CHAPTER 2: LITERATURE REVIEW AND METHODOLOGY

2.1 Literature Review

Despite their rudimentary characters, constant-market-share and shift-share analyses have had quite a remarkable success among specialists of regional economics. This was probably due to the fact that the analytical possibilities that they offer are quite large and the statistical information required is very elementary. The popularity of these techniques is also due to the lack of detailed statistical information at the regional level for the application of other more complex methodologies. These two analyses have been used in various studies to examine a country’s export performance. There are several other methods of evaluating the export performance of individual industries in a particular country. Among the other commonly applied tools to measure export performance have been revealed comparative advantage indices and price competitiveness indices.

2.1.1 Constant-Market-Share Analysis

Constant-market-share (hereafter CMS) analysis is a popular method of measuring a country’s export performance relative to its competitors. It takes a base-year set of export shares and evaluates the country’s export growth over some subsequent interval in terms of these shares and a residual ‘competitiveness’ effect. CMS analysis is a very simplified method for examining a country’s export growth by ascribing favourable or unfavourable export growth either to a country’s export structure or to its ‘competitiveness’. This is in contrast to a more complex analysis of export growth that examines factors such as technology,
market structure, demand patterns, factor availability and government policies.

The CMS model, in its simplest form, suggests that the export shares of a given
country are a function of that country’s relative ‘competitiveness’:¹

\[
s = \frac{q}{Q} = f\left(\frac{c}{C}\right), \quad f'(\cdot) > 0, \tag{1}
\]

where
\[s\] = the export share of the focus country;
\[q, Q\] = total exports of the focus country and the world, respectively;
\[c, C\] = ‘competitiveness’ of the focus country and the world, respectively.

Rearranging and differentiating with respect to time, equation (1) implies

\[
\dot{q} = s\dot{Q} + Q\dot{s}
\]
\[= s\dot{Q} + Qf'\left(\frac{\dot{c}}{C}\right). \tag{2}
\]

where a dotted variable represent that variable’s time derivative.

In this simplest CMS model, a country’s total export growth (\(\dot{q}\)) is explained by a
world growth effect (\(s\dot{Q}\)), and a competitive effect (\(Q\dot{s}\)). The first term
\(s\dot{Q}\) represents what the country’s growth in export would have been if it had
maintained its export share, and the second term \(Q\dot{s}\) represents any additional
export growth (either positive or negative) due to changes in relative
competitiveness.

¹ The exposition of the CMS framework is obtained from Richardson (1971)
Equation (1) still holds for a given commodity exported to a given market, i.e.,

\[ s_y = \frac{q_y}{Q_y} = f_y \left( \frac{c_y}{C_y} \right), \quad f_y(\cdot) > 0, \tag{3} \]

where \( i \) refers to a particular commodity and \( j \) to a particular importing region.

The observation that the structure of a country’s exports affects its total export growth, even in the absence of changes in relative competitiveness, leads to a more complex CMS model. A country, for example, may specialise in especially high-growth commodities, or it may export to especially high-growth geographical markets. The export share of the focus country \( (s) \) would therefore be a function of export structure as well as of relative competitiveness. Total export growth of the focus country would then be given the following equation:

\[ \dot{q} = \sum_i \sum_j s_{iy} \dot{Q}_{iy} + \sum_i \sum_j Q_{iy} s_{iy}. \tag{4} \]

Expansion of equation (4) yields an additional two terms, which measure the presence of a favourable commodity or market structure:

\[ \dot{q} = s \dot{Q} + \left[ \sum_i s_{iy} \dot{Q}_i - s \dot{Q} \right] + \left[ \sum_i \sum_j s_{iy} \dot{Q}_{iy} - \sum_i s_i \dot{Q}_i \right] + \sum_i \sum_j Q_{iy} s_{iy} \tag{5} \]

where the subscript \( i \) alone stands for a commodity total over all markets.

The first bracketed term is usually called the commodity effect, and will be positive if the focus country’s export structure is more concentrated on high-growth export commodities than is the world’s export structure. The second
bracketed term is called the market effect, and will be positive if the focus
country’s export structure is more concentrated on high-growth geographical
markets than is the world’s export structure. The last term is known as the
competitive effect and it is actually a residual effect. A positive residual term is
taken as a sign of competitive strength while a negative term is taken as a sign of
competitive weakness. Equation (5) can arbitrarily be rewritten so as to calculate
the market effect before the commodity effect, i.e., as

\[ \hat{q} = s\hat{q} + \left[ \sum_j s_j \hat{q}_j - s\hat{q} \right] + \left[ \sum_j \sum_j s_{ij} \hat{q}_{ij} - \sum_j s_j \hat{q}_j \right] + \sum_j \sum_j Q_{ij} \bar{s}_{ij}. \]  \hspace{1cm} (6)

where the subscript \( j \) alone stands for a market total over all commodities.

