-.631	.398	-.05
:	Size change, 1950-63	-.392	.154	-.03	-.621	.386	-.18	-.441	.195	-.12
Composition Shift :	City size, 1950	+.017	.0003	.004	.721	.520	.02	.553	.306	.02
:	Size change, 1950-63	.296	.088	.02	.766	.587	.08	.529	.280	.05

*Not significant at the 5% level

employment, and both show a positive slope not much different than the slope which results without using changes in city size.[6]

The shifts in employment are also unrelated to the changes in earnings. Table 25 shows the relationship to be negative for the local-factor shift and positive for the composition shift for both states. It also indicates that the slopes are very steep. The wide range of the shifts for the selected cities falls within a narrow range of changes in weekly earnings, hence the very steep slopes. Table 25 also indicates that grouping by states does not alter the steepness of the slopes.

Only two cities had changes in earnings less than the national average, and neither differed from the national average by very much.[7] For the selected cities, the relationship between the manufacturing employment shift and changes in earnings is negative, with the very low r^2 values indicated in Table 25. Other cities might show a different and more significant relationship. The conclusion here is only pertinent for this study and cannot be generalized, since this study stops short of analyzing changes in earnings and manufacturing employment shifts in all other cities. To make it more complete would require not only a different kind of analysis than is undertaken here, but also an analysis of the determinants of earnings, and earnings differentials, for all cities. The level of earnings, and converging or non-converging differentials between cities, may indeed be relevant for the shifts. This relevancy would

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[6] See Appendix H.

[7] See Appendix C.

TABLE 25

REGRESSION AND CORRELATION COEFFICIENTS: SHIFTS AND CHANGES IN EARNINGS PER WEEK FOR SELECTED CITIES IN MICHIGAN AND INDIANA, 1950-63

	Michigan			Indiana			All Cities		
	r*	r^2	b	r*	r^2	b	r*	r^2	b
Local-Factor Shift	-.316	.100	-40	-.145	.021	-205	-.170	.029	-134
Composition Shift	.372	.138	48	.595	.354	299	.434	.188	138

*Not significant at the 5% level

also apply to their determinants. However, this requires very detailed data that is not available for the city unit. Several of the studies at the national level indicate that wages and/or earnings may be tied to capital flows,[8] but there are conflicting interpretations of this complex problem.[9] In terms of the limited period and the area of analysis here, earnings in the selected cities in both states are not relevant for the shift in manufacturing employment.

d. The Sources of Employment Shift

Since the shift may occur in such fashion that the profile of the manufacturing sector is twisted, a breakdown of the kinds of manufacturing activity is necessary. The fact of a twisted profile means that some kinds of activity have had shifts greater than other kinds. If the actual increase in manufacturing employment is broken down by broad categories of activity, the fabricating industries show an actual decline in employment while the processing industries show a gain.[10] Table 26 gives the source of the small actual increase as well as the shift by activity. The fabricating industries are the

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[8]G. H. Borts, "The Equalization of Returns and Regional Growth", American Economic Review June, 1960, Vol. 50, p. 319. Also, Perloff, et. al., op. cit.

[9]J. Meyer, "Regional Analysis: A Survey", American Economic Review, Vol. LIII, March 1963, pp. 43-45.

[10]Processing industries are the 2-digit SIC numbers 20, 23, 24, 25, 29, 30 and 33. All others are fabricating industries. SIC numbers are identified in Appendix C. This is the classification used in H. S. Perloff, E. S. Dunn, E. E. Lampard and J. F. Muth, Regions, Resources and Economic Growth, Johns Hopkins Press, Baltimore 1960, p. 380.

chief source of the negative local-factor shift.[11] Both types of activities had negative shifts, with fabricating far from matching the

TABLE 26

MANUFACTURING EMPLOYMENT SHIFTS BY KIND OF ACTIVITY FOR SELECTED CITIES IN MICHIGAN AND INDIANA, 1950-1963

	Actual	Net Shift
Processing	+2,500	- 4,900
Fabricating	-7,300	-64,700
Miscellaneous	+6,700	-
Actual Increase	1,900	

national growth rate. The sign of the shift indicates that both activities had partially severed the tie between the source of the intermediate inputs and the final output. The fact that the shift in the fabricating industries is so much larger than the shift in the processing industries implies that this latter source, is not so heavily relied upon for inputs as previously. Since the output of the fabricating industries is in part an intermediate input, the tie is also broken. Indeed, if the individual two-digit SIC industries within the grouping of Table 26 are considered, the negative local-factor shift is even greater.[12] The change in locational advantages has caused

[11] The computed shifts are not accurate because of the manner in which the data is grouped in reporting. However, the direction and size is indicative of the impact.

[12] See Appendix F.

these results; thus, fabricating inputs and outputs are more favorably met elsewhere.

If demand is a cause, as some have argued,[13] it is more likely an intermediate demand as indicated above. It is difficult to identify intermediate and final demand precisely, but a concept of demand that does not discriminate between intermediate and final demand is not accepted here as a cause. It is true that final demand has an influence, but not to distinguish between its parts can lead to ambiguous conclusions. For example, a population shift concept can be used to measure changes in final demand. However, the correlation between population shifts and employment is not to be taken as an indication that demand changes caused the employment shift. The shift of population may occur because of a response to employment opportunities, as one analyst has indicated.[14] Also, the labor supply may have increased through a natural population growth and so may induce an employment shift by lowering labor costs. Since population shifts can influence, and be influenced, by changes in employment, an observed relation between the two is too ambiguous to serve as evidence. The use of a population shift concept to measure demand is not a solid support for the argument.

e. Impact of Shift by States

The shift had a greater impact on the selected cities in

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[13]Perloff, op. cit., p. 394. Also, G. E. McLaughlin and S. Robock, Why Industry Loves South, National Planning Association, 1949, p. 32.

[14]M. S. Gordon, Employment Expansion and Population Growth, the California Experience, 1900-1950, University of California Press, Berkeley and Los Angeles, 1954, p. 148.

Indiana by 2-digit SIC, than on those in Michigan. Indiana's negative shift was across the 2-digit classification, whereas Michigan's was primarily in fabricated metals, electrical machinery and automobile-transport equipment.[15] It is this kind of differential shifting within the manufacturing sector that twisted Michigan's manufacturing profile and moved Indiana's down. This condition is the effect of individual industries within the 2-digit classification shifting because of input advantages.

The fact of the actual decline in fabricating employment and the large negative shift indicates the relative decline of this specialization of manufacturing in both states. These manufacturing industries are not so rigorously tied to past input locations and certainly many factors account for the change.[16] The favorable manufacturing structure of the selected cities in Michigan accounts in part for the relatively lower negative local-factor effect.[17] The relatively slow growth of manufacturing industries in Indiana certainly contributed to the shift. However, the favorable or unfavorable structure is not related to city size or changes in size as indicated in Table 24. Indeed, the main source of the negative local-factor shift, fabricating industries, are also unrelated to size or change

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[15]Actual employment in SIC 371, automobile, in the selected cities in Michigan declined less than one percent (Table 22). In shift terms, it shows a positive shift as a result of the national rate of -4.2 percent. Appendix C.

