
A Review of Shift-Share Analysis and Its Application in Tourism

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ABSTRACT

Shift-share analysis has been widely applied to the regional economic research and empirical studies have effectively confirmed it a useful tool to depict the regional change. Although, many kinds of extended shift-share models have been advanced and put into practice in economic studies, few have hitherto been introduced and applied to the tourism research, especially in China. So the purpose of this paper is to systematically introduce and review the shift-share approach and its extended models, which will contribute to the further research and application of the shift-share models to tourism industry.

Keywords: Shift-Share Analysis, Tourism, Esteban-Marquillas Model, Spatially Extended Model, Predictive Capacity.

INTRODUCTION

A survey of the literature indicates that shift-share analysis continues to be popular among planners, geographers and regional scientists (Knudsen, 2000). Shift-share analysis is a tool that partitions the growth in an economic variable in a particular area (i.e., state, region and city) into various components. The shift-share method of analyzing regional growth apparently was originated in the early 1940s by Daniel Creamer (Yasin et al., 2004). Then it was summarized and induced by Dunn in (1960). Shift-share analysis has generally been used for describing regional and industrial economic growth and examining the structural effect and regional or industrial competitiveness underlining the changes over time (Sirakaya, Uysal and Toepper, 1995). It has been popular in the fields of regional economics, political economy, marketing, geography, and urban studies for about four decades. However shift-share analysis has just been applied to tourism industry in recent years and studies in tourism industry are still relatively rare to date (Fuchs et al., 2000; Sirakaya, Choi and Var, 2002; Sirakaya, Uysal and Toepper, 1995; Toh, Khan and Koh, 2001; Toh, Khan and Lim, 2004; Toh, Khan and Yap, 2003; Yasin et al., 2004). Moreover many kinds of extended shift-share models have been advanced and put into practice in economic studies, but few have hitherto been introduced and applied to the tourism research, especially in China. So, the purpose of this paper is to systematically introduce and review the shift-share approach and its extended models, which will be helpful to the further research and application of the shift-share models.

In this section, the advantages, formulation and limitations of the traditional shift-share approach are summed up. The rest of the paper is organized as follows: The second section is to compare the traditional comparative

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static model with dynamic model. Then Esteban-Marquillas model, spatially extended model of shift-share analysis are provided respectively in section three and four. The fifth section introduces Shift-share models associated with regression analysis in order to give the possible explanation for the regional growth. Shift-share models as predictive tools are presented in brief in the sixth section. Discussion and conclusions for current and future research are provided in the last section.

Advantages of Shift-Share Analysis

A major benefit of the shift-share technique is its simplicity that its use does not require primary data collection (Yasin et al., 2004), which eliminates the need for primary data collection, a costly and time-consuming activity (Sirakaya, Choi and Var, 2002). Stevens and Moore (1980) put forward that the factor to account for its popularity is the technically simple procedure. Shift-share analysis requires only relatively modest amounts of data that are generally accessible, making the resulting analysis fast and reasonably accurate. Despite of its simplicity, it does well in capturing the underlining changes in the variables under consideration (Nazara and Hewings, 2004) and it can well reflect regional or industrial changes over time. It has been used to measure differential economic growths by analysis on both the absolute and relative dimensions. Gazel and Schwer (1998) make the reassuring observation that static shift-share analysis is one of the simplest and least expensive techniques for investigating differential growth rates and, though subject to limitations, will continue to be widely used.