The first bracketed term in equation (6) is the market effect while the second
bracketed term is the commodity effect. These arbitrary choices would be minor
obstacles if CMS results were relatively stable over the various aggregation and
methodological changes.

The CMS approach was used by Kreinin (1967) to examine the composition of
changes in the export share of ten industrial countries from 1955 to 1957, for
three groups of manufactures i.e. chemicals, machinery and transport equipment
and other manufactures. Tyers and Phillips (1984) used the CMS method to
analyse the export performance throughout the 1970s of five ASEAN countries
(i.e. Indonesia, Malaysia, the Philippines, Singapore and Thailand) to Australia
for five commodity groups. The five commodity groups studied were agricultural
resource intensive, mineral resource intensive, labour intensive, technology intensive and human capital intensive. Ariff and Tan (1992) applied the CMS approach to examine the competitiveness of ASEAN manufactured exports to the Asia-Pacific region from 1970 to 1989. The manufactured exports were from five ASEAN countries namely Indonesia, Malaysia, the Philippines, Singapore and Thailand while the export market were Australia, Japan, United States and North-East Asian Newly Industrialising Economies (NIEs) of Korea, Taiwan and Hong Kong.

One of the main weaknesses of the CMS technique is that it is merely an identity with no behavioral implications. The various components simply add up to total growth and there is no theoretical basis for identifying these components. Numerous criticisms have been made about the CMS analysis (Richardson, 1971). Among the criticisms made of the CMS analysis is regarding the appropriate measurement of export shares. If export value shares are used, an increase in relative competitiveness (fall in relative prices) could lead to a decrease in export shares, given an elasticity of substitution of less than one in absolute value. Since the competitive effect depends directly on the change in export shares, either a positive or negative competitive effect is consistent with falling relative prices (rising competitiveness). Therefore, quantity shares are required in order to satisfy the requirement that shares vary directly with relative competitiveness. Typical CMS studies have incorrectly used export value shares, largely because of the absence of reliable quantity data.
Another criticism of the CMS analysis is that the export shares on which the decomposition is based tend to change during the interval of analysis and that the choice of which set of shares to use is arbitrary. This "index number problem" arises because CMS analysis must be performed over a discrete time period, whereas the equation (5) and (6) refer to an infinitesimally short time period. This problem can be shown by reference to the simplest CMS identity given by equation (2). Over a discrete time period, it might be rewritten in several ways, for example as

$$\Delta q = s^0 \Delta Q + Q^l \Delta s$$

or as

$$\Delta q = s^l \Delta Q + Q^0 \Delta s$$

where $0$ and $1$ indicate the beginning and end of the discrete time period.

A final criticism of the method is that inappropriate standards are chosen against which to evaluate export performance. Most CMS studies have used either total world exports or some subset for which data were available, and have applied the same world standard to every focus country in the study. However, if we are examining competitiveness, the appropriate standard will be the sum of all competitors of the country in question and certainly not the world in most cases. Therefore, a correct approach to the specification of a standard would imply a different "world" for each focus country. To be even more precise, a different standard might be calculated for each commodity and/or market, since the identity of competitors varies across exports even for a given exporter.
2.1.2 Shift-Share Analysis

Shift-share analysis, which is similar to CMS analysis, is well established in regional economic analysis where it has been used for many years to examine such regional issues as industrial structure, employment changes and labour productivity in manufacturing. Lasuen (1971) applied the shift-share technique to study employment changes in various industry categories and regions in Venezuela from 1941 to 1961. Edwards (1976) used the shift-share analysis to study the industrial structure and regional change in the British Columbia economy from 1961 to 1970. There have also been attempts to apply the technique to other economic problems such as to screen export opportunities (Green and Allaway 1985). Its persistent popularity is due mainly to the fact that it is a simple technique, which relies on easily accessible published data, making it fast and reasonably accurate, given its cost. This technique of analysis intends to express the factors that cause the differences of growth among the regions. The regional growth of each sector for a given period of time can be divided into three components: national growth, industry-mix and competitive effect. This technique can be used to analyse growth in any regional variable such as income, employment, output or exports. Suppose \( d_j \) is the growth of, say, employment in sector \( i \) of region \( j \), then

\[
d_j = g_j + k_j + c_j
\]  

