THE IMPACT OF FREE TRADE AGREEMENTS ON INTERNATIONAL AGRICULTURAL TRADE: A GRAVITY APPLICATION ON THE DAIRY PRODUCT TRADE AND THE ASEAN-CHINA-FTA

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Abstract

This paper uses a gravity model to analyse the impact of the ASEAN-China-FTA on the international trade of dairy products. It uses a multinomial PML estimator with country fixed effects and a suitable framework to differentiate between trade creation and trade diversion effects in terms of imports and exports. The used dataset contains disaggregated data for 36 countries, including the ASEAN member countries, China and the 25 largest dairy exporting countries from 1995 until 2013. The dataset contains data on the three SITC dairy product groups as well as their aggregate. The estimates of the model include significant values for all framework effects. They indicate that there are trade creation, import diversion and export diversion effects for all four commodity groups. The estimated overall net trade effect is negative. Hence the current implementation of the FTA should be critically evaluated with respect to dairy products.

Keywords

Gravity Model, Agricultural Trade, ACFTA, Trade creation and trade diversion effects, Dairy products

1 Introduction

The members of the ASEAN-CHINA-Free-Trade-Agreement (ACFTA) (fully implemented since 2010) are playing an important role on the world market for dairy products. They are especially important on the import side. For example, seven out of the ten largest skim milk powder importing countries are members of the Free Trade Agreement (FTA). Also, China is the largest whole milk powder importer, with a market share of 18% (KÜHL ET. AL. 2015). The domestic prices in dairy exporting countries strongly depend on the world market prices (see e.g. GRAMS 2005, KÜHL ET. AL. 2015). Hence developments regarding ACFTA-members are relevant for a number of countries other than themselves. This paper analyses the impact of the implementation of ACFTA on the world dairy product market.

A widely used approach to analyse bilateral trade flows in general and the effects of FTAs in specific is the so-called gravity model of trade. Over the last decades, the gravity model of trade has developed into a standard tool of international trade analysis (HEAD & MAYER 2015) and has produced some of the most robust findings in the respective field (LEAMER & LEVINSOHN 1995). Also, KRUGMAN (1997) referred to it as a rare example of „social physics“, as it characterizes social interactions by a law like empirical regularity.

For the analysis, a dataset containing disaggregated bilateral trade flows from 36 countries over the time period from 1995 until 2013 for three dairy product groups (after the Standard International Trade Classification (SITC)) is used. The dataset is analysed using an approach recently applied in the literature. YANG and MARTÍNEZ-ZARZOSO (2014) use the multinomial PML and combine it with a suited dummy-variable framework in order to be able to differentiate the trade creation and diversion.

The structure of this paper is as the following: First, a short introduction into ACFTA will be given, followed by an overview of the literature covering ACFTA. The next section introduces the gravity model of trade, first through an intuitive approach, then by explaining the development of the theory over time and ending with pointing out current research frontiers. Afterwards the applied model is specified and the dataset is described. After the presentation and the discussion of the results, the paper ends with a conclusion.

2 The ASEAN-CHINA Free Trade Agreement

2.1 Historic development of ACFTA

The Association of South-East Asian Nations (ASEAN) was founded in 1967, when the 'Bangkok Declaration' was signed. The number of members rose from five to ten countries over the years. In 1992, the ASEAN Free Trade Area came into effect. It established a common external preferential tariff scheme. China increased bilateral trade relations with ASEAN-members since the early 90's. Negotiations between ASEAN and China regarding FTAs started in 2002. A scheme to level tariffs on agricultural products, the so-called 'Early Harvest Programme', was launched in 2004. In the same year, an agreement on goods was signed, and entered into force in 2005. The aim of the agreement is that the duties on about 4000 types of goods decrease to zero for the six stronger developed ASEAN members (Thailand, Malaysia, Singapore, Indonesia, the Philippines and Brunei) by 2010 and to 5% for the rest of the members (Vietnam, Laos, Cambodia and Myanmar) by 2015[1].

2.2 Literature Review

The impact of ACFTA on trade flows has been examined by numerous authors, using different approaches and focusing on different aspects. For a general introduction to the overlying topic, one may consider looking at LYNCH (2010). A more specific introduction to FTAs in the Asian-pacific is provided by FINDLAY and URATA (2010). As ACFTA is only in full force since 2010 and as it was preceded by the ASEAN-FTA, a large literature share covers this FTA.

