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Free Trade Agreements and Production Sharing in Malaysian Manufacturing Industries

(Perjanjian Perdagangan Bebas dan Perkongsian Pembuatan di dalam Industri Pembuatan Malaysia)

Pai Wei Choong
Sunway University Business School

Noor Aini Khalifah
Universiti Kebangsaan Malaysia

Abu Hassan Shaari Md Nor
Universiti Kebangsaan Malaysia

Mohd Adib Ismail
Universiti Kebangsaan Malaysia

ABSTRACT

Malaysia unilaterally reduced its tariff and expanded its bilateral manufactured exports in the 1990s. However, in the 2000s, Malaysia signed a growing number of free trade agreements (FTA) to lower its tariff among member countries. This study examines the impact of the growing number of FTAs on Malaysia's bilateral manufactured exports at industry level in general and based on production sharing in particular over the period of 1990 to 2016 by three-year average. FTA-and-foreign input interaction term is embedded in the gravity equation model to examine the extent of FTAs in expanding production sharing-based bilateral manufactured exports. The empirical results of this study are based on dynamic panel system generalized method of moments (SYS-GMM) technique where FTA dummies are weakly exogenous. The findings show that the ASEAN Free Trade Area (AFTA) and bilateral trade agreements have significant impact on Malaysia's non-resource-based exports and are associated with production sharing; while AFTA-plus-one shows no evidence of diverting Malaysian production sharing-based bilateral manufactured exports from its member countries. Moreover, FTA formation has no relation to the Malaysian resource-based exports. The proliferation of FTAs does not assure net export-enhancing effect on manufacturing activities among member countries, but is largely associated with international production sharing.

Keywords: International trade; free trade agreements; gravity model; international production sharing; manufacturing in Malaysia

ABSTRAK

Pengurangan tarif secara sebelah pihak telah meningkatkan eksport pembuatan Malaysia pada tahun 1990an, iaitu sebelum percambahan perjanjian perdagangan bebas (FTA) pada tahun 2000an. Kajian ini bertujuan untuk memeriksa kesan percambahan FTA ke atas eksport pembuatan Malaysia di peringkat industri secara umum dan berhubung kait dengan perkongsian pembuatan antarabangsa secara khas. Terma interaksi FTA dan input asing dimasukkan ke dalam "gravity model" untuk memeriksa sejauh mana FTA meningkatkan eksport pembuatan Malaysia dan berhubung-kait dengan perkongsian pembuatan antarabangsa. Keputusan empirikal kajian ini adalah berdasarkan teknik panel dinamik sistem GMM dengan andaian pembolehubah dami FTA sebagai eksogen yang lemah. Keputusan kajian ini menunjukkan bahawa AFTA dan perjanjian perdagangan dua-hala memberi kesan signifikan ke atas eksport bukan-berasaskan-sumber dan berhubung-kait dengan perkongsian pembuatan antarabangsa; manakala tiada bukti menunjukkan bahawa penubuhan "AFTA-plus-one" mengalihkan eksport Malaysia dari negara anggota. Tambahan pula, penubuhan FTA tiada berkait langsung dengan eksport Malaysia berasaskan-sumber. Percambahan FTA tidak semestinya menjamin peningkatan eksport bersih sektor pembuatan negara di antara negara anggota tetapi sebahagian besarnya berhubung kait dengan perkongsian pembuatan antarabangsa.

Kata kunci: Perdagangan antarabangsa; perjanjian perdagangan bebas; model graviti; perkongsian pembuatan antarabangsa; pembuatan Malaysia

INTRODUCTION

In 1993, Malaysia and ASEAN members[1] formed the ASEAN Free Trade Area (AFTA) after the emergence of regional economic integrations — the North American Free Trade Area and the expansion of the European Union (EU). The initiatives of AFTA are to form a foreign direct investment (FDI)-led production base for the global market by eliminating intra-regional tariffs among member countries; goods imported from non-member countries however, are based on each member's external tariffs (Ministry of International Trade and Industry (MITI) Malaysia 2006). In the 1990s, Malaysia and its neighboring countries each have unilaterally reduced tariffs to attract FDI into the manufacturing sector (Baldwin 2008; Haddad 2007). Favorable government policies, falling transport, information and communication costs, and the rise of China's economy in the 1990s have motivated efficiency-seeking multinational enterprises to invest in the East Asian region, which hence accelerated production sharing and intra-regional trade, particularly in machinery and equipment (Baldwin 2008; Haddad 2007; Urata 2004). A marginal fall in tariffs reduced entire production costs through a magnification effect and accelerated international production sharing due to back-and-forth international transactions across different countries (Yi 2003)[2]. According to Sharma and Chua (2000), the development of AFTA has little economic impact on trade for ASEAN-5 countries — Indonesia, Malaysia, Philippines, Singapore and Thailand — over the period of 1980 to 1995[3].

However, after the failure of World Trade Organization (WTO) Doha Round trade negotiation in 2001, the number of free trade agreements (FTA)[4] in the East Asian region has proliferated from 5 in 2000 to 47 in 2010, and to 81 in 2017 (WTO Regional Trade Agreement 2018). Malaysia's plurilateral FTA–AFTA-plus-one (FTA+1)[5,] have grown from two in 2000 to seven in 2017, together with the emergence of seven bilateral trade agreements (BTA). Figure 1 shows the trend of FTAs signed and in effect for all regions, East Asian region and Malaysia from 1990 to 2018. FTA enables low-cost producers from member countries to optimize the use of resources within a trading bloc by supplying goods at scale economies. However, high-cost producers will be crowded out from the intra-bloc trade for competing goods. Many studies have examined the expansion of intra-regional trade led by FTAs among member countries, but not the extent of FTAs in motivating production sharing activities. Moreover, in the presence of unilateral tariff reduction, the current study also questions the relevance of the growing number of FTAs in expanding Malaysia's production sharing-based bilateral manufactured exports.

The current study contributes to this line of enquiry by focusing on Malaysia's manufactured exports which have been led by resource-based and non-resource-based industries since 1990. Figure 2 shows the expansion of Malaysian manufactured exports largely led by the non-resource-based industry. The exports of non-resource-based industry have moved in tandem with the growth of imported intermediate goods over the period of 1990 to 2016. In 2000, Malaysia's non-resource-based exports accelerated by 4.1 times higher from a low US 13 billion dollar in 1990, and grew by 54 percent to US 104 billion dollar in 2010. Malaysia's non-resource-based industry relies highly on imported inputs for exports which are largely mediated by multinational enterprises (Alavi 1999). As such, intermediate imports are important complementary inputs for production sharing exports. Given Malaysia's participation in production sharing led by unilateral tariffs reduction in the 1990s, this study examines the extent of the growing number of FTAs in determining Malaysia's bilateral manufactured exports at the industry level in general and its relation to international