[16]Fuchs, op. cit., Also, his "The Determinants of the Redistribution of Manufacturing in the U.S. Since 1929", Review of Economics and Statistics, May, 1962.

[17]That is, the actual 2-digit change greater than the nation by 2-digit. Tables 20, 21 and 22.

in size in any significant manner.[18]

This pattern is not altered by the changes in manufacturing earnings. For the selected cities in either state, changes in weekly earnings do not determine the shifts in the fabricating industries.

TABLE 27

REGRESSION AND CORRELATION COEFFICIENTS OF FABRICATING SHIFTS AND CHANGES IN EARNINGS PER WEEK FOR SELECTED CITIES, 1950-63

	Michigan	Indiana	All Cities
r*	-.175	.133	-.020
r^2	.031	.018	.001
b	-.002	.001	-.001

*Not significant at the 5% level

Table 27 shows a somewhat different pattern in the cities grouped by states, but earnings are not a significant determinant. The slope is positive in Indiana, but in both states it is very shallow. Earnings are important, but not for the redistribution of employment.[19]

The shift of employment within the manufacturing sector is a result of the changes in the relative locational advantages to which the individual industries accordingly made their adjustments. This is particularly the case in the fabricating industries where most of the

[18] Appendix G.

[19] Although the definition of earnings is different, the conclusions are similar to those obtained by Fuchs. Fuchs, "Changes in the Location of Manufacturing", op. cit., p. 103.

shifts occurred. However, the analysis of the inputs and outputs relevant for a conclusive resolution of the causes of the shifts rests upon detailed data for each city and its manufacturing structure. This data are not available at the level of city units. But the direction and the size of the local-factor shift indicates that the cities considered here had realized a loss of their relative positions in terms of location advantages. Consequently, the small actual increase of employment in the manufacturing sector and a lower share of national growth resulted.

CHAPTER IX

CONCLUSIONS

The employment in a city is a result of the city participating as a unit in a system of cities. As such a unit, the city can gain or lose employment as the system grows. Whether or not employment in the city is favorably or unfavorably affected also depends on the characteristics of the city. Moreover, the actual gain need not be equal to the expected gain. The expected gain is the result that would occur if the city's employment (total or industry) had grown at the national rate. The shift technique, a relative concept, is used to measure this difference and divide the total shift into the shift from the local-factor and composition effects. The analysis indicates that employment shifts and population size do not correlate and that the composition effect was generally one-third or less the size of the local-factor effect. The hypotheses examined are that the shift technique isolates the sources of the relative change, and that the employment shift is independent of city size and industrial composition.

The analysis here shows that grouping all of the selected cities results in a positive shift of total employment. However, the shifts in the selected cities analyzed by states according to industry sectors not only indicate the source of the shifts by sectors, but also the extent of the sector's impact on the total shift. In the cities in

Indiana, only two sectors had grown faster than the national sector's rate, whereas in Michigan, all but two sectors grew faster. The result is that the shift of total employment in Michigan was favorable (the actual employment was greater than the expected) but just the opposite occurred for the cities in Indiana.

The application of the shift technique to the sectors permits a division of the shift into the composition and local-factor shifts. The more significant shift is the local-factor shift, which is the effect of the locational advantages of the cities. The local-factor shift in the cities in Michigan was positive, but negative in the selected cities in Indiana. Furthermore, in both cases, the local-factor shift swamped the composition shift. The shift computed for the industry sectors shows that the cities in Michigan were relatively advantageous for the location of industry and Indiana's were not. The cities in Michigan did not obtain the positive shift in total employment because of the presence of the nation's growth industries. In Indiana's cities, on the other hand, the composition shift was larger than in Michigan, but it was insufficient to offset the locational disadvantages.

The sector employment patterns of the cities are unlike that of the equivalent national sector. In the nation, the manufacturing sector's employment was a stable percent of the non-agricultural employment for the period. However, for the cities, the sector with the largest impact on the total employment shift is the manufacturing sector. It was negative for the selected cities in both states. Since this is the sector with the largest percentage of total employment,

the outward shift is in effect a decline in the cities' manufacturing specialization.

Although the negative shift occurs throughout most of the industries within the manufacturing sector, the industries that produced the largest negative shifts were machinery (electrical and non-electrical) and automobile and transportation. However, grouping the data by states shows that the cities in Indiana had a negative shift three times the negative shift in the cities in Michigan. In both states, the relative decline in the manufacturing sector came from the negative impact of the local-factor effect. For the period, the cities had suffered a relative loss of their locational advantages that were not sufficiently offset by national growth industries within this sector.

The local-factor shift is distributed differently within the manufacturing sector in both states, indicating a different kind of loss of locational attractiveness. This can be shown by dividing the manufacturing sector into the broad categories of processing and fabricating, and using them in an expository sense of location orientation rather than in a precise technical sense of inputs. In the cities in Michigan, the shift is concentrated in particular industries in the category of fabricating industries. In Indiana cities, the shift is spread over the entire manufacturing sector, processing and fabricating. The shift occurs primarily in the fabricating industries indicating that the category need not be tied to the past experience. This loosening of the tie is not related to the city size but falls within the input matrix of a particular city. Although the

particular incidence of the shift in the manufacturing sector is different for the cities, the result is a decline in their relative locational attractiveness. The requirements for industry location are met elsewhere.

The shift technique is a useful tool for determining the sources of the relative changes in employment. This technique was used here for the two-digit standard industrial classification data for the manufacturing sector only. This also could have been determined for the other sectors and for three or four digit standard industrial classification data, if this kind of detailed data were available at the city level. The analysis could then be extended to the technical aspects of inputs and locational advantages, and establish relationships between inputs and outputs for each industry at the three or four digit standard industrial classification. This would provide the insights desirable for understanding the locational requirements of industries in terms of intermediate inputs, as well as indicating the specific source of changes. However, this kind of extension must await the availability of data at this level of disaggregation.

It is normally thought that the larger size city is more apt to grow, internally and through the presence of growth industries, than the smaller. In terms of locational advantages and industrial composition, e.g., a city of 200,000 is more likely to expand than a city of 70,000. If city size were significant for an employment shift, then the regression for the actual and expected employment on city size would diverge sharply to indicate a larger shift for the larger

size cities. This is not indicated in the analysis for the selected cities. In fact, the slopes of the regression differed very little from the small to the larger size cities. Since the regression lines are almost parallel, city size had no significant impact on the shift.

