THE DETERMINANTS OF VERTICAL INTRA-INDUSTRY TRADE IN SITC 8: THE CASE OF ASEAN-5 AND CHINA

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ABSTRACT

Vertical intra-industry trade (VIIT) has become increasingly important in Asia resulting from the rapid development of regional production network. China, endowed with abundance of labor has emerged as the regional and global manufacturing powerhouse. The dynamic changes of trade networking have reinforced ASEAN-5’s desire to boost the development of VIIT with China in manufactured products. As such, the objective of this study is to identify the determinants for VIIT between ASEAN-5 and China in miscellaneous manufacturing sector (SITC 8). After computing VIIT indices using the decomposition type threshold method, the indices were subjected to panel data analysis using spatial panel model. The econometric results show that trade openness is the significant determinant of VIIT. The results also confirm the presence of spatial interaction effects among ASEAN-5 countries as SVIIT (spillover effects of VIIT) is significant. These suggest that ASEAN Economic Community and China-ASEAN Free Trade Area can be the appropriate platform to promote VIIT in SITC 8.

JEL Classifications: F12, F14, C33, C43

Keywords: Vertical Intra-Industry Trade, Labor-Intensive Manufactured products, Spatial Panel Model

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INTRODUCTION

After the 1997 Asian Financial Crisis, the trade between ASEAN and Asia, particularly China had increased and the dependency on trade with the United States (US) market was diluted. During the nineties, China’s continuous open door policies, coupled with abundant labor had attracted tremendous inflow of foreign direct investment (FDI) (Eichengreen and Tong, 2006). The inflow of FDI into China had led to the increase in two-way trade of intermediate and final goods in the same industries between China and her neighbors leading to the formation of production networks in Asia as part of the global production networks (Chantasasawat et al., 2004). China ascension to WTO in December 2001 had further increased the reliability of China as a supplier to international
markets and reduced the risk premium of investment within China (Zhang, 2008). China has now emerged as the regional and global manufacturing powerhouse. Vertical intra-industry trade (VIIT) in manufacturing products, which is attributable to production fragmentation, plays the pivotal role in bilateral trade between China and her trading partners. Manufactured products contributed more than 80% to the total trade between East Asia and China in 2006-2007 (Athukorala, 2011) while processing exports and imports contributed 50-55% and 40-45% respectively to China’s total trade (Koopman et al., 2008). Interestingly, China’s imports were mainly from Asian countries. Half of the imported goods were intermediate goods for reprocessing and assembly, which were then sold to foreign markets (The Economist, 2009).

Previous studies on bilateral intra-industry trade in Asia were focused mainly on machinery and electrical products (Yong et al., 2013; Fukao, Ishito and Ito, 2003; Hurley, 2003; Ando, 2006, Tong and Lim, 2009 and Wong and Chan, 2003). Bilateral intra-industry trade on traditional labor-intensive manufactured products is not widely studied. Athukorala (2012) found the share of labor-intensive manufactured products has increased strikingly in Asian regional trade and despite the onset of 2008 global economic crisis, the exports of traditional labor-intensive manufactured products did not decrease significantly (Athukorala, 2011). This reflects the sustainability of these products. Chin et al. (2013) had earlier identified for each ASEAN-5 countries the niches in SITC 8 using decomposition type threshold method.

This study, which does not stop at trade decomposition, aims to fill in the gap of the current literature by identifying econometrically, the determinants of VIIT between ASEAN-5 and China in the miscellaneous manufacturing sector (SITC 8) using spatial panel model. SITC 8 is chosen as this manufacturing sub-sector encompasses most of the traditional labor-intensive manufactured products, the trade of which appears sustainable. ASEAN-5 is selected in this study instead of all ASEAN countries as there is limited data availability for Brunei and CMLV. This paper is organized as follows: Section 2 presents the analysis of bilateral trade between ASEAN-5 and China; Section 3 contains the literature review on intra-industry trade; Section 4 describes the methodology used in this study; Section 5 presents the empirical results and Section 6 concludes the paper.

