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The Formation of AFTA and Trade Diversion: Evidence from China's Agricultural Exports*

NGUYEN KHANH DOANH** · JEEHOON LEE*** AND YOON HEO****

This study analyzes the impacts of the formation of AFTA (ASEAN Free Trade Agreement) on China's agricultural exports. The Hausman-Taylor analysis is applied to panel data collected from China and its 68 trading partners from 1993–2012. Our major findings areas follows. First, the discrimination in tariffs imposed by AFTA diverts trade in agricultural products from China toward AFTA's member countries. Second, at the sectoral level, the trade diversion effects of AFTA's formation on China's exports are significant in the case of beverage and tobacco industries. AFTA and China need to focus more on diversifying and differentiating their farming products. To gain better access to AFTA's market, more investment in research and development activities is recommended as a cure for Chinese farmers. Moreover, this study implies that more efforts in reducing tariff and non-tariff barriers to further liberalize trade between China and AFTA could enhance their bilateral trade flows.

Keywords: AFTA, Gravity Model, Trade Creation, Trade Diversion, Hausman-Taylor

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** Associate Professor, Thai Nguyen University, Thainguyn, Vietnam;
E-mail: nkdoanh@yahoo.com

*** Associate Professor, Sejong University, Seoul, Korea; E-mail: petra@sejong.ac.kr

**** Corresponding author, Professor, Sogang University, Seoul, Korea;
E-mail: hury@sogang.ac.kr
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I. INTRODUCTION

The impacts of a trade bloc's formation on trade flows have long been a controversial issue. Some scholars view a regional trade agreement (RTA) as a stepping stone toward global integration since improved trade performance among members of an RTA acts as an impetus for expanding trade to the rest of the world (Ethier 1998). However, scholars on the opposite side hold the view that because of the reduction of tariffs among members, an RTA discriminates against nonmember countries, which hinders deeper economic integration on a global scale (Bhagwati 1995; Krueger 1997). Whether an RTA creates or diverts trade remains an ongoing debate both theoretically and empirically (Koo et al. 2006; Fox et al. 2008).

The past decades have also witnessed an intensive growth in bilateral trade flows between ASEAN countries and China. China has constantly maintained the position of being a large trading partner of ASEAN and vice versa; and the Southeast Asian countries have continuously expanded their export markets in China. The Framework Agreement on Comprehensive Economic Cooperation signed in 2002 between ASEAN and China was to further strengthen the trade relationship between the two sides.

One of the issues that stakeholders are concerned with is whether or not the formation of the ASEAN Free Trade Agreement (AFTA) in 1992 burdens the long-term trade relationship between the two partners when the Common Effective Preferential Tariff (CEPT) was applied within AFTA; the latter had set up a scheme for removing tariffs among ASEAN economies. This study attempts to scrutinize the trade diversion effects of AFTA on China, taking agricultural exports as a case study.

China is one of the largest partners of AFTA countries in the trading of farming products. China's main exports include vegetables, fruits, fishery products, and tobacco, whereas its major imports from AFTA include rubber, vegetable oils and fats, vegetables, and fruits. According to data collected from UN Comtrade, there are some points that should be taken into account in the trading of agricultural products between the two. Since CEPT came into effect in 1993, the annual growth rate of AFTA's imports from China declined dramatically, from 35% to 8.9% within the periods 1988–1992 and 1993–2012, respectively. China used to be a large exporter of farming products to AFTA, accounting for 10.49% of the market in 1988. However, its market share followed a steady downward trend, ending at 7.67% in 2012. China had a low complementarity index¹ in agriculture with AFTA (a value of about 0.02 in 2012), which indicates that China's agricultural export structure is not complementary to AFTA's agricultural import structure.

This study investigates the effects of AFTA on China's agricultural exports.

To do that, we first review theoretical and empirical issues on the effects of a trade bloc's formation on a nonmember country. Based on the estimated empirical results, we will provide the policy implications of our findings.

Unlike other studies analyzing the effects of AFTA on trade with time series or cross-sectional data, this study provides comprehensive insights into the effects of AFTA with panel data over a period of 20 years from 1993–2012. The use of panel data allows for individual heterogeneity (Baltagi 2005) and brings about more efficient outputs. Moreover, although there has been some empirical evidence of the effects of a preferential trade agreement from the perspective of member countries, there appears to be a lack of evidence from nonmember economies. Hence, this study attempts to address this issue by contributing empirical findings from the case of AFTA and one nonmember partner, namely China. Furthermore, to incorporate the advantages and overcome the shortcomings of both the fixed and random effects models, which have been widely used in many studies, we employ a Hausman-Taylor analysis for the panel data.