(7)

where

\[
g_j = \text{national growth effect in sector } i \text{ of region } j;
\]

\[
k_j = \text{industry-mix effect in sector } i \text{ of region } j;
\]
\[ c_{ij} = \text{competitive effect in sector } i \text{ of region } j. \]

But,

\[
g_{ij} = b_{ij} r_{oo} \tag{8}
\]

\[
k_{ij} = b_{ij} r_{io} - b_{ij} r_{oo} = b_{ij}(r_{io} - r_{oo}) \tag{9}
\]

\[
c_{ij} = b_{ij} r_{ij} - b_{ij} r_{io} = b_{ij}(r_{ij} - r_{io}) \tag{10}
\]

where,

\[ b_{ij} = \text{employment in sector } i \text{ of region } j; \]

\[ r_{oo} = \text{national average rate of growth}; \]

\[ r_{io} = \text{national average rate of growth of sector } i; \]

\[ r_{ij} = \text{growth rate of sector } i \text{ of region } j. \]

Therefore,

\[
d_{ij} = b_{ij} r_{oo} + b_{ij}(r_{io} - r_{oo}) + b_{ij}(r_{ij} - r_{io}) \tag{11}
\]

Equation (7) shows that each sector \( i \) of each region \( j \) has a standard growth, given by \( g_{ij} \), to which has to be added the contributions to its growth (positive or negative) caused by specifically regional factors, \( k_{ij} \) and \( c_{ij} \). The net-shift of the sector, which is the difference between \( d_{ij} \) and \( g_{ij} \) or the same as \( k_{ij} \) plus \( c_{ij} \), represents the effects of the specifically regional factors on the standard growth of the sector. The industry-mix effect, \( k_{ij} \), shows the positive or negative effects of the specialisation of the regional employment in sectors where the rate of growth at the national level is faster or slower. The competitive effect, \( c_{ij} \), represents the contribution to growth due to the special dynamism of the sector in that region compared with the average growth that such a sector has at the national level.
However, there are some objections to the exposed formulation of the shift-share analysis, particularly to the values that \( c_y \) (as in equation 10) can take are not only due to the special dynamism of the sector \( (r_y - r_{so}) \), but also to the specialisation of the regional employment in this activity, \( b_y \). To solve this problem, Esteban-Marquillas (1972) reformulated the above equations based on the definition of a new element \( b'_y \), which was called the homothetic employment in sector \( i \) of region \( j \). The homothetic employment, which is defined as the employment that sector \( i \) of region \( j \) would have if the structure of the employment in such a region were equal to the national structure, is expressed as follows:

\[
b'_y = b_y \frac{b_{io}}{b_{oo}} = b_{oo} \frac{b_{oi}}{b_{oo}}
\]  

(12)

where,

\[
b_{io} = \text{national employment in sector } i;
\]

\[
b_{oo} = \text{total national employment};
\]

\[
b_{oj} = \text{total employment in region } j;
\]

Therefore, by using the homothetic employment instead of the effective employment to express the competitive effect, the industry-mix effect is left without any influence on the competitive effect. The competitive effect could be expressed as follows:

\[
c_y = b'_y (r_y - r_{so}).
\]  

(13)

Expressing the competitive effect in such a way would leave something of the regional growth unexplained. Therefore, an additional component, known as the
allocation effect, \( a_{ij} \), was introduced to solve this problem. So, the employment growth of sector \( i \) of region \( j \) would be formulated in the following way:

\[
d_{ij} = g_{ij} + k_{ij} + c_{ij} + a_{ij},
\]

(14)

where,

\[
g_{ij} = b_{ij}r_{ioo}
\]

\[
k_{ij} = b_{ij}(r_{io} - r_{oo})
\]

\[
c_{ij} = b'_{ij}(r_{ij} - r_{io})
\]

\[
a_{ij} = (h_{ij} - b'_{ij})(r_{ij} - r_{io})
\]

Therefore,

\[
d_{ij} = b_{ij}r_{oo} + b_{ij}(r_{io} - r_{oo}) + b'_{ij}(r_{ij} - r_{io}) + (h_{ij} - b'_{ij})(r_{ij} - r_{io}).
\]

(15)

The allocation effect will show if the region is specialised in those sectors in which it enjoys better competitive advantages. The allocation effect will be positive if the region is specialised, \( (b_{ij} - b'_{ij} > 0) \), in those sectors of faster regional growth, \( (r_{ij} - r_{io} > 0) \), or if it is not specialised, \( (b_{ij} - b'_{ij} < 0) \), in the sectors in which it is lacking in competitive advantages, \( (r_{ij} - r_{io} < 0) \). On the other hand, the allocation effect will be negative if the region is specialised in sectors for which at the moment the region is lacking in advantages, or if it is not specialised in the sectors in which it has those competitive advantages.