THE ANALYSIS OF BILATERAL TRADE BETWEEN ASEAN-5 AND CHINA

The US, European Union and Japan were the major trading partners of ASEAN in the early nineties (Zhang and Hock, 1996). China’s share in ASEAN’s total trade then remained insignificant and was only 2.06% and 2.15% in 1993 and 1994, respectively (ASEAN Statistical Yearbook, 2003). China was an exporter of labor-intensive manufactured products and competed strongly with ASEAN countries, which have similar comparative advantage in similar types of commodities (Liu and Luo, 2004). The similar comparative advantages between ASEAN and China also limit their mutual absorptive capacity for each other’s products (Zhang and Hock, 1996).

The 1997 Asian Financial Crisis caused severe recession and trade contraction in ASEAN. The export of ASEAN to her largest trading partner, the US, dropped by 7.7% in 1998. On the other hand, China was willing to assist ASEAN during the crisis (Tong and Lim, 2009). The total export of ASEAN to China surged by 0.4% from 1997 to 1998 (ASEAN Statistical Yearbook, 2003). Since then, ASEAN promoted intra-regional trade
vigorously and subsequently causing their bilateral trade to increase significantly in the nineties. Following the ascension of China to WTO in December 2001, China has further liberalized her trade, partly contributing to the drastic rise in the bilateral trade between ASEAN and China in the 2000s. ASEAN-China trade rocketed to USD231 billion in 2008 from USD78 billion in 2003, at 24% annually (Hong Kong Trade Development Council, 2010). Since 2009, China has become the largest trading partner of ASEAN (ASEAN Statistical Yearbook, various years).

Trade between ASEAN-5 and China lean towards manufactured products, which contributed the rise from 55.9%, 55.6%, 55.5%, 58.7% and 62.2% in 1993 to 46.4%, 73.4%, 75.9%, 85.4% and 75.6% in 2000 for Indonesia, Malaysia, Philippines and Thailand respectively (UN COMTRADE database). With the exception of Singapore, the trade share of manufactured products for the rest of ASEAN-5 countries (Indonesia, Malaysia, Philippines and Thailand) further elevated to 60.3%, 82.6%, 82.8% and 82.6% in 2012. For Singapore, the already high trade share dropped marginally to 84.9% (UN COMTRADE database).

**FIGURE 1. BILATERAL TRADE BETWEEN EACH ASEAN-5 COUNTRY AND CHINA FOR SITC 8 DURING 1993-2012**

![Figure 1](image-url)

Source: UN Comtrade Database

Figure 1 portrays the bilateral trade volume between each ASEAN-5 country and China for SITC 8 from 1993 to 2012. The growth rates of bilateral trade between ASEAN-5 countries and China in SITC 8 are in line with the rising trend of bilateral trade between ASEAN-5 and China in manufactured products. The multi fold increases point towards more prominent roles of SITC 8 products in their trade relations.
LITERATURE REVIEW ON INTRA-INDUSTRY TRADE

Ample empirical studies have shown that intra-industry trade has been expanding over time (Grubel and Lloyd, 1971; Lancaster, 1980; Falvey, 1981; Krugman, 1981; Greenaway and Milner, 1983; Balassa and Bauwens, 1987; Tharakan and Kerstens, 2005; Fontagne and Freudenberg, 1997; Hu and Watkins, 1999; Fontagne, Freudenberg and Gaulier, 2005; Zhang, Witteloostuijn and Zhou, 2005; Turkcan, 2010; Ito and Okubo, 2011). Ando (2006) further pointed out that the equalization of the composition of exported and imported goods has converged in the East Asian region, signalling the increasing importance of intra-industry trade in this region. In light of the above, intra-industry trade (IIT) had received increasing attention in trade literature as traditional trade theories can no longer accommodate the new trade patterns that arose (Lancaster, 1980). Intra-industry trade can be further divided into horizontal intra-industry trade and vertical intra-industry trade. According to Fukao, Ishido and Ito (2003), vertical intra-industry trade dominated intra-industry trade in East Asia with the percentage of intra-industry trade in some ASEAN countries, i.e. Malaysia, Singapore and the Philippines higher than more developed countries such as Korea and Japan. In line with the findings of Fukao, Ishido and Ito (2003), Hurley (2003) also found that intra-industry trade, particularly vertical intra-industry trade have been growing and became crucial for ASEAN.

