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A Panel Data Analysis of Trade Creation and Trade Diversion Effects: The case of ASEAN-China Free Trade Area (ACFTA)

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A Panel Data Analysis of Trade Creation and Trade Diversion Effects: The case of ASEAN-China Free Trade Area (ACFTA)

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Abstract

This study uses a theoretically justified gravity model of trade to examine the impact of the ASEAN-China Free Trade Agreement (ACFTA) on exports, focusing on trade creation and diversion effects. The model is tested on a sample of 31 countries over the period dating from 1995 to 2010 using aggregate and disaggregated export data for agricultural raw materials, manufactured goods and chemical products, as well as machinery and transport equipment. In order to obtain unbiased estimates, multilateral resistance terms are included as regressors and the endogeneity bias of the FTA variables is addressed by controlling for the unobserved specific heterogeneity that is specific to each trade flow. The results indicate that ACFTA leads to substantial and significant trade creation. Using disaggregated data, the significant and positive relationship between exports and ACFTA can be confirmed in the case of both manufactured goods and also chemical products.

Keywords: Gravity Model, Panel Data, Trade Creation and Trade Diversion Effects, ACFTA

JEL Classification: F14, F15

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1. Introduction

Since the early 1990s, significant progress has been made in regional integration in the most important economic areas in the world. According to the report by the WTO in 2011, more than 500 regional trade agreements are currently in force. As bilateral and regional trade liberalisation is becoming increasingly prominent, it is important to ascertain what implications this may have for world trade. In the last two decades, Asian economies have been involved in a market integration of sorts and have gained fame as the "world factory" as a result. Since the economic crisis in 1997, Asia has been moving towards closer region-wide economic integration, including the proliferation of bilateral free trade agreements and even monetary institutional cooperation with neighbouring countries. Accompanied by enhanced economic interaction between East and Southeast Asian countries, economic cooperation and integration between the economies in the region has become more efficient. ASEAN and China are playing a key role in the evolving dynamics of Asian regionalism through their various bilateral free trade agreements. Since 2002, China and ASEAN have signed a series of free trade agreements as part of an economic cooperation agreement[4] (hereafter referred to as ACFTA[5]), including the agreement on a dispute settlement mechanism, the agreement on trade in goods and the agreement on trade in services, as well as the agreement on

[4] The full name of the agreement is "Framework Agreement on Comprehensive Economic Cooperation between ASEAN and China".

[5] As regards the Free Trade Area, China calls it the China-ASEAN Free Trade Area (CAFTA); ASEAN calls it the ASEAN-China Free Trade Area (ACFTA). In order to avoid confusion with other agreements such as the Central American Free Trade Agreement (also CAFTA), the acronym "ACFTA" will be used in this paper.

investment.[6] The formation of ACFTA helps ASEAN members to access the prosperous Chinese market and fosters economic growth in ASEAN countries. As China's first attempt to take part in a regional economic cooperation agreement, ACFTA provides China with opportunities to obtain more raw materials to be used in production and helps Chinese enterprises to extend their foreign market in Southeast Asia. Generally, ACFTA can be seen as a fundamental step forward that strengthens trade activities and initiates economic cooperation among ASEAN member countries and China.

The objective of this paper is to evaluate the trade creation and diversion effects of the free trade agreements between ASEAN and China. Any assessment of the trade effects stemming from the formation of free trade agreements is always accompanied by the concepts of trade creation and trade diversion, which were first introduced by Viner (1950). Trade creation occurs when new trade arises between member countries due to the reduction in internal trade barriers. Trade diversion emerges when imports from a low-cost extra-bloc country are replaced by imports from a higher-cost member country because the intra-bloc country has preferential access to the market and does not have to pay tariffs. Trade creation leads to a shift in the origin of a product from an intra-bloc producer, whose resource costs are higher to another intra-bloc producer whose resource costs are lower. This results in an improvement in resource allocation and presumably has positive welfare effects. Conversely, trade diversion refers to a welfare loss caused by a shift in the origin of a product from an extra-bloc producer whose resource costs are lower to an intra-bloc producer whose resource costs are higher.

[6] The agreement on trade in goods and the dispute settlement mechanism of the framework agreement on comprehensive economic cooperation between ASEAN and China was signed in 2004. The agreement on trade in services between ASEAN and China was signed in 2007. The agreement on investment between ASEAN and China was signed in 2009.

Following the methodology proposed by the recent literature on this topic, we will first specify a gravity model of trade that includes multilateral resistance terms (MRTs), as proposed by Anderson and van Wincoop (2003), and we will obtain unbiased estimates by controlling not only for *country-and-time* effects, but also for *country-pair* fixed effects, as proposed by Baier and Bergstrand (2007). The main contribution of the paper is twofold. First, this is to the best of our knowledge the first attempt to obtain ex-post unbiased estimates of trade creation and trade diversion effects in ACFTA taking into account the endogeneity bias of an FTA. Second, we will estimate the model not only using aggregate trade data, but also disaggregated data for four different sectors: agricultural raw materials, manufactured goods, chemical products and machinery products. The reason for doing so is to ascertain whether or not the trade effects in this region differ by commodity.

The rest of the paper is organised as follows. Section 2 describes the ASEAN-China Free Trade Agreement and addresses the most relevant related literature. Section 3 explains the theoretical foundations of the gravity model of trade. Section 4 presents the model specification and Section 5 describes the data and reports the empirical results. Finally, Section 6 concludes.

2. ASEAN-China Free Trade Agreement

2.1 ACFTA Background Information

In August 1967, Indonesia, Thailand, Singapore, the Philippines and Malaysia signed the "Bangkok Declaration". The main aim of this declaration was to announce the establishment of the Association of Southeast Asian Nations (ASEAN). The regional group has since been extended to ten country members and has made great progress in economic integration.[7] The ASEAN Economic Community (AEC) was due to come into force by 2015. The ASEAN Free Trade Area (AFTA), a common external preferential tariff scheme to promote the free flow of goods within ASEAN, is the foundation of the AEC. As a quick-growing economic organisation, ASEAN's total aggregate nominal GDP amounted to USD $ 1.8 trillion in 2010, ranking the 9th largest economic bloc in the world and the 3rd largest in Asia.[8]

China has become one of the fastest growing economies in the world since it began the process of economic reform and liberalisation in the late 1970s. After recording an average annual growth rate of over nine percent for the last two decades, China's nominal GDP reached 7.3 trillion US Dollars in 2011. In the same year, China's export value grew to about 3 trillion US Dollars and ranked first in terms of exports, overtaking Germany in the global community.[9] During this period of time, China also started to become actively involved in regional economic cooperation processes. Before the 1990s, China only had limited official bilateral relations with certain individual ASEAN members. This situation has been changing gradually since 1991 and trade between China and ASEAN has grown substantially since the mid-1990s. In 2002, China and ASEAN started negotiating a number of free trade agreements. In 2004, the so-called Early Harvest Program (EHP) was launched, which mainly focused on reducing bilateral tariffs levied on agricultural goods, including live animals, meat and edible meat, fish, dairy products, vegetables and fruits. According to the Asian Development Bank (ADB) 2010 report, bilateral trade between China and ASEAN

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[7] Member countries today include Vietnam, Laos, Cambodia, Myanmar, Thailand, Malaysia, Singapore, Indonesia, the Philippines and Brunei.