Herschede (1991) employed the Esteban-Marquillas shift-share model to examine the export competition for ten single-digit SITC product categories among ASEAN, China and East Asian Newly Industrialising Countries (NICs) in the
Japanese market. Voon (1998) also applied the same methodology to examine the
degree of export rivalry for four product categories among China and ASEAN in
the United States market. These four product categories were agricultural
products, primary products, less labour-intensive manufactures and more labour-
intensive manufactures.

One of the main weaknesses of this technique is that it does not explain why the
various effects come about, that is what endogenous factors were the underlying
causes of the dissimilarities. As with the CMS technique, the shift-share
technique is merely an identity with no behavioral implications. In fact, one of
the main criticisms of this technique is that the economic meanings of the shift
components are not well developed (Houston, 1967). The economic behavior
underlying the competitive and industry-mix effects is not readily distinguishable.
Thus, supply changes, demand shifts, technological changes, locational shifts, any
or all of these, may be behind either components.

Another criticism often leveled at shift-share analysis is that the technique takes
no account of changes in regional industrial structure over the analysis period.
Therefore, when shift-share component totals are determined for a particular
region, the weights used represent the industrial structure of the region in the base
period; and no account is made of structural change between the base and
terminal year of the analysis. Due to this 'index number problem', the longer the
period of analysis, the larger the bias resulting from changes in the weights.
Other criticisms of this technique include the lack of agreement among users with regard to terminology.

2.1.3 Revealed Comparative Advantage

The export performance of individual industries in a particular country can be evaluated by comparing the relative shares of a country in the world exports of individual commodities (Balassa, 1965). Developed by Balassa (1965), the Revealed Comparative Advantage Index (RCAI), also known as export specialisation ratio, refers to the share of a commodity in total merchandise exports of a country divided by the commodity’s share in world merchandise exports. For instance, the RCAI for country $i$ in product $j$ is the ratio of the share of $j$ in country $i$'s total exports to the share of $j$ in the world’s total exports.

Therefore, $\text{RCAI}_i^j$ can be written as:

$$\text{RCAI}_i^j = \left( \frac{X_i^j}{X_i^w} / \frac{X_i^w}{X_i^w} \right)$$

where

- $X_i^j =$ value of exports of commodity $j$ by country $i$
- $X_i^w =$ value of total exports by country $i$
- $X_i^w =$ value of world exports of commodity $j$
- $X_i^w =$ value of total world exports

Equation (16) can be rearranged to give the following expression:

$$\text{RCAI}_i^j = \left( \frac{X_i^j}{X_i^w} / \frac{X_i^i}{X_i^w} \right)$$

(17)
Equation (17) is the ratio of the country $i$'s export share in the world's exports of $j$ to the export share held by $i$ in the world's total export. Therefore, if country $i$'s share of world's exports of $j$ is greater than country $i$'s share of world's exports (of all goods or all goods of a certain type), then $\text{RCAI}_j$ is greater than one and a comparative advantage is revealed. In other words, a country has a revealed comparative advantage or has a greater specialisation only in those products for which its market share of world exports is above its average share of world exports.

Ariff and Tan (1992) used the RCAI to study the shift in comparative advantage of various commodities in five ASEAN countries (i.e. Indonesia, Malaysia, the Philippines, Singapore and Thailand) from 1970 to 1989. Amir (1999) used the RCAI to analyse the change in pattern of Malaysian export specialisation and to study the extent of manufacturing export competition between Malaysia and other ASEAN economies.

Comparative advantage, in theory, is essentially related to pre-trade relative prices and is affected by changes such as in resource and factor endowments, technology and demand. Revealed comparative advantage, on the other hand, is based on post-trade data and its figures are affected by relative price and non-price factors. Therefore, RCAI may not reflect the inherent comparative advantage of a country. Nevertheless, the RCAI can show the general direction in which the comparative advantage pattern is moving.
RCAI may be distorted by the omission of imports, and this omission may be particularly important where there is a country-size effect (Greenaway and Milner, 1993). The denominator of RCAI in equation (17) is likely to be negligible for many small developing countries. Its exports, in contrast, may be concentrated on a few traditional exports where its share of world trade is significant. Thus, RCAI may reveal very high levels of comparative advantage for a few traditional export commodities, and low levels of comparative disadvantage for most other non-traditional goods. This calls for a careful selection of the range of goods to aggregate when formulating the denominator in equation (17).