The determinants for IIT have been widely studied (Lancaster, 1980; Krugman, 1979 and 1981; Helpman, 1981; Falvey, 1981; Caves, 1981; Balassa and Bauwens, 1987 and 1988; Bergstrand, 1990; Greenaway, Milner and Elliott, 1999; Hu and Ma, 1999; Kimura and Ando, 2003; Schott, 2003; Fukao, Ishido and Ito, 2003; Ando, 2006; Xing, 2007; Turkcan, 2010; and Andresen, 2010). The impact of the determinants varies depending on the nature of whether the intra-industry trade is horizontal or vertical. Some previous studies showed that FDI is the most important determinant of vertical intra-industry trade (Balassa and Bauwens, 1987 and1988; Kimura and Ando, 2003; Fukao, Ishido and Ito, 2003; Hurley, 2003; Zhang and Li, 2006; Ando, 2006; Xing, 2007; Turkcan, 2010 and Turkcan and Ates, 2011). Other significant determinants of vertical intra-industry trade include difference in market size, trade openness, GDP per capita, distance, economics of scales and product differentiation.

METHODOLOGY

This study employs the decomposition-type threshold method developed by Fontagne and Freudenberg (1997) to compute the VIIT indices between each ASEAN-5 country and China. The computed VIIT indices were used as the dependent variable in the econometric model. Based on this method, the intra-industry trade (IIT) indices in SITC 8 between each ASEAN-5 country and China are computed first in order to identify the extent of trade overlap in each product of this manufacturing sub-sector. The trade of a product is classified as intra-industry if the smaller trade value (either exports or imports) of the product is at least 10% or more of its larger trade value (either exports or imports), which serve as the evidence of significant simultaneous exports and imports. The formula used to identify the presence of IIT for each product is as follows:
Min \left(\frac{X_{ACsit}M_{ACsit}}{X_{ACsit}M_{ACsit}}\right) \geq 0.1 \tag{1}

where $X_{ACsit}$ represents each ASEAN-5 country, A, exports of product S of SITC 8 to China, C, at period t while $M_{ACsit}$ represents each ASEAN-5 country, A, imports of product S of SITC 8, from China, C, at period t. Furthermore, VIIT involved a substantial gap between unit values of exports and imports (Fontagne and Freudenberg, 1997). As such, unit values of exports and imports for each IIT product will be computed by dividing trade value by the corresponding trade quantity. If the difference between the unit values of exports and imports is greater than 25%, it is considered a VIIT product. The following equations with dispersion factor of 25% are used to decompose IIT products into VIIT products:

$$UV_{ACsit}^{X}/UV_{ACsit}^{M}>1.25$$ \tag{2}

$$UV_{ACsit}^{X}/UV_{ACsit}^{M}<1/1.25$$ \tag{3}

where $UV_{ACsit}^{X}$ represents unit value of product S of SITC 8, exported to China, C, by each ASEAN-5 country, A, at time t and $UV_{ACsit}^{M}$ represents unit value of product S of SITC 8, imported from China, C, by each ASEAN-5 country, A, at time t.

Based on the analysis above, the aggregate of the VIIT indices between each ASEAN-5 country and China in SITC 8 can be calculated for each year. The formula to compute aggregate VIIT indices for each year is expressed as follows:

$$S^{VIIT} = \frac{\sum_{t=1}^{n}(X_{ACsit}+M_{ACsit})^{VIIT}}{\sum_{t=1}^{n}(X_{ACsit}+M_{ACsit})^{IIT}}$$ \tag{4}

where $S^{VIIT}$ refers to VIIT index.

