IDENTIFYING EXPORT OPPORTUNITIES FOR MALAYSIA USING THE SHIFT-SHARE TECHNIQUE

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INTRODUCTION

Various analytical techniques have been developed to date by researchers to identify export markets. A review of these techniques such as demand pattern analysis, income elasticity measurement, multiple factor indices, estimation by analogy, trend analysis, simple constant growth models and shift-share analysis was undertaken by Wee and Wong (1987a). There are two categories of measurements, absolute and relative. The absolute measure compares markets on a two by two basis, whereas a relative measure compares each market relative to all others in a group. The shift-share technique is a relative measure. This technique has potential for application to Malaysian exports, particularly in the current situation where a range of manufactured goods are produced and exported. In 1994 manufactured goods made up some 77 percent of Malaysian exports (Ministry of Finance, 1995). To remain viable exporters need to continually keep abreast of changing opportunities in overseas markets. This paper will illustrate the usefulness of the shift-share technique in analysing and tracking such changes in export opportunities.

In trying to measure or identify market growth, analysts are interested in the absolute and the relative changes in growth over time. Unfortunately, each measure alone does not reflect accurately the growth areas, since both are subject to limitations and certain biases.

Absolute measures tend to conceal the differential growth rate of markets through the size of numbers. Specifically, absolute measures tend to overstate the growth of larger markets and to understate the growth of smaller markets. Conversely, percentage measures tend to distort growth by overstating the growth of smaller markets and understating the growth of larger markets.

Further, whilst the absolute and the percentage measures help analysts determine growth markets, they do not tell them the relative growth increase in relation to other members of the group chosen. The Shift-Share technique is a relative measure which measures growth in relation to other members in the group.

SHIFT-SHARE ANALYSIS

The shift-share method measures the growth of individual markets or products relative to all members of a chosen group. This technique requires the explicit specification of three aspects: the time period for which growth comparisons are to be made, the countries included in the analysis, and the variable that is going to be used for measuring growth.

The calculations used in the shift-share method are aimed at determining the percentage net shift, which is the relative gain or loss in growth of a particular member relative to the group in the time period chosen. This is the distinguishing feature of this technique. The members identified with positive net shift are the ones with most potential.

Shift-share was first discussed by Perloff, Dunn, Lampard and Muth (1960). Shift-share was introduced as a descriptive device and a technique for systematically examining regional economic data, mainly employment. A description of the share-share methodology is given in Appendix A for interested readers.

Shift-share analysis has received limited application in marketing. Huff and Sherr (1967) presented the technique as a method of determining regional growth rates of markets. Yandel (1979) employed shift-share analysis to assess brand performance. Kevin, Mahajan and Peterson (1980) suggested that the technique could be employed as a diagnostic tool to appraise product performance. They were using shift-share analysis to determine three major elements of product portfolio analysis, namely product-market growth, firm growth, and individual product growth. Individual products were evaluated relative to others within the product portfolios for the purpose of determining which products were leaders and laggards in terms of their relative contribution to the overall company.

Green and Allaway (1985) first used the shift-share technique to identify export opportunities. They claimed that the process of export opportunity identification should be geared towards the development of a set of product/market pairs which are ranked or grouped by potential desirability. Green and Couture (1986) also used the technique to identify export opportunities in trade between Singapore and the United States. Wee and Wong (1987a) employed the shift-share analysis to identify export opportunities for Singaporean firms and subsequently used the method to identify export opportunities to China (Wee and Wong, 1987b). Green and Larsen (1991) used the shift-share technique to examine the changes that had occurred in Japan's international trade structure between 1985 and 1989. Ahmad, et al (1992) used the shift-share method to identify export opportunities for New Zealand.

Advantages of the Method

1. A key feature of this technique is its ability to measure the relative gains and losses of each market in comparison with the total market.
2. It is simple, economical and can be readily understood. The shift-share analysis involves only a few straight forward calculations. These can be easily done on any spreadsheet computer package. The data needed for the calculations are secondary data which are published and usually available to the researcher. Furthermore, the result of shift-share analysis can be easily understood.
3. It provides an alternative information source to compare with other findings.
4. Consideration of absolute shifts of an individual market or product in particular cases can provide useful information.
5. The method tends to highlight products or markets with:

   (i) slow growth rates

(ii) mature or saturated market conditions

(iii) existing supplier-buyer relationship, and

(iv) increased competition for an existing market.

