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THE ROLE OF SHIFT-SHARE IN REGIONAL ANALYSIS

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Introduction

During its short history, shift-share analysis has seen widespread use in regional analysis. Because careless or inappropriate uses of the shift-share accounting identity could lead to faulty policy recommendations, numerous articles have been devoted to how shift-share should not be used. While such articles have greatly improved our understanding of the shift-share accounting identity, they have perhaps left the impression among some analysts that shift-share produces no useful information and should therefore be avoided. Therefore, the primary purpose of this paper is to offer a definition of the proper role of the shift-share algorithm in regional analyses. The work of previous authors is combined with examples from this author's case study of Illinois and selected substate regions as the basis for a definition of shift-share's role. New applications revealed by the case study are included.

After a brief description of the shift-share accounting identity, the results of the case study are summarized, with particular attention devoted to the findings which indicate how shift-share's role can be expanded beyond previous applications. The case study is followed by a brief summary of other views about shift-share to further delineate its proper role in regional analysis.

The Shift-Share Accounting Identity

When used carefully, shift-share is a valuable descriptive tool for outlining the magnitude and direction of broad economic trends. Shift-share defines a change over time in terms of three components: Reference Area Growth (RG), Industrial Mix (IM), and Regional Share (RS). The three components must sum to the actual change (AC) (AC=RG+IM+RS). RG implies that the study area's economy is compared to the performance of another area's economy, usually the nation. If, overall, the reference area grew during the analysis period, RG is positive and equal to the reference area growth rate times the base year income or employment of the particular economic sector or region being studied. The difference between RG and actual change must be allocated to IM and RS. For a sector which grew less (more) rapidly in the reference area than the reference area grew as a whole, IM is negative (positive). IM is then summed across all sectors to determine whether or not the study area is dominated by nationally fast-growing (+IM) or slow-growing (-IM) sectors. RS completes the shift-share accounting identity. Since it is likely that particular sectors have differing rates of change in the region being studied and the reference area, some of the change observed in a sector must be attributed to those differing rates. Quite simply then, RS is the difference between the rate of change observed in a sector in the reference area and in the study area. Sectors which grew more slowly in the study area than in the reference area will have a negative RS, while sectors which performed more favorably in the study area than in the reference area will have a positive RS. If a

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particular sector in the study area is changing at a different rate than its reference area counterpart, its share of the reference area sector must shift (hence the name shift-share). Where RS and IM are of the same sign, or where the absolute value of RS exceeds that of an IM with an opposite sign, the sector's share of the total reference area economy will have shifted in the direction of the sign of RS. For more detailed discussions of RG, IM, and RS, please refer to the appendix.

Case Study Summary

The shift-share accounting identity was used to describe the trends in economic data for the state of Illinois, Cook County (includes Chicago), and the five suburban counties (Kane, Lake, DuPage, Will, McHenry) of the Chicago SMSA. At the time of the case study, 1978[1] data were the most current available. The study period of 1970-78[2] was used for the case study. The data were income and employment data published by the Bureau of Economic Analysis[3] for the twelve major divisions[4] (1-digit SIC). The nation served as the reference area.

The quantitative results are summarized in Table 1. Negative (positive) numbers indicate that local economic trends were more (less) favorable than the national trend for that sector. In addition to the ramifications for proper use of shift-share analysis, the data in Table 1 suggest an unrelated, but important conclusion about how urban areas should be studied. That conclusion is suggested by the complete lack of similarity between the results for Cook County and the five suburban counties of the Chicago SMSA. Studies of urban areas should analyze central cities and suburban areas separately. An earlier shift-share analysis [7] of Illinois' rural and metropolitan areas lumped all urban areas together. From the results presented in here, it appears likely that Scott and Johnson [7] lost information by aggregating urban counties with widely differing economic performance. If that procedure had been followed for this research, it seems certain that the generally poorer performance of Cook County would, due to its greater size, have completely obscured the relatively better performances of the suburban counties.

Most shift-share analyses have been performed using only one type of data, employment or income, but not both. Over the same study period, the qualitative results for a particular sector in a particular region should be similar whether income or employment data are used. Generally, the preceding statement is true, but not always. Of course, data or computational errors may be the cause, but generally differences between income and employment shift-share analyses of a particular sector are real and plausible from a theoretical perspective.

