＜論文＞

International Production Sharing and Its Impacts on Malaysia's Trade Balance

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Abstract

This study improves the research on Malaysia's disaggregate import demand functions conducted by Fukumoto (2020). The results suggest that the deeper the country is involved in international production sharing, the less essential the relative price will be. Economic growth driven by the electric industry may not harm trade balance. However, an increase in domestically produced transport equipment may have a negative impact on the trade balance. Thus, development and facilitation of domestic production in the automobile industry is essential and it is advised that the government should design policies to promote relevant industries.

Keywords：production sharing, vertical specialization, import demand, price and income elasticities, trade policy, devaluation of the ringgit

1．Introduction

There is a major limitation in existing studies that estimate Malaysia's import demand functions. For example, Tang and Mohammad (2000) and Tang and Nair (2002) examined Malaysia's aggregate import demand, and Fukumoto (2020) estimated Malaysia's import demand by classifying total imports into Broad Economic Categories (BEC). However, they used gross domestic product (GDP) deflator as the domestic price and calculated the relative price. Table 1 shows that GDP deflator correlates to construc-

tion and services, which are nontradable goods. In this study, we replace GDP deflator with the price index of manufacturing goods. Moreover, it is vital to consider the periods that Malaysia fixed its exchange rate, from 1998 to 2005, when it experienced a financial crisis.

The rest of the paper is organized as follows. Section 2 describes the empirical methodology and estimation models. Section 3 reports the estimation results of the long- and short-run elasticities and discusses the implications. Section 4 provides conclusions.

2．Estimation Method and Model Specification

Based on VAR(p), under a conditional modeling technique that focuses on the scalar variable, we used the bounds testing approach to examine the relationship between the variables. The bounds test can be applied without knowing whether all the underlying variables are purely I(0), I(1), or mutually cointegrated. Thus, it avoids the uncertainty problem of pre-testing, which arises when variables are classified as either I(0) or I(1)[1]. Furthermore, it can be applied to small sample size.

The bounds test involves two stages. In the first stage, the existence of cointegration among the variables is investigated. In the second stage[2], based on the cointegration, the autoregressive distributed lag (ARDL) model is used to estimate the long- and short-run coefficients. The following conditional unrestricted error correction model is estimated to test the cointe-

[1] The Phillips－Perron unit root test is conducted to confirm the order of integration; the results are available upon request. The variables are estimated to be either I(0) or I(1). Thus, since we have both I(0) and I(1) variables in the regressors, cointegration procedures that require all variables to be I(1) are not appropriate.

[2] The ARDL approach can be applied whether the underlying regressors are purely I(0), I(1), or mutually cointegrated (Pesaran and Shin, 1999).

grating relationship:

$$\Delta \ln M_t^g = a_0 + a_1 t + a_2 \ln M_{t-1}^g + a_3 \ln Y_{t-i} + a_4 \ln R P_{t-1}^g + \sum_{i=1}^{n} b_i \Delta M_{t-i}^g + \sum_{i=0}^{n} c_i \Delta RP_{t-i}^g + \sum_{i=0}^{n} d_i \Delta Y_{t-i} + dummy + \varepsilon_t \quad (1)$$

where $ln\ M_t^g$ denotes the natural log of real imports in category g; lnY_t, the natural log of real GDP; $lnRP_t$, the natural log of the relative price; and $\Delta=1-L$, the difference operator. A dummy variable is included to capture the impact of Malaysia's fixed exchange regime, which is represented with 1 when it is within 1998 to 2005 and 0 when it is otherwise. Table 2 presents the results of the bounds test, and it confirms the long-run relationships, except for BEC121, BEC112, and BEC62. This result is different from what we found in the previous research (Fukumoto, 2020). We also conducted the bounds test by replacing the income variable with the total exports when considering capital and intermediate goods, and private consumption when considering consumption goods. The result is robust despite the specifications of the model.

3 . Empirical Results and Implications

Since the bounds test shows a long-run relationship between disaggregate imports and the hypothesized explanatory variables for certain categories, we move on to the second stage of the bounds test, which is to estimate Equation 1, using the ARDL specification. We expect the long- and short-run coefficients of relative prices to be negative, and the domestic income variables to be positive. Table 3 summarizes the estimation results of each BEC category. The error correction term (ECM) represents the short-term adjustment processes toward the long-run equilibrium path. This term is negative in all cases. If its absolute value is smaller than unity, it means that the adjusted imports in the current period t are equal to

a fraction of the error in the previous period. A higher fraction indicates a higher rate of adjustment toward equilibrium.