The use of the shift technique has shown that the cause of the shift in employment, positive or negative, was the local-factor effect with little impact from the composition effect. The analysis supports the hypothesis that the relative changes in the cities are independent of city size and industrial composition. This is evidenced in the analysis for the industries by sectors and for the largest employment sector, manufacturing.

These conclusions are not altered by the change in city size, i.e., population changes, for the period. The employment shifts are independent of the absolute change in population. Indeed, a computed population shift does not match the employment shifts. This was evidenced for industries by sector as well as for the manufacturing sector.

Neither manufacturing earnings nor changes in earnings, had a significant impact on either the employment shifts or changes in city size. However, the conclusion with respect to earnings should be left open since this aspect of the analysis would require data on all inputs. It is not available at the city level.

The employment shift is the result of the differential locational advantages, for the sectors and the manufacturing industries. The lack of impact from the composition effect is due in part to the fact that the structure within a city is quite stable. Where it does

change, it occurs because of the impact of the presence of a growth industry share greater than for the nation, or a greater proportion of nationally declining industry. It is because of this aspect, national demand conditions, that any city may have a greater number of the nation's growth industries. Since the structure is stable for the period, it has varied little from the initial form, there is little impact from the composition effect.

The analysis here disagrees in part with other studies on changes in employment. One such study rejects demand changes and population shifts as reasons for manufacturing employment shifts and relies on climate and labor costs.[1] Another explains the relative changes in terms of shifts in terminal markets (population shifts).[2] These conflicting explanations arise because of definitional differences, but also because of the failure to isolate the causes of the changes for the relevant economic unit.

The present analysis of the city unit has isolated the shift as arising primarily in the manufacturing sector and within the fabricating industries. If population shifts are used to measure changes in demand, then change in demand is rejected here as a cause of the employment shift. The population shifts are not correlated with the employment shifts for the selected cities. For changes in demand to

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[1]V. R. Fuchs, Changes in the Location of Manufacturing in the U.S. Since 1929, Yale University Press, New Haven, 1962.

[2]H. S. Perloff, E. S. Dunn, E. E. Lampard, J. F. Muth, Regions, Resources and Economic Growth, John Hopkins Press, Baltimore 1960.

be a relevant cause, it must be specified in terms of intermediate demand, and then placed in the context of all other inputs. This cannot be measured by a population shift concept.

Labor costs are definitely relevant as an input, as would be climate in particular instances. However, it is the matrix of inputs available in a city, not its size, that forms the basis of its locational advantages. The analysis has shown that the employment shifts are due to the differential locational advantages. These advantages, and their changes, arise not only from the source and costs of inputs, but also external economies of industry, regional concentration, or metropolitan agglomeration, firm or industry internal economies of scale, changed markets and transport costs, area amenities, or simply chance. What is necessary at this point is the detailed data to specify them at the city level and to determine the mechanics and impact of their relative changes. This ordering process would permit a deeper understanding of the specific influences underlying the local-factor and composition effects. This would place the analysis in the correct context of relative access to inputs and markets. However, this extension of analysis is not presently useful in solving the employment problems of cities.

The analysis developed in this study uses the shift technique to isolate the sources of the employment shifts. The factors this approach isolates are relevant to the problems of diversification and/or th structural changes which help develop policy. This approach indicates those industries, either by sector or individually, where the economic forces have had their incidence. The approach indicates

the amount of employment which the city could have obtained, and points the direction which planned employment should take to offset a disadvantage or bolster an advantage.

The significance of the local factor effect as the source of employment shift provides additional information. It indicates the internal factors relevant to attract industry, but also indicates those industries that may or may not be conducive to employment growth in a particular city. Efforts to promote employment growth can accordingly be adjusted without overemphasizing city size and structure as relevant considerations. However, in any given context, the policies actually developed must consider local conditions. This analysis thus, provides some techniques which simplify the analysis of the complex employment problem.

APPENDIX A

POPULATION, EXPECTED POPULATION AND POPULATION SHIFT, BY CITIES: MICHIGAN AND INDIANA

City	1950	1960	Change	Expected	Shift
Marion, Ind.	62,300	76,100	13,800	74,200	+1,900
Richmond, Ind.	68,800	74,200	5,400	81,900	-7,700
LaPorte, Ind.	77,100	95,600	18,500	91,800	+3,800
Elkhart, Ind.	84,800	107,300	22,500	101,000	+6,300
Bay City, Mich.	88,500	107,000	18,500	105,400	+1,600
Muncie, Ind.	90,600	111,500	20,900	107,900	+3,500
Port Huron, Mich.	91,600	107,200	15,600	109,100	-1,900
Anderson, Ind.	104,300	126,400	22,100	124,200	+2,200
Terre Haute, Ind.	105,300	108,500	3,200	125,400	-16,900
Jackson, Mich.	107,900	132,000	24,100	128,500	+3,500
Ben. Harbor, Mich.	115,700	150,000	34,300	137,800	+12,200
B. Creek, Mich.	120,800	138,900	18,100	143,900	-5,000
Muskegon, Mich.	121,500	149,900	28,400	144,700	+5,200
Kalamazoo, Mich.	126,700	169,700	43,000	150,900	+18,800
Ann Arbor, Mich.	134,600	172,400	37,800	160,300	+12,100
Saginaw, Mich.	153,500	190,800	37,300	182,900	+7,900
Evansville, Ind.	161,200	165,900	4,700	192,000	-26,100
Lansing, Mich.	172,900	211,300	38,400	205,900	+5,400
Fort Wayne, Ind.	184,400	233,300	48,900	219,600	+13,700
S. Bend, Ind.	206,100	239,400	33,300	245,500	-6,100
Flint, Mich.	271,000	374,300	103,300	322,800	+51,500
G. Rapids, Mich.	288,300	363,200	74,900	343,400	+19,800
Ind'polis, Ind.	554,000	701,000	147,000	659,800	+51,200
State of Mich.	6,371,800	7,823,200	1,451,400	7,588,800	+234,400
State of Ind.	3,946,900	4,680,700	633,900	4,700,800	-20,100

Source: Bureau of the Census; Michigan State Health Department; Indiana State Health Department.