II. EMPIRICAL ANALYSIS

1. Theoretical Framework

The relationship between a regional trade agreement (RTA) and bilateral trade performance has remained a controversial issue over the past decades. Viner (1950) pioneered studies on the effects of a trade bloc by introducing trade creation and diversion effects. At one extreme, trade creation appears when high cost domestic products from one bloc's member country are replaced by low cost products that are imported from another bloc's member country. At the other extreme, trade diversion exists when low cost products from the rest of the world are replaced by high cost ones from member countries resulting from the reduction in import tariffs among the trade bloc's members.

Following Viner, extensive literature has tried to explain the effects of a regional trade agreement (de Paz et al. 1999; Frankel et al. 1998; Levy 1997). A regional trade agreement can be considered as a "building bloc" that stimulates global economic integration (Ethier 1998). On the contrary, an RTA can be blamed for trade discrimination between member and nonmember countries, which restricts further multilateralism (Bhagwati 1995; Krueger 1997). Theoretically, whether an RTA is creating or diverting trade remains an ongoing debate.

So far, there has been a growing body of empirical evidence on the effects of a regional agreement on trade. Regional trade agreements tend to stimulate trade flows when tariff rates within the bloc are reduced (Susanto et al. 2007; Hassan 2001; Clausing 2010). In some cases, the growth in trade flows among participants may boost their overall income, which in turn increases their demands for imports from outside countries (Koo et al. 2006). In contrast, a variety of studies has

pointed out trade blocs' diversion effects. Romalis (2007) reported that tariff discrimination imposed by members of NAFTA was associated with a decline in their imports from the rest of the world. Jugurnath et al. (2007) discovered the trade diversion effects of RTAs in the cases of APEC, MERCOSUR, and NAFTA.

Generally, a reduction in trade barriers among participants of a regional trade agreement is associated with discrimination between member and non-member economies. To date, there has been no consensus reached among economists, both theoretically and empirically, as to whether a regional trade agreement facilitates or restricts trade flows. Therefore, trade creation and diversion effects can only be determined on a case by case basis.

2. Model

(1) Methodology

We employ a modified gravity model in order to analyze the effects of AFTA on China's agricultural exports. Based on the idea that bilateral trade flows among countries depend on their economic sizes and geo-graphical distances, the gravity model has been widely used in empirical studies on international trade (Medvedev 2010; Ekanayake et al. 2010). The gravity model used in this study has the following specification:

$$\begin{aligned} \ln EX_{ijt} = & \beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln POP_{it} + \beta_4 \ln POP_{jt} \\ & + \beta_5 \ln DIST_{ij} + \beta_6 \ln GDPPC_DIF_{ijt} + \beta_7 ADJ_{ij} + \beta_8 LANG_{ij} \\ & + \beta_9 COL_{ij} + \beta_{10} AFTA + e_{ijt}, \end{aligned} \quad (1)$$

where, at time t ,

EX_{ijt} is China (country i)'s agricultural exports to country j ,

GDP_{it} is China's Gross Domestic Product (GDP),

GDP_{jt} is country j 's GDP,

POP_{it} is China's population,

POP_{jt} is country j 's population,

$GDPPC_DIF_{ijt}$ is the difference in per capita GDP between China and country j .

Additionally,

$DIST_{ij}$ is the geographical distance from China's capital to that of country j ,

ADJ_{ij} is a dummy variable that takes the value of 1 if China and country j share a common border, and 0 otherwise,

$LANG_{ij}$ is a dummy variable taking a value of 1 if China and country j share a common language, and 0 otherwise,

COL is a dummy variable taking a value of 1 if China and country j have a colonial relation, and 0 otherwise,

AFTA is a dummy variable taking a value of 1 if country j is an AFTA member, and 0 otherwise, and e_{ijt} is an error term.

Trade is considered to be positively related to economic size, which is instrumented by GDP. The GDP of an exporting country reflects its capacity to export, while the GDP of importing country reflects its demand for imports (Frankel 1993). Hence, the coefficients on GDP for both China and its trading partners are expected to be positive.