Our findings are fourfold. First, the impacts of Malaysia's fixed exchange system in the short run are negative and statistically significant. Inelastic coefficients indicate that it has a negative impact on imports in the short run. However, in the long run, it has an insignificant impact on most commodities except for BEC521, BEC22, and BEC42. The coefficient of BEC521 is elastic and negative, which shows that in this category, the fixed exchange system had a long-term negative impact on imports.

Second, the trade share of BEC22 and BEC42 is almost half of that of the total trade. BEC22 includes electric conductor and base metal related products, and BEC42 includes semiconductors. Commodities classified as BEC42 are highly integrated into international production sharing. We estimate the long-run inelastic coefficients of income variable and relative price. Furthermore, in the long-run, the relative price is statistically insignificant, which indicates that the relative price is not essential in determining imports of BEC42 products. In the short run, the relative price has a negative impact on imports, but it is inelastic. Thus, the relative price is insignificant in determining imports that are used intensively in the production of exported goods. As investigated by Goldsbrough (1981), the price elasticities of intra-firm trade are smaller than those of general international trade since intra-firm trade is between foreign affiliates and parents. Thus, the low-price elasticities may indicate a large share of intra-firm trade, or it may be related to the impact of international production sharing. A more detailed analysis is needed to determine how participating in international production sharing affects trade and how it weakens the impact of relative price. A dummy variable that captures the

impact of Malaysia's fixed exchange system has a different impact depending on whether it is in the short or long run. In the short run, it is negative, but it is positive in the long run. It reflects the decrease in Malaysia's exports during the crisis and hence, reduced its imported inputs that are used to produce exported goods. In the long run, it has a positive impact on imports of BEC42 products by stabilizing fluctuations in the exchange rate.

Third, in the long run, income is inelastic for most intermediate goods except for BEC42. Malaysia achieved its economic development by promoting export-driven foreign direct investment. Further involvement in international production sharing may not deteriorate the trade balance.

Fourth, since imports of BEC53 (parts and accessories for transport equipment) are mainly used in the production of the automobile industry which are domestically consumed, the government policy to promote the automobile industry may deteriorate the trade balance unless Malaysia successfully increases its share in domestic production by reducing imported intermediate inputs. The result also suggests that the increase in the transport equipment may worsen Malaysia's trade balance although its imports are rather small. Thus, the government should develop relevant industries, especially those that produce parts and accessories for transport equipment. In this sense, the government automotive policy in 2020 should be designed to promote domestic production which target to build domestic production network in parts and accessories for transport equipment.

4. Conclusions

This study estimates the long- and short-run elasticities of Malaysia's disaggregate import demand for the relative prices of imports and income variable together with a dummy variable that represents the impact of

Malaysia's fixed exchange rate system. It also has some policy implications. The bounds test is used to examine the existence of cointegration, and then, based on the test results, the ARDL approach is used to estimate the long- and short-run coefficients.

The results show that there are different impacts of Malaysia's fixed exchange rate system, depending on the type of commodity. In particular, the deeper the country is involved in international production sharing, the less essential the relative price will be. As the economy grows, trade balance worsens since the country also increases imports of intermediate inputs. However, further involvement in international production sharing may not deteriorate the trade balance. On the other hand, development and facilitation of domestic production in the automobile industry is essential. Thus, the government should design policies to promote relevant industries.

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Appendix 1. Commodity Classification

The UN comtrade database offers Broad Economic Categories (BEC) as well as SITC and HS. The UN provides the following transformations from BEC to each corresponding SNA class. See also UN (1971) for more details. In this study, we exclude 31, 322 and 522 from estimations.

1. Capital Goods
   - 41. Machinery and other capital equipment
   - 521. Transport equipment, industrial (except passenger motor car)
2. Intermediate Goods
   - 111. Food and beverages, primary, mainly for industry
   - 121. Food and beverages, processed, mainly for industry
   - 21. Industrial supplies, not elsewhere specified, primary
   - 22. Industrial supplies, not elsewhere specified, processed
   - 31. Fuels and lubricants, primary
   - 322. Fuels and lubricants, processed (other than motor spirit)
   - 42. Parts and accessories for machinery and other capital equipment (except transport)
   - 53. Parts and accessories for transport equipment
3. Consumption goods
   - 112. Food and beverages, primary, mainly for household consumption
   - 122. Food and beverages, processed, mainly for household consumption
   - 522. Transport equipment, non-industrial
   - 61. Consumption goods not elsewhere specified, durable
   - 62. Consumption goods not elsewhere specified, semi-durable
   - 63. Consumption goods not elsewhere specified, non-durable