APPENDIX B

EMPLOYMENT BY INDUSTRY SECTOR FOR SELECTED CITIES, MICHIGAN AND INDIANA 1950-1963

City-Sector	(Aver.) 1950	(Aver.) 1963	Expected	Net Shift
Battle Creek				
Construction	1,100	1,500	1,400	100
Trans.-Com.	1,700	2,500	1,600	900
Wholesale	900	900	1,100	-200
Retail	6,200	7,300	7,200	100
Fin.-Ins.	1,200	2,400	1,800	600
Service	3,500	5,500	5,100	400
Government	4,200	7,700	6,300	1,400
Manufacturing	20,500	22,800	23,300	-500
Miscellaneous	6,100	6,700	5,100	1,600
Total	45,400	57,300	51,500	5,800
Bay City				
Construction	700	1,200	900	300
Trans.-Com.	1,300	1,500	1,200	300
Wholesale	1,100	1,300	1,300	0
Retail	3,800	4,600	4,400	200
Fin.-Ins.	300	600	400	200
Service	1,500	3,500	2,200	1,300
Government	1,300	2,600	2,000	600
Manufacturing	11,300	9,500	12,900	-3,400
Miscellaneous	5,900	4,500	4,900	-400
Total	27,200	29,300	30,800	-1,500
Benton Harbor				
Construction	1,100	1,400	1,400	0
Trans.-Com.	1,400	2,200	1,300	900
Wholesale	800	1,100	900	200
Retail	5,400	6,700	6,200	500
Fin.-Ins.	600	1,200	900	300
Service	2,000	4,800	2,900	1,900
Government	1,300	4,800	2,000	2,800
Manufacturing	20,700	24,200	23,500	700
Miscellaneous	5,600	6,900	4,700	2,200
Total	38,900	53,300	44,100	9,200

Appendix B (Continued)

City-Sector	(Aver.) 1950	(Aver.) 1963	Expected	Net Shift
Flint				
Construction	2,200	3,900	2,700	1,200
Trans.-Com.	3,600	4,400	3,400	1,000
Wholesale	4,800	2,400	5,600	-3,200
Retail	13,100	15,600	15,100	500
Fin.-Ins.	2,000	2,700	2,900	-200
Service	4,700	10,800	6,900	3,900
Government	3,100	11,400	4,700	6,700
Manufacturing	62,400	69,700	71,000	-1,300
Miscellaneous	14,500	12,800	12,100	700
Total	110,400	133,700	125,200	8,500
Grand Rapids				
Construction	4,700	6,600	5,800	800
Trans.-Com.	6,800	8,300	6,500	1,800
Wholesale	6,400	6,300	7,500	-1,200
Retail	17,900	18,800	20,600	-1,800
Fin.-Ins.	3,600	4,900	5,300	-400
Service	8,100	14,700	11,900	2,800
Government	3,900	9,500	5,900	3,600
Manufacturing	48,700	50,200	55,400	-5,200
Miscellaneous	13,900	16,400	11,600	4,800
Total	114,000	135,700	129,300	6,400
Jackson				
Construction	1,400	1,200	1,700	-500
Trans.-Com.	2,800	4,000	2,700	1,300
Wholesale	1,100	1,100	1,300	-200
Retail	5,400	5,800	6,200	-400
Fin.-Ins.	600	1,000	900	100
Service	2,500	4,000	3,700	300
Government	2,400	5,800	3,600	2,200
Manufacturing	14,500	15,500	16,500	1,000
Miscellaneous	6,300	5,500	5,200	300
Total	37,000	43,900	42,000	1,900

Appendix B (Continued)

City-Sector	(Aver.) 1950	(Aver.) 1963	Expected	Net Shift
Kalamazoo				
Construction	2,900	2,500	3,600	-1,100
Trans-Com.	1,800	2,300	1,700	600
Wholesale	2,800	1,700	3,300	-1,600
Retail	6,600	8,600	7,600	1,000
Fin.-Ins.	1,000	1,600	1,500	100
Service	3,100	6,500	4,500	2,000
Government	3,700	9,000	5,600	3,400
Manufacturing	22,300	25,900	25,400	500
Miscellaneous	5,300	7,100	4,400	2,700
Total	49,500	65,200	56,100	9,100
Lansing				
Construction	2,600	4,100	3,200	900
Trans.-Com.	2,100	3,300	2,000	1,300
Wholesale	2,900	2,900	3,400	-500
Retail	13,400	13,400	15,500	-2,100
Fin.-Ins.	2,700	3,200	3,900	-700
Service	4,500	9,400	6,600	2,800
Government	6,300	26,400	10,300	16,100
Manufacturing	27,800	28,800	31,600	-2,800
Miscellaneous	7,700	11,400	6,400	5,000
Total	70,500	102,900	80,000	22,900
Muskegon				
Construction	1,300	1,300	1,600	-300
Trans.-Com.	1,100	2,400	1,100	1,300
Wholesale	1,100	1,200	1,300	-100
Retail	5,300	6,000	6,100	-100
Fin.-Ins.	500	1,100	700	400
Service	1,900	4,500	2,800	1,700
Government	1,700	4,500	2,600	1,900
Manufacturing	24,600	24,300	28,000	-3,700
Miscellaneous	7,500	6,000	6,200	-200
Total	45,000	51,300	51,000	300

Appendix B (Continued)

City-Sector	(Aver.) 1950	(Aver.) 1963	Expected	Net Shift
Saginaw				
Construction	1,900	2,700	2,300	400
Trans.-Com.	3,000	4,500	2,900	1,600
Wholesale	3,300	2,700	3,900	-1,200
Retail	7,500	8,400	8,600	-200
Fin.-Ins.	1,100	1,500	1,600	-100
Service	2,200	6,100	4,300	1,800
Government	2,000	4,800	3,000	1,800
Manufacturing	24,600	24,200	28,000	-3,800
Miscellaneous	9,100	7,600	7,600	0
Total	55,400	62,500	62,800	-300
Port Huron				
Construction	700	1,300	700	400
Trans.-Com.	700	2,500	700	1,800
Wholesale	1,800	900	2,100	-1,200
Retail	4,300	4,200	5,000	-800
Fin.-Ins.	700	700	1,100	-400
Service	1,200	3,000	1,800	1,200
Government	1,200	3,300	1,800	1,500
Manufacturing	10,100	8,500	11,500	-3,000
Miscellaneous	3,300	4,600	2,700	1,900
Total	24,000	29,000	27,200	1,800
Ann Arbor				
Construction	1,500	2,300	1,800	500
Trans.-Com.	1,600	2,900	1,500	1,400
Wholesale	1,600	1,000	1,900	-900
Retail	6,200	8,700	7,200	1,500
Fin.-Ins.	700	1,200	1,100	100
Service	2,300	6,500	3,400	3,100
Government	3,200	26,200	4,800	21,400
Manufacturing	20,300	24,900	23,100	1,800
Miscellaneous	9,600	5,700	8,000	-2,300
Total	47,000	79,400	53,300	26,100

Appendix B (Continued)