We adopted the spatial panel model to identify the determinants that enhanced the VIIT relationship between ASEAN-5 countries and China in SITC 8. Spatial panel model is appropriate for this study as intra ASEAN-5 trade have been increasing substantially after the formation of AFTA in 1993 (ASEAN Statistical Yearbook, 2003). We strongly believed that the existence of spillover effects among ASEAN-5 countries is present. Fixed effects are used in this study as Xing (2007) noted that the estimators of fixed effects are able to produce unbiased estimation if the unobserved variables are correlated with the regressors. Furthermore, this study analyzes the VIIT between ASEAN-5 and China, each cross sectional unit (each ASEAN-5 country) has its own fixed intercept value, and therefore fixed effect is more appropriate than random effect. The computed VIIT indices will serve as the dependent variable in the econometric model. Meanwhile, ASEAN-5’s FDI in China (thereafter, FDI), differences in GDP between each ASEAN-5 country and China (thereafter, DGDP), trade openness (thereafter, TO) and spatial interaction effect of VIIT (thereafter, SVIIT) will serve as the explanatory variables. The explanatory variables are taking on board in line with the
theoretical requirements of production fragmentation theories and the findings of previous studies. Based on theoretical expectation, the coefficient of FDI will have a positive sign if the motive of ASEAN-5’s FDI in China is efficiency seeking and the processing trade attributable to production fragmentation is actively taking part (Xing, 2007; Turkcan, 2010 and Thorbecke and Smith, 2010). DGDP, which serve as the proxy for the difference in market sizes between the trading partners, is expected to have a negative sign (Grossman and Helpman, 2005). The production fragmentation theory postulates that the production processes are divided into a few sequential stages in different countries. Therefore, if the market size between the two trading partners is similar and less divergent, trade coordination work can be carried out more smoothly, thereby reducing the service linked cost (Kimura and Ando, 2005, Grossman and Helpman, 2005). Besides, Carbaugh (2009, p.9) pointed out that trade openness serves as an indicator on how important international trade is to a country’s economy while Xing (2007) revealed that trade openness is the proxy of trade liberalization. Hence, it is expected that VIIT can be stimulated if the trade between ASEAN-5 countries and China is more liberalized (Falvey, 1981). On the other hand, according to Tran (2010), distance is not considered as one of the important variables as geographic attributed as being neighboring countries are assumed to be the primary reason for the establishment of CAFTA (China –ASEAN Free Trade Area). Furthermore, Eicheengreene et al. (2004) also revealed that distance is not powerful when explaining trade with neighboring countries. Besides, Dees (2001) as cited by Agnes and Ahima, 2003) noted that only ordinary trade is sensitive to exchange rate changes while Xing (2011) and Tharbecke (2010) revealed that the impact of exchange rate has less impact on China’s processing trade. In addition, our preliminary study found that exchange rate and GDP per capita are not significant in this study. Therefore, distance, exchange rate and GDP per capita which are prevalent in some trade models are not included in this study.

The spatial panel model is divided into three types, namely spatial lag, spatial error and spatial Durbin. Based on Elhorst (2010b), the model that involved spatially lagged dependent variable and/or spatially lagged independent variables is known as spatial lag model while spatial error model contains spatial autoregressive process in the error term. The latest type of spatial panel model, advocated after 2007, is known as spatial Durbin model (Elhorst, 2010a). Spatial Durbin model accounted for both spatially lagged and spatially autocorrelated error terms. Prior to estimation, all of the variables except VIIT and SVIIT are in the form of logarithms. The specification of the spatial lag, spatial error and spatial Durbin models are formulated as follows:

\[ Y_u = \delta \sum_{j=1}^{N} M_{ij} Y_{-j} + \alpha + \beta X + U_i + \varphi + e_u \]  
(5)

\[ Y_u = \alpha + \beta X + U_i + \psi_{it} \]  
(6)

\[ Y_u = \delta \sum_{j=1}^{N} M_{ij} Y_{-j} + \alpha + \beta X + \sum_{j=1}^{N} \varphi M_{ij} X_{ij} + U_i + \varphi + e_u \]  
(7)

where \( Y_u \) represents VIIT for cross sectional unit i (each ASEAN5 country) at time t (i=1... to 5; t=1,...,17). Both \( \delta \) and \( \beta \) refer to spatial autocorrelation coefficient and the coefficient of \( X_i \) respectively. \( X_{ij} \) represents 1xN vector of explanatory variables in the form of X. X include FDI, DGDP and TO. On the other hand, \( M \) is the weight matrix,
which describes the arrangement of the spatial units and measures the spatial interaction among ASEAN-5 countries. The weight matrix can be specified in several ways. This study adopted row standardized contiguity matrix as all ASEAN-5 countries are treated equally under AFTA. The row standardized contiguity matrix is expressed as follows:

$$M_{ij} = \left( \frac{M_{ij}^*}{\sum_j M_{ij}} \right) \tag{8}$$

where $M_{ij}^*$ equals to 1 if $i \neq j$ and $M_{ij}^*$ equals to 0 if $i = j$. Besides, $M_{ij}$ is the $i, j$th element of a prespecified nonnegative NxN spatial weights matrix and $\alpha$ represents constant term parameter. $U_i$ and $\delta_i$ represent the spatial specific effect, which control for each space-specific time-invariant variable and the time-period specific effect, which control for each time-specific spatial-invariant effects respectively. Nevertheless, $e_{it}$ refers to potential heteroskedastic error term while $\gamma_{it}$ represents the error term of unit $i$, which is depends on the error terms of its neighboring unit $j$ at time, $t$ based on spatial weights matrix $M$ and $e_{it}$, $\phi$ from equation 7 refers to the coefficient of $X_{it}$. Meanwhile, both $\sum_{j=1}^{N} \phi M_{ij} X_{ij}$ and $\sum_{j=1}^{N} M_{ij} Y_{ij}$ denote the spatial interaction effect of each explanatory variable (FDI, DGDP, TO) and dependent variable (VIIT) respectively, among ASEAN-5 countries with China.

To normalize the difference of GDP between each ASEAN-5 country and China, the following measurement is adopted:

$$DGDP = \frac{|GDP_C - GDP_A|}{(GDP_C + GDP_A)/2} \tag{9}$$

where $GDP_C$ is the GDP of China while $GDP_A$ is the GDP of each ASEAN-5 country.

Besides, Carbaugh (2009, p.9) noted that the formula to compute TO is as follow:

$$TO = \frac{[Exports_s + Imports_s]}{GDP_A} \tag{10}$$

where Exports$_s$ and Imports$_s$ refer to each ASEAN-5 country’s exports to China and imports from China in SITC 8, respectively.

A selection framework which is divided into two parts, namely specific to general approach and general to specific approach will be carried out to determine whether spatial lag, spatial error or spatial Durbin model is the most appropriate for the data using classic LM test (Elhorst, 2010b). Based on this framework, if both approaches are in favor of either spatial lag or spatial error model, the said model will be adopted to treat the data. Otherwise, if the former approach is favorable to both spatial lag and spatial errors model whereas the latter approach is in favor to spatial Durbin model, then the spatial Durbin model is deemed to be the most appropriate model in treating the data.
Definition and Source of Data

The GDP and FDI data are extracted from CEIC database. Meanwhile, the trade data of SITC 8, with 4-digit code are derived from UN Comtrade Database, SITC Revision 3. The number of products selected for Indonesia, Malaysia, Philippines, Singapore and Thailand are 81, 59, 63, 53 and 98, respectively. All the data are annual statistic from 1993 to 2009.

EMPIRICAL RESULTS

The decomposition results revealed that VIIT indices exhibited a stable and increasing trend between each ASEAN-5 country and China. From Table 1, the average VIIT indices throughout the study period are 0.896, 0.879, 0.919, 0.728 and 0.791 for Indonesia, Malaysia, Philippines, Thailand and Singapore, respectively.