Limitations of Method

The percent net shift figure has meaning only within the analysis group and the time frame used. The shift-share technique is sensitive to the groupings chosen. A second limitation is that, a one off-decision (one big purchase) can have a large (and possibly distorting) impact on results.

Thirdly, the shift-share technique identifies relative opportunities only and there are problems with such relativity. If the group is increased by adding one or more members, the net shift will change. At the extreme, it is possible, if we add one dominant member, to reduce, or even make negative, the net shift values of products that would otherwise be identified as attractive alternatives.

Fourthly, this technique uses historical data to predict the future. This is true for all forms of trend analysis. Nevertheless, extreme care should be taken when using historical data to predict the future because some dramatic changes might make historical data irrelevant to the situation.

Lastly, shift-share is insufficient on its own. It must be used in conjunction with other techniques if any interpretation of the results is to be meaningful. There are other important factors that should be taken into account in order to put the results in their proper context.

Since its introduction in 1960, shift-share analysis has been shrouded in controversy and debate (Stevens and Moore, 1980). Despite continued criticism, a weak theoretical foundation, and equivocal empirical support, its use in making forecasts continues to grow in popularity.

This persistence in popularity is due, mainly, to two factors. First, shift-share is a simple technique which relies on easily accessible published data. Second, shift-share has not yet been subjected to the kind of empirical tests which would raise serious doubts in the minds of practitioners about the accuracy of forecasts made with this technique.

This lack of doubt continues because the literature has not concentrated on the absolute predictive performance of shift-share, but has exclusively dealt with the relative performance of the alternative forecasting form of this approach. Since practitioners have not had any clear indication of serious weaknesses in the forecasts made with shift-share, they have continued to use this technique because of the practical advantages previously mentioned.

OBJECTIVES

The current study explored the application of this technique to identifying export opportunities for Malaysia. The results of the shift-share analysis were compared with the absolute and the percentage growth measures. The robustness of the technique was tested

by comparing the results for three time periods, and the technique was also used to measure the relative growth in Malaysian exports to selected countries. The specific objectives were:

1. To compare the results of shift-share analysis with those of absolute and percentage growth increase analysis.
2. To test the shift-share technique using the same product for three time periods to see how robust the technique is.
3. To identify the relative growth of Malaysian exports to selected countries.
4. To use the Shift-Share method for selected product categories to identify export opportunities in Japan, that is, to identify which of those product categories have potential in the Japanese market.

DATA

For this study, three time periods were used, 1986-89, 1986-90, and 1989-90. These were selected mainly because the most recent statistical data available were contained in them. Analyses of three time periods were required to determine the robustness of the technique.

The countries selected for study were Japan, United States, Thailand, Indonesia, Germany, Netherlands, New Zealand, United Kingdom, Hong Kong, Australia, Canada, Korea, France and Singapore.

Japan was selected for more detailed analysis for export opportunities because of its great importance to Malaysia as an export destination and also because of data availability.

The products chosen for the study were selected to represent different product categories that are important to Malaysia. The product classifications used is the Standard International Trade Classification (SITC). This is the classification used in Malaysia and commonly throughout the world.

For Malaysian exports, the following SITC product categories were chosen based on data availability and representativeness of export products. The included product categories such as SITC 776 (Transistors, Valves) and SITC 247 (Wood, rough or roughly squared). The full list can be found in column 1 of Table 1.

RESULTS AND DISCUSSIONS

Comparison of the Three Methods

The shift-share analysis, absolute growth, and percentage growth methods were applied to Japanese import data, 1986 and 1990. Potential market rankings for the selected products were determined using each method.

The results can be found in Table 1. An extract from those results highlighting the products with the highest potential for import into Japan, is presented in Table 2.