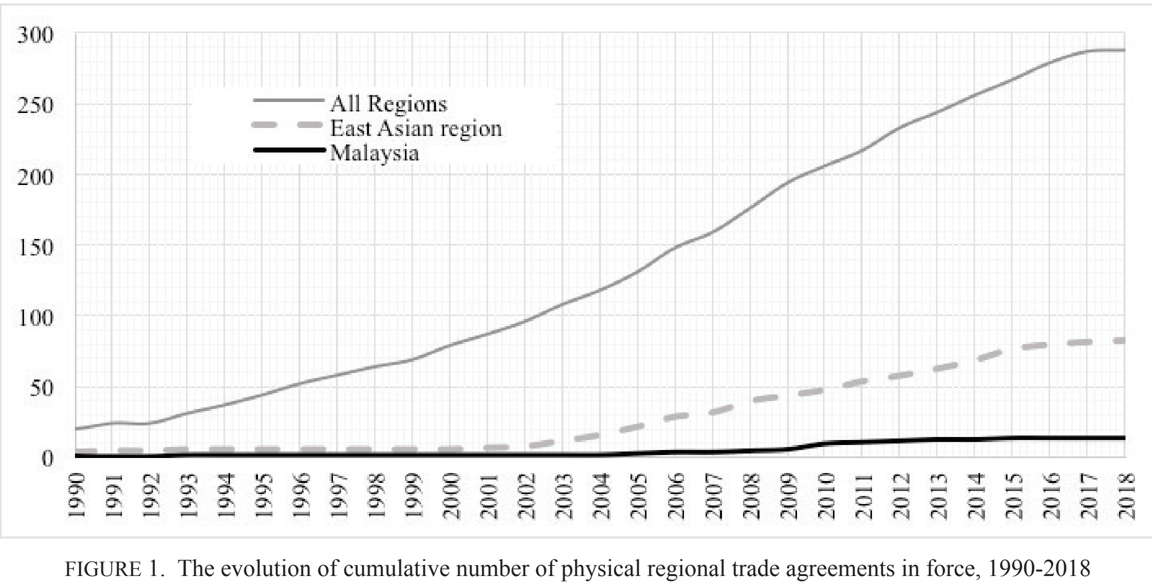

FIGURE 1. The evolution of cumulative number of physical regional trade agreements in force, 1990-2018
Source: WTO Regional Trade Agreements

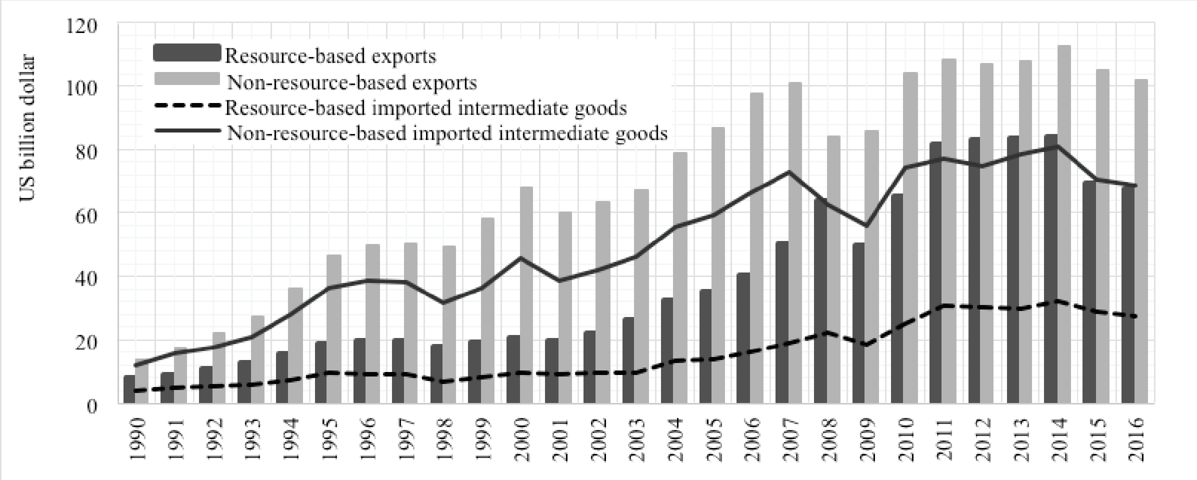

FIGURE 2. Imported intermediate goods and total exports of Malaysian manufacturing industries
Source: Authors' calculation based on OECD STAN database.

production sharing in particular. When dealing with international production sharing, intermediate imports together with exporting country's value added (national income) should be used as proxies of production capacity of exported goods as the value of exports is measured in gross value (Baldwin & Taglioni 2013). Neglecting intermediate imports as an explanatory variable may cause omitted variable bias. To address this research gap, this study includes imported intermediate inputs as an explanatory variable in Bergstrand and Egger's (2007) trade-based gravity equation model, and includes interaction terms of imported inputs-and-FTA dummies to examine the extent of bilateral manufactured exports being associated with production sharing activities. FTA dummies are recognized as a weakly exogenous variable as production sharing linked to export expansion motivates the proliferation of FTAs (Baier & Bergstrand 2007). As bilateral trade flows between country-pair tend to be persistent over time, the study employs the dynamic panel system generalized method of moments (SYS-GMM) technique to account for the dynamic process of export variations and eliminate the issues of serial-correlation, heteroskedasticity and endogeneity.

This paper is organized in the following sections. A literature review on the theoretical and empirical studies of FTA and production sharing is first presented, followed by a section on augmented gravity models, data and methodology used in the study. In the subsequent section, the empirical findings based on SYS-GMM technique are reported and discussed. In the final section, key inferences of the findings are summarized.

FREE TRADE AGREEMENTS AND PRODUCTION SHARING

Developing countries in the East Asian region have unilaterally reduced their tariff barriers since the mid-1980s and intensified their tariff-cutting in the late-1990s, especially in parts-and-components (Baldwin 2006). Together with the evolution of information and communication technology (ICT), tariff-cutting facilitated the vertical fragmentation of a production network in the global market which is largely mediated by multinational enterprises. The declining transportation, communication and coordination costs have magnified production sharing activities, drawing on the back-and-forth of international transactions in different countries (Yi 2003). As such, imported goods-in-process or parts-and-components become essential complementary inputs for sequential stages of a production network in different borders, expanding developing countries' exports of manufactured goods. From here, the embodiment of imported inputs in gross value of exported goods inflated the value of exports (Johnson 2014; Koopman et al. 2014). With this, Baldwin (2010, 2016) argued that the fragmentation of production sharing has dampened the comparative advantage of developing countries. Findings by Khalifah et al. (2015) showed that foreign presence in downstream sectors (measured in terms of capital) reduced the productivity of upstream domestic suppliers in the Malaysian electrical and electronic industry due to the industry's heavy reliance on imported material. Scale economies and the degree of vertical integration together with net-import intensity were positively related to technical efficiency in the case of Malaysia's automotive industry (Khalifah 2013). East Asian governments in developing countries opted to liberalize tariffs on parts-and-components to encourage FDI-led production sharing network and intra-regional trade, partly because of competitive pressure for FDI among ASEAN members and scarcity of essential parts-and-components in the domestic market.