2.1.4 Price Competitiveness

While it is clear that non-price factors play an important role in the determination of a country’s exports, there is an apparent relationship between movements in relative prices and export performance. Price competitiveness plays a prominent role in the export performance of a country as in most cases export market shares are found to be significantly affected by relative price changes.

To measure changes in the degree of price competitiveness, a country’s prices must be brought into relation to the prices of other exporting countries. The index of price competitiveness of an exporter in a particular market is defined as the ratio of that exporter’s price index to the average of the price indices of all other exporting countries, weighted by their export shares in that market. An
improvement in competitiveness is indicated by a decrease in a country’s index while deterioration in competitiveness is indicated by an increase in the index.

Junz and Rhomberg (1965) used the price competitiveness index to study the competitive price effects upon the manufactured exports of eleven major industrial countries to selected market areas over the period 1953 to 1963. The eleven countries studied were Austria, Belgium, Canada, France, Germany, Italy, Japan, Netherlands, Sweden, United Kingdom and United States.

2.2 Methodology

The degree of rivalry among the four ASEAN countries for the export of frozen shrimp is examined by using four different methods, i.e. CMS analysis, shift-share analysis, revealed comparative advantage indices and price competitiveness indices. The first two analyses assess the effects of different industry structures and growth rates on the export performance of each of the 4 competing countries in the Japanese market. Explaining the various effects requires the application of many other analyses such as location theory and input-output analysis, and an enormous amount of efforts. This undertaking could be so enormous that, for all intents, it would be non-operational. Therefore, it is outside the scope of this study to determine the endogenous factors underlying the various effects. Nevertheless, CMS and shift-share analyses are unrivaled in their abilities to provide quick, inexpensive and useful indications of past regional performance.
and to identify problems which may deserve the attention of public policy-makers or may require further study.

Further tests of comparative cost, comparative profit, or other forms of comparative advantage should be conducted to provide a firmer conceptual basis for the CMS and shift-share analyses. Therefore, in this study, indices of revealed comparative advantage and price competitiveness will be used to complement the first two methods.

2.2.1 Constant-Market-Share Analysis

In this study, the export performance of frozen shrimp from the four ASEAN countries to Japan for the period 1989 to 1998 is analysed based on the CMS identity as shown in equation (6) in section 2.1.1. Export quantity data is used for the analysis, as quantity shares are more appropriate measurement of export shares. To minimise the 'index number problem', the period 1989 to 1998 is divided into three intervals, i.e. 1989 to 1992, 1992 to 1995 and 1995 to 1998. For each of these intervals, a new CMS analysis is conducted. In this study, the standards for evaluation are to assess each focus country's exports to Japan against the rest of the world's exports to Japan and also against the exports to Japan of all the other three ASEAN countries. Since Japan is the only country of destination included, no market distribution effect is calculated. The market distribution effect is relevant only where the focus destination refers to a region or a group of countries and therefore does not apply to single country markets. In
this study, the competitive effect is really a residual effect, for the residual term captures the net gain or loss in the market shares, presumably due to the changes in variables that influence the competitiveness of the export products. Therefore, in this study the CMS analysis will be based on the following identity:

\[
\dot{q} = s\dot{Q} + \left[ \sum_i s_i \dot{Q}_y - \sum_j s_j \dot{Q}_j \right] + \left[ \sum_j s_j \dot{Q}_y - s \dot{Q} + \sum_j Q_j \delta_y \right]
\]  

(18)

where,

\( \dot{q} = \) total export growth of the competing country for the interval.

\( S = \) the export share of the competing country to standard exports in the first year of the interval.

\( \dot{Q} = \) total standard export growth for the interval.

\( s_j = \) the export share to destination \( j \) of the competing country to standard exports in the first year of the interval.

\( \dot{Q}_j = \) total standard export growth to destination \( j \) for the interval.

\( S_{ij} = \) the export share of commodity \( i \) to destination \( j \) of the competing country to standard exports in the first year of the interval.

\( \delta_y = \) the growth of the export share of commodity \( i \) to destination \( j \) of the competing country to standard exports for the interval.

\( Q_{ij} = \) total standard exports of commodity \( i \) to destination \( j \) in the last year of the interval.

