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Regional Blocs and Agricultural Trade Flow: The Case of ASEAN

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Abstract

The direction of the agricultural trade flow compared with the total trade flow can exhibit different patterns. In this study, total and agricultural trade flows for Indonesia, Malaysia, Philippines, and Thailand were examined employing a gravity model and utilizing cross section data. The results show that income and population are significant and positive in all cases while ASEAN has a facilitating impact on the agricultural trade flow in general. Although the distance variable is negative and significant for total trade flow, it is not significant in some cases for the agricultural trade flow. Given the fact that the population has a tendency to increase and income rises with the process of globalization, increasing trade flow can be expected in the region over time. Trade facilitating measures such as harmonization of regulations and an appropriate marketing mix towards partner countries will increase the trade flow in the region.

Discipline: Agricultural economics
Additional key words: globalization, gravity model

Introduction

World markets are steadily shaped by segmented economic blocs. There are more than 30 regional trading blocs worldwide[34]. The efforts to gain market share for agricultural and non-agricultural goods are the main goals in today's globalizing world. Countries in Southeast Asia also are important players in world trade (Table 1). The share of agricultural trade varies from quite low as in Brunei (0.05%) to quite high as in Laos (42.28%). Founded in 1967, the Association of Southeast Asian Nations (ASEAN) aims to accelerate economic growth, social progress and cultural development in the region through partnership[4]. The ASEAN Free Trade Area (AFTA) and Common Effective Preferential Tariff (CEPT) scheme were formed in 1992. The CEPT sets a tariff reduction list to reach a tariff level of 0−5% in 2006 with a specific timeframe from January 1, 1996 to January 1, 2006.

The flow of agricultural trade in ASEAN countries can be affected by various factors, such as gross domestic products of nations (GDP), population, distance, etc. Determining the impacts of these factors is important in expanding bilateral trade potentials with partner countries. This study tries to determine the effects of these factors for ASEAN countries in a cross section setting. The outcomes of this study can help these countries to form an appropriate marketing mix for the target markets.

Gravity models have been used extensively to examine trade flows. Beginning from the early versions of these models (Tinbergen[29] and Pöyhönen[25]) the trade flows from an economic union to a third country or to another union have been modeled. In some of these studies, Aitken[1], Bergstrand[6], Oguledo and Macphee[22], and Porojan[24] cross section data were used. In panel data studies (Zhang and Kristensen[36], Matyas et al.[21], Egger[11,12], Carrere[8]) trade flows were examined at an aggregate level. On the other hand, Otsuki et al.[23], Sanz and Gil[26], Cho et al.[9], and Furtan and van Melle[16] examined the direction of agricultural trade flow utilizing panel data. In a most recent study, Atici and Guloglu[5] examined Turkey's fruit and vegetable exports to the EU applying a gravity model

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Table 1. Agricultural and total trade values of ASEAN countries, 2003

Countries	Agricultural Trade (US$1,000)		Total Trade (US$1,000)		Share of Agr. Exp. in Total Export (%)
	Export	Import	Export	Import	
Brunei	1,873	246,867	3,500,000	1,700,000	
Darussalam					0.05
Cambodia	18,555	279,716	1,917,000	2,469,000	0.96
Indonesia	6,992,144	4,405,599	70,349,500	42,077,500	9.93
Laos	154,753	102,795	366,000	501,000	42.28
Malaysia	9,580,606	4,333,321	104,968,980	83,617,928	9.12
Myanmar	184,602	332,640	3,170,000	2,730,000	5.82
Philippines	1,865,206	3,071,193	37,026,000	39,502,000	5.03
Singapore	2,562,761	3,961,307	144,138,970	127,902,540	1.77
Thailand	10,355,905	3,528,368	78,416,000	74,214,000	13.2
Viet Nam	2,230,979	1,448,816	20,176,000	25,226,900	11.05

Source: FAO[14], 2004.

to the agricultural sub-sector trade flow. There are a few gravity models that research the flow of trade in South Asian countries. Thornton and Goglio[28] analyzed the regional bias and intra-regional trade in Southeast Asia. Sharma and Chua[27] researched the relationship of economic integration and intra-regional trade in ASEAN countries. However, gravity models that research the agricultural trade flow have not received enough attention. This study, therefore, aims to contribute to existing studies by analyzing the factors that affect the agricultural trade flow in ASEAN countries.

