MEASURING ECONOMIC GROWTH IN RURAL COMMUNITIES: THE SHIFT-SHARE APPROACH*

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INTRODUCTION

Communities interested in economic growth and development need to be concerned with understanding at least three aspects of the development process. The first deals with identifying existing and historical composition of industry in the community, including an explanation of how changes in the study area differ from changes in other areas, and an identification of industries in which the community has had a comparative advantage. The second aspect deals with the many considerations involved in increasing desired economic activity in the community. This includes business and industrial development. The third aspect is addressed to estimating impacts of growth and development on the local community. Knowledge of expected consequences of alternative growth and development possibilities improves residents' ability to select preferred types of community growth. All three aspects must necessarily be considered as a community strives to expand and improve economic opportunity for its residents.

This article demonstrates the usefulness of shift-share analysis in dealing with the first of these three considerations in rural counties. This descriptive technique emphasizes identifying changes that have taken place in the industrial composition of the local (town, city or county) economy relative to a reference area or standard of comparison (nation, state or region). The technique is demonstrated in a study of four rural Indiana counties. The objectives of this study were to: (1) identify changes in industrial composition in each county, (2) explain differences in rates of growth and (3) identify industries in which the study area has had a comparative advantage.

THE SHIFT-SHARE FRAMEWORK

Shift-share analysis separates an area's change in economic activity (measured by employed, in this study) into three factors and measures the contribution of each. The first factor measures change of a local area (county, in this study) in terms of change in the reference area, or standard of comparison (generally the nation but in this study the state economy was deemed more appropriate). This effect is determined for a county by multiplying base year employment in each industry by the growth rate in total state employment between base and terminal years.

The second factor, the component or industrial mix effect, measures distribution of rapidly and slowly growing industries in the county relative to the state. It is calculated by subtracting the all-industry state growth rate from individual industry growth rates in the state. These deviations are then multiplied by base year employment in the respective industries of the county. These first two factors compare industrial structure of the study area to that of the reference area.

The third factor, local-share effect, measures the competitive position of the county and each component or industry in it, relative to the state. It is calculated by taking the difference between county and state growth rates for an industry and multiplying that difference by county employment in the

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industry during the base year. Thus, the local-share effect, sometimes called the competitive-share or distributional effect, measures whether local industries are gaining or losing in their proportionate share of employment, relative to the reference area.

Shift-share analysis for industry i with employment as the unit of measure can be stated mathematically as follows:[1]

$$\Delta E_{ij} = (E_{ij}^t - E_{ij}^b) + R + M + L \qquad (1)$$

$$R = \left(\frac{E_{oo}^t - E_{oo}^b}{E_{oo}^b} \right) E_{ij}^b \qquad (2)$$

$$M = \left(\frac{E_{io}^t - E_{io}^b}{E_{io}^b} - \frac{E_{oo}^t - E_{oo}^b}{E_{oo}^b} \right) E_{ij}^b \qquad (3)$$

$$L = \left(\frac{E_{ij}^t - E_{ij}^b}{E_{ij}^b} - \frac{E_{io}^t - E_{io}^b}{E_{io}^b} \right) E_{ij}^b \qquad (4)$$

where

E = employment

R = reference area effect

M = industry mix effect

L = local share or distributional effect

E_{oo}^t = total employment in the reference area during the terminal period

E_{oo}^b = total employment in the reference area during the base period

E_{ij}^t = employment in industry i in area j during the terminal period

E_{ij}^b = employment in industry i in area j during the base period

E_{io}^t = employment in industry i in the reference area during the terminal period

E_{io}^b = employment in industry i in the reference area during the base period.

The sum over all industries yields the shift-share components for the area.

APPRAISAL OF THE TECHNIQUE

The shift-share technique is a relatively recent tool for regional and community analysis. The technique was popularized in 1960 by Dunn [9] and Perloff, et al. [11] and by Ashby [2] in 1965. Then, in 1967, the technique was severely criticized in a well-known article by Houston [10]. His argument was that (1) the technique is devoid of behavioral content, (2) only the competitive or local-share effect uses regional information and (3) the industrial-mix and local-share effects vary with the level of aggregation. Brown [4] made similar observations and concluded that the framework was not useful for regional projections. Still another article critical of shift-share analysis was written by Buck [5]. He argued that a positive local-share effect cannot be interpreted as evidence of the efficiency of industry in the area. This argument is based on interviews with manufacturing firms, located in a region in England, in industries which had been identified as having a growth rate faster than the nation-wide industry growth rate. In twenty-one interviews, no firm attributed its location in the region to locational factors. Positive local share effects were found to be due to faulty industrial classification, unique company organization factors and regional public policies. If these results can be generalized to other areas as Buck believes they can, at least in England, then shift-share analysis has very little to contribute to local or regional economic policy.