Based on Viner's theory of custom union, FTA is a discriminatory trading bloc where tariff barriers are eliminated among member countries, creating an intra-bloc trade by shifting trade from inefficient domestic producers to efficient producers in member countries, but diverting trade from low-cost producers outside the trading bloc to high-cost producers from member countries (Viner 2014). Baier and Bergstrand (2004) revealed that the net welfare gain of forming regional trade agreements increases, (1) the closer the geographical distance between member countries and the greater their remoteness from the rest of the world; (2) the larger and more similar in economic sizes of member countries to gain from intra-industry trade; and (3) the greater the difference in relative factor endowments of member countries relative to that of the rest of the world to benefit from the comparative advantage of Heckscher-Ohlin trade. AFTA was formed by ten ASEAN members over the period of 1993 to 1999, but showed little impact on intra-AFTA trade as the margin between preference tariff rate and applied tariff rate is very minimal, resulting in AFTA's low utilization rate (Baldwin 2006). Machinery and equipment comprise 50 percent share of the intra-AFTA trade due to the very low level of unilateral tariffs imposed on these items among ASEAN members (Baldwin 2006). However, the addition of China into WTO in 2001, together with the formation of ASEAN-China FTA (ACFTA) in 2005, triggered the ASEAN-plus-one FTA with Korea (AKFTA) and Japan (AJCEP) in 2007 and 2008 respectively, which extended to Australia-New Zealand and India in 2010. East Asian governments, particularly of small developing countries, applied the proliferation of FTAs and/or unilateral tariff reduction to avoid the home market magnification effect as their trade barriers are already set at the minimal level (Baldwin 2006). In addition, the institution-led FTAs are a contract between host countries' trade liberalization cum pro-business reform and developed countries' production sharing facilities (Baldwin 2016). The proliferation of bilateral and plurilateral FTAs, together with non-discriminatory unilateral trade liberalization, is largely associated with the fragmentation of production sharing which imposed less incentive to trade diversion (Baldwin 2016). The study by Sheng et al. (2014) showed that the formation of ACFTA is strongly linked to production network which increases intra-bloc trade among members, as well as each member's trade with the rest of the world following bilateral tariff reduction. Devadason (2010) demonstrated no evidence of trade diversion among ASEAN members after China's integration into the ASEAN production network. Lee et al. (2008) showed that the proliferation of the world's regional trading arrangement increased the bilateral exports of Japan and Korea, but there was no evidence of trade diversion for China's bilateral exports. Their empirical finding revealed that AFTA has enhanced Japan's bilateral exports, but has insignificant impact on China's and Korea's bilateral exports based on the dynamic partial adjustment model. Taguchi (2015) revealed that endogenous AFTA-plus-one (AFTA+1) has significant impact on member countries' trade-enhancing and trade-diverting effects using the panel fixed effect model, which may turn up to be insignificant for the overall net effect. Despite these studies, research on the impact of the growing number of FTAs on a member country's bilateral trade flow is still limited.

A tariff reduction between trading countries has a larger impact on bilateral trade among small countries than that among large countries as the multilateral trade resistance effect is relatively small to offset the bilateral trade-enhancing effect (Anderson & van Wincoop 2003)[6]. To avoid omitted variable bias, many studies included country-specific variables to capture the unobserved multilateral trade resistance (Anderson & van Wincoop 2003; Bergstrand & Egger 2013; Head & Mayer 2014).

MODEL, DATA AND ESTIMATION METHOD

MODEL SPECIFICATION AND DATA

Gravity model has been widely used as a workhorse to estimate the effect of FTAs on bilateral trade flows. Trade-based gravity equation model not only relies on trading countries' income and bilateral trade resistance, but also their multilateral trade resistance (Anderson & van Wincoop 2003; Bergstrand & Egger 2013). To examine the impact of FTAs on Malaysian manufactured exports, the current study modified the gravity equation model in Bergstrand and Egger (2007) based on production sharing literature (Hummels et al. 2001) by embedding FTA dummies and imported intermediate goods; this modified equation is written as:

$$\begin{aligned} X^k_{ij,t} = {} & \alpha^k_0 + \alpha^k_1 X^k_{ij,t-1} + \alpha^k_2 Minp^k_{ij,t} + \alpha_3 DEdw_{ij,t} \\ & + \alpha_4 G_{ij,t} + \alpha_5 S_{ij,t} + \alpha_6 D_{ij} + \alpha_7 B_{ij} + \alpha_8 Lang_{ij} \\ & + \textstyle\sum^3_{g=1} \theta_g FTA_{ij,t} + \sum^9_{t=1} \tau_t T_t + \eta_{ij} + \epsilon^k_{ij,t} \qquad (1) \end{aligned}$$

where $X^k_{ij,t}$ is the bilateral exports of k manufacturing industry from Malaysia (i) to its partner country j at year t; $Minp^k_{ij,t}$ is the bilateral intermediate imports of industry k from country j to Malaysia (i) at year t; $DEdw_{ij,t}$ is the difference in relative per capita income between trading countries as a proxy for difference in relative factor endowments at year t; $G_{ij,t}$ is the product of real gross domestic income of trading countries; $S_{ij,t}$ is the similarity of gross domestic product between trading countries; D_{ij} is the geographic distance between trading countries as a proxy for transport costs; B_{ij} is the common border of trading countries; $Lang_{ij}$ is the common language between countries; and T_t refers to time dummies. Additionally, subscript ij indicates country-pair between Malaysia (i) and trading country j (j = 1,…,148); subscript t indicates annual time period by three-year average (t=1990,…,2016); η_{ij} is an unobserved country-pair specific variable; $\epsilon_{ij,t}(\varepsilon_{ij,t})$ is the remaining error term; superscript k denotes Malaysia's manufacturing industry, namely resource-based (*RbI*) and non-resource-based (*Non-RbI*) industries; and subscript g indicates Malaysia's FTAs (g = *BTA*, *AFTA* and *AFTA*+1). The grouping of resource-based and non-resource-based industries as well as a list of Malaysia's bilateral and plurilateral FTAs are shown in Table 1 and Table 2, respectively. The variables' definition and construction as well as data source are presented in Table 3.

Alternatively, to examine the extent of FTAs in expanding Malaysian bilateral manufactured exports based on production sharing among member countries, interaction terms between each FTA dummy variable and imported intermediate goods are embedded in the model and expressed as:

$$X^k_{ij,t} = \beta^k_0 + \beta^k_1 X^k_{ij,t-1} + \beta^k_2 Minp^k_{ij,t} + \textstyle\sum_{g=1}^{3}\phi_g FTA_{ij,t}{*}Minp^k_{ij,t} + \beta_3 DEdw_{ij,t} + \beta_4 G_{ij,t} + \beta_5 S_{ij,t} + \beta_6 D_{ij} + \beta_7 B_{ij} + \beta_8 Lang_{ij} + \textstyle\sum_{t=1}^{9}\tau_t T_t + \eta_{ij} + \varepsilon^k_{ij,t} \qquad (2)$$

TABLE 1. Grouping of resource-based and non-resource-based industries

Code	Description
Resource-based Manufacturing Industries	
D10T12	Food products, beverages and tobacco
D16	Wood and products of wood and cork, except furniture
D17T18	Paper and printing
D19T22	Chemicals, rubber, plastics and fuel products
D23	Other non-metallic mineral products
D31T32	Furniture, other manufacturing
Non-Resource-based Manufacturing Industries	
D13T15	Textiles, wearing apparel, leather and related products
D24T25	Basic metals and fabricated metal products, except machinery and equipment
D26T28	Machinery and equipment
D29T30	Transport equipment

Source: Authors' compilation based on MITI (2006) and OECD Stan database.

