An Empirical Analysis of Changes in Comparative Advantage: The Case of Malaysia Manufacturing Exports 1990-2013

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Abstract: **In the Malaysia development plan, the manufacturing sector always aimed to transit to a more high-value, diverse and complex products. To achieve, the comparative advantage of each product in manufacturing needs to be known. Therefore, it is very important for Malaysia to identify the comparative advantage of manufactured goods. This identification could help to increase Malaysia's export demand in the future. This paper analyses the changes in the comparative advantage of Malaysian manufacturing exports over the period from 1990 to 2013 using Revealed Symmetric Comparative Advantage (RSCA) index for manufacturing export commodities at the three digit level of the Standard International Trade Classification (SITC). There are 215 commodities that cover all the Malaysia's manufactured goods. Results reveal that there are minor changes in the patterns of comparative advantage in the Malaysia. Relatively, there are more dynamic changes in low technology product than the primary, resources based, medium technology and high technology product. It shown that Malaysia more concreted on low technology products. These findings are useful for policy consideration to identify product specialization for enhancing competitiveness and promoting economic growth.**

Keywords: **Revealed Symmetric Comparative Advantage, Malaysian manufacturing exports, SITC.**

I. INTRODUCTION

Malaysia is an open economy and thus, trade is important for the sustenance of its economy. Consequently, the impact from slowdown of economy global, could decrease Malaysia's trading partners' demand for Malaysian exports directly. It will limit the demand for Malaysia's exports from these countries. Thus, it is important for Malaysia government to know its export's comparative advantage in order to sustain and stabilize overseas market demand.

The structure of an economy depends on magnitude and direction of trade. In addition, traditional trade theory of Heckscher-Ohlin assumes that factor endowment plays a major role in determining the competitiveness of the country. In this context, Malaysia has shifted its competiveness from agriculture to manufacturing economy. Malaysia's have transformed from a low-income agricultural based economy to the middle-income economy with a strong hold in the manufacturing sector [13][1][8]. This transformation is clearly reflected from share contribution of the agriculture and manufacturing sector in GDP (Gross Domestic Product) as shows in Figure 1. The share of agriculture sector dropped substantially between the period of 1990 and 2013. At the same time, manufacturing sector's share experiences a momentous growth in the same period.
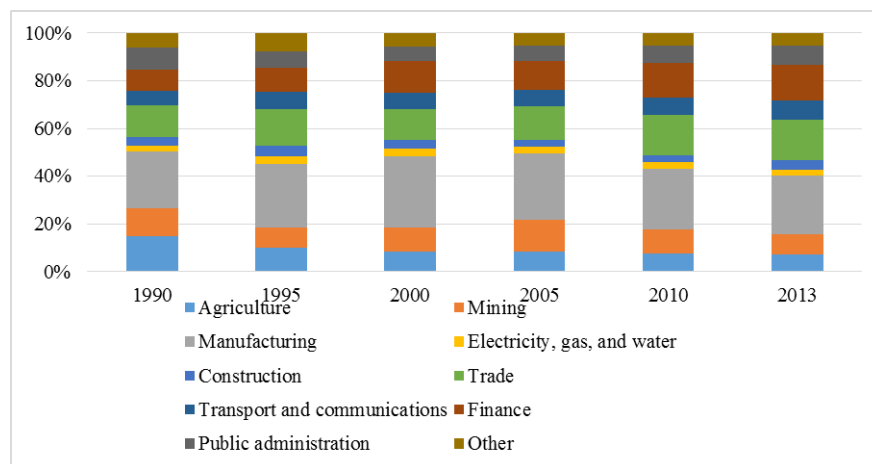
Figure 1: Structure of Production, 1990-2013 (percent of GDP)

Source: [2].

In the Tenth Malaysia Plan (2011-2015), the composition and direction of trade remained unchanged during the period of 2006 to 2010 (Economic Planning Unit, 2010a). A few challenges that are faced by Malaysia including the low-end value of export and the dichotomy in the manufacturing sector [8]. Besides that, the export sector is also depending on the low-level technology that without much innovation or creation of new technology to produce a new competitive edge for Malaysia export.