[8] WTO (2012b).

[9] WTO (2012b).

increased more than tenfold between 1995 and 2008 from about USD $ 20 billion to USD $ 223 billion. China's trade growth rate has increased rapidly since 2001, when the country joined the WTO and two initial meetings were held to discuss the creation of the ASEAN-China Free Trade Area. More specifically, the yearly average growth rate in bilateral trade from 2001 to 2008 was about 30 percent. In 2011, ASEAN became China's third largest trading partner behind the USA and the EU.[10]

According to the agreements, China and ASEAN regarded the period between 2002 and 2009 as a transitory period before the completion of the ASEAN-China Free Trade Area. During that period, the tariffs charged on goods traded between China and ASEAN would be gradually reduced. For example, in the agreement on trade of goods, tariff reduction started in July 2005 and aimed to cut the duties to zero by 2010 on about four thousand types of goods for the six relatively developed ASEAN countries (i.e. Thailand, Malaysia, Singapore, Indonesia, the Philippines and Brunei), and to five percent by 2015 for the rest of ASEAN members (i.e. Vietnam, Laos, Cambodia and Myanmar).

2.2 Review of the Empirical Literature on the ACFTA

Following the increase observed in trade volumes between ASEAN and China, researchers have devoted more and more attention to the effects of ACFTA. More specifically, one interesting issue is whether the ACFTA poses a threat to or creates opportunities for both parties, namely China and ASEAN. On the one hand, regional trade among ACFTA members could receive a significant boost through removing tariffs and non-tariff barriers. On the other

[10] ADB (2012).

hand, one could speculate that ACFTA will intensify competition between China and ASEAN countries in exports to both advanced countries and the regional domestic market, given the similarity in their production and demand structures.

A number of researchers have recently studied the integration effects of the ACFTA from different perspectives and using various methodologies. Research results remain mixed nevertheless. Some studies have asserted positive effects of the integrative cooperation, admitting that there might be some negative influence in a certain period of time. A few authors focus on ex-ante effects. Among them, Chirathivat (2002) used a Computable General Equilibrium (CGE) model to examine the *ex ante* impact of the ACFTA on sectoral products, finding that the ACFTA will elevate China's rice, sugar and vegetable oil imports and fruit exports. He concluded that the ACFTA would lead to an increase in GDP growth both in China and ASEAN. Park et al. (2008) performed a CGE model to quantify the output gains and potential welfare gains of ACFTA. They found that ACFTA would lead to net trade creation, higher output and have positive welfare effects for the region. The result also showed that more advanced countries in ACFTA, such as Singapore and Malaysia, would benefit more than less developed countries such as Cambodia, Laos, Myanmar and Vietnam. Also using a CGE approach, Estrada et al. (2011) explored the possibilities of trade liberalisation among ASEAN and another three large Asian economies, namely China, Japan and the Republic of Korea. They suggested that a large scale FTA founded by these four parties would create more trade opportunities and larger dynamic efficiency gains than the bilateral FTAs founded by each pair of them. Qiu et al. (2007) used disaggregated agricultural trade data and based on Global Trade Analysis Project (GTAP) model to investigate the impacts of the ACFTA on China's agricultural trade. They confirmed that the ACFTA could enhance resource allocation efficiency in both China and ASEAN and could promote bilateral agricultural trade and economic growth on both sides. They revealed that China would significantly increase its exports of goods with a comparative advantage, such as vegetables, wheat and horticultural products under the ACFTA framework. Moreover, through an analysis of the price effects of the ACFTA, they pointed out that northern China could obtain more trade welfare gains than southern China.

Among the studies using partial equilibrium approaches, Ahearne et al. (2004) used aggregate and disaggregated data to examine trade relations between China and other new industrial economies (NIEs) in Asia. They found a complementary exporting linkage between ASEAN and China at aggregate level and indicate that a tariff reduction in the ACFTA could raise trading competitiveness in member countries. Roland-Holst and Weiss (2004) also used disaggregated trade data to identify the specific conditions influencing China-ASEAN export competition. The authors found that due to increasing Chinese competition in the short term, ASEAN significantly lost market share in the US and Japanese markets. Despite this fact, they state that there is still considerable complementary trade potential between China and ASEAN in the long term. They also made a further observation of the adjustment patterns within ASEAN countries to investigate how these countries could achieve such complementary trade potential. Their results indicate that ASEAN economies might still hold their market shares of higher value-added goods and China's economic emergence could be expected to absorb and increase regional demands in East Asia.

Two additional studies focused exclusively on agricultural products. The study by Rong and

Yang (2006) concluded that the benefits from trade liberalisation agreements could not be confirmed. Ferrianta et al. (2012) specifically analysed the impact of the ACFTA on the maize economy of Indonesia and found that ACFTA constituted an external shock and had negative impacts on Indonesian maize self-sufficiency due to the implementation of an import prohibition policy which was in contradiction with a free trade agreement.