Methods

1. Gravity Model

This study will employ a gravity model to determine the trade flow. As mentioned before, the origins of the gravity models are due to Tinbergen[29] and Pöyhönen[25]. The gravity model belongs to the class of empirical models that are concerned with the determinants of interaction. In general form, it explains a flow F_{ij} of goods from an area *i* to an area *j* as a function of characteristics of origin O_i, characteristics of destination D_j and some separation measures S_{ij} [24]. Therefore, this can be represented as follows:

$$F_{ij} = O_i D_j S_{ij}, \quad i = 1,\ldots,I, \; j = 1,\ldots,J \qquad (1)$$

The formulation of that relationship is basically based upon analogy with the law of gravity in physics such that attraction is larger between larger and more closely positioned bodies. Applying this to trade, the gravity model implies that trade increases with size and proximity of trading partners[24,36]. There are some other theoretical foundations for the model. Linneman[18] used a partial equilibrium model of export supply and import demand. In this model trade flow between two countries is a function of total potential supply and demand, and a resistance factor. After the equilibrium conditions, the gravity equation then is the reduced form of the model. However, some simplifying assumptions of that model have a problem in explaining the multiplicative form of the gravity model[6]. Anderson[2] employs a trade share expenditure system and utility maximization with respect to income. Then assuming the log linear function for trade shares, the gravity equation for aggregate import is derived. Bergstrand[6] indicates that the gravity equation is a reduced form of general equilibrium demand and supply systems. In the model, demand is derived by maximizing a utility function with respect to income in importing countries. The trade supply is derived by firms' profit maximizing behavior for the exporting country. Then the trade flow is determined under equilibrium conditions where demand and supply flows equal each other. The theoretical foundations based on the Heckscher-Ohlin Theorem are also utilized by Deardoff[10] and Evenett and Keller[13] and it was found that the H-O framework will result in predictions of gravity equations. In the H-O model the larger the differences in factor endowments between two countries the larger the trade. However the trade between the developed countries, which have similar factor endowments, is higher in real life. Nevertheless, if high-income consumers consume higher budget shares for capital-intensive goods, then capital rich countries

trade more with other capital rich countries[20], which confirms the prediction of gravity models. As Evenett and Keller[13] indicate there are three types of trade models; technology differences in trade models such as Ricardian models, variations in factor endowments as in the H-O model, and increasing returns as in increasing returns trade models. In real life, although technology and factor endowments are different across countries, they can vary over time and can be transferred between countries. Although trade theories explain the reason for trade, they cannot explain why some countries trade intensively with each other. Therefore, this is the limitation of conventional trade theories related to the size of the trade flow. The gravity models consider more factors such as population, border, economic memberships, etc. that account for the size of the flow. Also, gravity models differ from the conventional import demand models because the demand models capture the factors that determine trade in an aggregate way not for country specific effects. The gravity model for this study can be specified in a general form as follows;

$$T_{ij} = f(GDP_{ij}, N_{ij}, D_{ij}, DU_{ij}) \quad (2)$$

where T, GDP, N, D, and DU are trade flow, gross domestic product per capita, population, distance, and dummy variables such as being an ASEAN country, respectively. The model estimates the gravity model for four ASEAN countries, namely Indonesia, Malaysia, Philippines, and Thailand for the year 2003. The partner countries are 10

Table 2. Bilateral agricultural trade flow of reporting ASEAN countries, in US$, 2003