City-Sector	(Aver.) 1950	(Aver.) 1963	Expected	Net Shift
Evansville				
Construction	3,300	2,600	4,000	-1,400
Trans.-Com.	4,800	4,400	4,600	-200
Whol.-Retail	13,900	14,500	16,000	-1,500
Fin.-Ins.	1,600	2,500	2,300	200
Service	6,500	8,600	9,500	-900
Government	4,600	6,000	6,900	-900
Manufacturing	32,000	24,200	37,300	-13,100
Miscellaneous	9,300	10,700	7,800	2,900
Total	76,700	73,500	87,000	-13,500
Fort Wayne				
Construction	3,700	4,100	4,500	-400
Trans.-Com.	6,700	6,700	6,400	300
Whol.-Retail	15,600	19,400	18,100	1,300
Fin.-Ins.	2,600	4,800	3,800	1,000
Service	5,800	9,700	8,500	1,200
Government	4,700	7,100	7,100	0
Manufacturing	37,800	35,700	43,000	7,300
Miscellaneous	11,000	10,300	9,200	1,100
Total	87,900	97,800	99,700	-1,900
Indianapolis				
Construction	12,100	13,600	14,800	-1,200
Trans.-Com.	23,800	21,500	22,800	-1,300
Whol.-Retail	61,100	66,900	70,800	-3,900
Fin.-Ins.	13,200	20,700	19,200	1,500
Service	24,300	32,400	35,600	-3,200
Government	25,700	43,700	38,800	4,900
Manufacturing	103,000	101,100	117,100	-16,000
Miscellaneous	27,000	29,000	22,500	6,500
Total	290,200	328,900	329,100	-200

Appendix B (Continued)

City-Sector	(Aver.) 1950	(Aver.) 1963	Expected	Net Shift
Muncie				
Construction	900	1,300	1,100	200
Trans.-Com.	1,800	2,200	1,700	500
Whol.-Retail	5,500	7,000	6,400	600
Fin.-Ins.	700	1,200	1,000	200
Service	3,100	3,500	4,500	-1,000
Government	3,000	4,900	4,500	400
Manufacturing	18,200	16,100	20,700	-4,600
Miscellaneous	6,800	5,200	5,700	-500
Total	40,000	41,400	45,400	-4,000
Anderson				
Construction	600	800	700	100
Trans.-Com.	800	900	800	100
Whol.-Retail	6,300	5,600	7,300	-1,700
Fin.-Ins.	600	800	900	-100
Service	1,900	2,000	2,800	-800
Government	1,000	1,600	1,500	100
Manufacturing	23,900	25,800	27,200	-1,400
Miscellaneous	1,900	1,900	1,600	300
Total	37,000	39,400	42,000	-2,600
South Bend				
Construction	3,300	2,800	4,000	-1,200
Trans.-Com.	5,600	3,800	5,400	-1,600
Whol.-Retail	15,100	15,800	17,500	-1,700
Fin.-Ins.	2,300	4,200	3,400	800
Service	8,400	11,500	11,500	0
Government	4,200	6,400	6,300	100
Manufacturing	53,400	34,400	60,700	-26,300
Miscellaneous	10,500	7,100	8,800	-1,700
Total	102,800	86,000	116,600	-30,600

Appendix B (Continued)

City-Sector	(Aver.) 1950	(Aver.) 1963	Expected	Net Shift
Marion				
Construction	400	500	500	0
Trans.-Com.	1,400	700	1,300	-600
Whol.-Retail	3,100	3,000	3,600	-600
Fin.-Ins.	500	500	700	-200
Service	900	1,200	1,300	-100
Government	1,000	1,600	1,500	100
Manufacturing	9,000	13,600	10,200	3,400
Miscellaneous	700	0	600	-600
Total	17,000	21,100	19,300	1,800
Terre Haute				
Construction	1,400	1,400	1,700	-300
Trans.-Com.	4,800	3,600	4,600	-1,000
Whol.-Retail	8,000	9,200	9,300	-100
Fin.-Ins.	900	1,300	1,300	0
Service	3,900	4,200	5,700	-1,500
Government	3,500	4,400	5,300	-900
Manufacturing	11,200	10,200	12,700	-2,500
Miscellaneous	9,500	6,500	7,900	-1,400
Total	43,200	40,800	49,000	-8,200
LaPorte				
Construction	1,200	900	1,500	-600
Trans.-Com.	1,100	1,000	1,100	-100
Whol.-Retail	4,300	4,200	5,000	-800
Fin.-Ins.	400	600	600	0
Service	1,400	2,300	2,100	+200
Government	1,000	1,000	1,500	-500
Manufacturing	12,600	13,500	14,300	-800
Miscellaneous	700	600	600	0
Total	22,700	24,100	25,700	-1,600

Appendix B (Continued)

City-Sector	(Aver.) 1950	(Aver.) 1963	Expected	Net Shift
Richmond				
Construction	800	700	1,000	-300
Trans.-Com.	600	800	600	200
Whol.-Retail	5,000	4,000	5,800	-1,800
Fin.-Ins.	500	900	700	200
Service	1,300	2,200	1,900	300
Government	1,000	1,200	1,500	-300
Manufacturing	12,200	13,200	13,900	-700
Miscellaneous	1,100	1,100	900	200
Total	22,500	24,100	25,500	-1,400
Elkhart				
Construction	1,000	900	1,200	-300
Trans.-Com.	600	1,000	600	400
Whol.-Retail	4,200	5,500	5,700	-200
Fin.-Ins.	500	800	700	100
Service	1,500	2,100	2,200	-100
Government	1,000	1,200	1,500	-300
Manufacturing	15,300	22,700	17,300	5,400
Miscellaneous	1,600	1,200	1,300	-100
Total	26,300	35,400	29,800	5,600
United States				
Construction	2,367,000	2,899,300	22.5	
Trans.-Com.	4,087,000	3,913,000	-4.3	
Wholesale	2,607,700	3,066,300	17.5	
Retail	7,402,000	8,537,300	15.3	
Fin.-Ins.	1,922,300	2,804,000	45.9	
Service	5,407,300	7,921,000	46.5	
Mining	920,000	650,700	-29.3	
Government	6,090,300	9,183,700	50.8	
Manufacturing	14,735,000	16,747,300	13.7	
Miscellaneous (Ag.)	14,113,100	11,894,400	-16.6	
Total	59,651,700	67,617,000	13.4	

Source: Indiana Employment Security Division, Michigan Employment Security Commission, Census of Manufacturers.