After analysing the effects of multiple FTAs simultaneously, KORINEK and MELATOS (2009) conclude that the ASEAN-FTA has been trade creating, but also lead to a trade diversion effect. Their results show that in comparison to other countries, the ASEAN-FTA-countries trade more with China and India. They also give an overview of the previous empirical work. Because the results vary widely, they hypothesize that the model specification is highly important. More recently MUJAHID (2014) found that the ASEAN-FTA had a significantly positive effect on food trade.

Specifically regarding ACFTA, CHIRATHIVAT (2002) stated that it would overall lead to a GDP increase both in China and the ASEAN countries. PARK ET. AL. (2008) found that ACFTA would lead to positive welfare effects and trade creation. More recently, SHENG ET. AL. (2012) found that total trade and intra-industry trade have increased due to the entry of the FTA. This supports the results of AHEARNE ET. AL. (2006), who found that the tariff reduction through ACFTA could increase the member countries trading competitiveness.

Using disaggregated data, QIU ET. AL. (2007) found that the FTA could promote bilateral trade for agricultural products between the ACFTA-Members. FERRIANTA ET. AL. (2012) predict the effects of ACFTA on the Indonesian Maize self-sufficiency, finding that it would be negative. Considering effects beside the pure trade effects, ISMANTO and KRISHNAMURTI (2014) found that ACFTA would lead to an increase of socio-economic costs in Indonesia due to its missing competitiveness.

1. The original texts of the agreement can be found on the ASEAN website (http://www.asean.org/communities/asean-economic-community/item/asean-china-free-trade-area-2)

3 Theoretic Modell

3.1 The intuitive Gravity Model of Trade

The gravity model has been developed over last decades[2], from a basic, intuitive model, to more sophisticated variants. The intuitive approach to the gravity model is to derive an equation analogue to Newton's Gravity equation. Newton's equation is given for two objects i and j by:

$$F_{ij} = G\frac{M_i M_j}{D_{ij}^2}$$

where F_{ij} is the attractive force between them, M_i and M_j are the masses, D_{ij} is the distance between the two objects and G is the gravitional constant (HEAD 2003).

A similar functional form can be used to analyse international trade flows:

$$F_{ij} = G\frac{M_i^{\alpha} M_j^{\beta}}{D_{ij}^{\theta}}$$

where F_{ij} is the trade flow from country i to j, M_i and M_j represent the economic size or 'economic masses' of the countries and D_{ij} represents the trade cost. This formula is usually referred to as 'naive gravity'. The approach was proposed by TINBERGEN (1962). Most studies, which are based on naive gravity, use the gross domestic product (GDP) as a proxy for M. The standard proxy for trade costs is the geographic distance (HEAD 2003) and is utilized in most gravity research.

The gravity model can be linearized by taking natural logs in order to achieve an equation in a form, which can be estimated using econometric methods (ε_{ij} represents the error term):

$$\ln F_{ij} = \beta_0 + \beta_1 \ln M_j + \beta_2 lnM_i + \beta_3 D_{ij} + \varepsilon_{ij}$$

As it is easy to assume, the ordinary distance between two countries is an imprecise proxy for the trade cost. In order to improve the estimation one usually includes additional proxy variables. For example, it is a standard practice to include binary dummy-variables, such as whether the countries share a border, have colonial links or are member of the same FTA.

3.2 The development and extension of the Gravity Model

Starting with ANDERSON (1979), several attempts to formally derive the gravity equation were made (HEAD 2003). After the initial attempts to work out the microeconomic foundations of the gravity model, HEAD and MAYER (2015) identify three major development stages: the admission of missing trade in 1995, the multilateral resistance/fixed-effects revolution (2002 – 2004) and the convergence with the field of heterogeneous firm theory (after 2008).

After being utilised in economic research for many years (although not in the mainstream research) (HEAD & MAYER 2015), the concept of 'missing trade' was introduced by TREFLER (1995) in 1995. The basic idea was to 'admit' that geographic distance and national borders have an important impact on trade, which was frequently neglected at that time (HEAD & MAYER 2015). Also dealing with trade barrier effects, the so-called 'border puzzle' described by MCCALLUM (1995) initialled a new attempt to understand border effects.

2. A summary of the concept of naive gravity is given by HEAD (2003). ANDERSON (2010) and HEAD and MAYER (2015) provide a more detailed overview, where the latter are covering more recent developments. BACCHETTA ET. AL. (2012) and SHEPHERD (2013) are also giving an introduction in the currently applied approaches, with a stronger focus on the practical application of gravity models.