Addressing the points raised by Houston, Ashby [1] has pointed out that much criticism was raised because too much was expected of the analysis. Shift-share analysis is a descriptive tool for organizing and standardizing data. It is not a predictive tool, and consequently, should not be criticized for its inability to predict. It is subject to many of the same aggregation problems that are present in other techniques. However, despite its shortcomings, it does provide a rational and orderly method for sorting out factors which relate to differences in the rate of growth among regions. This particular study gives attention to the point raised by Buck as to whether a positive local-share effect can be interpreted as the result of efficiency advantages.

METHODOLOGY CONSIDERATIONS AND IMPROVEMENTS

In preparing to conduct a shift-share analysis, decisions must be made regarding selection of reference area, time periods, data and degree of industry disaggregation. Several modifications from ordinary shift-share analysis were made in this study to

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[1] There is some discussion and disagreement in literature over the precise mathematical form of these equations. Bishop and Simpson [3] have presented a different weighting scheme which adjusts local economic structure to conform with the relative structure of the reference area rather than comparing growth rates. Still other suggestions have been made regarding which time period to use when calculating the weights [12], but as yet, no new preferred weighting scale has been agreed upon.

improve the results for rural counties.

Generally, the nation is selected as the reference area or standard of comparison. But, as noted earlier, for a study of primarily rural counties, the state was deemed more appropriate.

Other necessary decisions regard the unit of measure and data selection. Employment data are used to reflect economic activity in this study (as in the majority of studies) because of their availability, but there are several problems in using employment as a measurement of economic activity. When looking at changes occurring over time, certain industries are misrepresented, particularly those such as agriculture, which have experienced rapid productivity increases. Employment data show these industries declining in importance, whereas their importance in generating income or value added may be increasing. In these situations, an analyst can minimize the problem by choosing a relatively short time period or by using income or value-added data.

Still other difficulties with employment data relate to the handling of part-time employment and commuting. Basically, there are two sources of employment data available for Indiana counties. Data are available from the Census of Population and from the Indiana Employment Security Division, which collects data included in the County Business Patterns. Census data, generally providing the basis for shift-share analysis, are reported every ten years. Workers are reported in their county of residence. Employment Security Division data are available on an annual basis and, therefore, the analysis is not limited to ten-year periods. Workers are counted in the county in which they are employed rather than in their county of residence. This is an important distinction for most rural areas in Indiana. In addition, rural economies frequently have only one or two firms in a particular industry. In these industries, data cannot be reported publicly because of disclosure considerations, but all data were available for this investigation. Only employment covered by social insurance is reported and therefore all employment is not included. But because of the earlier considerations, data from the Employment Security Division were used in this study.

Typically, just one time period is used in a shift-share study, but insights from analyzing several shorter periods will be greater than for an analysis of one longer period. Dunn [9] has suggested that shorter periods are preferred to longer ones because the industrial mix effect is based upon spatial distribution of industries in the first time period. Distribution in the latter period will likely be different. Thus, the longer the time span between comparison years, the more distorted will be the results. In addition, use of relatively short time periods would seem to minimize controversy over whether base year or terminal year weights should be used in analysis. Since annual data were available, shift-share analysis was completed for four periods, 1960-1970, 1963-1973, 1963-1968 and 1968-1973. The time periods 1963 to 1968 and 1968 to 1973 were selected as the most revealing. The economies of the rural counties under investigation seemed to have been in a long-run decline until the late 1960s when a turn-around apparently occurred in much of the area.

A problem encountered in studying these counties was that the business cycle of rural economy was not synchronized with overall economic activity in the state. It is desirable to select beginning and ending years which reflect the same general business conditions, because if the former reflected a business slump and the latter reflected a vigorously expanding economy, then some changes in activity would be due to business conditions rather than to long-run growth of the economy. Selection of the years 1963, 1968 and 1973 biased the analysis somewhat for the counties, because in the latter years they appeared to be closer to peak of their business cycle than to state economy.