Variables Often Applied

Employment is the variable that used the most popularly in the literature (Andrikopoulos, Brox and Carvalho, 1990; Barff and Iii, 1988; Haynes and Dinc, 1997; Hellman, 1976; Karlsson, 1999; Rigby, 1992; Sirakaya, Choi and Var, 2002). In the same way, employment and arrivals are usually used as variables to measure changes in the shift-share analysis models in the tourism industry, which are all relatively easy and inexpensive to obtain. Taking for an example, Toh, Khan and Lim (2004) analyze the tourism competitiveness using the growth of visitors to Singapore, measured against the benchmark countries of Thailand, Malaysia, and Hong Kong. They conclude that shift-share approach allows the authors to determine how it is performing relative to its benchmark competitors, where Singapore's tourism industry is specializing, and where it is competitive. Sirakaya, Choi and Var (2002) examine the performance of the tourism industry using time-series employment data for the State of Texas and the USA in his paper. Yasin, Alavi, Sobral and Lisboa (2004) analyze the growth in tourist arrivals to five destinations (Portugal, Spain, France, Italy and Greece) between 1992 and 1996, from four major regions of the globe (Americas, Europe, Eastern Asia and Oceania, others).

Classical (Traditional) Model

In the standard framework, shift-share analysis decomposes a region's sectoral growth into three effects (see equation 1): national, industry-mix, and regional-shift (competitive) effects (Karlsson, 1999).

Equation 1:

$$\square e_i = [G + (G_i - G) + (g_i - G_i)]e_i \dots \dots (1)$$

The national effect is shown by Ge_i , i.e., the number of additional growth had the regional growth in sector i followed the national all-sector growth rate. The positive value means that national economy is increasing faster at the end of the period than that at the beginning. The converse is true. The industry-mix effect is shown by $(G_i - G)e_i$, i.e., the number of additional growth that is due to national growth in sector i . This effect will be positive if the national sector i grow faster than the average growth of the whole country. Finally, the regional shift effect, which is also called the competitive effect, is shown by $(g_i - G_i)e_i$. This is the number of additional regional employment that results from the region specializing in sector i . According to the absolute value of the shift effect, which is on earth the main contribution to the regional economic growth, whether industry-mix effect or the competitive effect, can be concluded? Net shift share is computed by actual growth minus the national sectoral shift effect. The positive value means that regional tourism industry has a swifter increase than the whole national economy.

Limitations of Shift-Share Analysis

The main limitations of the traditional shift-share methods center on concerns such as temporal nature, theoretical content and predictive capabilities of the technique (Yasin, Alavi, Sobral, and Lisboa, 2004).

According to Barff and Iii (1988), one of the most heavily criticized aspects stems from its temporal nature; this technique usually examines the economic changes at the beginning and end of an interval of several years – for example, 1990–2000. In other words, the technique does not allow adjustments to the changes that might occur during other years within that pre-specified interval. However, inherent limitations of this comparative static method, however, can be overcome by calculating the shift-share effects on a multiple-year basis by creating dynamic, time-series-like data (Sirakaya, Choi and Var, 2002).

Due to the uncertainty of its theoretical content, we cannot, however, make any judgments about the likely causes for competitive disadvantage according to the analytical results. That's to say, it cannot answer the perplexing questions of whether the model explains the significant changes in the industry, and if it is a valid model to examine such changes (Knudsen, 2000). Thus, to seek further explanations, we would need to carry out further analysis, such as regressing analysis of the competitive effect (Andrikopolous, Brox and Carvalho, 1990).

As to the predictive capabilities, shift-share models are widely used as predictive tools in spite of both theoretical shortcomings and some empirical evidence of unreliability (Hellman, 1976). It is generally accepted that the technique is a descriptive device which only reflects market demand and supply linkages between regional and corresponding national industries and which shows temporal shifts in regional comparative advantages in each industry (Williamson, 1980). But as to the predictive aspect, many researches have found it inferior to other simple methods.

COMPARATIVE STATIC/DYNAMIC MODEL

Main Limitations of the Comparative Static Model

The comparative static model refers the traditional shift-share analysis. As mentioned above, most applications of shift-share analysis to regional change have used a study period of several years and have examined conditions only at the beginning and end years. This comparative static approach does not take into account the continuous changes in both industrial mix and size of total growth of the region over the

study period (Barff and Iii, 1988). In such a static approach, as reported in the study by Sirakaya, Uysal and Toepper (1995) of the South Carolina's tourism industry's performance, the subtle swings for the aforementioned periods are lost. The comparative static approach measures the extent to which industrial mix or competitive effect at the beginning of a time period influences the growth over the period of consideration. This approach makes little sense if industrial mix changes or competitive effects sharply over the time interval, and thus is of limited value when applied to a long time periods (Barff and Iii, 1988).