One major problem of the early gravity model analysis was that it was not fully founded by microeconomic theory. The major aspects of this issue were solved with the publications by EATON and KORTUM (2002) and ANDERSON and VAN WINCOOP (2003). Here, the focus is restricted on the concept of ANDERSON and VAN WINCOOP (2003). Starting from a Constant Elasticity of Substitution (CES) expenditure function, they derived a structural gravity model in the form

$$X_{ij} = \frac{E_j Y_i}{Y}\left(\frac{t_{ij}}{P_j \Pi_i}\right)^{1-\sigma}$$

with the inward (Π_i) and outward (P_j) multilateral resistances (MR)

$$(\Pi_i)^{1-\sigma} = \sum_j \left(\frac{t_{ij}}{P_j}\right)^{1-\sigma} \frac{E_j}{Y} \text{ and } \left(P_j\right)^{1-\sigma} = \sum_i \left(\frac{t_{ij}}{\Pi_i}\right)^{1-\sigma} \frac{Y_i}{Y}$$

where X_{ij}denotes the trade flow from country i to county *j,* Y the world income, E_j the expenditures of country *j,* Y_i the income of country i and t_{ij} the trade costs between the countries i and *j.* The intuition behind the MR-Terms is that the bilateral trade is determined by the relative trade costs (the trade costs of an country i to all other possible countries influence the trade with country *j*). There are several ways to measure the MR-Terms. FEENSTRA (2004) introduced country-specific fixed-effects (FE). This lead to an increase in the use of panel data, as it not possible to estimate country specific variables in cross-sectional data when country-specific FE are included.

The last major step to dismiss the lack of microeconomic foundations of the gravity model was the convergence with the heterogeneous firm literature, where the compatibility of the gravity model and heterogeneous firm models was worked out. HEAD and MAYER (2015) especially note the work by CHANEY (2008), HELPMAN ET.AL. (2008) and MELITZ AND OTTAVIANO (2008).

3.3 Current research frontiers

More than on the microeconomic grounding, the current literature is focusing on the usage of the appropriate estimation technique. There are numerous approaches for different problems. The major issues are biased results, which often occur in the presence zero trade (cases when there is no observed trade). This is especially important when disaggregated data is examined as the number of zeros increase with a higher disaggregation level.

The work of SANTOS SILVA and TENREYRO (2006) can be seen as the starting point for the major share of this literature. They discuss the poisson pseudo maximum likelihood estimator (PPML) and promote it as a workhorse for gravity research. Nevertheless, there is an on-going discussion whether the PPML is the most suitable estimator. For example, based on the concept of pseudo maximum likelihood (PML), BURGER ET.AL. (2009) promote the use of a negative-binominal PML or a zero-inflated PPML. Another recent approach is the negative binomial quasi-generalized PML promoted by BOSQUET and BOULHOL (2014). Other authors promote estimators based on other concepts as the PML, e.g. the so-called EK-Tobit-estimator (EATON & KORTUM 2001) or a two step-Heckman approach proposed by Helpman et al. (2008). HEAD and MAYER (2015) find that the gamma PML or the multiplicative PML (introduced by EATON ET. AL. 2012) can lead to unbiased estimators.

As all of these approaches have some weaknesses or can be outperformed by others under specific circumstances (SANTOS SILVA & TENREYO 2009), there is currently no standard practice which is applied by the majority of authors. Several authors give recommendations about which estimator to use under which circumstances. These are often based on Monte-Carlo-Simulations (e.g. ANDERSON ET. AL. 2004, SANTOS SILVA & TENREYRO 2006, MARTÍNEZ-ZARZOSO 2011, HEAD & MAYER 2015). Instead of relaying on those recommendations, some authors apply several estimators and compare the results in a robustness analysis by using procedures like the so-called "MaMu-Test", proposed by MANNING and MULLAHY (2001) (e.g. YANG & MARTÍNEZ-ZARZOSO 2014 or KAREEM ET. AL. 2014).

4 Applied Model and used Dataset

4.1 Applied Model

The main interest of this paper is to analyse the effects of the ACTFA. When the effects of FTAs on trade are examined, it is necessary to consider the effects of trade creation and trade creation. These terms were first introduced by VINER (1950). Trade creation represents an intra-block increase of trade. Trade diversion occurs when trade shifts a more efficient producer towards a less efficient producer as a result of the introduction of an FTA. This paper follows a more elaborate definition used by MARTÍNEZ-ZARZOSO ET. AL. (2009), separating between trade diversion in terms of imports and in terms of exports.