The analysis of the "other" sector in the suburban counties indicated that income grew faster and employment slower than in the nation. A similar situation was evident in Illinois' wholesale sector for the years 1975 to 1978 (not in Table 1).

[1] 1978 income data were not available for the five suburban county area. The study period for that region is 1970-77.

[2] A longer data series could have been used, but too many ups and downs cancel over a longer period. Also, results will be influenced by forces no longer relevant, and by an initial economic structure which has little resemblance to the present.

[3] BEA data are four quarterly averages, thus eliminating seasonal bias. Income data are in constant 1972 dollars.

[4] The rationale for using that level of aggregation is explained in the next section.

TABLE I

Comparison of Illinois', Cook County's and the five suburban counties' trends with U.S. trends. Numbers indicate the change in the 1978* employment and income data if trends in the study area had matched national trends for that sector. Income data are in thousands of constant, 1972 dollars.

Sectors	Illinois		Suburban Counties		Cook County	
	Personal Income	Jobs	Personal Income	Jobs	Personal Income	Jobs
Total	+3,270,253	+482,386	-554,719	-73,124	+4,045,573	+ 461,061
Farming	- 126,648	- 1,542	- 1344	- 388	+ 2253	- 70
Other	+ 32,810	+ 7,112	- 1443	+ 2965	+ 8783	+ 2509
Mining	+ 68,618	+ 5,247	+ 1646	+ 1161	+ 37,658	+ 1763
Construction	+ 479,785	+ 48,511	- 12,904	- 1103	+ 443,950	+ 34,729
Manufacturing	+1,097,928	+137,263	-131,275	-18,833	+1,560,864	+ 144,352
TCPU	+ 351,256	+ 27,390	- 36,605	- 4096	+ 379,353	+ 28,408
Wholesale Trade	+ 266,865	+ 34,112	-100,788	- 9898	+ 524,581	+ 52,268
Retail Trade	+ 502,697	+ 93,147	- 43,246	-12,648	+ 438,903	+ 75,015
FIRE	+ 2,438	+ 18,984	- 70,691	- 7559	+ 140,487	+ 29,394
Services	+ 87,487	+ 41,729	-181,233	-21,614	+ 278,252	+ 51,939
Federal Civilian	+ 219,034	+ 17,660	+ 51,315	+ 3921	+ 67,058	+ 8472
State and Local Gov't.	+ 287,983	+ 52,773	- 28,151	- 5032	+ 163,431	+ 28,282

*1977 for suburban county income

The divergent results could be due to increasing capital intensiveness in Illinois relative to the nation. That would allow for an increase in output and total income with a relatively less rapid, or perhaps even an absolute decrease, in employment. External economies, increasing returns to scale, or a reduction in excess capacity (reduction of underemployment) could also be explanatory factors.

The opposite (income grew slower and employment faster) was evident from 1970 to 1978 in Cook County's farming sector. Plausible explanations include a relative rise in the number of nonproduction workers, perhaps as a result of government regulation or union policies. Diminishing rates of return or relative declines in worker productivity may also be at fault.

The results do not implicate any one of these as being the most plausible interpretation of a shift in income RS being accompanied by an opposite shift in employment RS within a single sector or region. Other factors, or a combination of factors, may be the proper explanation. The suggestions are offered as possible avenues for investigating the underlying causes of the phenomena described.

Thus, it appears that shift-share may produce additional useful insights into an area's economy when both income and employment data are analyzed. Many of the explanatory phenomena certainly have important policy implications.