TABLE 1. THE VIIT INDICES BETWEEN ASEAN-5 AND CHINA IN SITC 8

<table>
<thead>
<tr>
<th>Year</th>
<th>Indonesia VIIT</th>
<th>Malaysia VIIT</th>
<th>Philippines VIIT</th>
<th>Singapore VIIT</th>
<th>Thailand VIIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>1.000</td>
<td>0.569</td>
<td>1.000</td>
<td>1.000</td>
<td>0.823</td>
</tr>
<tr>
<td>1994</td>
<td>0.882</td>
<td>0.929</td>
<td>1.000</td>
<td>1.000</td>
<td>0.530</td>
</tr>
<tr>
<td>1995</td>
<td>0.949</td>
<td>0.909</td>
<td>1.000</td>
<td>0.780</td>
<td>0.936</td>
</tr>
<tr>
<td>1996</td>
<td>0.571</td>
<td>0.956</td>
<td>1.000</td>
<td>0.941</td>
<td>0.748</td>
</tr>
<tr>
<td>1997</td>
<td>1.000</td>
<td>0.967</td>
<td>0.978</td>
<td>0.719</td>
<td>0.851</td>
</tr>
<tr>
<td>1998</td>
<td>0.917</td>
<td>1.000</td>
<td>1.000</td>
<td>0.656</td>
<td>0.886</td>
</tr>
<tr>
<td>1999</td>
<td>0.940</td>
<td>0.985</td>
<td>1.000</td>
<td>0.777</td>
<td>0.645</td>
</tr>
<tr>
<td>2000</td>
<td>0.972</td>
<td>0.974</td>
<td>1.000</td>
<td>0.788</td>
<td>0.866</td>
</tr>
<tr>
<td>2001</td>
<td>0.879</td>
<td>1.000</td>
<td>1.000</td>
<td>0.974</td>
<td>0.437</td>
</tr>
<tr>
<td>2002</td>
<td>0.891</td>
<td>0.844</td>
<td>0.550</td>
<td>0.975</td>
<td>0.853</td>
</tr>
<tr>
<td>2003</td>
<td>0.794</td>
<td>0.822</td>
<td>1.000</td>
<td>1.000</td>
<td>0.830</td>
</tr>
<tr>
<td>2004</td>
<td>0.888</td>
<td>0.976</td>
<td>1.000</td>
<td>0.401</td>
<td>0.853</td>
</tr>
<tr>
<td>2005</td>
<td>0.814</td>
<td>0.720</td>
<td>1.000</td>
<td>0.197</td>
<td>0.820</td>
</tr>
<tr>
<td>2006</td>
<td>0.895</td>
<td>0.943</td>
<td>0.740</td>
<td>0.465</td>
<td>0.731</td>
</tr>
<tr>
<td>2007</td>
<td>0.909</td>
<td>0.918</td>
<td>0.784</td>
<td>0.800</td>
<td>0.950</td>
</tr>
<tr>
<td>2008</td>
<td>0.925</td>
<td>0.565</td>
<td>1.000</td>
<td>0.168</td>
<td>0.786</td>
</tr>
<tr>
<td>2009</td>
<td>1.000</td>
<td>0.861</td>
<td>0.578</td>
<td>0.727</td>
<td>0.901</td>
</tr>
</tbody>
</table>

Source: Authors’ Compilation
Note: The data above have been published by the authors in 2013 at Labuan Bulletin of International Business & Finance 11: 42.
The decomposition result is consistent with the findings of Yong et al. (2013), Zhao et al. (2010), Kimura (2006), Fukao et al. (2003) and Hurley (2003) as it confirms that IIT between each ASEAN-5 country and China is prone to processing trade which is attributable to VIIT. This signifies that VIIT is crucial in bilateral trade between each ASEAN-5 country and China. As such, it is noteworthy to identify the determinants of VIIT using spatial econometrics. The results of panel estimation are presented in Table 2 and Table 3.

Table 2 shows the econometric results derived from specific to general approach. From Table 2, the null hypothesis of no spatial lag and no spatial autoregressive process in the error term must be rejected. This implies the presence of spatial interaction effects in the model and therefore spatial Durbin model best describe the data. Besides, the test results pointed to spatial and time-period fixed effects as the two determinants, R^2 of 0.481 and LogL of 62.64 are of the highest value in comparison with the other three specifications. As such, spatial Durbin model with spatial and time-period fixed effects is adopted to carry out the estimation. The econometric estimation results are shown in Table 3.
TABLE 3: ESTIMATION RESULTS OF VIIT BETWEEN ASEAN5 COUNTRIES AND CHINA: SPATIAL DURBIN MODEL SPECIFICATION WITH SPATIAL AND TIME-PERIOD FIXED EFFECTS

<table>
<thead>
<tr>
<th>Determinants</th>
<th>Spatial and Time-period Fixed Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>DGDP</td>
<td>-0.046(-0.331)</td>
</tr>
<tr>
<td>FDI(-1)</td>
<td>0.011(0.694)</td>
</tr>
<tr>
<td>SVIIT</td>
<td>-2.251(-29.478)***</td>
</tr>
<tr>
<td>TO</td>
<td>0.021(4.338)***</td>
</tr>
<tr>
<td>R²</td>
<td>0.969</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.956</td>
</tr>
<tr>
<td>LogL</td>
<td>174.416</td>
</tr>
<tr>
<td>Wald test spatial error</td>
<td>1178.27(p=0.000)***</td>
</tr>
<tr>
<td>LR test spatial error</td>
<td>247.431(p=0.000)***</td>
</tr>
</tbody>
</table>

Notes: Number of observations = 85. t-values are provided in parentheses. Lags are chosen based on AIC and SC and Asterisk ***, ** and * denotes level of significance at 1%, 5% and 10% respectively.