TABLE 2. Malaysia's FTAs, 1990-2016

Bilateral FTA: Japan-Malaysia (2006), Malaysia-Pakistan (2008), Malaysia-New Zealand (2010), Malaysia-India (2011), Malaysia-Chile (2012), Malaysia-Australia (2013) and, Malaysia-Turkey (2015). *Plurilateral FTA*: AFTA (1993-1999), ASEAN-China (2005), ASEAN-Korea (2007), ASEAN-Japan (2008), ASEAN-India (2010) and, ASEAN-Australia-and-New Zealand (2010)

Note: ASEAN countries include Brunei, Cambodia, Indonesia, Lao, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam. The year FTAs have been signed and in effect is stated in the parenthesis.

Source: Asia Regional Integration Center, Asian Development Bank (2016).

TABLE 3. Data Source and Variable Construction

Variables	Variable definition and construction	Data source
k	Types of industry, resource-based (*RbI*) and non-resource-based (*non-RbI*) industry	
$ln\mathbf{X}^k_{ij,t}$	Volume of bilateral exports of k from Malaysia i to partner country j, deflated by Producer Price Index Malaysia (PPI) at 2010 price in thousand US dollar	OECD STAN Database
$ln\mathbf{Minp}^k_{ij,t}$	Volume of bilateral imported intermediate goods of k from i to country j deflated by PPI at 2010 price in thousand US dollar	OECD STAN Database
$\mathbf{FTA}_{ij,t}$	A dummy variable of FTA =1 if i and j are members; otherwise, 0 (zero).	ADB
$\mathbf{Y}_i(\mathbf{Y}_j)$	Malaysia's (partner country's) GDP in US dollar at 2010 price.	WDI
$ln\mathbf{G}_{ij}$	Aggregate of Malaysia's and country j's GDPs, where $\mathbf{G}_{ij,t} = \mathbf{Y}_{i,t} + \mathbf{Y}_{j,t}$.	
$ln\mathbf{S}_{ij,t}$	Similarity in economic size of Malaysia and country j, where $\mathbf{S}_{ij,t} = 1 - [(\mathbf{Y}_{i,t}^2 + \mathbf{Y}_{j,t}^2)/(\mathbf{Y}_{i,t} + \mathbf{Y}_{j,t})^2]$.	
$p\mathbf{Y}_i(p\mathbf{Y}_j)$	Malaysia's (or partner country's) per capita GDP in US dollar measured at constant (2010) price.	WDI
ln$\mathbf{DEdw}_{ij}$	Difference in relative factor endowments is proxied by difference in relative per capita GDP, where $\mathbf{DEdw}_{ij} = 1 + [(\mathbf{pY}_i - \mathbf{pY}_j)/(\mathbf{pY}_i + \mathbf{pY}_j)]$.	
$ln\mathbf{RER}_{ij,t}$	Malaysia-to-partner country's real effective exchange rate where ***RER*** refers to local currency against a weighted average foreign currencies deflated by consumer price index at 2010=100.	IFS
$ln\mathbf{D}_{ij}$	Bilateral great-circle distance between major cities of Malaysia and partner country as an indicator of transport costs.	CEPII database
$\mathbf{B}_{ij}$	A binary dummy variable which takes value 1 for a common land border and 0 otherwise, as other indicator of transport costs.	CEPII database
$\mathbf{Lang}_{ij}$	A binary dummy variable which takes value 1 for a common language and 0 otherwise, as a proxy of information and communication costs.	CEPII database

Note: All variables are in natural logarithmic form except for common border, language and FTAs. WDI denotes as World Bank Development Indicator, ADB as Asian Development Bank, and IFS as International Financial Statistics.

The variable imported intermediate goods is applied as a proxy for foreign inputs or goods-in-process for modular production process, with the resulting outputs exported back to the importing country. Hence, the coefficient estimate of $\alpha_2(\beta_2)$ is expected to be positive when dealing with production sharing-based bilateral manufactured exports in equation 1 (equation 2). A negative coefficient estimate suggests imported intermediate goods to be competing inputs for local production. Interaction terms between imported inputs and FTA dummy variable in equation (2) reflect the impact of FTAs on production sharing-based bilateral manufactured exports. The coefficient estimate of ϕ_g is expected to be positive when each FTA dummy variable enhances the production sharing-based bilateral manufactured exports among member countries; a negative coefficient estimate implies a decrease in bilateral manufactured exports from member countries. Similarly, the coefficient estimate of θ_g in equation (1) is expected to be positive when FTA enhances bilateral manufactured exports among members, and negative when FTA discourages bilateral manufactured exports. As such, the impact of FTAs on bilateral manufactured exports is not necessarily related to production sharing activities. Difference in relative per capita gross domestic product (GDP) between Malaysia and its trading countries is applied as a proxy for difference in relative factor endowment. The mathematical expression of difference in relative per capita GDP between countries in Table 3 implies that different levels of per capita GDP of Malaysia relative to that of its trading country have different impacts on bilateral manufactured exports, albeit the difference in absolute value is identical as opposed to applying absolute difference of relative factors in Bergstrand and Egger (2007). This mathematical expression is adapted based on the product quality differences index in Azhar and Elliott (2006). The coefficient estimate of $\alpha_3(\beta_3)$ is expected to be positive when bilateral manufactured exports between countries are led by differences in relative factor endowments due to the use of available and cheaper resources in the domestic market for exports; this is in line with the Heckscher-Ohlin theory of trade. On the other hand, a negative coefficient estimate suggests that the production of exported goods is largely related to cost efficiency led by joint input-characteristics of knowledge-based assets facilitated by multinational enterprises (Markusen 1995).

Aggregate and similarity in economic sizes represent trade potential between trading countries. The increase in aggregate and similarity of economic sizes of trading countries will motivate international production sharing by increasing the number of national and multinational enterprises in country i; hence, both the coefficient estimates of α_4 and α_5 (β_4 and β_5) are expected to be positive. Geographical distance, common border and common language represent bilateral trade resistance between countries. Farther distance between countries increases transport costs and decreases bilateral manufactured exports; hence, the coefficient estimate of $\alpha_6(\beta_6)$ is expected to be negative. When both trading countries have common border and common language, trade impediments between countries will be reduced, increasing bilateral manufactured exports; as such, both the coefficient estimates of α_7 and α_8 (β_7 and β_8) are expected to be positive. To avoid omitted variable of multilateral trade resistance, the current study also accounts for time invariant country-pair fixed effect (η_{ij}) pertaining to geographical, cultural, political and economic differences; time dummies are included in the models to remove cross-sectional correlation among unobserved country-pair effects due to time-related shocks over a given time period (Roodman 2009).

The models are estimated based on unbalanced panel data for 148 world partner countries (see Table 4) over the period of 1990 to 2016 by three-year average[7]. The study uses data from OECD STAN database as it breaks down bilateral trade between countries into country and industry levels, and end-use categories. The statistical summary of variables is shown in Table 5.