Table 1 presents the Standard Industrial Trade Classification (SITC) products and percentage net shift values of 18 selected product categories that were ranked in terms of

net shift from 1986-1990 for the Japan market. The other sets of figures in Table 1 represent the SITC categories that would have been identified as the different growth rates for the 18 selected products if one had used absolute or percentage changes in imports between 1986 & 1990.

There is an overlap of certain results between the three lists identified by the three different methods given in Table 1, but there are some products which appear as products with high potential on the shift-share list but do not appear in the other two lists.

Table 1: Growth of Imports Into Japan as Identified by Shift-Share Analysis, Absolute Growth, and Percentage Growth, 1986 & 1990

Shift share		Absolute Growth		Percentage Growth	
Product (SITC)	Net shift %	Product (SITC)	Growth RM'000	Product (SITC)	Growth %
Transistors, valves(SITC 776)	27.08	Petroleum products (SITC 334)	14246414	Transistors, (SITC 776)	306.43
Telecommuni-cation equip. (SITC 764)	25.95	Transistors, valves (SITC 776)	5814333	Telecommunication equip.(SITC 764)	249.38
Automatic data processing machine (SITC752)	19.77	Automatic data processing (SITC 752)	5026077	Art of apparel (SITC 848)	238.78
Art of apparel (SITC 848)	18.43	Wood, rough or roughly squared (SITC 247)	4743969	Radio broadcast receivers (SITC 762)	203.46
Iron, steel tubes, pipes, etc. (SITC 678)	5.05	Telecommunication equip. (SITC 764)	3825046	Transistors, valves (SITC 776)	185.2
Radio broadcast receivers (SITC 762)	2.88	Art of apparel (SITC 848)	2830851	Automatic data processing machine (SITC 752)	170.33
Woven man-made fibre fabrics (SITC 653)	0.84	Electrical apparatus, switch gear etc. (SITC 772)	1482356	Woven man-made fibre fabrics (SITC 653)	135.15
Materials of rubber (SITC 621)	(0.02)	Manufacturers of base metals (SITC 699)	916561	Electrical apparatus, switch gear etc. (SITC 772)	117.82
Electrical apparatus, etc (SITC 772)	(0.11)	Iron, steel tubes, pipes, etc. (SITC 678)	637341	Materials of rubber (SITC 621)	116.32
Processed animal or veg. oil (SITC 431)	(0.55)	Alcohol, phenols etc (SITC 512)	634129	Petroleum products (SITC 334)	111.71
Manufacturers of base metals (SITC 699)	(1.22)	Radio broadcast receivers (SITC 762)	533759	Manufacturers of base metals (SITC 699)	107.45

Ships and boats etc. (SITC 793)	(2.92)	Woven man-made fibre fabrics (SITC 653)	529153	Ships and boats etc. (SITC 793)	80.59
Pigments, paints, etc. (SITC 533)	(3.06)	Ships and boats etc. (SITC 793)	480652	Processed animal or veg. oil(SITC 431)	74.93
Cocoa (SITC 072)	(6.37)	Pigments, paints, etc. (SITC 533)	325738	Pigments, paints, etc. (SITC 533)	68.59

Shift share		Absolute Growth		Percentage Growth	
Product (SITC)	Net shift %	Product Growth (SITC)	Product RM'000	Growth (SITC)	%
Tin (SITC 687)	(6.92)	Materials of rubber (SITC 621)	95026	Wood, rough or roughly squared (SITC 247)	63.90
Petroleum (SITC 334)	(11.20)	Tin (SITC 687)	80986	Alcohol, phenols etc. (SITC 512)	41.48
Alcohol, phenol etc (SITC 512)	(15.22)	Processed animal or veg. oil (SITC 431)	72865	Tin (SITC 687)	15.57
Wood, rough or roughly squared (SITC 247)	(52.40)	Cocoa (SITC 072)	(14273)	Cocoa (SITC 072)	(3.54)

Note: Negative net shift or growth figures are shown within brackets

Table 2 shows the 7 product categories (e.g. Transistors, telecommunication equipment, etc.) that were identified with positive net shift in Table 1. These products however, were ranked differently in the "absolute" and "percentage growth" lists in Table 2. The products in the "absolute" list have relatively low growth rates in the other two lists. For instance, product category SITC 247 (wood in the rough or roughly squared) accounted for growth of approximately RM4.7 billion for the period of 1986 and 1990 in the Japanese market (Table 1) but it did not rank amongst the top 7 potential products in the shift-share list. Instead SITC 247 was ranked as the product category with the least potential in the shift-share list, with a net shift of -52.40%.