Population can be either a curse or a blessing on trade. At one extreme, a country with a large population could diversify its products to meet domestic demand; therefore, its imports will decline, indicating a negative impact of population on trade (Falvey et al. 2009). At the other extreme, a country with a large population could effectively promote a division of labor, which is known as the economies of scale effect (Oguledo and MacPhee 1994). Therefore, its imports will increase, indicating a positive impact of population on trade.

Geographical distances between countries burden bilateral trade flows because greater distances generate higher transport and information costs, where the latter are charged against trading partners (Sohn 2005). Therefore, β_5 is expected to have a negative sign.

The differences in per capita GDP between China and its trading partners are added to the model to capture the Linder hypothesis, which states that bilateral trade flows tend to be larger between trading partners with a high level of similarity in per capita income (Tang 2003). A negative sign on $GDPPC_DIF_{ijt}$ supports the Linder hypothesis. Otherwise, a positive coefficient reflects the Heckscher-Ohlin hypothesis on factor endowment (Ekanayake et al. 2010).

Adjacency, a common language, and common colonial relationships are factors that contribute to a high volume of trade (Clarete et al. 2003). Consequently, β_7 , β_8 , and β_9 are expected to be positive.

AFTA can either create or divert trade from China. If β_{10} is positive, it means that AFTA's formation is associated with an enhancement in China's agricultural exports. Otherwise, β_{10} will be negative if AFTA induces member economies to import agricultural products from sources within the bloc other than China.

To estimate a gravity model, the fixed and random effects models have been widely used. The fixed effects model allows for country-pair heterogeneity giving each country-pair its own intercept. In addition, the model can reduce potential specification errors caused from omitting important variables. One shortcoming of this model, however, is that time-invariant variables are eliminated.

Unlike the fixed effects model, the random effects model incorporates the differences between cross-sectional entities by allowing the intercept to change; however, the amount of change is random. The advantage of the random effects model is that it uses both time-series and cross-sectional variations. However, the

model assumes that there is no correlation between all the regressors and individual effects.

To incorporate the advantages of both the fixed and random effects models, and to overcome their shortcomings, Hausman and Taylor (1981) introduced a new approach in which both time-variant and time-invariant effects are included into the model. Therefore, in this study, we apply the Hausman-Taylor model.

The Hausman-Taylor model is proposed as follows:

$$y_{it} = \beta_1 x_{1it} + \beta_2 x_{2it} + \delta_1 z_{1i} + \delta_2 z_{2i} + \mu_i + \varepsilon_{it}, \quad (2)$$

where i denotes subgroup $I = 1, \dots, n$ and t denotes time.

Here, x_{1it} and x_{2it} are time-varying while z_{1i} and z_{2i} are time-invariant. The model assumes that x_{1it} and z_{1i} are uncorrelated with μ_i and ε_{it} ; x_{2it} and z_{2i} are correlated with μ_i but not ε_{it} . Temporal means that $\bar{y}_i$, $\bar{x}_i$, and $\bar{\varepsilon}_i$ are created by the time-averaging dependent and explanatory variables, and ε_{it} . Thus, model (2) becomes:

$$y_{it} - \bar{y}_i = \beta_1 (x_{1it} - \bar{x}_{1i}) + \beta_2 (x_{2it} - \bar{x}_{2i}) + (\varepsilon_{it} - \bar{\varepsilon}_i), \quad (3)$$

where $x_{1it} - \bar{x}_{1i}$ and $x_{2it} - \bar{x}_{2i}$ are used as instruments to estimate β_1 and β_2 . By employing a series of instrumental variables regression, the Hausman-Taylor estimates in (2) are obtained.

(2) Data Sources

The annual data on China and its 68 trading partners used in this study span the period 1993–2012. According to the World Trade Organization's classification, agricultural products are defined to incorporate SITC0, SITC1, SITC2 (minus 28, 29), and SITC4. Agricultural export data are obtained from the UN Comtrade. Data on GDP, per capita GDP as reported in millions of USD, and population as measured in millions of people come from the IMF's World Economic Outlook Database. Data on distance are extracted from the website vi.thetimenow.com. Data on language, adjacency, and colonial relationships are collected from the Economist Intelligence Unit.