The applied model follows an approach recently applied and discussed by YANG and MARTÍNEZ-ZARZOSO (2014) on a similar dataset. The applied estimator is the multinomial PML. It was proposed by HEAD ET. AL (2012) and is suggested by HEAD and MAYER (2015). KAREEM ET. AL. (2014) also identified it as the most favourable estimator in cases with a high percentage of zero trade instances. For multinomial PML, the market share

$$\pi_{ij} = \frac{X_{ij}}{X_j}$$

of an exporting county j is used as the depended variable, instead of X_{ij} as for other estimators (HEAD & MAYER 2015). Instead of traditional proxy variables or time-variant country and fixed country-pair effects like BAIER and BERGSTAND (2007), YANG and MARTÍNEZ-ZARZOSO (2014) only include country-fixed effects in the model.

A gravity equation for this approach is given by

$$\pi_{ijt} = \beta_0 + \phi_1 FTA1_{ijt} + \phi_2 FTA2_{ijt} + \phi_3 FTA3_{ijt} + \vartheta_i + \delta_j$$

where $FTA1_{ijt}$, $FTA2_{ijt}$ and $FTA3_{ijt}$ are dummy-variables for the FTA-effects, ϑ_i are the importing country specific and δ_j are the exporting country specific effects

The three FTA-dummies are included in order to separate the FTA impact into trade creation and trade diversion. This framework was developed by YANG and MARTÍNEZ-ZARZOSO (2014). For the framework, $FTA1_{ijt}$ takes the value 1 after 2003 if both countries are members of the agreement (the time period of the „Early Harvest Program" is included in the ACFTA-period, following YANG and MARTÍNEZ-ZARZOSO 2014). When the coefficient is significantly positive, this indicates the presence of trade creation.

$FTA2_{ijt}$ takes the value 1 after 2003 if only the exporting country j is member of the agreement. As a sign for trade diversion in export terms, a decrease of exports from member countries to non-member countries is indicated by a significantly negative coefficient. In contrast to $FTA2_{ijt}$, $FTA3_{ijt}$ takes the value 1 after 2003 if only the importing country i is a member. A significantly negative coefficient indicates trade diversion in terms of imports. The summary of the possible outcomes of the framework can be found in Table 1.

Table 1: Summary of the possible FTA-effects

	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	XC+XD	ME	MC+MD

Note: ϕ_1 is the coefficient of FTA1, which denotes exports among member countries. ϕ_2 is the coefficient of FTA2, 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.

Source: YANG and MARTÍNEZ-ZARZOSO 2014

4.2 Dataset

For this paper, a panel-dataset is used, containing the bilateral trade flows of 36 countries from 1995 until 2013, giving a maximum of 23960 observations (36x35x19). The countries are the ten ASEAN Countries, China and the 25 biggest dairy product exporting countries (in 2013). They can be found in Table 2. The trade flows are taken from the UNCTADstat database. The dataset includes trade flows for four product categories: „Milk and cream and milk products other than butter or cheese“ (SITC 022), „Butter and other fats and oils derived from milk“ (SITC 023), „Cheese and curd“ (SITC 024) and the calculated category „Total“ (dairy products) (SITC 022 + 023 + 024). Using disaggregated data does not only allow to identify effects on single product groups, but it can also be used as a basis to calculate aggregated trade costs more accurately (FRENCH 2011). The construction of the used FTA-dummy variables (FTA1, FTA2 and FTA3) was described under section 4.1.

Table 2: List of countries in the dataset

ACFTA-members	25 biggest dairy exporters in 2013	
	Germany	Austria,
Brunei	Netherlands	Argentina
Myanmar	New Zealand	Spain
Cambodia	France	United Arab Emirates
Indonesia	United States	Saudi Arabia
Laos	Belgium	Czech Republic
Malaysia	Italy	Uruguay
Philippines	Denmark	Lithuania
Singapore	Ireland	Switzerland
Thailand	Belarus	Finland
Vietnam	Australia,	India
China	Poland	Sweden
	United Kingdom	

Source: Authors elaboration using information from the World Trade Organization Website (http://www.wto.org/) and UNCTADstat database (SITC 022+023+024)

5 Results and Discussion

The results of the estimation can be found in Table 3. All estimated coefficients for the FTA-Dummies have highly significant values (at a significance level of 1%). Notably, the estimates for one variable have the same foresign for all three product groups, as well as for the aggregated product group ('Total').