Malaysia now is at a critical stage towards moving into a high income country. Malaysia transformation into a high income country will depend very much on her ability to restructure the economy to be the one that is highly competitive and sustainable. As stated in the Tenth Malaysia Plan (2011-2015), Government will focus its resources towards prioritizing specific National Key Economic Areas (NKEAs) as part of the strategy towards greater specialization. This will involve specialization not only in terms of sector but also subsector levels. In addition to the requirement to be competitive for economic transformation, Malaysia need to increase her competitiveness to be able to compete with her old and new rivals. It is expected that in a post-crisis environment, Malaysia will face a direct competition for the same market from developed countries as well as from emerging big economies such as China and India. Malaysia needs to identify products that have comparative advantage in face of the growing competition. Comparative advantage enables a country to offer goods at lower cost than the other countries and thus, a country should concentrate in making the good in which it has a comparative advantage.

The analysis of this paper focuses on dynamic shift in pattern of Malaysia comparative advantage. This paper addresses some research questions. First, what sort of export commodity do the Malaysia have comparative advantage? Second, to what extend the Malaysia comparative advantage shifted dynamically? The rest of this paper is organized as follows. Section II presents the literature review and Section III discusses the methodology. The result and analysis are described in Section IV. Finally, some conclusions are presented in Section V.

II. LITERATURE REVIEW

[10] has analyses the changes of trade pattern for Malaysia's exports based on 144 manufactures' comparative advantage in the world and Vietnam market from 2010 to 2015. They classify 144 different types of manufactures based on technology level that has five general groups and nine small groups, which cover the majority of Malaysia's manufactured goods. Their results indicate that most of the products with comparative advantage in the world market are high technology products, particularly E&E and process industries products. In Vietnam market, its agriculture-based products and process industries are more dominance than Malaysia. However, Malaysia manufactured products' competitiveness in Vietnam market have shifted from low technology products to medium technology products. The same pattern also occurs with the other world markets.

[15] study the pattern of China's manufactured exports in the world and Vietnam market from 2002 to 2009 based on 144 kinds of manufactures which categorized by technology level. The study found that types of China manufactured products with comparative advantage in both world and US markets are increasing. Most of the products with the comparative

advantage are low technology products and the comparative advantage for China medium technology products has improved, but the revealed comparative advantage indices are low. It also indicates that China manufactured exports are having high comparative advantage in the world market compared with US market.

Another study by [13] that focused on China manufactured sector has been used 27 product groups. It's representing high, medium and low technology sectors in order to know which China's comparative advantage in manufacturing has shifted towards high-technology sectors between 1987 and 2005. The study found that while China maintains its competitiveness in low technology labour intensive products, it has gained comparative advantage in selected medium-tech sectors and the high-tech telecommunications and automatic data processing equipment sectors.

[4] analysed the export competitiveness of the canned tuna export industry in Thailand for 1996- 2006. The findings shows that Thailand has comparative advantages in all major export markets, these have remained stable in the USA, the Middle East, Japan and Canada but have fallen substantially in Australia.

[16] study the dynamic changes in comparative advantage of the ASEAN, China, Republic of Korea and Japan (ASEAN+3). The study found that there have been changes in the patterns of comparative advantage in the ASEAN+3. The increases in overall comparative advantage are encouraged by the higher increases in comparative advantage of groups of products that had no or lower comparative advantage in the past. The comparative advantage pattern of the ASEAN is becoming similar with that of Japan. However, there is no stationary level of similarity in the patterns of comparative advantage.

[12] has analysed the Malaysia comparative advantage of wood products in the European market. They found that high comparative advantage products are the secondary processing products and mechanized mass market products. The revealed comparative advantage is very rely on the quantity traded, a high quantity did not indicate the high comparative advantage. There are many factors influencing the comparative advantage such as abundant resources, communication and technology, production cost and demand pattern.

[11] analysed export competitiveness of Malaysian E&E products. The study found that Malaysia's E&E products was highly perform only in the US market for almost all SITC. Indonesia has monopolized the Singapore market and Hong Kong was dominated by China. Malaysia's E&E exports to the world generally has comparative advantage over other competitors namely Indonesia, Thailand and China.