III. ESTIMATED RESULTS

In order to investigate the effects of AFTA on China's agricultural exports, the study employs a Hausman-Taylor analysis at both the aggregate and 1-digit sectoral levels. The estimates for the gravity model at the aggregate level are reported in Table 1.

TABLE 1. THE EFFECTS OF AFTA ON CHINA'S AGRICULTURAL EXPORTS AT THE AGGREGATE LEVEL

Variables	Coefficient	Z-test	Probability
CONST	22.067**	2.12	0.034
lnGDP _{it}	0.88***	10.57	0.000
lnGDP _{jt}	0.69***	9.49	0.000
lnPOP _{it}	-3.03*	-1.93	0.054
lnPOP _{jt}	0.24**	2.46	0.014
lnDIST _{ij}	-1.13***	-4.57	0.000
lnPGDP_DIF _{ijt}	-0.15***	-4.00	0.000
ADJ	-0.24	-0.55	0.583
LANG	2.40***	4.34	0.000
COL	0.36	0.65	0.513
AFTA	-0.67***	-3.51	0.000
Wald Chi ² (10)		2681.95	0.000

SOURCE: The authors' computation.

NOTE: *, **, and *** indicate significance at the 0.1, 0.05, and 0.01 levels respectively.

The GDP coefficients for both countries are positive and significant at the 1% level; this confirms the positive correlation between economic size and trade flows. The coefficient on population is negative and significant at the 10% level. In contrast, the coefficient on the trading partners' population is positive and significant; this shows that a 1% growth in the trading partner's population contributes to a 0.24% increase in China's agricultural exports.

Distance is proven to be a barrier to trade since its coefficient is negative and significant at the 1% level. The coefficient on the difference in per capita GDP between two countries is negative and significant. This negative sign indicates that China's pattern of agricultural exports reflects Linder's hypothesis. The coefficients on language and colonial relationships have their expected signs, which suggest the positive effects of these cultural and historical characteristics on trade. The coefficient on adjacency is negative but insignificant.

The dummy variable on AFTA captures the effects of this trade bloc on China's agricultural exports. The coefficient of AFTA is negative and significant, confirming that the formation of AFTA diverts trade from China to its member economies. In fact, China's share in ASEAN's agricultural imports is relatively small (around 8% in 2012), whereas ASEAN's member economies are their major source of agricultural imports (around 29% in 2012).² Moreover, the agricultural export structures of China and ASEAN countries are competitive rather than complementary. Therefore, tariff reduction after the formation of AFTA might serve as a significant factor to further strengthen the long-term and firm-trade relationships among the member nations; this diverts trade from a nonmember partner such as China.

TABLE 2. THE EFFECTS OF AFTA ON CHINA'S AGRICULTURAL EXPORTS AT THE 1-DIGIT SECTORAL LEVEL

Variables	0. Food and live animals	1. Beverages and tobacco	2. Crude materials	3. Animal, vegetable oil, fats
CONST	20.82* (1.77)	3.60 (0.15)	13.00 (0.89)	160.31*** (6.54)
lnGDP _{it}	0.95*** (9.97)	0.39** (2.13)	0.80*** (6.95)	1.79*** (9.44)
lnGDP _{jt}	0.68*** (8.03)	0.25 (1.39)	0.94*** (9.77)	0.60*** (3.17)
lnPOP _{it}	-3.26* (-1.83)	0.58 (0.17)	-2.88 (-1.30)	-25.29*** (-7.24)
lnPOP _{jt}	0.22* (1.88)	1.11*** (3.59)	0.33*** (2.76)	1.18*** (3.56)
lnDIST _{ij}	-0.97*** (-3.21)	-1.52 (-1.55)	-0.85*** (-3.37)	-1.21 (-1.15)
lnPGDP_DIF _{ijt}	-0.12*** (-2.79)	0.07 (0.89)	0.02 (0.31)	0.00 (0.00)
ADJ	-0.36 (-0.68)	-1.25 (-0.73)	-0.23 (-0.50)	-1.65 (-0.89)
LANG	2.46*** (3.64)	4.56** (2.06)	1.79*** (3.19)	5.33** (2.28)
COL	0.70 (1.03)	0.44 (0.20)	-0.01 (-0.01)	0.38 (0.16)
AFTA	-0.24 (-1.12)	-1.22*** (-2.86)	0.14 (0.56)	-0.67 (-1.09)

SOURCE: The author's computation.