Still another decision regarding the number of industries was required. The relative size of the local-share effect and industrial-mix effect is related to level of aggregation. Dunn [9] indicated that unless data are disaggregated to the point of actually comparing economic activities, the local-share effect calculated for each industrial sector will contain an element of subsector industrial mix effect. On the other hand, individual firm data cannot be disclosed, and broad economy trends are difficult to identify if the number of industries becomes quite large.

In this study, total employment for each county was disaggregated into 60 industrial sectors. The purpose was to identify occurring economy changes as clearly as possible. This disaggregation greatly improved our understanding of changes occurring in local economy, but because of the disclosure problem, the 60 sectors were aggregated to 13 for reporting purposes. The data for these 13 aggregated sectors revealed broad trends occurring in employment growth.

APPLICATION

This technique was applied to the four Indiana counties included in the Title V Rural Development Project [7]. These counties are Clay, Parke, Sullivan, and Vermillion. Because of its proximity to the city of Terre Haute, Vigo County was also included. These five, plus one other rural county, compose Indiana Region VII.

The industrial mix in Clay and Sullivan Counties during the 1963-1968 period had a negative influence on employment growth, while Parke and Vermillion Counties had a mix of industries which were faster growing than the mix in Indiana (Table 1). Only Sullivan County had a positive local-share effect for all industries during this period, as other counties had a negative proportionate share of statewide employment. But every county had at least a few industries in which the local-share effect was positive.

During the 1968 to 1973 period, Clay, Parke and Sullivan Counties had relatively fast-growing industrial mixes but continued to lose their proportionate share of state employment. Perhaps the most significant change revealed in the analysis was the dramatic increase in Vermillion County's local share of employment. Many industries there, particularly manufacturing, revealed positive local-share effects during this 1968-1973 period.

Relative to Indiana, Vigo County, which contains Terre Haute (the urban center for the four rural counties), had a faster growing industrial mix between 1968 and 1973 than between 1963 and 1968. Likewise, the county had a positive local-share effect between 1968 and 1973 compared to a large negative effect between 1963 and 1968. During the ten-year period, industries which have historically supported Vigo County's economy decreased in importance (coal mining and food product manufacturing), and a new group of manufacturing industries replaced them

(chemicals, electrical products, machinery, primary metals and fabricated metals).

The industrial mix of Region VII also switched from a slow to a fast-growing composition between the two five-year periods. At the same time, Region VII began to increase its share of statewide industrial employment after an early relative loss. The industries contributing most to employment growth were manufacturing of chemicals, electrical products, apparel and scientific instruments, machinery, primary metal products and the professional services in medical and educational fields. These fast-growing industries now dominate the slow-growing industries of coal mining, food product manufacturing, clay products manufacturing and transportation and wholesaling—which have retarded employment expansion.

PROJECTIONS AND POLICY RECOMMENDATIONS

Much of the criticism of shift-share analysis has arisen because of the analyst's need for predicting and making policy recommendations. Local people, as users of the study, want to know what to expect in the future. They want to know what actions they can take to encourage economic growth and development to occur according to their desires.[2]

There has been a tendency for economists to equate a positive local-share effect with a comparative advantage. This had led to a few policy recommendations. If an area has lost employment relative to other areas (negative local share), then it may need to improve its infrastructure before it can anticipate growth. Similarly, it is reasoned that an area with a negative industrial mix needs to seek growth industries. Stilwell [13] has pointed out that, in actuality, either of these remedies could enhance community growth regardless of whether positive or negative figures appear in the shift-share analysis. Consequently, policy recommendations of this type should not be made without additional knowledge of the community's economic situation and infrastructure.

Perhaps more serious is Buck's criticism, which was noted earlier, that local-share effect should not be interpreted as being the result of a comparative advantage. If this is true, then it would seem to limit shift-share analysis simply to a means of organizing

TABLE 1. SUMMARY OF INDUSTRIAL MIX AND LOCAL-SHARE EFFECTS IN FIVE INDIANA COUNTIES AND REGION VII, 1963-1968 AND 1968-1973

Geographic Area	Industrial Mix Effect 1963-1968	Local Share Effect 1963-1968	Industrial Mix Effect 1968-1973	Local Share Effect 1968-1973
	-------------------------number employed-----------------			
Clay Co.	-298	-348	200	-194
Parke Co.	21	- 38	328	- 57
Sullivan Co.	-183	57	177	-147
Vermillion Co.	40	-439	- 5	1,340
Vigo Co.	-599	-2,289	589	780
Region VII	-1,126	-2,885	1,473	2,947

data. To determine whether Buck's conclusions applied to this study and to provide additional information that might be useful for policy recommendations, a survey of firms was completed.