In Table 2 all three different methods identified the product categories of SITC 776 (transistors and valves) and SITC 764 (telecommunication equipment) to be amongst the first or second highest potential products. However, the absolute growth method identified the product category SITC 334 (petroleum products) as offering the highest potential in the Japanese market, but the other two methods did not identify petroleum products even in the top seven.

In fact, in the shift-share list, the petroleum products had been identified as having not much potential with a net shift of -11.20% (Table 1). The rapid development of downstream petroleum products in Malaysia in the last few years had resulted in a strong increase in petroleum products, an average of 14% growth between 1989 to 1993. (Economic Report 1994/95).

Table 2: Export Opportunities in Japan Identified by Shift-Share Analysis, Absolute Growth, and Percentage Growth, 1986 & 1990

Shift share		Absolute Growth		Percentage Growth	
Product (SITC)	Net shift %	Product (SITC)	Growth RM'000	Product (SITC)	Growth %
Transistors, valves (SITC 776)	27.08	Petroleum products (SITC 334)	14246414	Transistors, valves (SITC 776)	306.43
Telecommuni-cation equipment (SITC 764)	25.95	Transistors, valves (SITC 776)	5814333	Telecommunication equip. (SITC 764)	249.38
Automatic data processing machine (SITC 752)	19.77	Automatic data processing machine (SITC 752)	5026077	Art of apparel (SITC 848)	238.78
Art of apparel (SITC 848)	18.43	Wood, rough or roughly squared (SITC 247)	4743969	Radio broadcast receivers (SITC 762)	203.46
Iron, steel tubes, pipes, etc. (SITC 678)	5.05	Telecommunication equip. (SITC 764)	3825046	Transistors, valves (SITC 776)	185.27
Radio broadcast receivers (SITC 762)	2.88	Art of apparel (SITC 848)	2830851	Automatic data processing machine (SITC 752)	170.33
Woven man-made fibre fabrics (SITC 653)	0.84	Electrical apparatus, switch gear etc. (SITC 772)	1482356	Woven mad-made fibre fabrics (SITC 653)	135.15

However, whilst the Malaysian exports of petroleum products increased, the Japanese imports of petroleum products had decreased during the same period. This is reflected in the shift of negative 11.2% for petroleum products imports into Japan (Table 1) indicating that, despite the surge of Malaysian exports of petroleum products, which had resulted in a high absolute growth figure, this product's export potential to Japan, may not be promising. Similar analysis of other overseas markets will shed information on the potential in those markets for this product category.

The three methods were also used to measure growth for markets for a given product in this case telecommunication equipment and parts (SITC 764). The three methods generated different market opportunity rankings.

Though Singapore was the largest buyer of telecommunications equipment from Malaysia, in absolute terms, the shift-share analysis showed that growth of exports of telecommunications equipment to Singapore on a relative basis was low (Table 3). The shift share analysis placed Singapore last on that list, with a net shift of -28.96%, meaning that although Singapore, in absolute terms, was the biggest export destination, in relative terms, Singapore compared to other markets in the set, showed lower potential.

Table 3: Market Opportunities for Malaysian Product Category SITC 764, (Telecommunication Equipment) Identified by Shift-Share Analysis, Absolute Growth, and percentage Growth, 1986-1990

Shift share		Absolute Growth		Percentage Growth	
Country	Net shift %	Country	Growth RM'000	Country	Growth %
Japan	47.53	Singapore	1209927	Thailand	3198.07
United States	43.44	United States	928263	Japan	2967.44
Thailand	9.03	Japan	146401	United States	726.46
Indonesia	(0.11)	United Kingdom	104560	Germany	638.46
Germany	(0.35)	Germany	89197	United Kingdom	628.30
Netherlands	(0.75)	Canada	60368	Indonesia	612.95
New Zealand	(0.86)	Thailand	27271	Singapore	609.33
United Kingdom	(1.12)	Hong Kong	20507	Hong Kong	500.75
Hong Kong	(2.44)	Australia	7512	Canada	441.80
Australia	(4.36)	France	5517	Netherlands	351.16
Canada	(11.49)	Indonesia	5087	Australia	268.41
Korea	(22.92)	Netherlands	2172	France	50.97
France	(26.64)	New Zealand	(105)	Korea	(14.38)
Singapore	(28.96)	Korea	(1206)	New Zealand	(34.66)

Note: Negative figures are shown within brackets.