APPENDIX C

MANUFACTURING EMPLOYMENT BY 2-DIGIT SIC FOR SELECTED CITIES, 1950-1963

City-SIC	1950	1963	Expected	Net Shift
Battle Creek				
20	6,400	7,300	7,500	-200
22-3	-	-	-	-
24	-	-	-	-
25	-	-	-	-
26	1,600	1,500	2,000	-500
27	500	600	400	200
28-9	100	100	100	0
33	1,100	1,500	1,100	400
34	3,100	2,700	3,600	-900
35	3,700	6,400	3,800	2,600
36	600	700	1,100	-400
37	3,300	700	4,000	-3,300
371	2,600	700	2,500	-1,800
Misc.	100	1,300	100	1,200
E/K	72.49	117.89		
Bay City				
20	1,100	1,000	1,300	-300
22-3	400	400	400	0
24	600	200	500	-300
25	600	100	700	-600
27	200	200	200	0
28-9	500	500	500	0
33	1,100	900	1,100	-200
34	200	400	200	200
35	1,200	700	1,200	-500
36	900	800	1,700	-900
37	4,400	4,000	5,300	-1,300
371	4,200	3,200	4,000	-800
Misc.	100	300	100	200
E/K	65.32	115.56		

Appendix C (Continued)

City-SIC	1950	1963	Expected	Net Shift
Benton Harbor				
20	700	1,500	800	700
22-3	300	100	300	100
24	200	400	200	200
25	300	100	300	-200
26	1,500	2,000	1,900	100
27	800	800	600	200
33	3,400	3,900	3,400	500
34	1,000	1,600	1,200	400
35	5,000	3,000	5,100	-2,100
36	4,600	6,400	8,700	-2,300
37	2,800	2,700	3,400	-700
371	2,800	2,600	2,700	-100
Misc.	100	1,700	100	1,600
E/Ik	69.13	99.99		
Flint				
20	900	1,300	1,000	300
22-3	400	300	400	-100
25	100	100	100	0
26	100	200	100	100
27	700	800	600	200
28-9	500	600	500	100
33	300	300	300	0
34	8,500	9,200	9,800	-600
35	200	600	600	0
36	100	100	100	0
37	50,400	55,800	60,700	-4,900
371	50,400	55,800	48,300	7,500
Misc.	200	400	200	200
E/Ik	78.63	148.54		
Grand Rapids				
20	3,200	3,500	3,700	-200
22-3	1,400	3,000	1,300	1,700
24	1,600	1,000	1,200	-200
25	8,800	7,300	10,000	-2,700
26	1,500	1,400	1,100	300

Appendix C (Continued)

City-SIC	1950	1963	Expected	Net Shift
Grand Rapids (Continued)				
27	1,900	2,100	1,500	600
28-9	600	500	600	-100
33	1,400	2,100	1,400	,700
34	13,200	12,000	15,200	-3,200
35	9,700	6,700	9,900	-3,200
36	1,300	2,300	2,500	-200
37	700	700	800	-100
371	500	400	500	-100
Misc.	3,400	7,600	3,800	3,800
E/1k	73.45	109.71		
Jackson				
20	600	600	700	-100
22-3	400	400	400	0
27	200	300	200	100
28-9	200	200	200	0
33	600	800	600	200
34	2,200	1,700	2,500	-800
35	2,100	2,800	2,100	,700
36	800	1,600	1,500	100
37	5,100	4,900	6,100	-1,200
371	5,000	4,400	4,800	-400
Misc.	2,200	2,100	2,500	-400
E/1k	76.66	119.15		
Kalamazoo				
20	800	1,700	900	800
22-3	400	400	400	0
24	100	100	100	0
26	9,100	8,500	11,500	-3,000
27	700	1,100	500	600
28-9	2,800	3,000	3,000	0
33	400	400	400	0
34	2,100	600	2,400	-1,800
35	1,100	2,400	1,100	1,300
36	400	600	800	-200
37	2,500	3,000	3,000	0
371	2,300	2,100	2,200	100
Misc.	1,900	3,300	2,100	1,200
E/1k	70.78	114.81		

Appendix C (Continued)

City-SIC	1950	1963	Expected	Net Shift
Lansing				
20	800	1,300	1,200	100
22-3	100	100	100	0
24	100	200	100	100
27	900	1,100	700	400
28-9	200	400	200	200
33	1,900	2,200	1,900	300
34	700	1,300	800	500
35	1,500	2,400	1,500	900
37	21,200	18,700	25,500	-6,800
371	21,200	18,700	20,300	-1,600
Misc.	400	600	400	200
E/K	73.09	143.34		
Muskegon				
20	400	600	500	100
25	2,200	1,500	2,400	-900
26	600	1,000	800	200
27	200	200	200	0
28-9	200	1,200	200	1,000
33	5,200	5,300	5,200	100
34	600	800	700	100
35	7,600	6,100	7,800	-1,700
36	400	1,000	800	200
37	5,600	4,300	5,700	-1,400
371	5,600	4,200	5,400	-1,200
Misc.	1,600	2,300	1,800	500
E/K	73.25	115.49		
Saginaw				
20	1,800	2,100	2,100	0
22-3	100	100	100	0
24	300	100	200	-100
25	700	600	800	-200
26	200	100	300	-200
27	200	400	200	200
28-9	300	300	300	0
33	9,200	7,600	9,200	-1,600

Appendix C (Continued)

City-SIC	1950	1963	Expected	Net Shift
Saginaw (Continued)				
34	600	700	700	0
35	3,100	3,900	3,200	700
36	700	800	1,300	-500
37	6,600	7,300	8,000	-700
371	6,600	7,300	6,300	1,000
Misc.	800	200	900	-700
E/X	73.19	133.03		
Port Huron				
20	300	400	300	100
22-3	300	300	300	0
26	700	600	900	-300
27	200	200	200	0
28-9	700	700	800	-100
33	1,400	3,700	1,400	2,300
34	200	300	200	100
35	1,500	900	1,500	-600
37	2,200	700	2,700	-2,000
371	1,500	200	1,400	-1,200
Misc.	2,600	600	2,900	-2,300
E/X	70.79	100.30		
Ann Arbor				
20	300	500	300	200
24	100	100	100	0
27	600	800	500	300
33	600	700	600	100
34	900	1,200	1,000	200
35	2,100	4,600	2,100	2,500
36	2,100	3,100	4,000	-900
37	8,900	11,200	9,700	1,500
371	8,900	11,200	8,500	2,700
Misc.	4,700	2,500	5,200	-2,700
E/X	72.07	135.32		

Appendix C (Continued)

City-SIC	1950	1963	Expected	Net Shift
Evansville				
20	4,300	3,000	5,000	-2,000
22-3	1,200	1,500	1,100	400
24	1,100	900	800	100
25	2,100	2,100	2,400	-300
26-7	1,400	1,000	1,400	-400
28	1,300	1,000	1,100	-100
34	2,700	2,600	3,100	-500
35-6	13,500	8,700	18,000	-9,300
37	4,300	3,200	5,200	-2,000
Misc.	900	200	800	-600
E/A:	62.95	110.41		
Fort Wayne				
20	3,300	3,500	3,800	-300
22-3	1,500	1,500	1,400	100
26-7	2,300	2,200	2,200	0
30	1,500	1,500	2,500	1,000
33	2,100	2,100	2,100	0
35	4,500	3,500	4,600	-1,100
36	12,800	10,800	24,300	-13,500
37	8,800	9,600	10,000	-400
Misc.	1,000	1,000	1,100	-100
E/A:	68.44	127.72		
Indianapolis				
20	12,700	11,700	14,800	-3,100
22-3	4,300	2,500	3,900	-1,400
24	900	900	700	200
25	1,300	900	1,500	-600
26	3,600	2,900	4,600	-1,700
27	2,400	2,000	1,900	100
28	8,000	8,500	9,500	-1,000
33	4,800	3,300	4,800	-1,500
34	7,000	7,000	8,100	-1,100
35	11,800	11,400	12,000	-600
36	16,200	15,700	30,700	-15,000