TABLE 4. Malaysia's trading country coverage (148 countries)

Aruba, Albania, United Arab Emirates, Argentina, Australia, Austria, Burundi, Belgium, Benin, Burkina Faso, Bangladesh, Bulgaria, Bahrain, Bosnia and Herzegovina, Belarus, Bolivia, Brazil, Brunei Darussalam, Bhutan, Botswana, Central African Republic, Canada, Switzerland, Chile, China, Cote d'Ivoire, Cameroon, Congo, Colombia, Cabo Verde, Costa Rica, Cuba, Cyprus, Czech Republic, Germany, Dominica, Denmark, Dominican Republic, Algeria, Ecuador, Egypt, Spain, Estonia, Ethiopia, Finland, France, Gabon, United Kingdom, Georgia, Ghana, Guinea, Gambia, Greece, Guatemala, Guyana, Hong Kong, Honduras, Croatia, Hungary, Indonesia, India, Ireland, Iran, Iceland, Italy, Jamaica, Jordan, Japan, Kazakhstan, Kenya, Kyrgyzstan, Cambodia, Saint Kitts and Nevis, Korea, Kuwait, Lebanon, Sri Lanka, Lesotho, Lithuania, Luxembourg, Latvia, Macau, Morocco, Moldova, Madagascar, Maldives, Mexico, Former Yugoslav Republic of Macedonia, Mali, Malta, Myanmar, Mongolia, Mozambique, Mauritania, Mauritius, Malawi, Namibia, Niger, Nigeria, Nicaragua, Netherlands, Norway, Nepal, New Zealand, Oman, Pakistan, Panama, Peru, Philippines, Poland, Portugal, Paraguay, Qatar, Romania, Russia, Rwanda, Saudi Arabia, Sudan, Senegal, Singapore, El Salvador, Serbia, Sao Tome & Principe, Suriname, Slovak Republic, Slovenia, Sweden, Swaziland, Seychelles, Syrian Arab Republic, Togo, Thailand, Trinidad and Tobago, Tunisia, Turkey, Chinese Taipei, Tanzania, Uganda, Ukraine, Uruguay, United States, Saint Vincent and the Grenadines, Venezuela, Viet Nam, Yemen, South Africa, Zambia and Zimbabwe

TABLE 5. Summary statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
$\ln X_{ij,t}^{RbI}$	1302	9.583	2.980	–2.030	16.30
$\ln X_{ij,t}^{Non\text{-}RbI}$	1302	9.452	3.184	–2.330	17.14
$\ln Minp_{ij,t}^{RbI}$	1154	7.841	3.566	–3.210	15.26
$\ln Minp_{ij,t}^{Non\text{-}RbI}$	1221	7.793	3.989	–5.340	16.55
$\ln DEdw_{ij,t}$	1296	–0.043	0.675	–2.030	0.670
$\ln G_{ij,t}$	1296	26.483	0.859	25.220	30.46
$\ln S_{ij,t}$	1296	–2.592	1.165	–7.230	–1.390
$\ln D_{ij}$	1332	9.022	0.661	5.750	9.890
B_{ij}	1332	0.027	0.162	0.000	1.000
$Lang_{ij}$	1332	0.047	0.212	0.000	1.000
$BTA_{ij,t}$	1332	0.012	0.109	0.000	1.000
$AFTA_{ij,t}$	1332	0.047	0.211	0.000	1.000
$AFTA{+}1_{ij,t}$	1332	0.063	0.243	0.000	1.000

Note: All variables are expressed in natural logarithm, except for dummy variables. *X*=bilateral manufactured exports; *Minp*=imported intermediate goods; *DEdw*=difference in relative GDP per capita; *G*=sum of GDP; *S*=similarity of GDP; *RER*=relative real effective exchange rate; *D*=geographical distance; *B*=common border; *Lang*=common language; *BTA*=bilateral FTA; *AFTA*=ASEAN FTA; and *AFTA+1*=AFTA-plus-one.

GMM ESTIMATION METHOD

Baier and Bergstrand (2002, 2007) stressed the potential endogeneity of FTA, drawing on unobserved domestic policy-related barriers (omitted variable bias) which tend to reduce bilateral trade between member countries[8] and/or the intense trade relation between countries before the decision of FTA formation (simultaneity). Hence, ignoring the endogeneity issue underestimates the coefficient of FTA. Baier and Bergstrand (2007) found that an endogenous FTA doubled intra-bloc trade after accounting for country-and-time fixed effects in first-differenced panel gravity estimation. Yang and Martinez-Zarzoso (2014) included country-pair and time-varying country fixed effects in a static panel fixed effect model to overcome the endogeneity bias of FTA. Many studies on trade-based gravity equation model propose the Poisson pseudo-maximum likelihood (PPML) technique to deal with the issue of zero-trade flows and cross-sectional heteroskedasticity. Gómez-Herrera (2013) found that, among the various estimation techniques (including PPML), Heckman's two-step sample selection model and the panel fixed effect model show consistent results and reveal high magnitude of regional trade agreement coefficient on bilateral trade flows; however, the panel fixed effect model suffers from measurement errors[9]. Both zero-trade flow and endogeneity bias of FTA dummies have been studied simultaneously in Egger et al. (2011), which found that ignoring endogeneity bias of FTA is more severe than ignoring selection bias into trading (zero-trade flow bias). Accounting for endogenous FTA raises its impact on members' trade by 40 percentage points higher than the effect of assuming for exogenous FTA, while assuming for zero trade flows bias only leads to a difference of 10 percentage points (Egger et al. 2011). As bilateral trade flows between countries tend to be persist over time (Bun & Klaassen 2002; Harris et al. 2012), a dynamic panel SYS-GMM can be a proper econometric tool to estimate the impact of weakly exogenous FTA on production sharing-based bilateral manufactured exports.

Dynamic panel estimation techniques are employed to estimate equations (1) and (2). The pooled ordinary least squares regression model and fixed-effect panel model are not appropriate due to the presence of autocorrelation, heteroskedasticity, lagged-dependent variable and possible weakly exogenous explanatory variables (FTA dummies). First-difference generalized method of moments (FD-GMM) developed by Arellano and Bond (1991) and SYS-GMM extended by Blundell and Bond (1998) allow us to overcome these issues. The GMM estimation methods remove heterogeneous country-pair and time specific effect by taking the first difference of equations (1) and (2). To eliminate the potential endogenous problem and the correlation between the lagged-dependent variable and error term, Arellano and Bond (1991) suggested the differenced lagged-dependent and weakly exogenous variables to be instrumented with their lags in levels by two or more periods, and exogenous variables are served as their own instruments. This method is known as FD-GMM estimation. FD-GMM estimator does not work well in an unbalanced panel as the first differencing will magnify the gap of lagged-dependent variable due to data omission; moreover, important time-invariant explanatory variables (i.e. geographical distance, common land border and common language) will be omitted from the model

(Roodman 2009). Blundell and Bond (1998) note that the level variables are weak instruments for their first differences if they are highly persistent. To eliminate these problems, SYS-GMM estimation includes level and first-differenced equation as a system of equations whereby the level regression is instrumented with lagged first-differenced variables and the first-differenced regression is instrumented with lagged level variables (Bond 2002). The SYS-GMM estimator can be a one-step or two-step estimator. The one-step SYS-GMM estimator assumes error terms to be independent and homoscedastic across countries and over time, while the two-step estimator uses the estimates of first-differenced residuals to construct variance-covariance matrix, relaxing the assumption of independence and homoskedasticity (Arellano & Bond 1991). The asymptotic standard errors of the two-step GMM estimator have been corrected by Windmeijer (2005) and embodied in STATA program using *xtabond2* command (Roodman 2009). In light of the econometric issues, this study adopted the two-step SYS-GMM estimation in the analysis. The results of one-step SYS-GMM estimation as well as exogenous FTA dummies are reported for comparison.