Appendix 2. Data Definitions and Sources

Trade data such as trade volume and unit price indices under BEC classification scheme used in this study are provided by the Institute of Developing Economies (IDE), Malaysia's constant GDP in US dollars and GDP deflator comes from the World Bank, and exchange rate of Ringgit to US dollar comes from International Financial Statistics reported by IMF. Price indices and GDP deflator are measured in 2010 prices.

M_t^g : Imports of the g^{th} BEC category deflated by the import unit price index at time t.

RP_t^g : Relative prices of the g^{th} category at time t given by $RP_t^g = \frac{PM_t^g * EXRA_t}{PD_t^g}$

where PM_t^g is the import unit price of the g^{th} BEC commodity, $EXRA_t$ is exchange rate of Ringgit to US dollar, and PD^g is the domestic price. For the domestic price, we use price index of manufacturing.

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Table 1. Correlation between GDP deflator and Prices

	Agriculture, Forestry and Fishing	Mining and Quarrying	Manufacturing	Construction	Services
GDP Deflator	0.64	0.92	0.79	0.59	0.52

Source：Calculated by Author using CEIC Database.

Note：We calculate correlation for each price i as follows：

corr= (ΔPt(i), ΔPt(j)) where Δ denotes one year difference from previous year.

Table 2. Summary of Cointegration Test between 1991 and 2017

	Bec Code	Classification	Cointegration with GDP
Capital Goods	41	Machinery and other capital equipment	yes*
	521	Transport equipment, industrial	yes**
Intermediate Goods	111	Food and beverages, primary, mainly for industry	yes
	121	Food and beverages, processed, mainly for industry	no
	21	Industrial supplies, not elsewhere specified, primary	yes*
	22	Industrial supplies, not elsewhere specified, processed	yes**
	42	Parts and accessories for machinery and other capital equipment (except transport)	yes*
	53	Parts and accessories for transport equipment	yes**
Consumption Goods	112	Food and beverages, primary, mainly for household consumption	no
	122	Food and beverages, processed, mainly for household consumption	yes*
	61	Consumption goods not elsewhere specified, durable	yes
	62	Consumption goods not elsewhere specified, semi-durable	no
	63	Consumption goods not elsewhere specified, non-durable	yes*

Notes：

(1)The symbols＊and ＊＊denote significance at 0.05, and 0.01 levels, respectively. No symbols indicate significance at 10%.

(2) F-statistics is available upon request.

Table 3. Summary of ARDL estimations

	Bec Code	Classification	Long Run			Short Run			
			Y	RP	Dummy	Y	RP	Dummy	ECM
Capital Goods	41	Machinery and other capital equipment	0.740***	-0.874***	-0.0233	1.294**	-0.191		-0.914***
	521	Transport equipment, industrial	0.502	1.368	-2.193**		-0.909***		-0.411**
Intermediate Goods	111	Food and beverages, primary, mainly for industry	1.326***	-1.537***	-0.0830				-0.836***
	121	Food and beverages, processed, mainly for industry					0.965		-0.730**
	21	Industrial supplies, not elsewhere specified, primary	1.703***	1.483	-1.004		-0.907***		-0.238
	22	Industrial supplies, not elsewhere specified, processed	1.001***	-0.970***	-0.110***		0.322		-1.426***
	42	Parts and accessories for machinery and other capital equipment (except transport)	0.885***	-0.275	0.221*		-0.680***	-0.190**	-0.540***
	53	Parts and accessories for transport equipment	1.345***	-1.112***	0.0183			-0.282***	-0.832***
Consumption Goods	112	Food and beverages, primary, mainly for household consumption							-0.245*
	122	Food and beverages, processed, mainly for household consumption	0.857**	-2.998***	-0.152				-0.438***
	61	Consumption goods not elsewhere specified, durable	1.498***	-1.344**	0.259	2.238***	-0.535***	-0.174*	-0.408**
	62	Consumption goods not elsewhere specified, semi-durable					-0.651***	-0.243**	-0.129
	63	Consumption goods not elsewhere specified, non-durable	1.282***	-1.017***	0.0361		-0.272*	-0.132***	-0.682***