Indonesia		Malaysia		Philippines		Thailand	
US	1,374,423,215	Australia	668,401,768	US	1,003,440,067	US	2,251,134,166
Japan	871,738,455	Indonesia	663,407,507	Japan	400,250,036	Japan	2,281,730,538
Australia	471,061,869	US	416,001,740	Australia	330,130,966	Philippines	581,894,664
Malaysia	401,733,704	China	403,545,580	China	140,090,612	Malaysia	532,929,658
Singapore	372,370,543	Singapore	249,732,274	Singapore	135,814,426	China	506,026,704
Vietnam	372,370,543	India	234,133,026	Canada	131,813,684	Australia	448,581,078
China	317,757,795	Netherlands	198,440,527	India	131,012,068	Netherlands	395,159,485
Thailand	313,183,551	Japan	140,638,032	Vietnam	118,059,584	Canada	347,057,142
Netherlands	211,450,186	Thailand	129,903,185	Netherlands	96,475,534	Singapore	341,207,038
Brazil	198,143,089	Philippines	110,995,476	Malaysia	88,924,655	Indonesia	225,944,511
Canada	110,210,199	Vietnam	95,792,984	Thailand	74,342,994	Russia	200,174,491
Philippines	103,563,965	Brunei	77,757,067	Indonesia	56,564,945	Brazil	190,831,233
Kazakhstan	71,349,436	Italy	51,176,961	Brazil	33,217,918	India	166,765,635
Turkey	34,861,722	Canada	44,309,072	S. Africa	16,006,413	Italy	133,231,663
Pakistan	34,653,178	S. Africa	42,042,854	Italy	9,532,333	S. Africa	119,126,916
Italy	33,354,391	Myanmar	41,202,109	Turkey	8,400,485	Cambodia	116,290,276
Cambodia	32,674,320	Brazil	38,309,176	Mexico	5,607,974	Vietnam	98,159,081
Russia	31,559,967	Pakistan	25,849,453	Pakistan	3,492,750	Senegal	87,855,151
S. Africa	30,928,851	Russia	25,779,754	Russia	3,027,053	Myanmar	63,962,018
Myanmar	14,060,781	Turkey	15,639,339	Norway	2,363,845	Laos	62,965,656
India	8,231,674	Mexico	9,671,558	Myanmar	2,270,476	Norway	43,811,198
Brunei	8,230,000	Cambodia	7,246,289	Cambodia	1,487,043	Mexico	18,989,562
Algeria	8,128,606	Norway	5,101,270	Brunei	975,105	Brunei	15,644,031
Mexico	7,750,749	Oman	4,623,211	Hungary	721,148	Pakistan	15,027,614
Norway	4,143,287	Algeria	2,868,787	Oman	629,008	Austria	8,992,487
Austria	1,861,699	Hungary	1,620,103	Austria	425,534	Hungary	8,716,253
Hungary	1,831,233	Kazakhstan	910,273	Algeria	247,731	Oman	8,691,012
Oman	1,072,819	Austria	327,584	Laos	29,399	Algeria	8,236,615
Senegal	487,088	Senegal	277,868	Senegal	23,790	Turkey	6,470,733
Laos	139,721	Laos	108,445	Kazakhstan	11,025	Kazakhstan	970,532

Source: UN Comtrade[30], 2005.

ASEAN countries plus 20 other countries chosen according to some factors, such as the share of a partner reporting (home) countries' total and agricultural trade in the reporting countries' trade volume. Therefore, there are a total of 30 partner countries for each ASEAN country studied. These countries are listed in Table 2. The total and agricultural trade data are derived from UN's comtrade database[30]. The data on current GDPs in terms of US$ and population are from the World Bank's[35] development database. The distance data are from the USDA's[31] web page.

2. The Model

The gravity model for this study can be formulated in a functional form as follows;

$$T_{ij} = \alpha Y_{i,j}^{\beta 1} N_{i,j}^{\beta 2} D_{ij}^{\beta 3} e^{\beta 4 A_{ij}} e^{u_{ij}} \quad (3)$$

where T_{ij} is total value of bilateral total and agricultural trade flow (export + import) between ASEAN countries to the selected markets, $Y_{i,j}$ is GDP per capita of reporter and partner countries, $N_{i,j}$ is population of reporter and partner countries, D_{ij} is the geographical distance between reporting and partner countries, and A_{ij} is a dummy variable of 1 for an ASEAN member or 0 otherwise. Reviewing the recent literature about gravity models, equation (3) may be rewritten in log-linear cross section data form as follows:

$$\ln T_{ij} = \ln \alpha + \beta 1 \ln(Y_i * Y_j) + \beta 2 \ln(N_i * N_j) + \beta 3 \ln D_{ij} + \beta 4 A_j + u_{ij} \quad (4)$$