Appendix C (Continued)

City-SIC	1950	1963	Expected	Net Shift
Indianapolis (Continued)				
37	22,400	26,900	27,000	-100
Misc.	7,600	7,400	8,400	-1,000
E/K	64.96	122.15		
Muncie				
20	1,400	1,900	1,600	300
30	800	800	1,300	-500
32	2,200	1,900	2,600	-700
33	1,600	1,700	1,600	100
34	1,700	1,000	2,000	-1,000
35	900	900	900	0
36	1,100	900	2,100	-1,200
37	6,500	6,000	7,800	-1,800
Misc.	2,000	1,000	2,200	-1,200
E/K	64.96	123.88		
Anderson				
20	700	900	800	100
23	400	400	400	0
25	200	200	200	0
26	300	300	400	-100
27	200	600	200	400
32	1,000	800	1,100	-300
33	600	500	600	-100
34	5,700	6,000	6,600	-600
35	1,200	700	1,200	-500
36	11,800	13,200	22,000	-8,800
37	100	600	100	500
Misc.	1,700	1,600	1,900	-300
E/K	66.93	132.91		
South Bend				
20	2,000	1,800	2,300	-500
23	1,900	900	2,100	-1,200
25	2,100	2,000	2,400	-400
26	500	500	600	-100
27	1,100	1,100	900	200

Appendix C (Continued)

City-SIC	1950	1963	Expected	Net Shift
South Bend (Continued)				
30	5,600	5,600	9,200	-3,600
33	400	400	400	0
34	500	1,100	600	500
35	7,200	5,200	7,300	-2,100
37	30,600	14,100	36,900	-22,800
Misc.	1,500	1,700	1,700	0
E/K	74.67	123.19		
Marion				
20	500	700	600	100
25	300	300	300	0
26	700	1,200	800	400
27	300	200	200	0
32	1,600	2,300	1,900	400
33	1,700	2,300	1,700	600
35	200	200	200	0
36	1,300	3,900	2,500	1,400
37	700	500	800	-300
Misc.	1,700	2,000	1,900	100
E/K	49.97	112.47		
Terre Haute				
20	4,100	2,700	4,800	-2,100
26	1,900	1,800	2,300	-500
33	1,800	900	1,800	-900
34	1,100	900	1,300	-400
Misc.	2,300	3,900	2,600	1,300
E/K	58.26	100.09		
LaPorte				
20	200	400	200	200
22	700	500	500	0
23	600	700	700	0
25	700	900	800	100
33	400	900	400	500
34	1,300	1,600	1,500	100

Appendix C (Continued)

City-SIC	1950	1963	Expected	Net Shift
LaPorte (Continued)				
35	3,800	3,000	3,900	-900
36	200	600	400	200
37	1,900	1,900	2,300	-400
Misc.	2,800	3,000	3,100	-100
E/Mk	63.07	104.79		
Richmond				
20	400	300	500	-200
23	200	400	200	200
25	300	400	300	100
27	200	400	200	200
32	400	600	500	100
33	1,100	1,500	1,100	400
34	1,100	1,300	1,300	0
35	5,500	4,900	5,600	-1,000
37	1,500	1,700	1,800	-100
Misc.	1,500	2,000	1,700	300
E/Mk	62.34	110.27		
Elkhart				
20	800	1,100	900	200
23	300	300	300	0
24	600	300	500	-200
25	1,200	1,800	1,400	400
26	1,100	1,100	1,400	-300
27	200	300	200	100
28	1,300	2,000	1,500	500
30	800	1,400	1,300	100
33	200	700	200	500
34	1,400	3,200	1,600	1,600
35	1,700	1,000	1,700	-700
36	1,600	1,700	3,000	-1,300
37	1,400	4,300	1,800	2,500
Misc.	2,600	3,500	2,900	600
E/Mk	64.03	112.71		

Appendix C (Continued)

City-SIC	1950	1963 (Expected)	Expected Percent Change	Net Shift
United States				
20	1,490,000	1,734,000	16.4	
21	97,000	86,200	-11.1	
22	1,207,000	888,200	-26.4	
23	1,141,000	1,258,200	10.3	
24	748,000	577,000	-23.0	
25	331,000	375,100	13.3	
26	477,000	602,900	26.4	
27	755,000	592,100	-21.6	
28	682,000	808,900	18.6	
29	240,000	182,100	-24.1	
30	241,000	396,000	64.6	
31	375,000	353,500	-5.7	
32	499,000	590,600	18.4	
33	1,148,000	1,145,100	-0.3	
34	964,000	1,110,500	15.2	
35	1,432,000	1,460,700	2.0	
36	725,000	1,509,200	89.8	
37	1,290,000	1,554,400	20.5	
371	736,000	705,000	-4.2	
Misc.	724,000	806,000	11.3	
E/W	58.51	95.64		

Source: Indiana Employment Security Division, Michigan Employment Security Commission, Census of Manufactures.

2-Digit S.I.C. Descriptions:
- 20 --Food and Kindred Products
- 21 --Tobacco
- 22 --Textile Mill Products
- 23 --Apparel and Related Products
- 24 --Lumber Products
- 25 --Furniture and Fixtures
- 26 --Paper and Allied Products
- 27 --Printing and Publishing Industry
- 28 --Chemical and Allied Products
- 29 --Petroleum and Coal Products
- 30 --Rubber Products
- 31 --Leather and Leather Goods
- 32 --Stone, Clay and Glass Products
- 33 --Primary Metal Products

Appendix C (Continued)

2-Digit S.I.C. Descriptions: (Continued)

34 --Fabricated Metal Products
35 --Machinery (Except elect.)
36 --Electrical Machinery
37 --Automobile and Trans. Equipment
371--Automobile and Auto. Equipment
Misc.Other

APPENDIX D

SOURCE OF NET SHIFT OF EMPLOYMENT BY SECTORS
BY SELECTED CITIES, 1950-1963

Michigan - Cities:	Battle Creek	Bay City	Benton Harbor	Flint	Grand Rapids	Jackson	Kalamazoo	Lansing	Muskegon	Saginaw	Port Huron	Ann Arbor
Net shift, tot. empl.	5,800	-1,500	9,200	8,500	6,400	1,900	9,100	22,200	300	-300	1,800	26,100
Net shift from local-factor, tot. empl.	4,400	-900	5,100	9,300	5,200	2,100	7,600	20,000	900	300	1,400	25,600
Net shift from composition, tot. empl.	1,400	-600	4,100	-800	1,200	-200	1,500	2,900	-600	-600	400	-500

Source: Appendix B.