The survey was designed to identify factors under the influence of the local community which might contribute to increasing economic growth in the area. Among other questions, firms were asked to identify reasons why each was located in the area, limiting factors to expansion of existing operation and to present and future job skills needed. Each firm was also asked tentative plans for growth during the next six months, two years and five years. The data in Table 2 show employment and local-share effects for four basic industries in the region. Mining, particularly coal mining, and transportation employment have declined. Terre Haute was historically a railroad center with large numbers employed in railroad transportation. Manufacturing employment has shown strong growth and the region has become a center for electrical power generation plants. Eighty-four firms from these four sectors were interviewed.

In apparent contrast to the study in the United Kingdom reported by Buck [5], locational advantages were sighted by firms in industries where a positive local-share effect appeared in the shift-share analysis. Organizational and classification problems found to influence the local-share effect in England were practically nonexistent in this study. Firm after firm listed locational factors as key considerations influencing their location in the area. Typical of these was the response of a new chemical plant which listed labor force skills, water supply, proximity to other plants and community cooperation as reasons for locating in the area. Only one firm responded that an institutional factor, a federal government contract, was important in its location decision. Admittedly, caution must be exercised in generalizing the results of this limited survey. But in these counties, the vast majority of firms cited natural resource availability,

access to markets and availability and cost of skilled labor and other inputs as reasons for locating in the area.

This is important because of the implications for local policy makers. If locational factors which are internal to the community are important in determining whether new firms located in the area, the trend is more likely to continue than if external forces are more important in determining location of industry. If basic industries have positive local-share effects due to locational advantages, then there is reason (according to export base theory) to expect future increases in the nonbasic or residentiary sectors. As Cosgrove has stated:

"When a comparative advantage (positive regional share coefficient) is established in basic industries, the economic processes underlying the export-base theory suggest the advantages in income and employment are transmitted to the non-basic industries. In other words, a comparative advantage in basic industries suggests that a relative advantage, to a degree, will follow in residentiary industries" [6, p. 83].

However, in this study of rural counties, when the political boundaries are not economic trade area boundaries, it was felt that economic base analysis concepts should apply to the Terre Haute region of which these four counties are a part. It would not be instructive to predict trade and service sector employment increases based on increases in manufacturing employment for one of the rural counties, because much of the trade and service sector development is located outside county boundaries.

In Indiana Region VII, of which these counties are a part, the basic industries with positive local-share effects in the 1963-1968 period were manufacturing of apparel, wood products, paper, rubber, metals, machinery, electrical equipment and scientific instruments. According to economic base theory, this should stimulate increases in employment in the nonbasic sector, although other manufacturing sectors, railroad transportation, utilities and mining had some offsetting effects. Increases were evident in many of the nonbasic sectors by the 1968-1973 period, but in many sectors the improvement was not enough to produce positive local-share effects in the shift-share analysis. The local share of all nonbasic industries in the region was −3,167 in the early period and +746 in the latter period.

Between 1968 and 1973, the mining industry was no longer exerting a negative effect on the local share of employment in the region. The attraction of several manufacturing industries to the region continued with chemical manufacturing contributing the most to the relatively large local-share effect from the

TABLE 2. EMPLOYMENT AND LOCAL SHARE EFFECTS IN SELECTED INDUSTRIES IN INDIANA REGION VII DURING 1963, 1968 AND 1973

Industrial Sector	Employment			Local Share Effects	
	1963	1968	1973	1963-68	1968-73
Mining	1,543	955	1,035	-375	-15
Manufacturing	14,281	16,829	20,386	1,343	2,688
Motor Freight, Transportation & Warehousing	1,773	1,560	1,348	-621	-599
Utilities	913	975	1,277	- 68	121

basic industries. Based on previous experience, this strength in basic employment can be expected to result in future employment increases in the nonbasic sectors of the region.

Interpreting a positive local-share effect as the result of a comparative advantage and incorporating concepts from economic base theory allow some predictive statements to be made from shift-share analysis. Additional survey questions related to labor needs and industry linkages can also be helpful in making suggestions of possible actions and policies which local groups might consider to improve their community's economy. But, the shift-share technique itself is purely descriptive and much caution must be utilized in making predictions and policy recommendations based on the results of the analysis.

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