Dynamic model

Statement and Calculation

The dynamic approach, on the other hand, measures the extent to which industrial mix or regional competitive effect, updated annually, influences total growth. The summation of the dynamic effects over a period presents an accurate expression of the contribution of continuously changing effects to total growth, even over relatively long time periods (Barff and Iii, 1988). Dynamic shift-share analysis is an extension of Thirlwall's (1967) suggestion that the study period be fractured into two or more sub-periods to reduce the severity of the changes. Calculating the national growth effect (NGE_k), the industrial mix effect (IME_k), and the competitive shift effect (CSE_k) on an annual basis and then summing the results over the study period provides a more accurate allocation of job changes among the three shift-share effects. We term dynamic shift-share analysis (see equation 2).

Equation 2:

$$\sum_k \square e_i = \sum_k NGE_k + \sum_k IME_k + \sum_k CSE_k \dots\dots (2)$$

Main Advantages

One of the benefits of using a dynamic shift-share analysis is that it structures accountability for changing conditions for any study period (Barff and Iii, 1988). It enables changes to be tracked over the years without losing information for those periods (Sirakaya, Choi and Var, 2002). The calculation of the effects on an annual basis also allows unusual years and years of economic transition to be identified. The use of the dynamic form of shift-share is important when the study period is characterized by either large changes in regional industrial mix or major differences between regional and national growth rates (Barff and Iii, 1988).

Limitations

Compared with the comparative static model, the main limitation of dynamic shift-share analysis focuses on the time and effort required to collect annual data and to compute the annual shift-share effects (Sirakaya, Choi and Var, 2002). Simultaneously the model itself still fails to give the explanation of the change. Dynamic shift-share analysis just manifests a deterministic relationship rather than statistically testable relationships, which cannot answer the possible reasons hidden in the significant changes in the tourism industry.

Application suggestions

According to a study conducted by Barff and Iii (1988), these types of effects, even over short periods, would have been more dramatic if the area had been substantially smaller (for example, a county rather than a state). The dynamic form seems to be the better approach if only past growth pattern are

characterized by either large changes in regional industrial mix or major differences between regional and national growth rates (Barff and Iii, 1988).

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However, if the shift-share technique is used for analyzing the cumulative effects of regional policy on a region, then the comparative static method (the traditional form) is superior to the dynamic form. Moreover, findings suggest that the two methods produced similar results when a shorter period was examined (Sirakaya, Choi and Var, 2002).

ESTEBAN-MARQUILLAS MODEL AND ITS APPLICATION

The traditional shift-share model has been criticized on the grounds that it does not take into account the interaction effect between the industry-mix effect and the competitive effect (Toh, Khan and Lim, 2004). Responding to this problem, Esteban-Marquillas (1972) introduces the homothetic concept to account for the interaction effect, which essentially adds a fourth component called the allocation effect. Haynes and Machunda (1987) mathematically proved that the Esteban- Marquillas Extension indeed possesses the aggregation-disaggregation symmetry and strongly recommended that because the extension has analytical superiority over the traditional shift-share formulation, it should be exploited and used by researchers (Toh, Khan and Lim, 2004). In tourism field, Alavi and Yasin (2000) and Toh, Khan and Lim (2004) have respectively used it to measure the growth in tourist arrivals.