There are a few studies that are more closely related to our approach in terms of methodology. Zhou (2007) estimated a gravity model to explain bilateral trade effects in the region of China and ASEAN, paying particular attention to the potential endogeneity problem of a WTO dummy variable. He presented a two-stage estimation approach and found that WTO membership is endogenous for China and ASEAN. The results yielded a positive coefficient for the WTO dummy variable and indicated that being WTO members could positively affect bilateral trade between China and ASEAN. Hastiadi (2011) employed a Two-Stage Least Squares (2SLS) approach and a fixed effects model to prove the importance of regional economic cooperation in East Asia including China, Korea, Japan and ASEAN. He emphasised that, while there could be rival competition in the export market between China and ASEAN in the short term because of the similar comparative advantages and production structures of the countries involved, a long-term regional integration process could promote export growth for East Asia as whole. Also using a gravity approach, Robert (2004) examined the validity of the Linder Hypothesis in the ACFTA using data from 1996 to 2000. The Linder Hypothesis assumes that countries with similar demand patterns trade more with each other having assumed similar GDP per capita. So proving the Linder effect could indicate trade enhancement through the ACFTA. However, this effect could not be identified in this study, as the coefficient of the relevant variable, GDP per capita differences, was found to be statistically insignificant.

Finally, Zhang and Hock (1996) investigated the interdependence of foreign trade and Foreign Direct Investment (FDI) between ASEAN and China and pointed out that China's trade dependence on ASEAN is relatively greater than ASEAN's trade dependence on China's economy. The FDI flowing from ASEAN to China displayed a complementary trend, which is consistent with its comparative advantage. Although there could be some negative spillovers in the short term from the rapid expansion of China's economy, they find that both sides would benefit from long-term economic integration.

3. The Gravity Model

Following the specification of Newton's universal law of gravitation in physics, the gravity model utilises the gravitational force concept as a research instrument to address various investigation purposes in economics and political sciences. It has been applied to study the determinants of bilateral trade volumes and performs well in assessing other bilateral flows, namely capital flows, aid flows or migration flows. It has been used to assess the effects of market access, trade resistance and the impacts of regional trade agreements on bilateral trade. In a basic gravity model, trade between country *i* and country *j* is proportional to the size of the economies and inversely relates to the distance, a proxy for transportation costs, between them. Hence, it can be described as:

$$X_{ij} = A\frac{Y_i Y_j}{D_{ij}} \qquad (1)$$

where X_{ij} is trade flows or exports from country i to j. Y_i is *GDP* for country i and Y_j is *GDP* for country j. D_{ij} denotes geographical distance between the two countries, which is often measured using “great circle” calculations.

As a most commonly used analytical framework, the gravity model has been applied in a large number of empirical studies. In order to investigate the effects of economic policies and some other issues including institutional, cultural, historical or geographical factors on trade, economists have also experimented with various variables and indicators in gravity models, such as colonial links, landlocked countries, common currency, common border and common language. Among them, one of the key issues is to analyse the specific effects of trade policies by introducing dummy variables, namely FTA_{ij}, to indicate the existence of a regional trade agreement between country i and j. This methodology can be extended to estimate trade creation and trade diversion and thus makes an important contribution to the regionalism debate.

3.1 Theoretical Developments of the Gravity Model

Despite the gravity model being considered a useful physical analogy with empirical validity after being introduced by Tinbergen (1962) and Pöyhönen (1963), applying it remained controversial until the late seventies because of its original lack of theoretical foundation. Linnermann (1966) made the first attempt to provide theoretical support for the gravity model. He worked with a Walrasian model in a three country-three good setting, which was criticised for making *ad-hoc* hypotheses to obtain the reduced forms. In the seventies, Anderson (1979) employed the “Armington assumption” - product differentiation by country of origin (Armington, 1969) - and by specifying demand using these terms, he helped to explain the presence of income variables in the gravity model. Bergstrand (1985) adopted a similar approach and specified a more comprehensive supply side of the economy. He showed that price terms in the form of GDP deflators are an important variable in the gravity equation. Helpman (1987) and Bergstrand (1989) also provided foundations for the gravity model in a monopolistic competition model of new trade theory, in which the product differentiation by country of origin approach is replaced by product differentiation among companies and the empirical success of the gravity model is considered to be supportive of a monopolistic competition explanation of intra-industry trade.

The standard assumption made by the Heckscher-Ohlin model that goods prices equalise across countries has not been empirically verified, mainly due to the presence of "border effects." In order to consider these border effects properly, goods prices must differ among countries. Based on a Constant Elasticity Substitution (CES) system, Anderson and van Wincoop (2003) used a Non-linear Least Squares (NLS) model considering the endogeneity of trade costs to refine the theoretical foundations of the gravity model and provide evidence of border effects in trade. They indicated that the costs of bilateral trade between two countries are affected not only by bilateral trade costs such as distance, landlocked, common border and languages, but also by the relative weight of these trade costs in comparison to trading partners in the rest of the world (the so-called multilateral resistance terms).[11]

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[11] Anderson and van Wincoop (2003) derived the gravity equation in a cross-sectional model as follows:

$$x_{ij} = \frac{y_i y_j}{y^W}\left(\frac{t_{ij}}{P_i P_j}\right)^{1-\sigma},$$

where x_{ij} refers to exports from country i to j, y_i and y_j are the nominal income of country i and j, $y^W \equiv \sum_j y_j$ denotes world nominal income, t_{ij} is the trade cost factor between country i and j, and σ is the elasticity of substitution between all goods. P_i and P_j measure the trade barriers of country i and j in exports and imports, i.e. outward and inward multilateral trade resistance.

Anderson and Wincoop (2003) pointed out that multilateral resistance factors should be taken into account in empirical research in order to avoid a biased estimation of the model parameters. In the same vein, Mátyás (1997, 1998) proposed that bilateral trade flows should be estimated as a three-way specification including time effects and exporter and importer fixed effects in order to avoid inconsistent modelling results caused by unobserved variation. A similar approach was also taken by Abraham and Hove (2005) in a gravity estimation of exports from Asia-Pacific countries. However, some researchers (Baier and Bergstrand, 2007) have found that conventional *time-invariant* fixed effects are insufficient to capture the unobservable factors in the gravity equation, such as *time-varying* multilateral resistance terms. Baier and Bergstrand (2007) followed the methodologies of Anderson and van Wincoop (2003) and extended the data series from cross-section to panel setting to be able to introduce time-varying fixed effects. In order to eliminate the endogeneity bias stemming from FTA dummy variables (the so-called "gold medal error" identified by Baldwin and Taglioni (2006)), Baier and Bergstrand (2007) used *country-pair* fixed effects in addition to the abovementioned *time-varying* trade costs to obtain unbiased estimates. This analytical methodology will also be applied in our model specifications.