NOTE: The values in the parentheses denotes the z-statistics; *, **, and *** indicate significance at the 0.1, 0.05, and 0.01 levels respectively.

Table 2 presents results for the Hausman-Taylor regressions across the four different agriculture sectors (dividing by 1-digit SITC). Conventional variables (including GDP, population, distance, and language) behave the same as the aggregate level. The coefficient of the difference in per capita GDP is positive and insignificant in the categories of beverages and tobacco; crude materials; and animal, vegetable oil, and fats; however, it is negative and significant in food and live animals. The latter suggests that China's pattern of exports in this sector captures Linder's theory. The coefficients on colonial relationships and adjacency are insignificant across the four sectors.

At the sectoral level, the coefficient on AFTA is negative in the cases of food and live animals; beverages and tobacco; animal, vegetable oil, and fats, while positive in the case of crude materials. However, this coefficient is significant in the case of beverages and tobacco, and insignificant in others. Therefore, AFTA's formation exerts trade diversion effects on beverages and tobacco, and ambiguous effects on the remaining 1-digit agricultural sectors.

The findings of this study are contrary to the findings of MacPhee and Sattayanuwat (2014), which stated that AFTA's formation does not divert its members' imports from outside the countries. However, MacPhee and Sattayanuwat

(2014) only considered the effect on total trade. The impacts of AFTA on specific industries, especially agriculture, have not been taken into account, which explains the contradictory results. Again, this study's findings are also different from what has been found in Koo et al. (2006), which pointed out that AFTA does not divert trade in agricultural products. The difference can be explained by the fact that Koo et al. (2006) investigated the effect on trade in agriculture for all AFTA's non-member countries. As mentioned in that study, AFTA's structure of agricultural trade with nonmember partners is complementary. However, in this study, when examining the case of agricultural trade with China separately, we have pointed out that the structure of the agricultural trade between the two sides is competitive, not complementary.

IV. CONCLUSION

The removal of trade barriers among participants under a regional trade agreement is associated with discrimination between member and nonmember economies. To date, there has been an ongoing debate as to whether a regional trade agreement facilitates or hinders trade flows among trading partners, theoretically and empirically. This study attempts to search for the effects of AFTA's formation on trade flows of nonmember economies, taking China's agricultural exports as a case study. The Hausman-Taylor analysis is applied to annual data collected from China and its 68 trading partners. The following issues have been addressed by the study.

Firstly, at the aggregate level, the coefficient on AFTA is negative and significant. This result suggests that the exports of agricultural products are diverted from China as a result of the removal of trade barriers within AFTA's member economies.

Secondly, to further investigate the effects of AFTA on China's agricultural exports, the study also performs Hausman-Taylor regressions at the 1-digit sectoral level. The coefficient on AFTA is negative and significant in beverages and tobacco, and insignificant in the three remaining 1-digit agricultural sectors. We conclude that AFTA's formation generates trade diversion effects on beverages and tobacco, and ambiguous effects on the three other sectors.

The study's findings once again confirm that the effects of a regional trade agreement can only be judged on a case by case basis. Because the complementarity index of China's agricultural products to AFTA is low, the case of AFTA and China suggests that the country should focus on diversifying and differentiating its farming products in order to avoid fierce competition from members with preferential treatment, and to gain better access to AFTA's market. More investment in research and development activities to improve the quality of farming products is, therefore, recommended as a cure. Moreover, the findings of this study imply that more efforts in reducing tariff and non-tariff barriers to further liberalize trade

between China and AFTA's economies should be accelerated so as to enhance their bilateral trade flows. In fact, the agreement on trade in goods between the two sides has been implemented since 2005. It is expected that the agreement will play an active role in boosting trade between China and AFTA.

This study has sought to ascertain the trade diversion effects of AFTA on China's agricultural exports. In other words, the loss to China's farming product exporters has been confirmed. However, the magnitude of the loss and sector that suffered the most has not been identified. Therefore, further studies on this issue should be undertaken so that a strategic plan can be outlined to tackle the impacts posed by AFTA's formation.

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ENDNOTES

¹ The complementarity index measures the extent to which the export structure of a country is complementary to its partner's import structure. A higher value of the index indicates a higher level of complementarity.

² The authors' calculation from UN Comtrade Database.