The income variable impacts economic capacity of trade while the population variable impacts market size. The income (GDP per capita of reporter and partner countries) therefore positively impacts trade flow. Population determines market size and a larger population means a larger domestic market (economies of scale) and therefore may lead to less trade flow. However, if larger population causes higher demand because of the absorption effect we can expect a positive sign for the parameter of the population variable. The distance between two partners determines the transportation cost and negatively affects the trade flow. Neighbor countries are expected to have more trade because of similarities in tastes and preferences[1]. Conventional trade flow variables such as GDPs of reporter and partner countries, distance, and population were found to be as expected in most of the studies[22]. Brada and Mendez[7], on the other hand, found that the population of home and partner countries' had a positive impact on trade flow. In addition, a study examining agricultural trade flow from Spain to the EU[26] found that the populations of reporter and partner countries have a positive impact on agricultural export flow. The dummy variable of being an ASEAN member may have an ambiguous sign. If being an ASEAN member increased the intra-regional trade, it is expected to have positive impacts on trade volume. However, if being a member did not impact trade flow in an intended way, that dummy variable may be negative. Sharma and Chua[27] in a panel data study found that the ASEAN dummy variable was negative and significant which indicates that the integration scheme did not increase intra-ASEAN trade. On the other hand, Thornton and Goglio[28] in another panel study found that membership of ASEAN was not significant in the early years but it was an important factor in promoting intra-regional trade in the 1990s due to liberalization.

For developing countries, special market access arrangements represent a large percentage of agricultural export gains and have important implications for rural employment and the balance of payments[32]. Since the ASEAN countries in the study are a net exporter of agricultural products, higher trade with partner countries will help them to improve their balance of payments and other indicators of development. Anderson et al.[3] found that agricultural trade liberalization of the Doha Development Agenda benefits developing countries through a rise in income and decrease in rural poverty. In addition, the income generated by higher trade flow can help developing countries stimulate social development through rising income and distribution of wealth. Per capita income[15], income levels[17], and evaluation of policies through higher trade flow[19] were found to be primary determinants in the timing of social reforms.

As we can observe from Table 2, the main trading partners are either high income large countries or ASEAN members for the reporting countries examined. The main agricultural trading partners are as follows: US, Japan and Australia for Indonesia; Australia, Indonesia and US for Malaysia; US, Japan and Australia for Philippines; and Japan, US and Philippines for Thailand. These findings can shed a light on the results and implications of the study.

Results

The results of the gravity model are presented in Tables 3 and 4. Table 3 presents regression results of total trade flow for Indonesia, Malaysia, Philippines, and Thailand while Table 4 presents the regression results of the agricultural trade flow for the countries mentioned above. In the model, results reflect heteroscedastic corrected t values, in case heteroscedasticity is observed. As can be seen, the income variable is highly significant and positive

Table 3. Regression results of total trade flow for ASEAN countries, 2003

	Const.	ln*Y*	ln*N*	ln*D*	ASEAN	R^2
Indonesia	13.42**	1.07***	1.07***	–0.57	1.77	0.80
	(2.08)	(7.53)	(11.35)	(–0.82)	(1.28)	
Malaysia	22.16***	1.14***	1.08***	–1.44***	0.03	0.80
	(5.14)	(7.26)	(5.95)	(–4.37)	(0.02)	
Philippines	11.87*	1.63***	1.50***	–0.94*	2.18*	0.80
	(1.72)	(7.49)	(5.53)	(–1.80)	(1.75)	
Thailand	19.70***	0.79***	0.60***	–0.69	1.31	0.64
	(4.84)	(4.49)	(3.2)	(–1.65)	(1.34)	

***, **, *: Significant at 1%, 5% and 10 % respectively, t values are in parentheses.

Table 4. Regression results of the agricultural trade flow for ASEAN countries, 2003