3.2 Endogeneity Bias

One important econometric issue regarding gravity equations that must be noted here is the direction of the causality of free trade agreements and trade flows. Is the trade creation hypothesis sufficiently robust to guarantee the magnitude of trade effects without over or underestimation? This can obviously be rejected when variables have been omitted. The omitted variables problem stems from the correlation between the decision to form an RTA and the unobservable bilateral economic or policy-related conditions included in the error term. Endogeneity bias occurs frequently in gravity models when estimating the actual effects of free trade agreements, i.e., if any of the right-hand-side (RHS) variables in the gravity equation are correlated with the error term, that variable is considered econometrically endogenous and ordinary least squares (OLS) estimation will yield biased and inconsistent estimates as a result. A number of studies estimating the effects of trade agreements with gravity models wrongly assume that FTAs are exogenous random variables, i.e., the decision made by countries to sign trade agreements is unrelated to unobservable factors (e.g., Antonucci and Manzocchi (2006), Cipollina and Salvatici (2010), Endoh (1999)).

According to the "natural trading partner" hypothesis proposed by Wonnacott and Lutz (1989) and Krugman (1991), countries tend to sign trade agreements with partners they have already achieved high trade volumes with. Baier and Bergstrand (2007) pointed out that FTA dummy variables could be endogenous, as countries are likely to select their FTA partners based on existing levels of trade. They argued that earlier empirical studies failed to provide evidence of the positive effects of FTAs on trade flows between members, mainly because FTA dummies were, in most cases, assumed to be exogenous random variables. They claimed that bilateral trade could be explained not only by FTA dummy variables, but also other unobserved factors in the error term (e.g. non-tariff barriers, institutional characteristics, democratic relationships, trade-related infrastructures). Similarly, Baier and Bergstrand (2004) also proved that the probability of signing an FTA between two countries is positively correlated with their economic size and the difference in their relative factor endowments. Related to our research interests in the ACFTA, the decisions made by China and ASEAN countries to sign free trade agreements could also depend on unobservable heterogeneities such as the existence of specific domestic regulations and other political motives related to bilateral trade. Hence, the reasons behind a country selecting into a preferential trade agreement are difficult to identify and often correlated with the level of trade. This raises the typical problem of endogeneity bias due to omitted variables in gravity equations.

In the presence of endogeneity bias in cross-section data, Instrumental Variable (IV) approaches can be generally applied to solve the problem. However, Baier and Bergstrand (2007) pointed out that an instrumental variable approach is not sufficiently reliable to settle the endogeneity issue in the case of FTA dummy variables, as it is difficult to find a suitable instrumental variable for FTAs. Alternatively, Baldwin and Taglioni (2006) argued that applying *time-varying* country dummy variables can reduce the bias caused by incorrect specifying or omitting multilateral trade resistance. Baier and Bergstrand (2007) suggested that unbiased estimates of average treatment effects of FTA can be obtained by introducing *country-and-time* effects and *country-pair* fixed effects simultaneously. Similarly, Martínez-Zarzoso et al. (2009) claimed that a simple method to measure unbiased estimates is to introduce individual country dummies in cross-sectional studies and bilateral fixed effects as well as *country-and-time* effects in panel data estimations to eliminate the endogeneity bias effectively.

4. Modelling Trade Effects in the ACFTA

4.1 An Augmented Gravity Equation

We follow the Vinerian specification of integration effects with an extension of three different sets of FTA dummy variables representing trade creation, export diversion and import diversion effects, as proposed by Endoh (1999), Soloaga and Winters (2001), Carrère (2006), Magee (2008) and Martínez-Zarzoso et al. (2009), so that we can test whether the creation of an ASEAN-China Free Trade Area has facilitated international trade among the member countries at the expense of non-member countries. The inclusion of FTA dummy variables in a gravity equation can be problematic because the dummies capture a range of contemporaneous dyadic fixed effects. Meanwhile, country-specific heterogeneity is ignored if all the countries in a certain FTA are treated as a homogenous group. In order to overcome this problem, we apply the panel data fixed effects model to control for all the time-invariant factors that vary bilaterally. We aim to obtain unbiased estimates for the ACFTA dummy variables, namely trade creation (*FTA_1)*, export diversion (*FTA_2)* and import diversion effects (*FTA_3)*, using a panel data approach that controls for all country-and-time and time-invariant country-pair unobserved heterogeneity. The baseline augmented gravity model is given by

$$\begin{aligned} \ln X_{ijt} &= \beta_0 + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln Pop_{it} + \beta_4 Pop_{jt} + \beta_5 Dist_{ij} \\ &\quad + \phi_1 FTA\_1 + \phi_2 FTA\_2 + \phi_3 FTA\_3 + \sum_k \delta_k P_{ijk} + u_{ijt} \end{aligned} \qquad (2)$$

where *ln* denotes variables in natural logs. The dependent variable, X_{ijt} indicates bilateral exports from exporter *i* to importer *j* in period *t* at current US$. GDP_{it} and GDP_{jt} are the level of nominal gross domestic product in country *i* and *j* in period *t*. As a proxy for economy size of the observed country, *GDP* denotes the consumption and demand level of a country and is likely to have a positive relationship with trade flows. Pop_{it} and Pop_{jt} are the populations of country i and j in period t. The impact of population on bilateral trade is ambiguous. Population would tend to negatively correlate with trade flows, as larger populations imply larger domestic markets, richer resource endowment and more diversified outputs, as well as less dependence on international specialisation. However, Brada and Méndez (1985) pointed out that the coefficient of population can also be positive, because a larger population in an importing country enables imported goods to compete better with domestic goods and compensates exporters for the cost of sales activities abroad. This demonstrates economies of scale and promotes the country to trade more with foreign partners in a wider range of goods. $Dist_{ij}$ measures the great-circle distance between the capital cities (or economic centres) of country i and j. As the geographical distance is used to proxy for transportation and communication costs, as well as required delivery time, its sign should be negative. $\sum_k \delta_k P_{ijk}$ includes other binary variables, such as sharing a common border (*Adj*) and speaking the same language (*Lang*). u_{ijt} is assumed to be a log-normally distributed error term.

FTA_1, *FTA_2* and *FTA_3* are binary variables that measure the specific trade effects in the ASEAN-China Free Trade Area. *FTA_1* takes a value of 1 if both countries i and j belong to the ACFTA and zero otherwise. A positive and statistically significant coefficient of *FTA_1* represents trade creation effects and indicates that intra-regional trade has been promoted more by the free trade agreement and is higher than normal trade levels.