The Role of Shift-Share

Before the reader draws any additional conclusions or undertakes any actions on the basis of a shift-share analysis, he or she is urged to keep in mind the specific capabilities, numerous limitations, and shortcomings of the shift-share technique. "Shift-share is an accounting identity whose major purpose is to focus attention on the strengths and weaknesses in a region's economic performance relative to its competition — other regions" [8]. "The general view seems to be that the components of change (shift-share) technique does not by itself provide an adequate framework for the analysis and forecasting of regional employment trends, and should be used in conjunction with other research techniques" [2]. "Shift-share was never meant to be a model of growth and thus is unsuited to the task of making projections" [1]. "Shift-share was introduced as a descriptive device and a technique for systematically examining regional economic data" [8]. Shift-share "relies on its role (in policy formation) in the organization of informa-

tion as a prelude to more detailed study. These are questions which shift-share itself does not purport to answer, but the particular sector about which such questions should be asked are revealed by the shift-share approach" [9]. In the words of Stevens and Moore [8], shift-share is "a quick, convenient, and inexpensive way to gauge a region's economic growth and to identify inter-regional issues which may deserve the attention of public policy makers." "There can be little objection to shift-share as a descriptive tool which summarizes information concisely" [3]. Buck's statement describes what is likely to always be shift-share's major contribution to regional analyses.

The results should not be extended to levels of aggregation other than the twelve major divisions used by BEA, particularly highly disaggregated (very fine detail) data. Shift-share is extremely sensitive not only to differences between areas (that is what we want the technique to describe), but also differences in sectoral composition. For example, if a region or a sector is too small, the distribution of particular firms and establishments in the region's manufacturing sector (or any other sector) is likely to differ substantially from the reference area. The resulting RS would then largely measure differences in sectoral composition between the region and reference area, rather than comparative advantage or disadvantage, which is the usual inference drawn from RS. In the words of Stilwell [9]: "The problem of classifying firms into industries increases as the sectoral groupings become finer. The effect of arbitrary classification of firms to industries become more important the more disaggregated the industrial and/or spatial groupings involved. There is a sort of averaging-out process which is unable to act for more disaggregated information." "This means that random market and company organization factors are more likely to cancel out in a large universe" [3]. Thus, the BEA data by twelve major divisions, the most readily available, also were at the most appropriate level of aggregation. The same argument was applied in choosing study regions. Hence, the smallest area studied was the five suburban county region adjacent to Cook County.

A useful and simple expansion of shift-share's descriptive role was identified by this research. By applying shift-share to both income and employment data and comparing the results, additional valuable information may be revealed. Generally, each sector's performance relative to the reference area will appear similar for employment and income shift-share analyses. However, there are phenomena important to regional analysts which could cause the results for employment and income to differ in sign or magnitude. Some possible causes for the divergence were suggested earlier during the discussion of the case study. Phenomena such as external economies and diseconomies, changing capital-labor input ratios, declining worker productivity, and changing rates of production capacity utilization are among the potential causes of the divergence which may have important planning and forecasting implications. It is worth repeating that shift-share will not identify which of the many potential causes is at work. Rather, it indicates where some additional research is likely to produce the largest benefits.

To this point, the reader may have wondered why RG, the reference area growth component, was not simply called the national growth component, a term more in keeping with previous papers. The use of the term RG was a deliberate move to emphasize that while the nation is, in practice, usually selected to serve as the reference area, in theory any region may serve as the reference area. A frequent criticism of a shift-share analysis is that since the study area and reference area had little in common at the beginning of the study period, there was little or no reason to believe that RG had any meaning for the study area. In other words, is it

meaningful to compare the economic performances of dissimilar areas? Even though some of the base-year differences in economic character will be captured by the IM component, a reference area other than the nation would, at times, improve the usefulness of shift-share's output. Isserman and Merrifield [6] developed an algorithm which can be used to synthesize from existing spatial units, (such s counties) a reference area which can be substituted for the nation in a shift-share analysis. After specifying the study period, a statistical procedure is applied which identifies counties whose sector-specific economic growth rates were similar to the growth rates observed for the study area prior to the study period. By establishing that benchmark, the impact of forces which affected the study area but not the reference area, and the differential effect of forces which affected both, can be isolated. While the algorithm developed by Isserman and Merrifield [6] is still in a very preliminary stage, the concept which it attempts to implement could broaden the means by which shift-share contributes useful data to regional analyses.