	Const.	ln*Y*	ln*N*	ln*D*	ASEAN	R^2
Indonesia	7.71	0.99***	1.08***	–0.25	2.67**	0.61
	(1.42)	(4.89)	(6.26)	(–0.41)	(2.52)	
Malaysia	17.45***	0.94***	1.09***	–1.25**	0.81	0.67
	(4.08)	(4.80)	(5.73)	(–2.67)	(0.80)	
Philippines	9.92*	1.43***	1.47***	–0.97*	2.28**	0.76
	(1.72)	(7.26)	(7.45)	(–1.80)	(2.14)	
Thailand	13.38***	0.76**	0.79***	–0.41	1.75**	0.55
	(3.22)	(2.36)	(4.16)	(–0.62)	(2.46)	

***, **, *: Significant at 1%, 5% and 10 % respectively, t values are in parentheses.

as expected for all countries with the highest value (1.63) for Philippines and lowest (0.79) for Thailand. It indicates that a 1% increase in the incomes of reporter and partner countries (economic mass) leads to 1.63% increase in trade flow for Philippines and 0.79% for Thailand. Population on the other hand, is positive and significant in all cases meaning that larger population in partner countries facilitates trade flow because of the higher import demand. The distance variable is negative in all cases as expected indicating that higher transportation cost leads to less trade flow, and is significant except for Indonesia and Thailand. The ASEAN dummy variable is positive in all cases but significant only for Philippines. It indicates that Philippine's total trade flow with ASEAN members is almost eight times higher than non member countries (i.e. exp (2.18) − 1 = 7.84) considering the 30 reporting countries studied. On the other hand, when agricultural trade flow is analyzed, we observe that the income variable is quite significant and positive for the reported countries. The population variable is positive and significant in all cases. The distance variable is negative for all countries as expected but significant only for Malaysia and Philippines' agricultural trade flow. The ASEAN variable is positive for all cases and significant except for Malaysia. This indicates that ASEAN membership has a facilitating impact on the agricultural trade flow and emphasizes the importance of intra-regional agricultural trade flow for these countries.

Conclusion

This study examined the total and agricultural trade flow of four ASEAN countries utilizing cross section data and employing the gravity model. The results show that income and population are the main determinants of both total and agricultural trade flow in the region. Certainly, gravity models have been very useful in explaining the trade flows among countries. However, several points have to be remembered in analyzing sector-specific gravity studies, such as agriculture. Although the distance variable explains the direction of trade flow such that trade flow decreases with longer distances, this argument seems to be invalid in some cases for specific agricultural products especially for processed products such as oils and nuts, which are the main trading commodities in the region. In addition, some other conventional variables such as border and language in that context may have insignificant effects on export flow if reporter or home

and partner countries are similar in production and consumption of the export product. The reason is that the reporting countries in the region face a high import demand by distant partners for their agricultural products despite the higher transportation cost. Therefore, some countries that are producing similar agricultural products (such as tropical products) tend to export these products to distant markets because they are competitors for these markets[5]. Although the ASEAN has a limited impact on total trade flow, in general it has a facilitating impact on agricultural trade flow in the region. Despite the fact that initially that union was a regional collaboration bloc rather than an economic one, it seems that the recent trade liberalization process and globalization have increased its economic feature. As ASEAN expands further and becomes a single economic union, such as the ASEAN Economic Community (AEC) as proposed a few years ago, free trade may enhance the effect of this organization. In addition, given the fact that the population has a tendency to increase and income rises with the process of globalization, we can expect an increasing trade flow in the region over time. In terms of a higher agricultural trade flow within the bloc, member countries need to invest more in diversified and processed agricultural products to be more competitive. Another point to consider is that the region faces some obstacles in trade transactions such as differences of infrastructure and environmental standards[33] that need to be addressed to increase the intra-regional trade flow. Trade facilitating measures such as simplification of customs and licensing procedures and harmonization of regulations certainly will help to stimulate a higher trade flow. Further studies in that area can include some non-tariff barriers such as sanitary measures and standards or other trade restrictive measures to explore the determinants of the trade flow further in the region.

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