FTA_2 takes a value of one if exporter i belongs to the ACFTA and destination country j does not and zero otherwise. A positive and statistically significant coefficient of *FTA_2* is defined as an export diversion effect in the ACFTA and indicates that regional integration leads to a switch of export activities from ACFTA member countries to non-ACFTA member countries. *FTA_3* takes a value of one if exporter *i* is a non-ACFTA member and destination country *j* belongs to the ACFTA and zero otherwise. A positive and statistically significant coefficient of *FTA_3* indicates an import diversion effect in ACFTA. It can be stated that ACFTA members have shifted their importing activities from non-member countries to member countries.

Here, an additional explanation of trade creation and trade diversion effects is considered necessary. Firstly, the "export diversion effects" and "import diversion effects" mentioned above are different from the definitions proposed by Viner (1950). The term "export trade diversion" was first described by Endoh (1999) and "import trade diversion" was defined by Balassa (1967). According to Carrère (2006) and Martínez-Zarzoso et al. (2009), one observation alone of intra-bloc trade (ϕ_1) is insufficient to confirm whether or not there is net trade creation in a free trade area because, for example, an increase in intra-bloc exports ($\phi_1>0$) may be accompanied by a reduction in imports from extra-bloc countries ($\phi_3<0$). These trade creation and diversion effects may offset each other. Hence, besides the coefficient of *FTA_1*, we still need to examine the magnitudes and directions of trade among member and non-member countries (i.e. ϕ_2, ϕ_3,). Let us assume $\phi_1>0$ and $\phi_2>0$ which denotes that trade creation is accompanied by an increase in exports from intra-bloc countries to extra-bloc countries. This can be described as pure trade creation in the ACFTA. However, a positive ϕ_1 accompanied by a negative ϕ_2 denotes a combination of trade creation effects and export diversion effects. Here, if $\phi_1 > \phi_2$, we can conclude, despite trade creation effects being offset to a certain extent by export diversion effects, trade creation still prevails. Conversely, the case of $\phi_1 < \phi_2$ indicates a dominant export diversion effect representing a welfare loss on behalf of member countries. Such possible trade effects under an FTA were identified by Martínez-Zarzoso et al. (2008, pp8) and are presented below in Table (1) as a summary.

Table 1. The Possible Outcomes of Trade Effects in an FTA

4.2 Analytical Specifications

In order to capture all the unobserved *time-invariant* and *time-varying* heterogeneity among trading partners, the following model specifications are intended to obtain unbiased and consistent estimates.

First, we estimate equation (2) using a pooled OLS technique and exclude time and individual country dummy variables from the model. This conventional OLS estimation merely pools all the available data together, but does not consider the differentiation between the individual trading pairs. Although the coefficients of pooled OLS can be biased and inconsistent due to ignoring multilateral resistance terms and heterogeneity related to time and country-specific effects, we still run this original model as a benchmark for other specifications.

Although there is flexibility when it comes to applying econometric techniques in a gravity model, a fixed effects model has been used in the majority of empirical studies. Kepaptsoglou et al. (2010) summarised the related empirical literature published over the last ten years and concludes that the fixed effects model tends to provide better results and has been preferred in most studies. Thus, we apply a fixed effects model in our following estimations. Firstly, our second model will be a fixed effects model without time or country dummy variables. Note that the demean process in the fixed effects model comes at the cost of not being able to estimate the impact of *time-invariant* bilateral determinants, such as distance, adjacency, common border or other economical, political and cultural factors. Therefore, $Dist_{ij}$, $Lang_{ij}$ and Adj_{ij} in equation (2) will be eliminated from the estimation because they are fixed over time and the model is specified as

$$\ln X_{ijt} = \beta_0 + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln Pop_{it} + \beta_4 \ln Pop_{jt} + \phi_1 FTA\_1 + \\ + \phi_2 FTA\_2 + \phi_3 FTA\_3 + \pi_{ij} + \mu_{ijt} \qquad (3)$$

According to Anderson and van Wincoop (2003), the standard gravity model could be misspecified when ignoring multilateral resistance and remoteness terms in the model. In order to estimate our model appropriately, it is essential to model not only bilateral trade resistance through country-pair fixed effects, but also multilateral trade resistance, i.e. the trade barriers that each country faces when dealing with all its trading partners. One widely used approach in the literature to tackle multilateral resistance terms is to use country-specific effects (Baldwin and Taglioni (2006)). Country dummy variables capture all the time-invariant individual effects of exporters and importers that are omitted from the rest of model specifications, such as preferences, institutional differences etc. Additionally, time dummy variables will also be generated to control for macroeconomic effects, such as global economic booms and recessions. Therefore, the inclusion of country fixed effects and time effects at least partly avoids the omitted variable bias identified by Anderson and van Wincoop (2003). The model considering individual country-specific effects and time effects is specified as

$$\ln X_{ijt} = \beta_0 + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln Pop_{it} + \beta_4 \ln Pop_{jt} + \phi_1 FTA\_1 + \\ + \phi_2 FTA\_2 + \phi_3 FTA\_3 + \pi_{ij} + \lambda_i + \varphi_j + \mu_{ijt} \quad (4)$$

However, in order to correctly account for multilateral resistance, the exporter and importer effect that proxy for multilateral resistance should be time-varying. Following the methodologies proposed by Baier and Bergstrand (2007), the panel data specification allows us to control for both *time-varying* multilateral resistance terms and to avoid the endogeneity bias of the gravity equation by introducing *country-and-time* effects while maintaining the *country-pair* fixed effects. The gravity equation is given by

$$\ln X_{ijt} = \beta_0 + \phi_1 FTA\_1 + \phi_2 FTA\_2 + \phi_3 FTA\_3 + \xi_{it} + \psi_{jt} + \pi_{ij} + u_{ijt} \quad (5)$$

As each country trades with many countries in the world and the prices for its exports change yearly and depend on the conditions in all other trading partners, multilateral resistance terms should be specific to each country and each year. As mentioned by Magee (2008, p353), *time-varying* factors affecting trade cannot only be described by traditional gravity equation components like GDP, GDP per capita or population. There are still other variables that are difficult or unlikely to be observed and measured, such as infrastructure, factor endowments, multilateral trade liberalisation or openness and other *country-and-time* specific factors. Baier and Bergstrand (2007, pp78) also claimed that this unobserved heterogeneity could highly correlate to the decision of two countries to form an FTA and lead to the endogeneity bias we discussed in Section *3.2*. In this sense, the aspects of *time-varying* heterogeneity across countries have to be taken into consideration in the estimation. In our fourth model, we simultaneously introduce *country-and-time* fixed effects (by generating a full set of *exporter-and-time* and *importer-and-time* dummy variables) and *country-pair* fixed effects to correct the bias induced by unobserved *time-varying* multilateral resistance terms. Doing so minimises omitted variable bias and "purifies" the actual impacts of the free trade agreement on bilateral trade flows.