The consistency of GMM estimation methods depends on the validity of the instruments used in the estimation. Tests for first-order and second-order serial correlation in disturbances of first-differenced equation are applied to examine the consistency of coefficient estimates (Baltagi 2013). This study expects not to reject the Hansen test of over-identification restriction. To imply no second-order serial correlation in disturbances, the study does not reject the second-order serial correlation (AR2).

EMPIRICAL FINDINGS

Table 6 presents the regression results of bilateral exports of Malaysian non-resource-based manufacturing industry based on equation (1) in columns (1), (2), (5) and (6) with no interaction terms, and based on equation (2) in columns (3), (4), (7) and (8) with interaction terms. The results were estimated based on exogenous FTA dummies from column (1) to column (4), and endogenous FTA dummies from column (5) to column (8), using one-step and two-step SYS-GMM estimations. The results with weakly exogenous FTA dummies raised the impact of both FTA dummies in equation (1) and interaction terms of imported inputs-and-FTA dummies in equation (2) on bilateral manufactured exports, as compared to the results with strictly exogenous FTA dummies; this finding is consistent with the endogeneity of FTA found in Baier and Bergstrand (2002, 2007). Table 7 shows similar results of bilateral exports of Malaysian resource-based manufacturing industry, but the impact of FTA dummy in equation (1) and its interaction term with imported-inputs in equation (2) show insignificant results. The two-step SYS-GMM estimation in this dynamic panel data analysis was more efficient than the one-step estimation because of the optimized use of weighting matrices (Blundell & Bond 1998), and that the asymptotic standard error has been corrected (Windmeijer 2005).

The diagnostic tests reported in both tables suggest the appropriateness of the GMM estimation. The Hansen tests did not reject the validity of over-identifying restrictions, and hence, the instruments are concluded to be valid. The serial correlation tests failed to reject the null hypothesis of no second-order serial correlation, but rejected the null hypothesis of no first-order autocorrelation. Hence, the first-differenced errors did not suffer from autocorrelation issues. The results show that bilateral exports of Malaysian manufacturing industry is persistent over time. The current exports of Malaysian manufactured products depend on their occurrence in the past. The coefficient estimate of lagged-export variable for all manufactured exports is positive and significant at the 1 percent level. Malaysia's resource-based manufactured exports have relatively high persistency with coefficients of 0.739 and 0.742 in equations (1) and (2) respectively, while the coefficients of non-resource-based exports are 0.434 and 0.453 in equations (1) and (2) respectively. The regression results of the bilateral manufactured exports are in line with the trade-based gravity equation model, where market sizes and bilateral distance between trading country-pairs are important determinants. However, non-resource-based manufactured exports are more responsive to both aggregate and similarity in economic sizes as well as bilateral distance between Malaysia and its partner country, as compared to the responsiveness of resource-based manufactured exports. The coefficient estimate of aggregate economic sizes for non-resource-based exports is close to unity, suggesting the importance of trade potential between trading countries.

The regression results in Table 6 show evidence of non-resource-based industry's participation in international production network. Imported inputs have positive impact on the bilateral exports of non-resource-based industry at the 1 percent level of significance. This suggests that imported inputs are important complementary inputs for the modular production process, with the resulting output exported back to the partner country. Using the authors' calculation based on OECD STAN database, 63 percent of Malaysian total manufactured exports are traded in the form of intermediate goods over the period of 1990 to 2016. Differences in relative factor endowments have negative impact on bilateral manufactured exports at the 10 percent level, suggesting that the production of exported goods is largely related to joint-inputs of knowledge-based assets facilitated by multinational enterprises (Markusen 1995). In addition, the results show that converging economic sizes and relative factor endowments between trading countries motivate bilateral non-resource-based

TABLE 6. The influence of FTAs on non-resource-based manufactured exports, Malaysia

	Exogenous FTAs				Weakly Exogenous FTAs			
	(1) One-step	(2) Two-step	(3) One-step	(4) Two-step	(5) One-step	(6) Two-step	(7) One-step	(8) Two-step
$\ln X_{ij,t-1}^{Non\text{-}RbI}$	0.471***	0.442***	0.472***	0.459***	0.466***	0.434***	0.474***	0.453***
	(0.073)	(0.083)	(0.080)	(0.080)	(0.069)	(0.080)	(0.076)	(0.085)
$\ln Minp_{ij,t}^{Non\text{-}RbI}$	0.072***	0.082***	0.073***	0.078***	0.070***	0.075***	0.070***	0.069***
	(0.019)	(0.021)	(0.020)	(0.020)	(0.019)	(0.021)	(0.020)	(0.021)
$BTA_{ij,t}*lnMinp_{ij,t}^{Non\text{-}RbI}$			0.011	0.013			0.018	0.031**
			(0.012)	(0.013)			(0.015)	(0.015)
$AFTA_{ij,t}*lnMinp_{ij,t}^{Non\text{-}RbI}$			0.058***	0.048**			0.068***	0.068***
			(0.021)	(0.019)			(0.021)	(0.024)
$AFTA+1_{ij,t}*lnMinp_{ij,t}^{Non\text{-}RbI}$			–0.004	–0.007			–0.000	–0.009
			(0.006)	(0.006)			(0.009)	(0.012)
$\ln DEdw_{ij,t}$	–0.225**	–0.265**	–0.229**	–0.254**	–0.240**	–0.262*	–0.238**	–0.210*
	(0.107)	(0.116)	(0.111)	(0.116)	(0.108)	(0.138)	(0.109)	(0.126)
$\ln G_{ij,t}$	0.926***	0.895***	0.913***	0.860***	0.939***	0.955***	0.909***	0.920***
	(0.145)	(0.159)	(0.156)	(0.155)	(0.140)	(0.174)	(0.149)	(0.179)
$\ln S_{ij,t}$	0.404***	0.401***	0.401***	0.399***	0.404***	0.403***	0.398***	0.410***
	(0.071)	(0.078)	(0.075)	(0.078)	(0.068)	(0.084)	(0.072)	(0.086)
$\ln D_{ij}$	–0.460***	–0.542***	–0.460***	–0.521***	–0.421***	–0.528***	–0.435***	–0.470***
	(0.120)	(0.125)	(0.121)	(0.118)	(0.123)	(0.149)	(0.119)	(0.145)
B_{ij}	–0.440	–0.546	–0.550	–0.618	–0.650*	–0.739	–0.660*	–0.812
	(0.383)	(0.399)	(0.381)	(0.393)	(0.389)	(0.553)	(0.393)	(0.559)
$Lang_{ij}$	0.432	0.445	0.449	0.467	0.491	0.633	0.479	0.748*
	(0.298)	(0.335)	(0.298)	(0.327)	(0.308)	(0.460)	(0.300)	(0.430)
$BTA_{ij,t}$	0.191	0.228			0.359**	0.347***		
	(0.143)	(0.157)			(0.169)	(0.121)		
$AFTA_{ij,t}$	0.683***	0.588**			1.001***	0.866***		
	(0.256)	(0.239)			(0.265)	(0.300)		
$AFTA+1_{ij,t}$	–0.080	–0.154*			–0.138	–0.187		
	(0.074)	(0.082)			(0.104)	(0.120)		

