CHAPTER 2

LITERATURE REVIEW

This chapter reviewing related literature consists of two parts. The first part introduces the alternative comparative advantage measurements which were used in the last four decades. The last part is the review of studies which investigated evidence of a comparative advantage in industrial production among developed and developing countries.

2.1 The Alternative Comparative Advantage Measurements

The comparative advantage concept was originally introduced by David Ricardo in 1817. It is still the main theoretical explanation in exploring international specialization and the pattern of trade. Economists have since developed effective measurements representing international comparative advantage or specialization. Nevertheless, each measurement has differences in methodology and variables used. This section discusses the details of some alternative measurements and reviews the shortcomings of each measurement.

2.1.1 Revealed Comparative Advantage, RCA (1965)

The RCA approach was developed by Balassa (also called the Balassa Index) in 1965. This measurement was initially created in an attempt to overcome obstacles in measuring Ricardo's index because of unobserved relative autarkic prices (Benedictis and Tamberi, 2001). This approach uses only value of exports to measure a comparative advantage in production of each country. The index can be presented as:

$$RCA_{ij} = (x_{ij} / X_j) / (x_{iw} / X_w)$$

where RCA_{ij} is the index for industry i of country j, x_{ij} is export of industry i of country j, X_j is total exports of country j, x_{iw} is the world export of industry i, and X_w is total world exports.

If $RCA_{ij} > 1$ indicates that country j has a revealed comparative advantage in good i but the reverse if $RCA_{ij} < 1$. This index is actually well known and has been applied in many studies related across countries' export performance analysis. However, there are three limitations to using this index. The first problem is a limitation of policy implications and the difficulty of interpreting the value of index across countries. The second problem is that the RCA index is static analysis. Finally, the last problem is that RCA index is not symmetric and its mean is not fixed (Benedictis and Tamberi, 2001). Therefore, we have to recognize the limitations of using the RCA index to analyze a comparative advantage in production.

Due to the limitations of original RCA approach, it was normalized in two ways. Firstly, Proundman and Redding, in 1998, normalized the index by fixing its mean value. Secondly, another way was to make the index symmetric, as introduced by Laursen in 2000. These methods can resolve some problems, although they still have problems in application, particularly limitations of policy implications.

2.1.2 Domestic Resource Cost, DRC (1961 and 1972)

A DRC approach is another measurement to indicate the international specialization between two countries. This approach can be separated into two basic concepts: Chenery (1961) and Bruno (1972). However, these two concepts are also based on "cost and benefit analysis" and "comparative advantage theory". Chenery (1961) proposed that a country has a comparative advantage in producing one commodity when the total cost of producing it is lower than the price of exporting it. On the other hand, Bruno stated this approach as "the necessary total cost of domestic resource required in one activity in order to earn or save a unit of foreign currency" (Zhong and Xu, 2002). In other words, it indicates whether the production of one good in a country is economically beneficial (whether or not the total benefit is grater than the total cost).

Following the two concepts, economists used them to generate different estimation formulas. The choices of using them actually depend on the limitations of the data and the objective of each study (for example, Pearson, 1973; Ajanunt et al, 1986; Leung and Cai, 2005). To clearly understand this measurement, one estimated method should be expressed (see Leung and Cai 2005). A DRC index is expressed as:

$$DRC_{ij} = \frac{c_{ij}^{d}}{p_{ij} - c_{ij}^{f}}$$

where c_{ij}^{d} is the cost of using domestic resource (non-tradable inputs) for country i to produce one unit of good j; c_{ij}^{f} is the cost of using foreign resource (tradable inputs) for country i to produce one unit of good j; and p_{ij} is the price of good j. In addition, the numerator represents the country i's domestic opportunity costs. On the other hand, the denominator represents the value added in producing good j. To indicate a comparative advantage by using this index, if $DRC_{ij} < 1$ ($DRC_{ij} > 1$), then country i will have a comparative advantage (a comparative dis-advantage) in producing goods j. Therefore, if $DRC_{ij} < 1$, it implies that the country's resources should be allocated more to production of good j.

In fact, a DRC approach is also widely used to measure a country's comparative advantage in production (like the RCA index). In this approach, however, there are two limitations in its application. Firstly, the index is actually short term dynamic analysis so that its value may vary in the long run. Thus the policy implications suggested by this index may be ambiguous because a low value of index does not guarantee whether it is still low over time. Secondly, this approach has also a methodological problem. Since there is only one standard method to calculate the index, the index is possibly inconsistent with a selected estimated method. Therefore the index may be biased in revealing the comparative advantage of each country.