With respect to Table 1 it is possible to identify the effects of ACFTA. As all estimates are significant, there are trade creation, and/or trade diversion effects. The estimates for FTA1 (ϕ_1) are positive, which means that the agreement has lead to a creation of intra-bloc trade. The estimates for FTA2 (ϕ_2) and FTA3 (ϕ_3) are negative. These decreases in the intra-bloc imports as well as exports have to be interpreted as trade diversion effects. For all dairy products combined and product group SITC 022, the export trade diversion effect is predominant to the export trade creation effect. For SITC 023 and 024, the trade creation effect exceeds the trade diversion effect. On the import side, the trade creation effect exceeds the trade diversion effect in all four analysed cases.

Table 3: Estimation Results

SITC	Total (022+023+024)	022	023	024
FTA1	1.080***	0.942***	1.478***	1.548***
	(0.14)	(0.13)	(0.18)	(0.18)
FTA2	-1.252***	-1.437***	-1.209***	-0.953***
	(0.17)	(0.18)	(0.18)	(0.17)
FTA3	-0.645***	-0.482***	-0.822***	-0.914***
	(0.08)	(0.07)	(0.10)	(0.11)
Observations	22820	22610	20615	21140
Pseudo-R^2	0.109	0.102	0.153	0.129
Log pseudolikelihood	-2441.73	-2441.41	-2117.57	-2224.30

Robust standard errors in parentheses; *** denotes significance level at 1%

Source: own calculations

With the estimated coefficients for ϕ_1, ϕ_2 and ϕ_3 it is possible to calculate the net trade creation effects in percent by transforming the estimated semi-elasticities. As all estimates are significant, they are all included in the calculation. The effects can be found in Table 4. All effects are negative and lie between -27% and -62% for the individual commodity groups and at -56% for the aggregated commodity. It should be considered that the model includes country specific effects. Thus, the estimated effects are time-invariant. Hence, it questionable if effects, which are captured by dummy variables (e.g. for a common border) in models whithout fixed effects, are captured in the same extent in the present model.

Table 4: Summary of trade creation effects

	FTA1	FTA2	FTA3	Net effect	Net TC %
SITC 022	0.942***	-1.437***	-0.482***	-0,977	-62
SITC 023	1.478***	-1.209***	-0.822***	-0,553	-42
SITC 024	1.548***	-0.953***	-0.914***	-0,319	-27
Total	1.080***	-1.252***	-0.645***	-0,817	-56

Note: the Net TC % is calculated as: (exp(net effect)-1)x100, following (MARTÍNEZ-SAROZO ET. AL. 2009)

Source: own calculations

There are some aspects which should be considered for the interpretation. For example the Chinese milk production increased about 610% during the analysed time period (FAO 2015). As the applied model does not include time-varying fixed effects, such changes on a country level may be not represented in the model. Also, the ACFTA allows exceptions individual goods on an individual country level, especially for agricultural goods.

6 Conclusion

This paper analyses the impact of ACFTA on the dairy product trade. The used data contains the trade flows for 3 dairy product groups (SITC 022, 023 and 024) and their aggregated values from 1995 until 2013. As recommended by HEAD and MAYER (2015), a multiplicative PML was used to estimate the trade creation and diversion effects following the framework by YANG and MARTÍNEZ-ZARZOSO (2014). When interpreting the results, it should be considered that it is possible that they are still biased due to asymmetrical trade flows. The dataset was not checked on those instances, but as the dataset contains the 25 largest dairy exporting countries, it is likely that their trade flows will be asymmetrical.

The results indicate that the introduction of ACFTA lead to significant trade creation and trade effects in terms of imports as well as exports. For the combined group of dairy products, the trade creation effect is predominant with respect to the imports, but is exceeded by the trade diversion effect in terms of exports. The negative net trade creation effect of the agreement, indicates that the current policy should be evaluated critically with respect to the trade of dairy products. This is contradicts the more general finding of YANG and MARTÍNEZ-ZARZOSO (2014), who found a positive net trade creation effect for agricultural products, without a significant trade diversion effect.