Equation 3 includes four components compared with the traditional model. The first and the second effects are just the same as those in equation 1. The third component still denotes the regional competitive effect but is different from that in traditional model, which incorporates a homothetic concept. Taken for an example, Toh introduces homothetic tourist arrivals to represents the expected tourist arrivals, assuming the structure and pattern of tourist arrivals from country A to country B is similar as to the benchmark destination area. The fourth component, i.e., allocation effect, also known as interaction effect, measures the growth on tourist arrivals that is attributed to the interaction of the industry-mix effect and the competitive effect. This component is unique to the Esteban-Marquillas (1972) model. It can be used to indicate if a

country is specialized in attracting tourists from regions in which it has a competitive advantage. The magnitude of this effect indicates how well the country is doing in attracting tourists from regions according to its competitive advantage (Yasin et al., 2004). Therefore, as indicated by Alavi and Yasin (2000), a country may have a "competitive advantage" or "disadvantage" and may be "specialized" or "not specialized" in attracting tourists from region (i).

Equation 3:

SPATIALLY EXTENDED MODEL

The current decomposition posits a strictly hierarchical view of influence—the nation influences the region, but one region does not influence another region. What is missing so far from this analysis is the recognition of spatial structure, within which a particular region is located, as an important element in the growth accounting. It goes without saying that regions are interconnected one with another. This is a logical consequence of the fact that regions are spatial sub-units within a country. The general idea here is that the decomposed effects are not spatially independent; the performance of surrounding regions, of regions with similar structures, or of regions that are dominant trading partners will all have an influence on the growth performance of a particular region (Nazara and Hewings, 2004). They first incorporate spatial structure within shift-share analysis, to take into account interregional interaction in the decomposition analysis. Then they develop a twenty alternative taxonomy of regional growth rate decompositions, including the original standard shift-share analysis as well as six alternative structures outlined in the taxonomy for non-spatial structures. Compared with the traditional shift-share analysis, such spatially extended model reflects two changes. First, it offers varied forms so that appropriate form may be selected in terms of the study's need or the data type that obtained. Second, besides the whole nation and peculiar area, neighboring region is included here, which can reflect how the study unit interacts with its neighboring regions and which region is on earth the most important competitor to the study unit.

Equation 4:

$$\square e_i = [G_i + (g'_i - G_i) + (g_i - g'_i)]e_i \dots \dots (4)$$

Equation 4 is one of the basic forms of spatially extended shift-share models. Let "e_i denote the actual growth. Let G_i denote the national counterpart, g'_i the neighboring regions' growth. Due to the newly advance of this spatially extended model, application has not been found in tourism journals. Nevertheless, such a spatially extended model of shift-share analysis will be of great importance to the research in tourism field.

SHIFT-SHARE MODELS ASSOCIATED WITH REGRESSION ANALYSIS

As mentioned above, one of the limitations is that shift-share model itself is unable to give the reasons resulted in such changes. Andrikopoulos, Brox and Carvalho (1990) try to explain changes in regional attractiveness as measured by the competitive component by applying the shift-share model to the manufacturing sector in the province of Quebec and using time series data for twenty two-digit industries as the basis of regression analysis.

Equation 5:

$$CSE = \beta_0 + \beta_1 R_K + \beta_2 R_E + \beta_3 R_P + \beta_4 R_Y + \beta_5 R_U + \beta_6 R_V + \beta_7 R_W + \beta_8 R_I \dots \dots (5)$$