As countries with close political, cultural and historical relationships are likely to trade more than normal and these *country-pair* factors may have a significant impact on the level of bilateral trade between these two countries, but not with third countries, researchers have attempted to incorporate as many relevant dummy variables as possible in the model to represent these bilateral ties so as to obtain an unbiased estimation. However, as so many unobservable dyadic factors remain, the choice of specific *country-pair* fixed variables is always an intractable problem in empirical studies. One effective alternative to solve the problem is to generate a full range of *country-pair* dummy variables to capture bilateral factors that are specific to country pairs but constant over time, so that nearly every *country-pair* variable can be included in the model.

5. Data, Main Results and Discussion

5.1 Data

We use a panel data set of 31 countries including China, ASEAN-10 countries and China's top 20 trading partners in 2010 (see Appendix I) covering a 16-year period dating from 1995 to 2010 at aggregate and disaggregated level with a maximum of 14,880 observations (31×30×16). All export values are taken from the UNCTAD database and are based on the Standard International Trade Classification (SITC) under Revision 3 and expressed in nominal values to avoid measurement error. We also perform analyses of four sub-categories separately, including agricultural raw materials (SITC 2 less 22, 27 and 28), manufactured goods (SITC 5 to 8 less 667 and 68) and two sub-categories of manufactured goods: chemical products (SITC 5) and machinery and transport equipment (SITC 7). GDP data in nominal values and population in number of inhabitants are obtained from the World Bank Development Indicators data series. The data on geographical and cultural proximity, such as distance, adjacency and common language, come from the CEPII database.

5.2 Main Results and Discussion

We employ the panel data models described above to estimate the trade creation and trade diversion effects of the ACFTA agreement. The main results are presented in Table (2). Compared with cross-sectional data, panel data can be applied to distinguish the specific effects across countries and capture the characteristics of integration effects on trade over time. In Column (1), our estimation follows Equation (2) under the pooled OLS technique including the main proxies for trade costs (*Dist, Lang, Adj*), but without any country or time dummies. The results are similar to those in Table (A.2) where yearly regression results are presented. The coefficients of *FTA_1*, *FTA_2* and *FTA_3* still remain unexpectedly negative due to ignoring multilateral resistance terms. A model with dyadic fixed effects is presented in Column (2). The demean process in fixed effects approaches comes at the cost of not being able to estimate the impacts of *time-invariant* determinants, such as distance, adjacency, common border or other economical, political and cultural factors. The coefficients of Pop_i

and Pop_j become negative and the impact of *FTA*s on trade are all positive and significant. In Column (3) we present a model with dyadic and time fixed effects and with country dummies representing multilateral resistance terms. Compared with the model in Column (2), the coefficients of *FTA*s are still positive and statistically significant at one-percent, but are slightly smaller. Goodness-of-fit (R^2) increases from 18.5% to 34.7%. The different results registered by these models indicate that the estimated effects of *FTA*s on trade flows depend considerably on how researchers control for the unobserved country heterogeneity and, therefore, imply that estimations for unbiased results are highly reliant on correct model specifications.

Table 2. Panel data gravity estimations with different fixed effects

Finally, the results considering *time-varying* multilateral resistance terms and *country-pair* fixed effects are shown in Column (4). As mentioned in *Section 3.4*, as the dummy variables *FTA_1*, *FTA_2* and *FTA_3* usually vary in three dimensions (*i*, *j* and *t*), the best way to control for everything else is to include two types of dummy variables as suggested by Baier and Bergstrand (2007) and Benedectis (2011), i.e., *export-and-year* and *importer-and-year* effects on the one hand, and *country-pair* effects on the other hand. By doing so, we control for all determinants that vary in those dimensions with *it* and *jt* (such as GDP and population in country *i* and *j*) and also the *time-invariant* dyadic effects between two countries (such as distance, common language and border). The results, presented in Column (4), provide unbiased estimates for *FTA_1*, *FTA_2* and *FTA_3*. The coefficients of *FTA_1*, *FTA_2* and *FTA_3* in Column (4) are positive and statistically significant and are also higher than in column (3) and lower than in column (2). The positive coefficient of *FTA_1* indicates that the

ACFTA had caused an intra-regional trade creation effect and increases the welfare of member countries. The average treatment effect is 118.6% {=[exp(0.782)-1]×100} higher than expected from normal levels of trade. The dummy of *FTA_2,* which represents exports from ACFTA member countries to non-member countries, displays a significantly positive coefficient, which indicates a welfare gain effect also for the countries outside the trade bloc (positive export diversion effect or export expansion). Concerning the import diversion effects, the coefficient of *FTA_3* is also positive and significant at the ten-percent level. It reveals an upward trend in exports from non-member countries to ACFTA member countries (import expansion). As $\phi_1>0$ and $\phi_3>0$, a pure trade creation effect in terms of exports and imports is identified in our model.

In order to provide further insight to explain the impacts of the ACFTA on intra- and extra-regional exports in various types of products, we also estimate the gravity model given by equation (5) for four different products. The theoretically justified specification suggested by Baier and Bergstrand (2007) that controls for *country-and-time* effects (*it*, *jt*) and *country-pair* fixed effects (*ij*) is used. The main results are presented in Table (3).