Nevertheless, the agreement may favour the intra-bloc trade. As some of the FTA-members play an important role on the world markets for dairy products, it is likely that the policy has a strong effect on the domestic producer price in other countries, as they are influenced by the world market prices.

Literature

AHEARNE, A. G., FERNALD, J. G., LOUNGANI, P. and SCHINDLER, J. W. (2006): *Flying Geese or Sitting Ducks: China's Impact on the Trading Fortunes of Other Asian Economies*. SSRN Scholarly Paper ID 965750. Rochester.

ANDERSON, J., (1979): A theoretical foundation for the gravity equation. In: *The American Economic Review* 69 (1), 106–116.

ANDERSON, J. E. (2010): *The Gravity Model*. NBER Working Papers 16576. National Bureau of Economic Research, Inc.

ANDERSON, J. E. and WINCOOP, E. V. (2003): Gravity with Gravitas: A Solution to the Border Puzzle. In: *American Economic Review*, 93(1), pp. 170–192.

ANDERSON, M. A., FERRANTINO, M. J. and SCHAEFER, K. C. (2004). *Monte Carlo Appraisals of Gravity Model Specifications*. SSRN Scholarly Paper ID 549301. Rochester, NY.

BAIER, S. L. and BERGSTRAND, J. H. (2007): Do free trade agreements actually increase members' international trade?. In: *Journal of International Economics*, 71(1), pp. 72–95.

BACCHETTA, M., BEVERELLI, C., CADOT, O., FUGAZZA, M., GRETHER, J.-M., HELBLE, M., NICITA, A., PIERMARTINI, R. (2012): *A practical guide to trade policy analysis*. World Trade Organization.

BOSQUET, C. and BOULHOL, H. (2014): Applying the GLM Variance Assumption to Overcome the Scale-Dependence of the Negative Binomial QGPML Estimator. In: *Econometric Reviews*, 33, 7, pp. 772–784.

BURGER, M., VAN OORT, F. and LINDERS, G.-J. (2009): On the Specification of the Gravity Model of Trade: Zeros, Excess Zeros and Zero-inflated Estimation. In: *Spatial Economic Analysis*, 4, 2, pp. 167–190.

CHANEY, T. (2008): Distorted Gravity: The Intensive and Extensive Margins of International Trade. In: *American Economic Review* 98 (4), 1707–21.

CHIRATHIVAT, S. (2002): ASEAN–China Free Trade Area: Background, implications, and future development. In: *Journal of Asia Economics*, 13(5), 671–686.

EATON, J. and KORTUM, S. (2001): Trade in capital goods. In: *European Economic Review* 45 (7), 1195–1235.

EATON, J. and KORTUM, S. (2002): Technology, Geography, and Trade. In: *Econometrica* 70 (5), 1741–1779.

EATON, J., KORTUM, S. S. and SOTELO, S. (2012): *International Trade: Linking Micro and Macro*. Working Paper 17864. National Bureau of Economic Research.

FAO (2015): FAOSTAT-Database. http://faostat3.fao.org/. Last access 14.8.2015.

FERRIANTA, Y., HANANI, N., SETIAWAN, B. and MUHAIMIN, W. (2012): Impact of Trade Liberalization Asean-China Free Trade Area (ACFTA) on The Performance of Indonesia Maize Economy. In: *Journal of Basic and Applied Scientific Research*, 2(7), pp. 6801–6809.

FEENSTRA, R. C. (2004): *Advanced International Trade: Theory and Evidence*. Princeton University Press, Princeton, New Jersey.

FINDLAY, C. C. and URATA, S. (eds) (2010): *Free trade agreements in the Asia Pacific*. Hackensack, N.J: World Scientific (World Scientific studies in international economics, v. 11).

FRENCH, S. (2011*): The composition of exports and gravity*. Sydney, University of New South Wales.

GRAMS, M. (2005): Reform der EU-Milchmarktpolitik bei instabilen Weltmärkten Reform of the EU dairy policy vis-a-vis unstable world markets. In: *Agrarwirtschaft*, 54(3), pp. 148–157.

HEAD, K. (2003): *Gravity for beginners*. University of British Columbia, 2053.

HEAD, K. and MAYER, H. (2015): Gravity Equations: Workhorse, Toolkit, and Cookbook. In Gopinath, G., Helpmann, E., and Rogoff, K. (eds) *Handbook of International Economics, Vol. 4*. Amsterdam: Elsevier-North Holland.