In equation 5, the competitive share effect is related to three sets of explanatory variables. The first set reflects locational condition of the region which captures the effects of locational advantages (disadvantages) on the region's economic performance. R_k refers to industrial investment. A positive correlation between the competitive share and relative investment, points to a labor-intensive industry and a negative relationship to a capital-intensive industry. R_E refers to the relative employment. A positive correlation between the competitive share and relative employment suggests that the share variable is conducive to the location of newly created industries in the region. A negative correlation, on the other hand, indicates "the extent to which existing markets are already exploited, which would have an inverse effect on location". The second set of factors consists of regional variables including local market conditions as relative population R_p , relative unemployment R_u , relative incomes R_i , and local supply conditions as Klassen's dependency coefficient R_v , relative wages R_w . A large regional market which can shift the comparative advantage in the direction of income-elastic goods is strongly affected by scale economies. Consequently, these variables are expected to bear positively on the competitive share. Relative unemployment, on the other hand, is expected to bear negatively in the competitive share component. The effect of the dependency coefficient on the competitive share is expected to be positive, since the greater the degree of specialization, the greater its comparative advantage in more complex skill-intensive industries. However, as has been suggested elsewhere, regional specialization could have an inverse effect on the competitive share, in the case of a simple, standardized manufacturing complex. Relative wages are expected to have a negative effect on the competitive share component as higher wages reduce the attractiveness of the region to manufacturing. Finally, the industrial structure of a region may affect its relative attractiveness to industrial activity. The results of the industrial-mix effect support the hypothesis that part of the relative attractiveness (unattractiveness) of the region as measured by the competitive share is explained by the industrial structure of the region (Andrikopolous, Brox, and Carvalho, 1990).

Similarly, such regression analysis of the competitive effect can effectively account for the possible reasons for growth but it has never found to apply to the tourism research.

SHIFT-SHARE MODELS AS PREDICTIVE TOOLS

The major criticism of the shift-share model has centered on the question of whether the model is stable enough to allow it to be successfully applied in forecasting situations. Brown (1969) finds that the instability is so severe that no significant fit may be obtained by regressing the components against variables that measure competitive advantage. Andrikopoulos, Brox and Carvalho (1990) confirm that the instabilities inherent in the shift-share model limit its usefulness for predictive purpose in his study. On the other side of the issue, some researchers find the shift-share model stable enough to allow for useful prediction.

A majority of the regional economists who make the tests seem to feel that some kind of modification of shift-share methods offered a good potential for making accurate regional forecasts. Ways of improving forecasts with the shift-share approach which were suggested explicitly or implicitly by the various empirical studies include (Williamson, 1980): (1) apply the technique to only large or urban regions as opposed to small rural regions (presumably the trend in regional shares for the large regions would be more stable); (2) limit the forecasts to relatively short periods (say, only 1 to 5 years into the future rather than 10 or more years); (3) include finer industrial breakdowns in developing the forecasts of regional exports (say, for most export-base industries, use at least two-digit industrial detail and use three- or four-digit detail when available); (4) develop and make use of more historical observations in projecting regional shares, as opposed to the customary use of only one observation from each of the two most recent census years; (5) make special allowance for indications of regional convergence of

growth rates in the forecasts for each industry; and (6) make systematic and explicit allowances for other influences which would tend to shift regional shares (through, say, an incorporation of multiple regression techniques in the shift-share approach).

CONCLUSIONS

Shift-share analysis has been widely applied to the regional economic research and empirical studies have effectively confirmed it a useful tool to depict the regional change. Furthermore, many extended models have put forward and put into experience. However, few have hitherto been introduced and applied to the tourism research, especially in China. So the purpose of this paper is to systematically introduce and review the shift-share approach and its extended models, which will be helpful to the application of the shift-share models and to the further research in tourism.

In summary, the main limitations of the traditional shift-share methods have been generally overcome by the modification and extension to the shift-share analysis. Firstly, temporal limitations of the comparative static method can be overcome by calculating the shift-share effects on a multiple-year basis by dynamic model (Sirakaya, Choi and Var, 2002). Secondly, as to the uncertainty of its theoretical content which makes us fail to obtain any judgments about the likely causes for competitive disadvantage according to the analytical results, we may carry out further analysis, such as regressing analysis of the competitive effect (Andrikopolous, Brox and Carvalho, 1990). Thirdly, it is generally accepted that the technique is a descriptive device and whether the model is stable enough to allow it to be successfully applied in forecasting situations is still of necessity to be examined.

In conclusion, theoretical and empirical research of shift-share analysis on tourism has been so rare till now that further application needs to carry out, which will contribute to tourism research and help to well understand the development and the competitive situation of regional tourism industry.

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