Effect of Differing Time Periods

Three time periods were used to determine the effect of the duration between time periods on shift-share ranking for the United States market. The duration between time periods had different lengths, ranging from four years to one year (refer to Table 4).

It can observed from the table, that the 2 sets of time periods of (1) 1986-1989 and (2) 1986-1990 had almost the same rankings while the period (3) 1989-1990 had a different ranking. For example, both time periods sets of (1) and (2) show "automatic data processing machine"(SITC 752) with the highest shift-share value in those periods, whereas the time period (3) of 1989-1990 identifies "petroleum products" (SITC 334) as having the highest potential amongst the products evaluated here.

Petroleum products (SITC 334) was identified as having a very high potential in the United States market with a positive net shift or 63.58% for the time period (3) of 1989-1990. Nevertheless, for period (2), the net shift was negative at -19.01% and for more period (1), it was even more negative with -39.5%. It can be noticed from the results, that a short duration and a long duration can produce different results when using the shift-share analysis.

Table 4: Comparisons of 3 Time Periods Using Shift-Share for the United States Market

1986-1989 (1)	Net shift %	1986-1990 (2)	Net shift %	1989-1990 (3)	Net shift %
Automatic data processing machine (SITC 752)	56.41	Automatic data processing machine (SITC 752)	61.05	Petroleum products (SITC 334)	63.58
Transistors, valves (SITC 776)	32.06	Transistors, valves (SITC 776)	22.33	Electrical apparatus, switch gear (SITC 772)	21.97
Electrical apparatus, switch gear (SITC 772)	7.43	Electrical apparatus, switch gear (SITC 772)	14.66	Automatic data processing machine (SITC 752)	13.12
Art of apparel (SITC 848)	2.24	Material of rubber (SITC 621)	1.63	Cocoa (SITC 072)	0.58
Material of rubber (SITC 621)	1.56	Processed animal or veg. oil (SITC 431)	0.14	Pigments, paints, etc. (SITC 533)	0.34
Wood, rough or roughly squared (SITC 247)	2.22	Art of apparel (SITC 848)	0.11	Processed animal or veg. oil (SITC 431)	0.25
Processed animal or veg. oil (SITC 431)	0.06	Wood, rough or roughly squared (SITC 247)	0.07	Material of rubber (SITC 621)	
Tin (SITC 687)	(0.35)	Pigments, paints, etc (SITC 533)	(0.36)	Wood, rough or roughly squared (SITC 247)	0.46
Pigments, paints etc. (SITC 533)	(0.47)	Tin (SITC 687)		Woven man-made fibre fabrics (SITC 653)	1.60
Alcohol, phenol, etc. (SITC 512)	(1.97)	Alcohol, phenol, etc (SITC 512)	(3.28)	Tin (SITC 687)	(2.97)
Ships and boats etc. (SITC 793)	(2.44)	Ships and boats etc (SITC 793)	(5.29)	Manufacturers of base metals (SITC 699)	(3.21)
Iron, steel tubes, pipes, etc (SITC 678)	(5.03)	Cocoa (SITC 072)	(5.60)	Alcohol, phenols, etc. (SITC 512)	(3.95)
Woven man-made fibre fabrics (SITC 653)	(5.37)	Woven man-made fibre fabrics (SITC 653)	(5.93)	Iron, steel tubes, pipes, etc (SITC 678)	(4.36)
Cocoa (SITC 071)	(5.75)	Iron, steel tubes, pipes, etc. (SITC 678)	(6.49)	Art of apparel (SITC 848)	(6.57)
Manufacturers of base metals (SITC 699)	(9.05)	Manufacturers of base metals (SITC 699)	(10.16)	Ships and boats etc(SITC 793)	(8.66)
Radio broadcast receivers (SITC 762)	(11.51)	Radio broadcast receivers (SITC 762) (SITC762)	(17.24)	Radio broadcast receivers	(17.33)
Telecommunication equip (SITC 764)	(18.52)	Petroleum products (SITC 334)	(19.01)	Telecommunication equip. (SITC 764)	(20.50)
Petroleum products (SITC 334)	(39.54)	Telecommunication equip.(SITC 764)	(25.33)	Transistors, valves (SITC 776)	(30.38)

