Kasetsart J. (Soc. Sci.) 16 : 88-91 (1995)

A Note on Shift-share Analysis in Terms of Market Shares

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ABSTRACT

The author considers the potential applications of shift-share technique in an international market research context. He discusses the complication of introducting market shares in the shift-share formula and how it relates to the Holcblat-Tavernier decomposition (1989).

Key words: shift-share analysis, decomposition, marketing research, market shares.

INTRODUCTION

Shift-share analysis or constant-market-share analysis has become a well-known and relatively simple statistical technique in international trade and marketing analysis. Several appilications of the technique, together with several methodological discussions, have already been described extensively. In this short paper the complication of introducting market shares in a shift-share expression and its relation to the Helcblat-Tavermier decomposition are discussed.

Shift-share analysis : concepts and applications

Fothergill and Gudgin (1979:309) defined shift-share analysis as a technique which allows to measure or at least to consider the degree in which a structural characteristic causes differences between categories in a population. The categories are usually (but not necessarily) spatial categories (e.g. regions). The differences are usually determined by growth rates; the structural characteristics are usually industrial structures (for economic growth) or age structures (for demographic growth).

The mathematical formulation of the technique is not unique and differs from application to application. A general formulation of the technique has been presented in De Lombaerde and Pauwels (1989). the proposed generalisation refers not only to the introduction of a standard notation (Stevens and Moore, 1980), but also to a formulation of the technique in terms of a variable number of dimensions and dimension levels in the analysis.

Richardson provided a good discussion of the methodological problem in shift-share analysis in a regional-economics context (Richardson, 1978). The methodological problems include : the choice of the level of disaggregation, the choice of the weights, the instability of the differential component, the multiplier effects of the structural component (e.g. industrial structure) wrongly attributed to the differential shift however (point by

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point) that these criticisms do not outweigh the practical usefulness of the technique. The authors did this as well on the theoretical level as on the basis of empirical research into the regional employment evolution in the UK. Smith (1991) provided a recent support of the shift-share technique in empirical research can also be found.

The breakthrough of the technique as a tool of economic analysis came with Perloff *et al.* (1960). They used the shift-share approach as a technique for regional economic inquiry. The study of Perloff *et al.* (1960) led to a flux of research applying shift-share analysis to problems in regional economics.

Later on, the technique has also been applied in the research on transport economics (De Lombaerde and Verbeke, 1989) and of international marketing research and international trade (Leamer and Stern, 1976; Hoen and Van Leeuwen, 1991.)

In the domain of internationl marketing research, the first term is usually called the "constant-market-share", two intermediary shifts are calculated (the "commodity composition effect" and the "market distribution effect"), and the residual term is called the "competitiveness effect" (Leamer and Stern, 1976:171-183).

Variation on the "classical" shift-share technique in an international trade context include a weighted versions (De Lombaerde and Verbeke, 1989), marginal shift-share analysis (De Lombaerde, 1990) and shift-share analysis of market shares, which will be discussed further

A point should be made of the recent extension of the shift-share technique for the analysis of regional growth to open economies. The specification of a share-effect implies the choice of a "superior" reference level (in comparison with the zero dimension level) in at least one dimension. In regional economics applications, the national level was used quite uncritically as the relevant reference level. Especially for small open economies (in which the import dependence and export intensity can be important for the distinct regions and respective industries), the relevancy of its application was questionned. A (small) number of recent contributions were explicitly the taken open character of economies into account as an additional structural component.

Sihag and McDonough (1989) included their shift-share expression for regional growth as the "world growth" and a "world industry mixed effect". Henderson *et al.* (1989) proposed a technique for the calculation of employment multiliers (on the basis of input-output data), which accounted for variations in the import coefficients. Markusen *et al.* (1991) expanded the classical shift-share expression in regional econnomics by splitting both the national growth component and the industry effect into components that reflect employment growth due to exports, imports and internal demand. by specifying an expression in terms of output, the authors further added a component which reflects the expected labour productivity increase.

Shift-share analysis in terms of market shares

Shift-Share analysis has a major limitation for decomposing growth of market shares. The problem consists of the fact that necessary share and shift-terms in a shift-share expression are cancelled because average growth rates on a higher dimension level are per defintition 0 (cfr.the sum of the market shares is always 1).

The mentioned problem can be solved by rewriting the decomposition of a change of the global market share (such as of a country) as a shift-share decomposition of the change of the absolute values of the trade flows with an adapted residual shift :

$$S_{jt} - S_{jo} = (M_t - M_o)/M_o \cdot S_{jo}M_o$$
$$+ \sum_i [(M_{it} - M_{io})/M_{io} - (M_t - M_o)/M_o] \cdot S_{jio}M_{io}$$

$$+ \sum_i \sum_k [(M_{ikt} - M_{iko})/M_{iko} - (M_{it} - M_{io})/M_{io}] \cdot S_{jiko}M_{iko}$$

$$+ \sum_i \sum_k S_{jikt}M_{ikt} - S_{jiko}M_{iko} - (M_{ikt} - M_{iko})/M_{iko} \cdot S_{jiko}M_{iko}$$

$$+ (M_{jt} - M_t)/M_t - (M_{jo} - M_o)/M_o$$

Where :

S_{jt} = market share of country j in total maket in year t

$= M_{jt}/M_t$ (cfr.supra), and : $S_{jt} = \sum_i \sum_k M_{ikt}/M_t \cdot S_{jikt}$

M = world market (=total imports);

M_j = world market imports from country j;

M_i = specific geographical maket i (all products);

M_k = world market for specific product k;

M_{ik} = specific geograhpical market i for specific product k;

O,t = reference period, current period resp.

It is possible to derive several relevant arithmatically-equivalent versions from this expression. It can be shown, for example, that when the right-hand-side of the expression is rewritten as a function of the market shares and the relative importances of geographical or product markets, excluding (growth rates of) trade flows, an expression is obtained which corresponds with the *Holcblat-Tavernier decomposition* (Holcblat and Tavernier, 1989).

$$S_{jt} - S_{jo} = \underbrace{\sum_i \sum_k M_{iko}/M_o \cdot (S_{jikt} - S_{jiko})}_{\text{I}}$$

$$= \underbrace{\sum_i \sum_k M_{ikt}/M_t - M_{iko}/M_o) \cdot S_{jiko}}_{\text{II}}$$

$$= \underbrace{\sum_i \sum_k (S_{jikt} - S_{jiko}) \cdot (M_{ikt}/M_t - M_{iko}/M_o)}_{\text{III}}$$

Holcblat and Tavernier (1989:43) decompose futher also their second term (initial specialisation effect, effet d'entrainement) as follows :

$$\sum_i \sum_k S_{jiko} \cdot (M_{ikt}/M_t - M_{iko}/M_o)$$

$$= \sum_i S_{jio} \cdot (M_{it}/M_t - M_{io}/M_o)$$

$$+ \sum_i \sum_k (S_{jiko} - S_{jio}) \cdot (M_{ikt}/M_t - M_{iko}/M_o)$$

This procedure is to some degree analogous to the specification of the country-shif and the product-shift effects in the shift-share analysis. Observe that the non-symmetry property[1] is still valid

CONCLUSION

Shift-share analysis is a useful analytical technique for marketing research. It's applications can be further extended by introducing market shares, hence the adaptation of the expression to obtain the arithmatically-equivalent expression corresponding to the Holcblat Tavernier decomposition.

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1 the non-symmetry propetry is basically saying that the order of the country-shift and the product-shift effects the shift-share expression which is crucial for their quantification (not for their sign).

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