(*Cont.*) TABLE 6

Constant	–14.806***	–12.966***	–14.644***	–12.482***	–15.443***	–14.565***	–14.789***	–14.435***
	(2.784)	(2.905)	(3.005)	(2.923)	(2.740)	(3.301)	(2.864)	(3.448)
Hansen test	0.325	0.325	0.488	0.488	0.624	0.624	0.684	0.684
Diff-in-Hansen test	0.000	0.000	0.000	0.000	0.228	0.228	0.597	0.597
AR(2)	0.613	0.621	0.613	0.597	0.623	0.630	0.615	0.616
Observations	1,024	1,024	1,025	1,025	1,024	1,024	1,025	1,025
No. of country-pairs	146	146	146	146	146	146	146	146
No of instruments	51	51	53	53	79	79	81	81

Notes: (1) All models are estimated using dynamic panel System GMM estimation (Stata xtabond2 command). (2) Endogenous FTA dummy variables are instrumented with their lags in levels, lagged by two and more periods; while exogenous FTA dummy variables are served as their own instruments. (3) The definition of each variable is reported in Table 3. (4) The estimation is based on year 1990–2016 with three-year average. (5) Significant time dummies are included in the estimation, but are not reported here. (6) Outliers found in the sample data are excluded. (7) Figures in the parentheses are standard errors, except for Hansen, Diff-in-Hansen and AR2 tests which are p-values. (8) ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

manufactured exports that are linked to production sharing, riding on the new trade theory of differentiated products and scale economies (Wang et al. 2010).

The results of bilateral non-resource-based manufactured exports in Table 6 conform to the study's expectation that the growing number of FTAs are specifically associated with production sharing-based bilateral manufactured exports; however, not all signed FTAs that are in effect enhance bilateral manufactured exports. As compared to the results based on exogenous FTA dummies in equations (1) and (2), both BTA and AFTA have increased their impacts on bilateral non-resource-based manufactured exports by about 50 percent higher when assuming FTAs as weakly exogenous variables. Based on the results of equation (1) in column (6), the estimated coefficients of BTA and AFTA are positive and significant at the 1 percent level, while the coefficient estimate of AFTA+1 is insignificant. This implies that BTA and AFTA have enhanced the bilateral exports of Malaysian non-resource-based industry by 41.5 percent ($= e^{0.347} - 1$) and 137.7 percent ($= e^{0.866} - 1$) respectively. The insignificant impact of AFTA+1 reveals that the growing number of AFTA+1 has insignificant effect on the Malaysian non-resource-based exports. The results based on equation (2) in column (8) capture the extent of FTAs' association with production sharing-based bilateral manufactured exports. The interacting FTA dummy with imported intermediate inputs show positive and significant impact on the bilateral manufactured exports among member countries of both BTA and AFTA, but insignificant impact of AFTA+1. This suggests that BTA and AFTA have enhanced the bilateral exports of non-resource-based industry and are largely associated with international production network, which is consistent with the findings of Baldwin (2016). The coefficient estimate of interacting AFTA dummy with imported inputs is more than double than that of the interaction term between BTA dummy and imported inputs. The formation of AFTA has promoted Malaysia's bilateral trade-based production sharing among members, albeit each member has unilaterally reduced its tariff barriers (Baldwin 2008; Haddad 2007). Moreover, the presence of FTAs does not decrease production sharing-based bilateral manufactured exports from non-member countries.

The results in Table 7 show that the growing number of FTAs have insignificant impact on Malaysian bilateral resource-based manufactured exports and their association with production sharing. The bilateral manufactured exports have positive response to the difference in relative factor endowments at the 5 percent level of significance, which shows consistent results based on equations (1) and (2). This implies that Malaysia's resource-based industry has comparative advantage in using domestic resources for exports, which is in line with the Heckscher-Ohlin theory of trade. However, in the presence of FTA dummy variables, imported inputs have positive impact on the production sharing-based bilateral manufactured exports at the 10 percent level of significance and on bilateral manufactured exports in general at the 5 percent level of significance[10]. The growing number of FTAs together with unilateral tariffs reduction have increased competition among neighboring countries for resource-based exports and hence, motivated Malaysia's resource-based industry to import cheaper inputs for exports.

CONCLUSION

This study examined the relevance of the growing number of FTAs in expanding Malaysia's bilateral manufactured exports for a panel data of 148 partner countries over the period of 1990 to 2016 with three-year average. Specifically, this study empirically assessed whether the formation of FTAs enhances production sharing-based bilateral manufactured exports among member countries. The results support the evidence that both BTA and AFTA have expanded Malaysian bilateral non-resource-based manufactured exports, as reflected by the positive and significant coefficients of BTA and AFTA dummies. By interacting each BTA and AFTA dummy with imported inputs, positive and significant interaction terms were observed. This implies that both BTA and AFTA have expanded production sharing-based bilateral exports of non-resource-based manufacturing industry in Malaysia. Although Malaysia has unilaterally reduced its tariff barriers to a low level in the 1990s, BTA and AFTA still play a role in enhancing production sharing activities among member countries. Moreover, the formation of FTAs shows no evidence of decreasing bilateral manufactured exports from non-member countries. The production sharing-based non-resource-based exports can be largely facilitated by multinational enterprises as aggregate and similarity of economic sizes as well as relative factor endowments are important determinants of bilateral manufactured exports. The low tariffs and the proliferation of FTAs encourage multinational enterprises to locate their production facilities within ASEAN countries for cost efficiency. However, with AFTA+1, Malaysia does not suffer from decreasing bilateral manufactured exports from its member countries due to competition within intra-bloc trade. Malaysia's bilateral resource-based manufactured exports follow the pattern of conventional trade theory as supported by the positive and significant difference in relative factors. The growing number of FTAs do not expand the bilateral manufactured exports, but encourage resource-based industry to source cheaper imported inputs for exports. These conclusions are valid as the dynamic nature of bilateral manufactured exports, time dummies and unobserved country-pair specific effects are embodied in the gravity model using panel SYS-GMM estimator.