[9] analysed of shifting export specialization to Singapore. As a result, they found that Malaysia competitiveness shifted from agro-based industry to semi-manufactured products, especially iron, steel and zinc. [8] conclude that the share of manufacturers of machinery goods in the country's exports was slightly above the world's average. Within the subsector, Malaysia does not possess a comparative advantage in most of the product groups. Malaysia has no comparative advantage for textile, clothing, and footwear industries. The country's export share was less than the world's average for most of the product groups. In addition, Malaysia does not have a comparative advantage for the manufacturing of metal as well.

Previous trade pattern studies in Malaysia have largely ignored the dynamic aspect of trade. For example, such as [10] has analyses the changes of trade pattern in Malaysia's exports from 2010 to 2015, using five general and nine small groups of manufactured goods based on technology level which cover the majority of Malaysia's manufactured goods.. Other studies such as by [16], included the dynamic changes in their comparative advantage analysis of the ASEAN, China, Republic of Korea and Japan (ASEAN+3). However, they did not classified manufactured by technology classification. The present study attempts to fill this gap and aim to examine the dynamic change using detail classification of manufactured goods.

III. METHODOLOGY

A. Data:

This paper uses data on exports that published by the United Nations Commodity Trade Statistics Database (UN-COMTRADE). The exports data uses the 3-digit SITC Revision 2 and focuses on 215 exports of manufacturing commodities. These 215 RSCA indexes are then grouped into five based on [5] technological classification of manufacturing exports. Using [5] specification, there are 46 commodities in the primary products (PP), 54 commodities in the resource based (RB1 and RB2), 43 commodities in the low-technology manufactures (LT1 and LT2), 54 commodities

in the medium-technology manufactures (MT1 and MT3) and 18 commodities in the high-technology manufacturers (HT1 and HT2).

B. Method:

Revealed Symmetric Comparative Advantage (RSCA)

The RSCA by [6] are employed in the present study. According to [6], RSCA is the best measure of comparative advantage. The RSCA index is a simple decreasing monotonic transformation of Revealed Comparative Advantage (RCA). RSCA index is formulated as follows:

$$RSCA_{ij} = (RCA_{ij} - 1)/(RCA_{ij} + 1) \qquad (1)$$

The values of RSCAij index ranges from negative one to positive one ($-1 \leq RSCAij \leq 1$). The values of RSCAij that greater than zero implies that the country i has a comparative advantage in group of products j. In contrast, RSCAij that less than zero implies that the country i has comparative disadvantage in group of products j.

Distribution of RSCA: Specialization or De-specialization:

The distribution of RSCA can be used to analyze the dynamics of comparative advantage. Some descriptive statistics such as arithmetic mean, median, standard deviation and skewness are applied to examine the shift in comparative advantages in the Malaysia. Standard deviation is used to examine the dispersion of revealed comparative advantages. Positive value of skewness coefficient of RSCA for a specific country and a specific year indicates that the country is more concentrated on products with low comparative advantage. In contrast, negative value skewness coefficient of RSCA for a specific country and a specific year implies that the country is more concentrated on products with high comparative advantage. By looking at the values of skewness coefficient over time, we can analyze the direction of specialization or the shift in comparative advantages [16].

We might make a hypothesis that Malaysia is more de-specialized and concentrated on products with higher comparative advantage over the periods of observations (as shown by higher value of mean or median; smaller standard deviation and smaller value of skewness over time).

Spearman's Rank Correlation: Complement or Substitution:

To examine the shifts in the patterns of comparative advantages, we apply Spearman's rank correlation analysis. It measures the closeness of the relationship the two sets of rankings that is, between the rankings of the one variable and the rankings of the other variable (in our case: RSCA across periods and RSCA across commodity). Hence, the degree of association between rank orders of RSCA (across periods and across commodity) can be compared by looking at the Spearman's rank correlation coefficients, which are formulated as [7][3].

The values of Spearman's rank correlation coefficients ranges from negative one (a perfect negative relationship in rank orders) to positive one (a perfect positive relationship in rank orders). A value of zero indicates no relationship in rank orders. If the correlation coefficient is closer to one (1), the shift in patterns (rank orders) of comparative advantage is less significant. For the extreme case, the coefficient equals to one (1) when the rank orders of RSCA of the two periods of observation are the same, there is no change in the rank orders at all. If it is closer to minus one (-1), the shift in patterns (rank orders) of comparative advantage is more significant. For the extreme case, the coefficient equals minus one (-1), when the rank orders of RSCA of the two periods of observation are completely in the reverse orders.