\( \dot{Q}_{ij} = \) total standard export growth of commodity \( i \) to destination \( j \) for the interval.
The first bracketed term in equation (18) is the commodity effect while the second bracketed term is the competitive effect.

2.2.2 Shift-Share Analysis

In this study, the Esteban-Marquillas shift-share model is used to examine the degree of competition among the four ASEAN countries for the export of frozen shrimp to the Japanese market. Export quantity data is used for the analysis. The period of study from 1989 to 1998 is divided into three intervals, i.e. 1989 to 1992, 1992 to 1995 and 1995 to 1998 to minimise the ‘index number problem’. For each of these intervals, a new shift-share analysis is conducted. In this study, the shift-share analysis is used to compare, for instance, how competitive each country was in increasing its exports to Japan compared to the effectiveness of the reference economy as a whole (that is the combined exports of Indonesia, Thailand, the Philippines and Malaysia). The effectiveness of the reference economy’s exports is designated as the share effect, \((SE)\). Differences between a competing country’s actual change in exports \((AC)\) and the reference economy’s exports \((SE)\) are attributed to differences in industry structure (production composition or industry-mix), growth rates (the competitive effect) and interaction (interdependence) between the two variables. Thus, in this study, the modified version of the Esteban-Marquillas shift-share model is set out as follows:

\[
AC = SE + ISE + CE + IE
\]  

(19)

and,
Share Effect (SE) = $E_{oc}P_{ir}G_{ir}$

Industry Structure Effect (ISE) = $E_{oc}(P_{ic}-P_{ir})G_{ir}$

Competitive Effect (CE) = $E_{oc}P_{ir}(G_{ic}-G_{ir})$

Interactive Effect (IE) = $E_{oc}(P_{ic}-P_{ir})(G_{ic}-G_{ir})$

where,

$E_{oc}$ = Total exports to Japan from the competing country in the first year of the interval.

$P_{ic}$ = Proportion of total exports to Japan from the competing country accounted for by exports in industry $i$ of the competing country in the first year of the interval.

$G_{ic}$ = Growth rate of exports to Japan from industry $i$ in the competing country for the interval.

$P_{ir}$ = Proportion of total exports to Japan from the reference economy accounted for by exports in industry $i$ of the reference economy in the first year of the interval.

$G_{ir}$ = Growth rate of exports to Japan from industry $i$ of the reference economy for the interval.

The actual change in exports of a competing country (AC) less the share effect (SE) equals (ISE + CE + IE).
2.2.3 Revealed Comparative Advantage

To be consistent with the previous two analyses, the period of study for evaluating revealed comparative advantages in the production of frozen shrimp by the four competing countries will be divided into three intervals, i.e. 1989 to 1992, 1992 to 1995 and 1995 to 1998. For each interval, the RCAI for each competing countries will be calculated based on the average for that interval. The RCAI for this study will be based on the following expression:

\[ \text{RCAI}_j^i = \left( \frac{X_j^i}{X_j^w} \right) \left( \frac{X_i^i}{X_i^w} \right) \]  \tag{20}

where

- \( X_j^i \) = average value of exports of commodity \( j \) by country \( i \) for the interval
- \( X_i^i \) = average value of total fisheries exports by country \( i \) for the interval
- \( X_j^w \) = average value of world exports of commodity \( j \) for the interval
- \( X_i^w \) = average value of total world fisheries exports for the interval

where \( j \) refers to frozen crustacean.

A ratio exceeding unity, or one that is increasing, is taken as an indication of revealed comparative advantage.

2.2.4 Price Competitiveness

In order to measure the changes in the degree of price competitiveness, a country's prices must be brought into relation to the prices of other exporting countries. Thus, in this study the export prices of frozen shrimp for each competing country in the Japanese market will be brought into relation to the export prices of the other three exporting countries. The base year for the analysis
is 1989. The price competitiveness index of an exporter in that market is then obtained by dividing the exporter’s price index by the weighted average of the price indices of the other three competing exporters; the weight being their export shares (in quantity) in that market. An improvement or deterioration in competitiveness will be indicated respectively by a decrease or increase in a country’s competitiveness index.

2.3 Source of Data

Data published by the Japan Marine Products Importers Association in the Japanese Imports of Marine Products (Statistics) will be used for the CMS analysis and shift-share analysis. These data will also be used for the calculation of the price competitiveness indices. The calculation of the revealed comparative advantage indices will be based on on-line data obtained from the FAO Statistical Database website (http://apps.fao.org/).