2.1.3 Constant Market Shares, CMS (1951)

A CMS analysis was originally developed by Tyszynski (1951) who used it firstly to explain change in trade flow of several countries. Basically, the background of CMS analysis is that a country's export share and import share in the world market are not only changed by a change in the competitiveness of a country but also by a change in the export structure (Oldersma and Bergeuk, 1993). Moreover, a CMS approach is to indicate the export performance of country by decompose the source of export change of a country into three components: growth (scale) effect, competitive effect, and commodity effect. To analyze a country's export change, the traditional CMA analysis is measured by using following equation:[1]

$$\sum\sum \Delta q_{ij} = \underbrace{\sum\sum s_{ij}^{o} \Delta Q_{ij}}_{(1)} + \underbrace{\sum\sum \Delta s_{ij} Q_{ij}^{o}}_{(2)} + \underbrace{\sum\sum \Delta s_{ij} \Delta Q_{ij}}_{(3)}$$

where, q_{ij} is export of good i to country j, Q_{ij} is import of good i by country j, s is share of q/Q, and the superscript ^{o} refer to the base year (Oldersma and Bergeuk, 1993). The first term, called growth effect, expresses the increase of that country's exports due to the increase in world exports under condition of individual market shares is constant. The second term, called competitive effect, represents the average growth of country's export if imports are fixed. And the last term, called commodity effect, indicates "how well the exporting country has adapted its export share to make use of the import growth of its trading partner" (Ahmadi-Esfahani, 2006). Thus a CMS analysis can be represented following as:

Export change = Growth effect + Competitive effect + Commodity effect

[1] In fact, the traditional CMS equation was extended by breaking down competitive effect and commodity effect (see Ahmadi-Esfahani, 2006).

In this analysis, three effects is able to be positive or negative value. The sum of the three effects value reflects a country's export performance. Hence, a CMS analysis does not only indicate export performance but also the source of export change. However there are two problems in application. Firstly, the choice of the base year market and commodity composition can influence the results of a CMS analysis (Richardson, 1971). Secondly, the index has an interpretation problem in the residual terms, competitive effect and commodity effect (Oldersma and Bergeuk, 1993). In summary, a CMS analysis has been well-known and used widely in many studies. Nevertheless, the results still have problems of policy recommendation because the source of export performance (a country's export change) does not point out the determinant factor of the three effects.

2.1.4 The Michaely Index, MI (1962)

The Michaely Index, was introduced by Michael Michaely in 1962, has been another well-known measurement for explaining international specialization. This index can be defined as:

$$MI_{ij} = X_{ij} / \sum_{i} X_{ij} - M_{ij} / \sum_{i} M_{ij}$$

where X_{ij} is export of good (sector) i from country, and M_{ij} is import of good (sector) i by country j. In above equation, the first term is the percentage share of good i in total country's export and the latter term is the percentage share of good i in total country's import. Additionally, the index value ranges [-1,1]. The positive index indicates that a country has a comparative advantage in good i, while the negative index represents that a country is not specialized in good i. Finally, this index has some problems in application, namely, limitations of policy implications and static analysis.

2.1.5 The Comparative Advantage Index, CAI (1999)

The CAI index was recently introduced by Saito (1999). The index was originally applied to measure a comparative advantage among OECD countries by considering their technological progress. The index was really based on "the Ricardian measure" and "the Hicksian measure". Moreover, the Ricardian measure was known as the measure of differences in labor productivity. In contrast, the Hicksian measure was recognized as measure of differences in total factor productivity[2]. Specifically, the comparative advantage index (CAI) is described as follows:

$$CAI_{ijt}^{mn} = TE_{ijt}^{mn} + EE_{ijt}^{mn} + WE_{ijt}^{mn}$$

The index is indeed decomposed as three components; technology effect (TE), endowment effect (EE), wage effect (WE)[3]. In other words, the source of comparative advantage (comparative dis-advantage) for the index is considered using the value of the three components. In addition, this approach requires the four variables to compute the index: output, fixed capital formation, quantity of labor, and wage and salaries[4].

[2] In addition, total factor productivity refers to the production function which includes both labor input and capital input. However, in the Ricardian measure, the production function is assumed to have only labor input.

[3] Basically, the technology effect and the endowment effect are decomposition of the productivity effect (see Chapter 3). The Hicksian measure (differences in total factor productivity) indeed refers to the technology effect.

[4] This approach actually concerns the change in productivity which has an impact on international comparative advantage. The cause of the change in productivity is mainly technological progress. If technology is taken into the production function Y = F (AK, L), technological progress refers to capital augmenting (a value of parameter A). In this approach, technological progress is assumed to be Hicks-neutral.