Note: Negative figures are shown within brackets.

Relative Growth of Malaysian Exports to Selected Countries.

Malaysia's major trading partners, Japan, Singapore, United States, United Kingdom, Germany, and Hong Kong were selected to identify the relative growths of Malaysian exports. This was done to identify countries which had increased their relative shares of specific Malaysian exports and also those countries whose relative shares of specific Malaysian exports declined.

Table 5 summarises the results for the relative growth of exports of "Automatic Data Processing Machine" (SITC 752) and for "Materials of Rubber" (SITC 621) obtained using shift-share.

Table 5: Relative Growths of Malaysian Exports of SITC 752 and SITC 621 Product Categories to selected Countries as Identified by Shift-Share Analysis for 1986 & 1990

Countries	SITC 75 (Automatic Data Processing Machine) % Net shift	SITC 621 (Materials of Rubber) % Net shift
Japan	4.19	(30.42)
Singapore	(16.11)	(0.81)
Hong Kong	(41.98)	8.99
United Kingdom	(18.35)	18.98
Germany	5.44	12.97
United States	72.55	28.50

Note: Negative net shifts are shown within brackets

Japan, Germany and the US took more of Malaysia's Data Processing Machines (SITC 752) relative to other members in this group. The identification of these markets can be useful to exporters as well as to policy makers. They should evaluate such markets further to identify opportunities they offer. Similar analyses can be made for other products as well.

The analysis for Materials of Rubber (SITC 621) is also shown in Table 5. In this case, Hong Kong, UK, Germany and the US imported more of Malaysia's materials made from rubber, relative to the others, i.e. Japan, Singapore. The latter indicated negative relative growths. This means that their relative share of Malaysian exports of Materials of Rubber (SITC 621), over the period concerned, were declining. Similarly, for SITC 752 (Date Processing Machines) relative shares of these machine exports to Singapore, Hong Kong and UK declined as well. Information on declining relative shares with respect to markets, can also be useful in export planning.

PRACTICAL IMPLICATIONS

The purpose of comparison of the three methods was to highlight the differences between them in the way they measure growth. The significance of these differences suggested that no one method should be used on its own because of its inherent limitations. This is

highlighted in Table 3 where Singapore was found to be at different extremes for two of the methods. These characteristics should be taken into account when making interpretations.

The Effect of Different Duration

The differences in the rankings for the three sets of time periods calculated by the shift-share method suggested that this relative measure could be affected by the time periods and the duration between the time periods chosen.

The more or less equal rankings of the longer duration's compared to the different ranking for the shorter duration suggested that smoothing occurred over the longer duration. This is in contrast with the shorter duration which showed fluctuations. Researchers need to be aware of these duration effects.

Relative Growth of Malaysian Exports

The shift-share method identified the relative increase in selected Malaysian export. This should be of interest to exporters and government organisations interested in trade. The relative growths should provide the people concerned with a picture of the movement of exports to trade partners. This could act as a guide for markets which should be evaluated further.

Questions could be asked as to why export growth was declining to certain countries and increasing to others. This could highlight problems that the government needs to tackle, such as high tariffs, quotas, political problems, and so on. Further analyses are needed to identify problem areas to be worked on by the Malaysian exporters and the government.

Export Opportunities in Japan Identified by Shift-Share

Amongst the products analysed, transistors & valves (SITC 776) and telecommunication equipment (SITC 764) were identified by shift-share as offering the best export potentials to Japan. Current imports by Japan of these two product categories are very high relative to the other products. Automatic data processing machines (SITC 752) and Apparel (SITC 848) offered reasonably attractive potentials as well.