Table 3. Panel data gravity estimations using disaggregated trade with *country-and-time* and *country-pair* fixed effects

According to the results for agricultural raw materials in Column (1), although *FTA* dummies are positively related to exports, we cannot confirm any trade creation or trade diversion effects because the estimated coefficients are not statistically significant at conventional levels. This result surprisingly cannot, at least fully, verify the optimistic prospects from some other researcher such as Park et al. (2008) and Gradziuk (2010) who believed that the bilateral trade for raw materials between China and ASEAN will be promoted by the free trade agreement. The results for manufactured goods are reported in Column (2). The positive and significant coefficients estimated for *FTA_1* and *FTA_3* indicate on the one hand that the trade agreements between ASEAN and China increase exports of manufactured goods among the member countries and on the other hand also promote imports of manufactured goods to member countries from non-member countries. The positive signs of the coefficient of *FTA_1* (ϕ_1) and the coefficient of *FTA_3* (ϕ_3) ($\phi_1>0$ and $\phi_3>0$) reveals a pure trade creation effect in terms of imports and indicates that the ASEAN-China free trade area has become a major export market for manufactured products. Column (3) reveals the relationship between *FTA* and exports of chemical products. The coefficients of *FTA_1* (ϕ_1) and *FTA_2* (ϕ_2) are positive and statistically significant at the one percent and five percent level, respectively. $\phi_1>0$ and $\phi_2>0$ report a pure trade creation effect in terms of exports for chemical products. Column (4) also shows positive trade creation and export diversion effects for machinery and transport equipment, but the coefficients are imprecisely estimated and not statistically significant at conventional levels, perhaps because in this case some non-tariff barriers remain in place.

6. Conclusions

This paper analyses the impact of free trade agreements between ASEAN and China on export flows focusing on their trade creation and trade diversion effects. We used aggregate and disaggregated data for four different categories of goods (including agricultural products and raw materials, manufactured products, chemical products and machinery and transport equipment) traded by 31 countries and covering the period dating from 1995 to 2010. We considered the endogeneity bias problem stemming from omitted variables and dealt with it by controlling for *time-varying* multilateral resistance terms and *country-pair* fixed effects to obtain unbiased and consistent estimates.

According to the estimated results using aggregate and disaggregated data, the trade agreements between ASEAN and China yield an overall positive trade effect. The positive and significant estimated results for the aggregate data confirmed that reducing and removing tariff barriers in ACFTA promotes total trade volume not only among intra-bloc member countries, but also between intra-bloc and extra-bloc countries. When the ACFTA effect is estimated for different products, there are significant trade creation effects in terms of exports of manufactured goods and chemical products, although the trade creation and diversion effects for agricultural raw materials, as well as machinery and transport equipment, are not significant.

Based on our findings, the actual trade policy between China and ASEAN should be maintained, as it favours not only ACFTA's intra-regional trade growth and development, but also benefits extra-bloc countries. However, from the perspective of international production chains, China and most ASEAN countries are still hovering in the low segment of international trade. Even if the ACFTA bloc has a great economic and trade potential, its implementation is still in an initial stage compared to other well-developed regional trade agreements. On the one hand, the reduction and elimination of tariffs for sensitive goods, such as agricultural products, is still restricted in ACFTA. On the other hand, the progress in other areas, such as the reduction of non-tariff barriers, free trade in services, foreign direct investment, labour mobility and environmental standards, has been slow. In order to achieve a deeper economic integration in the region, ACFTA should not only focus on tariff barriers, but also on improving production efficiency, product competitiveness and structures of trade complementarities. Meanwhile, trade facilitation should get more attention, such as coordination of products standards and simplification of customs clearance procedures. In future research, we believe it is necessary to take into consideration more disaggregated data for specific commodities. Moreover, from a perspective of similarities and differences in trade structures and integration impacts, a comparative study between ACFTA and other FTAs using disaggregated trade data could also be a relevant research topic.

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Table 1. The Possible Outcomes of Trade Effects in an FTA

	Export Effects		Import Effects	
	$\phi_2>0$	$\phi_2<0$	$\phi_3>0$	$\phi_3<0$
$\phi_1>0$	Pure TC(X)	TC+XD ($\phi_1>\phi_2$) or XD ($\phi_1<\phi_2$)	Pure TC(M)	TC+MD ($\phi_1>\phi_3$) or MD ($\phi_1<\phi_3$)
$\phi_1<0$	XE	XD+XC	ME	MD+MC

Note: ϕ_1 is the coefficient of *FTA_1* which denotes exports among member countries. ϕ_2 is the coefficient of *FTA_2* which denotes exports from member countries to non-member countries. ϕ_3 is the coefficient of *FTA_3* which denotes exports from non-member countries to member countries. TC(X) and TC(M) denote trade creation in terms of exports and trade creation in terms of imports, respectively. XD and MD denote export diversion and import diversion, respectively. XE and ME denote expansion of extra-bloc exports and expansion of extra-bloc imports, respectively. XC and MC denote contraction of intra-bloc exports and contraction of intra-bloc imports, respectively.

Table 2. Panel data gravity estimations with different fixed effects

	(1) Pooled OLS	(2) *ij*, FE	(3) *i*, *j*, *t*, *ij*, FE	(4) *it*, *jt*, *ij*, FE
ln_Y_i	0.098***	0.011	0.005	
	(7.05)	(1.11)	(0.52)	
ln_Y_j	-0.085***	0.003	-0.002	
	(-7.50)	(0.37)	(-0.32)	
ln_Pop_i	0.486***	-0.021***	-0.011**	
	(32.33)	(-3.55)	(-2.17)	
ln_Pop_j	0.396***	-0.023***	-0.010	
	(28.94)	(-2.72)	(-1.39)	
ln_$Dist_{ij}$	-0.815***			
	(-25.77)			
$Lang_{ij}$	2.170***			
	(36.37)			
Adj_{ij}	0.221**			
	(1.99)			
FTA_1 (ϕ_1)	-2.017***	1.079***	0.348***	0.782***
	(-17.27)	(10.59)	(3.29)	(3.25)
FTA_2 (ϕ_2)	-0.322***	0.966***	0.235***	0.456***
	(-4.20)	(14.95)	(3.30)	(3.25)
FTA_3 (ϕ_3)	-0.718***	0.811***	0.072	0.334*
	(-9.83)	(14.59)	(1.16)	(1.65)
Constant	4.522***	13.223***	12.798***	12.297***
	(7.78)	(41.87)	(44.17)	(67.49)
N	14395	14395	14395	14449
R^2	0.249	0.185	0.347	0.527
R^2 adjusted	0.248	0.185	0.346	0.495
RMSE	2.788	0.740	0.662	0.585
LL	-35181.580	-16082.235	-14486.160	-12269.646
Type of FE:				
π_{ij}	*No*	*Yes*	*Yes*	*Yes*
τ_t	*No*	*No*	*Yes*	*No*
λ_i, φ_j	*No*	*No*	*Yes*	*No*
ξ_{it}, ψ_{jt}	*No*	*No*	*No*	*Yes*

Note: Robust and clustered standard errors in brackets, *p<0.1, **p<0.05, ***p<0.01. *t*-values are reported below each coefficient. Estimation uses White's heteroskedasticity-consistent covariance matrix estimator.
fe: fixed effects. τ_t: time effects. λ_i, φ_j: country time invariant fixed effects. ξ_{it}, ψ_{jt}: country time-varying fixed effects. π_{ij}: time invariant country-pair fixed effects.