From Table 3, the high value of $R^2$ and adjusted $R^2$, which are 0.969 and 0.956 respectively, indicate the appropriateness of the model specification. To further examine whether spatial Durbin model can be simplified to spatial error model, both Wald test and LR test (general to specific approach) are adopted. Both results of Wald test and LR test simultaneously infer that the spatial Durbin model cannot be simplified to spatial error model at 1% significance level. Hence, the null hypothesis of spatial Durbin model cannot be simplified to spatial error model must be rejected. The results further ascertain that the spatial Durbin model is appropriate for the estimation. This model generalizes both spatially lagged dependent variable and spatially autocorrelated error terms.

Based on the estimation results, SVIIT is the most prominent determinant of VIIT between ASEAN-5 countries and China in SITC 8. It is negative and statistically significant at 1% significance level. This infers the presence of spillover effects of VIIT, and there is intense competition among ASEAN-5 countries in relation to VIIT with China in SITC 8. Such competition should be minimized in order that each ASEAN-5 country can sustain the bilateral VIIT with China in this manufacturing sub-sector.

Besides, the coefficient of TO has the expected theoretical sign and is significant at 1% significance level. Trade openness reduces trading costs and service costs that were needed to link up various locations. Therefore, trade openness provides greater opportunity for production fragmentation and results in greater intensity of VIIT between ASEAN-5 countries and China. This finding is consistent with Zhang and Li (2006) and Yi (2003). With the estimated coefficient TO of 0.021, if trade is liberalized by 1%, the VIIT between ASEAN-5 countries and China will be stimulated by 0.021%. Contrary to the theoretical expectation, the results revealed that both DGDP and FDI are not significant. These findings imply that both variables are not important in determining VIIT between ASEAN5 countries and China in SITC 8 as the products under SITC 8 are mainly traditional labor-intensive products which are less affected by the inflow of foreign direct investment or the changes of market size between trading partners. Additionally, the fragmentation of production processes has occurred to a large extent...
and cross border FDI flows is no longer a necessity for vertical production integration and networking.

CONCLUSIONS

This study aims to identify the determinants of VIIT between ASEAN-5 and China in the miscellaneous manufacturing sector (SITC 8) using spatial panel model. This study found that trade openness plays a significant role in VIIT between ASEAN-5 countries and China. This implies that VIIT between ASEAN-5 countries and China can be stimulated in SITC 8 if the trade in these two regions is further liberalized. As a result, the full implementation of CAFTA since January 2010 might provide a platform to expand the VIIT in SITC 8 between ASEAN-5 countries and China.

Furthermore, the econometric estimation confirms the presence of spatial interaction effects among ASEAN-5 countries in relation to China’s trade. The negative sign of SVIIT shows that ASEAN-5 countries are competing among each other to undertake VIIT with China. To transform the competition into complementation among ASEAN-5 countries, ASEAN Economic Community (AEC) can play a pivotal role. The establishment of AEC with one single market for merchandise, services and factors of production which is estimated to materialize in 2015 will be a good channel for each ASEAN-5 country to leverage their comparative advantage respectively, and as a whole sustain the bilateral trade with China in SITC 8. In light of the importance of AEC, close supervision and monitoring of trade practices and processes are vital in order that the enforcement and implementation of its programs can be carried out effectively.

ENDNOTES

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1 VIIT refer to trade in ‘vertical differentiated’ products within the similar industry distinguished by quality and price (OECD Glossary of of Statistic, 2007).
2 The production processes are divided into a few sequential stages in different countries depending on the differences of factor costs among countries within the same production network.
3 ASEAN-5 is the common and widely accepted abbreviation for the 5 founder members of ASEAN, namely Indonesia, Malaysia, Philippines, Singapore and Thailand.
4 CMLV consists of Cambodia, Myanmar Laos and Vietnam.

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