Indiana - Cities:	Evans-ville	Fort Wayne	Indiana-polis	Muncie	South Bend	Terre Haute	Ander-son	Marion	LaPorte	Rich-mond	Elkhart
Net shift, tot. empl.	-13,500	-1,900	-200	-4,000	-30,600	-8,200	-2,300	1,800	-1,600	-1,400	5,600
Net shift from local-factor, tot. empl.	-14,900	-2,800	-12,700	-4,200	-31,600	-7,700	-3,400	1,400	-2,600	-2,200	4,900
Net shift from composition, tot. empl.	1,400	900	12,500	200	1,000	-500	1,100	400	1,000	800	700

Source: Appendix B.

APPENDIX E

SOURCE OF NET SHIFT OF EMPLOYMENT IN MANUFACTURING
FOR SELECTED CITIES, 1950-1963

Michigan - Cities:	Battle Creek	Bay City	Benton Harbor	Flint	Grand Rapids	Jackson	Kalamazoo	Lansing	Muskegon	Saginaw	Port Huron	Ann Arbor
Net shift, mfg. empl.	-500	-3,400	700	-1,300	-5,200	-1,000	500	-2,900	-3,700	-3,900	-3,000	1,800
Shift from local-factor	-900	-3,700	-1,800	-4,700	-2,800	-1,400	-1,100	-4,100	-1,800	-3,100	-2,900	1,200
Shift from composition	400	300	2,500	3,600	-2,400	400	1,600	1,300	-1,900	-700	-200	600

Source: Appendix C.

Indiana - Cities:	Evansville	Fort Wayne	Indianapolis	Kokomo	South Bend	Terre Haute	Anderson	Marion	LaPorte	Richmond	Elkhart
Net shift, mfg. empl.	-13,100	-7,300	-16,000	-4,600	-26,300	-2,500	-1,400	3,400	-800	-700	5,400
Shift from local-factor	-14,700	-16,300	-26,900	-6,000	-30,000	-2,600	-9,700	2,700	-300	0	4,000
Shift from composition	1,600	9,000	10,900	1,400	3,700	100	8,300	700	-500	-700	1,400

Source: Appendix C.

APPENDIX F

LOCAL-FACTOR SHIFT IN PROCESSING AND FABRICATING INDUSTRIES FOR SELECTED CITIES, 1950-1963

Michigan - Cities:	Battle Creek	Bay City	Benton Harbor	Flint	Grand Rapids	Jackson	Kalamazoo	Lansing	Muskegon	Saginaw	Port Huron	Ann Arbor	Total
Processing	200	-1,400	1,000	300	-800	100	800	700	300	-1,900	2,300	300	1,900
Fabricating	-2,300	-2,500	-4,400	-5,200	-5,800	-1,100	-3,100	-5,000	-2,600	-500	2,800	3,600	-31,700

Indiana - Cities:	Evans-ville	Fort Wayne	Indiana-polis	Muncie	South Bend	Terre Haute	Ander-son	Marion	LaPorte	Rich-mond	Elkhart	Total
Processing	-1,800	-1,200	-6,400	-200	-5,700	-3,000	0	700	800	500	1,000	-15,300
Fabricating	-12,300	-15,000	-19,400	-4,600	-24,300	-900	-9,400	+1,900	-1,000	-800	2,400	-83,400

APPENDIX G

REGRESSION AND CORRELATION COEFFICIENTS OF LOCAL-FACTOR SHIFTS IN FABRICATING INDUSTRIES AND CITY SIZE, AND CHANGES IN CITY SIZE FOR SELECTED CITIES, 1950-1963

		Michigan		Indiana		All Cities	
		r	r^2	r	r^2	r	r^2
Local-Factor Shift: Fabricating	City Size (1950)	-.488	.238	-.694	.482	-.622	.387
Local-Factor Shift: Fabricating	Change, Size	.433	.188	-.571	.326	-.436	.190

APPENDIX H

CORRELATION COEFFICIENTS OF CHANGES IN WEEKLY EARNINGS AND CHANGES IN TOTAL EMPLOYMENT, CITY SIZE AND MANUFACTURING EMPLOYMENT FOR SELECTED CITIES, 1950-1963

		r	r^2
Change in E/Wk:	Change in total empl.	.301	.091
Change in E/Wk:	Change in city size	.267	.071
Change in E/Wk:	Change in mfg. empl.	.132	.017

APPENDIX I

TECHNICAL NOTE ON THE COMPUTATION OF SHIFTS

The short-hand notation of the derivation of the shifts is developed on the basis that the total net shift is composed of the sum of the local-factor and the composition shifts. Any residual in a given place, positive or negative, between the total employment shift and the shift due to industry changes within the total, stems from the sector growth. Therefore, the residual plus the shift within industry is equal to the total shift.

In detailed notation, if,

N_{ji} = employment in i industry and j city in initial period

N^*_{ji} = employment in i industry and j city in the terminal period

$N_{i\cdot}$ = national employment in i industry $= \sum_j N_{ji}$

$N_{\cdot j}$ = total city employment $= \sum_i N_{ji}$

$N_{\cdot\cdot}$ = total national employment in all industries $= \sum_{ji} N_{ji}$

then, the total shift for a city is

$$(1) \quad N_{sj} = N^*_{\cdot j} - (N^*_{\cdot}/N_{\cdot\cdot})\, N_{\cdot j}$$

The local-factor shift for each city is

$$(2) \quad N_{lj} = N^*_{ij} - (N^*_{i\cdot}/N_{i\cdot})\, N_{ij}$$

For all cities,

$$N_{lj} = \sum_i \left[N^*_{ij} - (N^*_{i\cdot}/N_{i\cdot})\, N_{ij}\right]$$

And,

$$N_{sj} - N_{lj} = \left[N^*_{\cdot j} - (N^*_{\cdot}/N_{\cdot\cdot})\, N_{\cdot j}\right] - \sum_i \left[N^*_{ij} - (N^*_{i\cdot}/N_{i\cdot})\, N_{ij}\right]$$

$$= \sum_i (N^*_{i\cdot}/N_{i\cdot})N_{ij} - (N^*_{\cdot\cdot}/N_{\cdot\cdot}) \sum_i N_{ij}$$

$$(3) = \sum_i \left[(N^*_{i\cdot}/N_{i\cdot}) - (N^*_{\cdot\cdot}/N_{\cdot\cdot})\right] N_{ij}$$

Where (3) is the difference between the total shift and the composition shift. That is,

$$N_{sj} - N_{1j} = N_{cj} = \sum_i \left[(N^*_{i\cdot}/N_{i\cdot}) - (N^*_{\cdot\cdot}/N_{\cdot\cdot})\right] N_{ij}$$

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