Table 3. Panel data gravity estimations using disaggregated trade with *country-and-time* and *country-pair* fixed effects

	(1) Agricultural Raw Materials	(2) Manufactured Goods	(3) Chemical Products	(4) Machinery and Transport Equipment
FTA_1 (ϕ_1)	0.198	1.182***	0.624***	0.652
	(0.65)	(3.57)	(2.79)	(1.58)
FTA_2 (ϕ_2)	0.0803	0.291	0.464**	0.718
	(0.26)	(1.05)	(2.29)	(1.52)
FTA_3 (ϕ_3)	0.339	0.718***	0.147	-0.213
	(1.56)	(3.87)	(1.01)	(-1.11)
N	12926	13835	14340	13348
R^2	0.370	0.489	0.551	0.479
R^2 adjusted	0.322	0.453	0.521	0.440
RMSE	0.770	0.707	0.593	0.703
Ll	-14484.758	-14364.711	-12375.554	-13769.192

Note: Robust and clustered standard errors in brackets, *p<0.1, **p<0.05, ***p<0.01. *t*-values are reported below each coefficient. Estimation uses White's heteroskedasticity-consistent covariance matrix estimator.

Appendix A

Table A.1 List of countries

Member Countries of ACFTA	Top 20 Trade Partners of China in 2010
Brunei	Australia
Cambodia	Belgium
China	Brazil
Indonesia	Canada
Laos	Germany
Myanmar	Spain
Malaysia	France
Philippine	United Kingdom
Singapore	Hong Kong SAR
Thailand	India
Viet Nam	Italy
	Japan
	Republic of China (Taiwan)
	Republic of Korea
	Mexico
	Netherlands
	Panama,
	Russian Federation
	Turkey
	United States

Appendix B. Estimation for specific years

Following Baier and Berstrand (2007) and Martínez-Zarzoso et al. (2009), we also present estimations from a cross-sectional gravity approach for single years. Table (B.1) illustrates the results of equation (2) with a log-linear form using the nominal total export value of 31 countries in 2003, 2005, 2007 and 2010 separately. We employ individual country fixed effects in each of the estimations considering the multilateral resistance terms proposed by Anderson and van Wincoop (2003). The results show that most of the conventional gravity variables in Table (B.1) (GDP, population, distance, common language and border) have clear anticipatory effects on exports.[12] For example, in Column (1) for 2003, the coefficients of Y_i and Y_j fulfil our expectations as stated in the gravity model. Trade is positively related to economy size. Larger economies tend to produce a larger amount of goods for exportation and import more to meet the higher demand. The coefficients of Pop_i and Pop_j are positive, although the latter is not statistically significant. This indicates that economies of scale in production, which are related to a large population, improve the opportunities and desires of extending international trade to a wider variety of goods. As a proxy of transport costs, distance (*Dist*) has a significantly negative coefficient and fluctuates between -0.8 and -1.0. Speaking the same language (*Lang*) and sharing a common border (*Adj*) are significantly and positively related to exports, as expected.

Table B.1. Cross-sectional gravity estimation with multilateral resistance terms

	(1) 2003	(2) 2005	(3) 2007	(4) 2010
ln_Y_i	0.638***	0.657***	0.276***	0.054
	(21.47)	(23.24)	(9.11)	(0.47)
ln_Y_j	0.214***	0.212***	0.197***	0.108
	(7.67)	(7.71)	(3.31)	(0.84)
ln_Pop_i	1.004***	1.094***	1.034***	1.108***
	(27.21)	(29.52)	(25.79)	(26.16)
ln_Pop_j	0.078	0.063	0.113	0.111
	(0.43)	(0.34)	(0.39)	(0.40)
ln_$Dist_{ij}$	-0.843***	-0.878***	-0.899***	-0.948***
	(-14.61)	(-15.21)	(-14.60)	(-15.21)
Lang	0.346**	0.296**	0.282*	0.190
	(2.35)	(2.01)	(1.80)	(1.22)
Adj	0.865***	0.753***	0.774***	0.522**
	(4.58)	(3.95)	(3.80)	(2.45)
FTA_1 (ϕ_1)	-3.483***	-3.886***	-1.389	-1.754
	(-2.98)	(-3.32)	(-1.12)	(-1.43)
FTA_2 (ϕ_2)	-4.402***	-4.959***	-2.278***	-2.735***
	(-16.15)	(-18.10)	(-9.01)	(-8.35)
FTA_3 (ϕ_3)	0.547	0.512	0.531	0.570

[12] As the null hypothesis of homoskedasticity was rejected for testing heteroskedasticity, heteroskedastic- consistent standard errors were computed in all of the estimations.

	(0.48)	(0.45)	(0.43)	(0.48)
Constant	-12.939***	-13.700***	-6.865*	-0.120
	(-4.25)	(-4.48)	(-1.75)	(-0.02)
N	907	909	913	842
R^2	0.892	0.890	0.875	0.868
R^2 adjusted	0.883	0.882	0.866	0.858
RMSE	1.097	1.099	1.173	1.140

Note: Standard errors in brackets, *p<0.1, **p<0.05, ***p<0.01. *t*-values are reported below each coefficient. Estimation uses White's heteroskedasticity-consistent covariance matrix estimator.

The estimated coefficients seem to be logical and consistent up to this point and also display the expected signs. However, the following coefficient estimates of our target variables, *FTA_1*, *FTA_2* and *FTA_3* in Table (B.1) either show unexpected negative signs or are statistically insignificant. All of the results reject the trade creation hypothesis. As Nowak-Lehmann et al. (2007) explained, because cross-sectional analysis is unable to capture the relevant relationships among variables over time or the unobserved *country-pair* specific effects, the estimation can lead to biased results due to omission of the correlation between individual effects and the independent variables. Baier and Bergstrand (2007) also claimed that using individual country fixed effects to correct the endogeneity bias induced by prices is not sufficient to obtain the plausible estimates, as other omitted variable bias still remains, such as *time-varying* country-specific heterogeneity.