CONCLUDING REMARKS

This study confirmed what other studies have found about the application of the shift-share technique to identifying export opportunities. This study also identified information related particularly to the robustness of the technique which indicated that the results obtained are susceptible to both the time period used and the products and countries included in the analysis.

Time Frame to Use

The time frame chosen for the analysis is critical since the calculation involves only two points in time. The researcher should concentrate on choosing an appropriate set of base years. The following factors should be taken into account.

First, the duration between the time periods should be long enough to show a reasonable life cycle. At the same time it should not be too long because it might conceal meaningful trends within the life cycle. It would be useful to have a long duration between time periods, like 15 to 20 years, to examine a number of shifts within this duration.

Secondly, the value of the analysis would be enhanced if the time periods chosen accounted for the effect of other economic forces. This is to take into account the forces that might influence the result of the analysis.

In shift-share analysis, only import statistics are used. However, if the total consumption or the total market for a particular product is being examined, it is necessary to check if there is any domestic production of that product. In shift-share, local production is not taken into account. The researcher should be aware of this when interpreting the results.

Further research could be directed at extending the shift-share method to overcome the limitations of the three methods considered in this study based on current technology. This might include improving shift-share to incorporate moving averages, characteristics of time series and so on. Also, the effects of product/market selections on shift-share analysis need to be further investigated.

The shift-share technique is a useful relative measure which could be used for identifying export opportunities. However, it should not be used on its own. Other methods should be used together with shift-share for comparison purposes.

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APPENDIX A

THE SHIFT-SHARE TECHNIQUE

Use of the shift-share method requires the explicit specification of:

1. two times periods for which growth comparisons are to be made, each time period being twelve months duration;
2. the geographic unit of analysis;
3. the variable that is to be used for measuring growth.

Steps involved in shift-share analysis:

1. Record the value for each market (i) for the initial period (t-1).
2. Record the value for each market (i) for the terminal period (t).
3. Add the total for each period.
4. Calculate the actual change for each market. This is the absolute growth value. This is the difference in values from one period to another.

   $$\Delta V_i = \Delta V_{i,t} - \Delta V_{i,\,t-1}$$

   If ΔV_i

   < 0 the *i*th market experience a decline,

   $= 0$ the *i*th market's growth remained unchanged,

   > 0 the *i*th market experience an increase.

5. Calculate the total growth rate for all markets (k). This is equal to the ratio of the total value in the terminal period to the corresponding value in the initial time period.

$$k = \frac{\sum_{i=1}^{m} V_{i,t}}{\sum_{i=1}^{m} V_{i,t-1}}$$

where k is the growth rate for all markets

$V_{i,t}$ is the value for each market i for time period t

$V_{i,t-1}$ is the value for each market i for time period $t-1$

6. Calculate the Expected value. To get this, multiply the value at the initial time

$$E(V_{i,t}) - kV_{i,t-2}$$

Where $E(v_{i,t})$ is the expected value for a market i if it had grown at the rate of all markets.

7. Calculate the expected change in the value of a growth variable for a particular market in a given time period.

$$E(\Delta V_{i,t}) - E(V_{i,t}) - V_{i,t-1}$$
$$- V_{i,t-1}(k - 1)$$

Where $E(\Delta V_i)$ represents the expected change.

8. Calculate the net shift, N_i. The sum of all the net shift values should be zero.

$$N_i = \Delta V_i - E(\Delta V1_i)$$

Where N_i is the net shift which is equal to the difference between the actual value change for market i and the expected change for that market.

9. Calculate the total absolute net shift, S. The sum of the positive net shift or the sum of the negative net shifts represents the total absolute net shift.

$$S = \frac{\sum_{i=1}^{m} | \Delta V_i - E(\Delta V_i) |}{2}$$

10. Calculate the percentage net shift, P_i, for market *i*. This is the relative gain or loss in the value of the growth variable for a particular market in a given time period defined as a percentage. The sum of the positive net shifts is one, the sum of the negative net shifts is minus one.

$$P_i = \frac{N_i}{S} \times 100\%$$