TABLE 7. The influence of FTAs on resource-based manufactured exports, Malaysia

	Exogenous FTAs				Weakly Exogenous FTAs			
	(1) One-step	(2) Two-step	(3) One-step	(4) Two-step	(5) One-step	(6) Two-step	(7) One-step	(8) Two-step
$lnX_{ij,t-1}^{RbI}$	0.764***	0.762***	0.734***	0.726***	0.745***	0.739***	0.742***	0.742***
	(0.077)	(0.075)	(0.082)	(0.073)	(0.080)	(0.069)	(0.080)	(0.074)
$lnMinp_{ij,t}^{RbI}$	0.026*	0.027*	0.032**	0.037**	0.027*	0.031**	0.027*	0.030*
	(0.015)	(0.015)	(0.015)	(0.015)	(0.014)	(0.015)	(0.014)	(0.016)
$BTA_{ij,t}*lnMinp_{ij,t}^{RbI}$			0.014*	0.015			0.009	0.014
			(0.008)	(0.010)			(0.010)	(0.018)
$AFTA_{ij,t}*lnMinp_{ij,t}^{RbI}$			0.002	-0.003			0.000	0.010
			(0.014)	(0.016)			(0.015)	(0.028)
$AFTA+1_{ij,t}*lnMinp_{ij,t}^{RbI}$			-0.001	0.001			0.010**	0.006
			(0.004)	(0.004)			(0.004)	(0.007)
$lnDEdw_{ij,t}$	0.134***	0.123***	0.121***	0.121**	0.135***	0.119**	0.132***	0.118**
	(0.039)	(0.043)	(0.043)	(0.052)	(0.041)	(0.053)	(0.042)	(0.056)
$lnG_{ij,t}$	0.348**	0.326**	0.378**	0.361***	0.380**	0.353***	0.387**	0.348**
	(0.143)	(0.135)	(0.147)	(0.134)	(0.147)	(0.131)	(0.148)	(0.140)
$lnS_{ij,t}$	0.154**	0.148**	0.174***	0.166***	0.170***	0.162***	0.170***	0.158***
	(0.060)	(0.057)	(0.062)	(0.059)	(0.062)	(0.054)	(0.062)	(0.056)
lnD_{ij}	-0.294**	-0.322**	-0.340**	-0.347**	-0.328**	-0.324**	-0.323**	-0.319**
	(0.130)	(0.138)	(0.142)	(0.140)	(0.137)	(0.135)	(0.135)	(0.145)
B_{ij}	-0.049	-0.042	-0.079	0.003	-0.032	-0.073	-0.088	-0.121
	(0.130)	(0.137)	(0.174)	(0.198)	(0.146)	(0.219)	(0.169)	(0.258)
$Lang_{ij}$	0.029	-0.013	0.045	-0.036	0.016	0.037	0.028	0.038
	(0.076)	(0.091)	(0.091)	(0.123)	(0.088)	(0.113)	(0.093)	(0.124)
$BTA_{ij,t}$	0.170*	0.185*			0.102	0.197		
	(0.091)	(0.106)			(0.121)	(0.190)		
$AFTA_{ij,t}$	-0.018	-0.054			-0.088	0.063		
	(0.130)	(0.144)			(0.158)	(0.300)		
$AFTA+1_{ij,t}$	0.067*	0.054			0.158***	0.102		
	(0.037)	(0.037)			(0.055)	(0.084)		

(*Cont.*) TABLE 7

Constant	-3.873*	-2.987*	-3.766*	-3.235*	-4.199**	-3.481*	-4.398**	-3.437*
	(1.977)	(1.749)	(1.989)	(1.783)	(2.037)	(1.869)	(2.078)	(1.945)
Hansen test	0.315	0.315	0.381	0.381	0.871	0.871	0.863	0.863
Diff-in-Hansen test	0.207	0.207	0.262	0.262	0.663	0.663	0.695	0.695
AR2	0.973	0.983	0.941	0.944	0.966	0.958	0.957	0.960
Observations	968	968	971	971	968	968	968	968
No. of country-pairs	142	142	142	142	142	142	142	142
No of instruments	52	52	50	50	80	80	80	80

Notes: (1) All models are estimated using dynamic panel System GMM estimation (Stata xtabond2 command). (2) Endogenous FTA dummy variables are instrumented with their lags in levels, lagged by two and more periods; while exogenous FTA dummy variables are served as their own instruments. (3) The definition of each variable is reported in Table 3. (4) The estimation is based on year 1990–2016 with three-year average. (5) Significant time dummies are included in the estimation, but are not reported here. (6) Outliers found in the sample data are excluded. (7) Figures in the parentheses are standard errors, except for Hansen, Diff-in-Hansen and AR2 tests which are p-values. (8) ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

The results have several implications. Firstly, FTA dummies are weakly exogenous. The growing number of FTAs happened after the rapid expansion of production sharing-based bilateral non-resource-based manufactured exports in the 1990s due to Malaysia's unilateral tariff reduction and pro-FDI business strategy. Hence, any study that serves FTA as a strictly exogenous variable may yield misleading conclusions. Secondly, the empirical results showed the support of FTAs for the production sharing-based manufacturing industry. For countries involved in plurilateral FTAs, competition will be intensified within intra-bloc trade and as a result, inefficient producers from member countries will be diverted from trade while efficient producers can have access to a greater market. Hence, the formation of plurilateral FTAs such as AFTA+1 does not assure net export-enhancing effect among member countries. Finally, this study's results suggest that BTA and AFTA promote bilateral manufactured exports among member countries for production sharing-based manufacturing activities in the presence of unilateral tariffs reduction among ASEAN members. In this regard, further research may be needed to include the effective tariff rate of protection in the model.

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NOTES

1 Malaysia's Southeast-Asian neighboring countries which joined AFTA were Brunei Darussalam, Indonesia, Philippines, Singapore and Thailand formed AFTA in 1993, and was followed by Vietnam in 1995, Lao PDR and Myanmar in 1997 and Cambodia in 1999 (MITI Malaysia 2018).

2 The more the modular production network being located across different borders, the larger the magnified effect of a reduction in tariffs (Yi 2003).

3 This has been supported by Baldwin (2008) about the low utilization of AFTA's common effective preferential rate, which is partly due to the delay of administrative costs when applying for preferential access and the advantages of export duty exemption such as warehouse facilities and duty-free processing zones.

4 This refers to the FTAs that are signed and in effect.

5 ASEAN members have extended AFTAs with each developed country – Japan, South Korea and Australia-New Zealand as well as each large emerging country – China and India in the mid-2000s and beyond (MITI Malaysia 2018).

6 A reduction in tariffs barriers will lowers the trading countries' multilateral trade resistance as price of importing country become cheaper, causing an increase in imports from other countries and decreases their bilateral trade balance; and, tariff reduction causes exporting country to reduce its export price and hence, decrease in their bilateral trade balance; Thus, a lower multilateral trade resistance effect will offset the trade-enhancing led by tariff reduction between trading countries (Bergstrand and Egger, 2013).

7 The way of calculating 3-year period of a variable is based on the average value of three-year period. For instance, the 3-year average export values for 1990-1992 = $(X_{1990}+X_{1991}+X_{1992})/3$; while, for FTA dummy variable, if Malaysia and its partner country involve in trade agreement within the three-year period, then the dummy value is considered as 1, otherwise 0.

8 See Baier and Bergstrand (2007, p.6).

9 Refer to Table 2 in Gómez-Herrera (2013).

10 As compared to the results with exogenous FTAs in Table 3, the coefficient estimates of imported inputs are generally significant at the 10 per cent level. Its relation to production sharing linked bilateral exports is minimal.

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Pai Wei Choong*
Department of Economics and Finance
Sunway University Business School
Selangor, MALAYSIA
E-mail: pwchoong@sunway.edu.my

Noor Aini Khalifah
Faculty of Economics and Management
Universiti Kebangsaan Malaysia
Bangi, MALAYSIA
E-mail: na.khalifah@gmail.com

Abu Hassan Shaari Md Nor
Faculty of Economics and Management
Universiti Kebangsaan Malaysia
Bangi, MALAYSIA
E-mail: ahassan@ukm.edu.my

Mohd Adib Ismail
Faculty of Economics and Management
Universiti Kebangsaan Malaysia
Bangi, MALAYSIA
E-mail: mohadis@ukm.edu.my

* Corresponding author