HELPMAN, E., MELITZ, M. and RUBINSTEIN, Y. (2008): Estimating Trade Flows: Trading Partners and Trading Volumes. In: *Quarterly Journal of Economics* 123 (2), 441–487.

ISMANTO, I. and KRISHNAMURTI, I. (2014): *The Political-Economy of ASEAN-China FTA*. Research Report. Karawaci, Indonesia: University of Pelita Harapan.

KAREEM, F. O., MARTÍNEZ-ZARZOSO, I. and BRÜMMER, B. (2014): *Fitting the Gravity Model when Zero Trade Flows are Frequent: a Comparison of Estimation Techniques*. Paper prepared for the ETSG 2014 Munich.

KORINEK, J. and MELATOS, M. (2009): *Trade Impacts of Selected Regional Trade Agreements in Agriculture*. OECD Trade Policy Papers 87.

KRUGMAN, P. (1997): *Development, geography, and economic theory*, Vol. 6. The MIT Press.

KÜHL, S., BUSCH, G., BRÜMMER, B., FAHLBUSCH, M. and SPILLER, A. (2015): Der Markt für Milch und Milcherzeugnisse im Jahr 2014. In: *German Journal of Agricultural Economics*, 64(Supplement), pp. 16–30.

LEAMER, E. and LEVINSOHN, J. (1995): International trade theory: the evidence. In: *Handbook of international economics*. Vol. 3. Elsevier, pp. 1339–1394.

LYNCH, D. A. (2010): *Trade and globalization: an introduction to regional trade agreements*. Lanham, MD: Rowman & Littlefield.

MANNING, W. G. and MULLAHY, J. (2001): Estimating log models: to transform or not to transform?. In: *Journal of Health Economics*, 20(4), pp. 461–494.

MARTÍNEZ-ZARZOSO, I. (2011): The log of gravity revisited. In: *Applied Economics*, 45(3), pp. 311–327.

MARTÍNEZ-ZARZOSO, I., FELICITAS, N.-L. D. and HORSEWOOD, N. (2009): Are regional trading agreements beneficial?: Static and dynamic panel gravity models. In: *The North American Journal of Economics and Finance*, 20(1), pp. 46–65.

MCCALLUM, J. (1995): National borders matter: Canada-US regional trade patterns. In: *The American Economic Review* 85 (3), 615–623.

MELITZ, M. and OTTAVIANO, G. (2008): Market Size, Trade, and Productivity. In: *Review of Economic Studies*, 75 (1), 295–316.

MUJAHID, I. (2014): *Food Trade Impacts of Trade Agreements in the Developing World*. Poster paper prepared for presentation at the EAAE 2014 Congress 'Agri-Food and Rural Innovations for Healthier Societies'

PARK, D., PARK, I. and ESTRADA, G. E. B. (2009): Prospects for ASEAN–China Free Trade Area: A Qualitative and Quantitative Analysis. In: *China & World Economy*, 17(4), pp. 104–120.

QIU, H., YANG, J., HUANG, J. and CHEN, R. (2007): Impact of China-ASEAN Free Trade Area on China's International Agricultural Trade and Its Regional Development. In: *China & World Economy*, 15(5), pp. 77–90.

SANTOS SILVA, J. M. C. and TENREYRO, S. (2006): The Log of Gravity, In: *Review of Economics & Statistics*, 88(4), pp. 641–658.

SANTOS SILVA, J. M.C. and TENREYRO, S. (2009): *Comments on" The Log of Gravity Revisited"*. Manuscript, London School of Economics.

SHENG, YU, TANG, H. C. and XU, X. (2012): *The impact of ACFTA on People's Republic of China–ASEAN trade: Estimates based on an extended gravity model for component trade*. ADB Working Paper Series on Regional Economic Integration, No. 99.

SHEPHER, B. (2013): *The gravity model of international trade: A user guide*. United Nations ESCAP.

TINBERGEN, J. (1962): *Shaping the World Economy*. The Twentieth Century Fund, New York.

TREFLER, D. (1995): The case of the missing trade and other mysteries. In: *The American Economic Review* 85 (5), 1029–1046.

VINER, J. (1950): *Customs union theory.* New York: Carnegie Endowment for International Peace.

YANG, S. and MARTÍNEZ-ZARZOSO, I. (2014): A panel data analysis of trade creation and trade diversion effects: The case of ASEAN–China Free Trade Area. In: *China Economic Review*, 29, pp. 138–151.