Since the index is derived from the Ricardian measure, it needs to be computed by comparing two commodities between two countries (commodity i and j, country m and n). For the index's interpretation, a negative index indicates that country m has a comparative advantage in commodity i, whereas the positive index points to a comparative dis-advantage in that commodity. Additionally, the index's decomposition can also point out whether each effect has a positive (or negative) impact on a country's specialization. For instance, the negative wage effect represents that country m has a comparative advantage in wage effect (or difference in wage rate) over country n. It also demonstrates a comparative advantage in producing commodity i for country m

The CAI approach is likely to measure directly a comparative advantage in production rather than the other four measurements. The index is actually computed by using input factors data, labor and capital. In contrast, other measurements seem to use non-input factors, such as export and import levels, to represent international comparative advantage. In truth, comparative advantage should be explained by comparing cost of production (or production specialization) between two countries. By using export levels to indicate comparative advantage, it seems to measure indirectly a comparative advantage in production.

Moreover, the index potentially suggests concrete policy implications because the index can specify the source of comparative advantage in production. For that reason, the index is a more appropriate measurement to investigate international specialization and explain the pattern of trade. Nonetheless the index's recognized problem is a limitation of data, especially fixed capital formation.

2.2 The Background of Evidence in International Trade

Since the development of these various measurements, researchers have applied them to study production specialization across countries. In this section, the literature review is separated into two important parts: a general background of comparative advantage in international trade among developing and developed countries, and the determinant factor of change in comparative specialization patterns.

Yeats (1990), Bender and Wai Li (2002), and Mayer (2003) studied the characteristics of developing countries' specializations and explored their pattern of trade during the period 1970-2000. These papers applied the RCA index to explore international comparative advantage[5]. While the RCA index has a lot of limitations in application, it can explain general evidence of countries' comparative advantage. The result from these studies may be summarized into two important points.

Firstly, Yeats found that developing countries had a revealed comparative advantage in labor intensive industrial products in their trade with developed market countries during the period 1965-1985. These labor-intensive industrial products were, for example, food products, leather, and textile products. Therefore their pattern of trade concentrated in labor intensive commodities.

Secondly, an increase in trade integration among other countries may significantly cause a change in country's comparative advantage. For instance, Mayer (2003) found the fact that a shift in comparative advantage in the labor intensive sector from middle income toward the integrating low income countries. This evidence was the same as result of Bender and Wai Li's paper. This paper concluded that even though East Asian countries had experienced strong export performance, they were losing their international specialization to the lower tier economies such as those in Southeast Asia and Latin America.

In addition, Pathomkajonkul (1995) studied a comparative advantage of Thailand across countries by using the technique of the endowment triangle. He found that Thailand, during the period 1970-1980, had a comparative advantage in low-skill labor intensive products but had a comparative dis-advantage in capital and high-skill labor intensive products. However a change in accumulation of capital led to a decrease in comparative dis-advantage in them. This pattern had also occurred in Indonesia and Malaysia.

[5] In Yeats' study paper, country's specialization was examined by using RCA index and Heckscher-Ohlin index.

Nowadays technological development is a factor determining a country's specialization pattern. Nevertheless the choice of the measure of technology differences has received little consideration. A recent study by Harrigan (1997) focused on the importance of different technology in explaining international specialization patterns. This paper was based on an application of the theory of total factor productivity comparisons to measure Hicks neutral technology difference in OECD countries. It found that differences in technology levels were considered the determinant factor of international comparative advantage in production among them. Dalum, Laursen, and Villumsen (1996) also recognized the importance of technology level in export specialization patterns among OECD countries. This paper examined the stability of OECD countries' export specialization pattern at the country level. By focusing on technology differences, it found that international trade specialization in OECD countries had decreased slightly in the period of 1965 - 92. This result implies that development in new technology has helped to keep their trade specialization.

In fact, the pattern of trade has possibly been explained by the theory of comparative advantage and the theory of product cycles. The latter explains shifts in comparative advantage patterns from developed countries to developing countries by considering the stage of product cycle. Gagnon and Rose (1992) studied the dynamic patterns in international trade flows between America and Japan. Their conclusion was that there was a little evidence agreed with product cycle dynamics between 1962 and 1998.

Finally, the shortcoming of comparative advantage is that all comparative advantage measurements do not consider other factors, such as transportation costs and value of exchange rate values. Dalum, Laursen, and Villumsen (1996) found that international comparative advantage was likely to be influenced by transportation cost. Therefore we always need to recognize the shortcomings of each measurement in interpreting results.