Summary and Conclusions

Shift-share has a place in regional analysis. Used within its limitations, it is a valuable descriptive tool, which as a first step identifies characteristics of particular sectors which should receive additional information. In other words, it helps the analyst allocate research effort. The use of shift-share should be expanded to cover both income and employment data. Not only will each of the two analyses contribute additional information by themselves, but further insights may be gained by comparing them. Shift-share's applicability may be expanded to new areas and improved in some existing uses by a capability to identify a region which in some instances may be preferable to the nation as a reference area.

APPENDIX

The technique employed in this study was shift-share analysis. Shift-share enables changes in regional economic patterns to be better understood by dividing changes in employment and income into three components. They are:

1. Reference Area Growth (RG) Component. It is the standard against which the differential performances of regions and individual industries are measured. RG is that part of regional employment or income change which is attributable to the growth of an appropriate reference area. The difference between the actual growth in each region or division and RG for that region or division is referred to as a net relative change. Any region or division whose income or employment changed by the same percentage as the reference area, performed as well as the reference area, and the net relative change is zero. Where actual change was less than RG, net relative change is negative; if actual change was greater, net relative change is positive.

The other two components depend on whole or in part on RG. They are the criteria used to explain a difference between actual growth and RG; the net relative change. They are:

2. Industrial Mix (IM) Component. It is a measure of the change in employment and income due to the difference in the growth rate of an industry within the reference area and the overall reference area growth. IM will be positive for an industry which grew faster than the reference area, and

negative for an industry which grew slower than the reference area. Summing the values of the mix component for individual industries gives a regional mix component. IM depends entirely upon the reference area used and the time interval chosen. A positive value indicates that the sector grew at a more rapid rate than the average for the reference area, and thus is a relatively rapid growing sector. A negative value indicates that the sector grew more slowly than the reference area, and thus is a relatively slow growing sector. Because of linkages within and among industries and sectors, shift-share should be considered a "technique for providing minimum estimates for the IM effect on growth" [9]. IM takes into account only the employment or income changes which are a direct result of fast or slow relative growth in the industry in question. It does not take into account the "ripple effects" which that industry might have on other sectors within the region.

3. Regional Share (RS) Component. It is a measure of the extent to which changes in employment or income are the result of a specific industry growing in the region at a rate different than the growth rate of the industry within the reference area. A positive RS is commonly interpreted [8,9] as an indication that the region had a net comparative advantage over the reference area, and as a disadvantage if RS was negative. The comparative advantage or disadvantage may stem from any number of factors, including government policies, location, climate, etc. The shift-share technique, and specifically RS, does not implicate the source of the comparative (dis)advantage, but it does focus attention on the regions and sectors within them where underlying factors should be more closely scrutinized.

REFERENCES

1. Ashby, L. D. 1968. "The Shift and Share Analysis: A Reply." *Southern Economic Journal.* (January 1968), 423-425.

2. Bishop, K. C. and C. E. Simpson "Components of Change Analysis: Problems of Alternative Approaches to Industrial Structure." *Regional Studies.* Vol. 6, (1972) 59-68.

3. Buck, T. W. "Shift and Share Analysis — A Guide to Regional Policy?" *Regional Studies.* Vol. 4, (1970) 445-450.

4. Edwards, J. A. "Industrial Structure and Regional Change: A Shift-Share Analysis of the British Columbia Economy 1961-70." *Regional Studies.* Vol. 10, (1976) 307-317.

5. Houston, D. B. "The Shift and Share Analysis of Regional Growth: A Critique." *Southern Economic Journal.* Vol. 33, (1967) 577-581.

6. Isserman, A. M. and J. D. Merrifield "The Use of Control Groups in Evaluating Regional Economic Policy." *Regional Science and Urban Economics,* Vol. 12, No. 1, (1982) 43-58.

7. Scott, J. T. and Johnson, J. D. "Shift-Share Analysis of Income and Employment Among Rural and Metropolitan Counties of Illinois." *Regional Science Perspectives.* Vol. 8, No. 1, (1978) 93-110.

8. Stevens, B. H. and C. Moore "A Critical Review of the Literature on Shift-Share as a Forecasting Technique." *Journal of Regional Science,* Vol. 20, No. 4, (1978) 419-437.

9. Stilwell, F. J. B. "Further Thoughts on the Shift-Share Approach." *Regional Studies.* Vol. 4, (1970) 451-458.