IV. RESULT AND ANALYSIS

A. De-specialization:

International trade theory suggests that a country will exploit its products that have comparative advantage and specialize on these products. As a result, the comparative advantage of these products will increase and meanwhile, the comparative advantage of other products will decrease, stagnant or face only a small increase. If this is the case, there must be a larger difference (dispersion) in comparative advantages among products of a country. Statistically, this will be shown by a large standard deviation of the comparative advantages.

Figure 2 exhibits trends in mean, median, standard deviation and skewness of RSCA in Malaysia. Some general pattern of comparative advantage can be noted. First, except high technology products, in 1990, Malaysia have a concentration on the products with low comparative advantage (shown by positive value of skewness coefficient). However, over time, the concentration turns to the products with higher comparative advantage except low technology (shown by decreasing value of skewness).

Second, the difference in comparative advantages among products tends to be smaller gradually over time (shown by decreased values of standard deviation) in Malaysia. In other words, Malaysia exhibit de-specialization. The increase in the mean (or median) that followed by the decrease in the standard deviation of RSCA implies that the increase of overall comparative advantage could be largely due to the increase in comparative advantage of products that have no or lower comparative advantage in the past.

Figure 2: Trends in Mean, Median, Standard Deviation and Skewness of Malaysia Comparative Advantage, 1990-2013.

B. Shift in the Pattern of Comparative Advantage:

We calculate Spearman's rank correlations RSCA across different periods (years) i.e. 1995, 2000, 2005, 2010 and 2013 to scrutinize separately the structural changes (rank orders) of comparative advantages in the Malaysia using the 1990 as base year. Table 1 shows that all the Spearman's rank correlation coefficients are statistically significant at 1 percent level. The Malaysia has experienced the changes in the patterns (rank orders) of comparative advantage in the different levels. It is clearly shown that Malaysia, especially in Low technology (LT), has smaller coefficients of the Spearman's rank correlation than others. It means that there were more dynamic changes in the patterns (rank orders) of comparative advantages in the LT as compared to PP, RB, MT and HT.

Table 1: Malaysia Spearman's Rank Correlation Coefficient across period

Tahun	PP	RB	LT	MT	HT
1995	0.9400*	0.8378*	0.8479*	0.8558*	0.8122*
2000	0.8533*	0.7626*	0.6860*	0.6924*	0.7069*
2005	0.7362*	0.6277*	0.5631*	0.6699*	0.5439*
2010	0.6415*	0.6196*	0.4314*	0.5879*	0.5315*
2013	0.6457*	0.5446*	0.3875*	0.5767*	0.5686*

Sources: UN-Comtrade

V. CONCLUSION

In the Malaysia, it is found that increases in overall comparative advantage is happen together with the decreases in its standard deviation. This implies that the increases in overall comparative advantage are encouraged by the higher increases in comparative advantage of products, which had no or lower comparative advantage in the past. However, Malaysia have specialization in the commodities with comparative advantage in low technology groups of products which have limited contributions to achieve the aims of TN50 of high-tech economy. In addition, the situation could be further deteriorated by the finding that there have been minor changes in the patterns of comparative advantage in Malaysia over the past 24 years. In fact, the Malaysia's comparative advantage has shown the most significant pattern changes in low technology products as compared to other.

These highlights that change in comparative advantage in Malaysia's manufacturing export is not heading toward high-tech product. Malaysia could try to increase its competitiveness by increasing its efficiency, adopting suitable technology, expanding R&D efforts, increasing human capital, encouraging FDI in skill and technology intensive industries to facilitate technology transfer, and as well as expanding its infrastructural services and by seeking lucrative markets abroad. Malaysia should maintain its comparative advantage in the commodity that Malaysia currently possessing, and gain additional comparative advantage in the other commodities. Thus, in order to remain competitive and acquire competitiveness in new sectors, the known strategies for success must be intensified and "new" strategies must be found to stay ahead.

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