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Assessing the impact of the main East-Asian free trade agreements using a gravity model. First results

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Abstract

The purpose of this article is to assess the impact of the three main East-Asian free trade agreements (ASEAN, ASEAN-China and ASEAN-South Korea) on intra-regional and extra- regional trade. To do this, we use a panel-data gravity model with three regional indicator variables. On the basis of the results, we conclude that the ASEAN agreement favours regional and multilateral trade, with the creation of exports to the rest of the world outweighing the diversion of extra-regional imports. The ASEAN-China and ASEAN-South Korea agreements have thus far not been shown to have an impact on East-Asian trade flows.

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1. Introduction

Since the economic crisis of 1997, as far as monetary and financial matters are concerned East Asia has been characterised by the institutionalisation of inter-state relations within the ASEAN+3 region, which includes the ten member countries of the ASEAN¹, South Korea, China and Japan. The failings of the international financial and monetary system in the wake of the crisis prompted these thirteen economies to cooperate so as to fulfil their common need: the financial and monetary stability in the region (Guilhot, 2008 and 2009). As regards trade, institutional progress has been made chiefly on a bilateral basis and no regional free trade agreement (FTA) covering all East-Asian countries has yet been signed. Nonetheless, these bilateral agreements can have an impact on trade flows and, therefore, on regionalisation.

In this article we use a panel-data gravity model with three regional control variables over the period 1985-2007 to assess the impact on intra-regional and extra-regional trade of the three "major" free trade agreements signed, namely the arrangement set up within ASEAN, and the agreements between ASEAN and China and between ASEAN and South Korea. The originality of this paper resides in the range of agreements covered, the objective pursued and the econometric method employed.

Several econometric studies have been performed to measure the impact of free trade agreements on trade within a region and between the region and the rest of the world. Analyses have been conducted on the AFTA (ASEAN Free Trade Area) (Elliot and Ikemoto, 2004) and statistical studies have been carried out on the ASEAN-China FTA (Lijun, 2003; Yue, 2004; Tongzon, 2005) and on the ASEAN-South Korea FTA (Park, 2006). But no econometric study has examined the three "major" East-Asian free trade agreements.

The second objective of this paper is to demonstrate the impact of these agreements on trade between the signatory countries, but also their impact on trade with the rest of the world. This is why three variables indicating membership of an agreement were introduced. By making use of the new terminology proposed by Trotignon (2009), it is possible to determine whether the agreements signed are building blocks or stumbling blocks, that is to say, whether they favour or hinder multilateralism.

Another originality of this paper stems from the econometric method used to estimate the panel data: a gravity model incorporating specific effects. This technique allows us to assess the relative importance of the determining factors in bilateral trade flows, while taking into account the heterogeneity of each country pair. This method is increasingly employed in gravity models, but has never before been used to measure the impact of these three East-Asian free trade agreements.

Part one therefore looks at the state of trade regionalism in East Asia. In part two, we present the methodology used to estimate the model (variables and specifications). The results are presented in part three.

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¹ The ASEAN, acronym of the association of the nations of Southeast Asia, was created in 1967. It has been enlarged on a number of occasions, the founding members (Indonesia, Malaysia, Philippines, Thailand and Singapore) having been joined by Brunei in 1984, Vietnam in 1995, Laos and Burma in 1997 and Cambodia in 1999.

2. Trade regionalism in East Asia

Trade regionalisation in East Asia (which, for our purposes, is confined to the ASEAN+3 grouping) has increased over the years, notably as a result of China's rising influence on regional trade (Zebregs, 2004). In 2007, intra-ASEAN+3 exports represented 33.5% of its total exports and intra-ASEAN+3 imports 42.7% (Cf. Table 1).

Table 1 : East Asia's major trading partners for year 2007, in %

	Japan		China		Sth Korea		ASEAN		ASEAN+3		USA		EU(25)		RoW	
	Exp	Imp	Exp	Imp	Exp	Imp	Exp	Imp	Exp	Imp	Exp	Imp	Exp	Imp	Exp	Imp
Japan	0	0	15,3	20,5	7,6	4,4	12,2	13,9	35,1	38,9	20,4	11,6	14,7	10,4	29,8	39,1
China	8,4	14	0	0	4,6	10,9	7,5	11,3	20,5	36,2	19,1	7,3	19,9	11,6	40,5	44,9
Sth Korea	7,1	15,8	22,7	17,7	0	0	9,3	9,3	38,5	42,7	12,4	10,5	14,8	10,3	34,3	36,5
ASEAN	10,3	11,7	9,2	12,5	3,7	5	25,2	24,7	48,4	53,9	12,4	9,6	12,6	10,8	26,6	25,7
ASEAN+3	6,9	10,4	8,5	10,6	4,5	6,3	13,6	15,4	33,5	42,7	16,8	9,4	16,2	10,9	33,6	37

Source: Counting of the author according to Direction of Trade Statistics, Yearbook 2008 of FMI

This concentration of trade flows has not yet been the object of institutionalisation measures across the region (partly because of the rivalry between China and Japan), but bilateral free trade agreements have emerged between the countries. Three FTAs will be examined: the free trade agreement within the ASEAN (AFTA), and the ASEAN-China and ASEAN-South Korea FTAs.

ASEAN created a free trade area in 1991 and member countries committed to reducing tariff levels to 0-5% by 2002, before abolishing them completely by 2010. This arrangement also applies to the four new members, but they will have until 2015 to fully abolish customs duties. The gradual reduction of their customs duties rules that we insert them into our study.

In 2001, China and the ten member countries of ASEAN began negotiations for the creation of a free trade area. One year later, the agreement was signed. It was decided that reductions in customs duties would take place in stages. For the six members (Indonesia, Malaysia, Philippines, Singapore, Thailand and Brunei), reductions will apply to all goods by 2010, while new entrants (Cambodia, Laos, Vietnam and Burma, CLVB) have until 2015 to reduce their tariffs, with a certain degree of flexibility for so-called sensitive goods, as well as preferential customs procedures(Lijun, 2003).

Following on from the cooperation initiated by China, **South Korea** began formal talks with **ASEAN** in 2004, resulting in the Joint Declaration on Comprehensive Cooperation Partnership between ASEAN and the Republic of Korea in December 2005. The latter is geared towards promoting economic cooperation between the two parties and covers various aspects, including trade, investment and services. In 2006, these negotiations led to the creation of a free trade area between South Korea and the ASEAN member countries, except for Thailand, which joined the mechanism a year later once their differences on the topic of agriculture (notably the exclusion of rice from the agreement) had been resolved (Park, 2006).

These three FTAs were selected for our study because of the size of the economies involved and the success of the agreements. Other bilateral agreements (signed on an individual basis between one of the twelve countries and another member of the region) have not been taken into consideration. This rise in the number of FTAs, creating what Baghwati (2002) describes as the "spaghetti bowl", makes it impossible to accurately assess their impact or to take into

account any "global" impact on the region. In spite of the Japanese economy's importance in the region, the "Japan-ASEAN Comprehensive Economic Partnership" (JACEP) project, signed in October 2003, cannot be included in our study for a number of reasons: first, although it has gradually evolved into a free trade agreement, the latter was only signed at the end of 2008 – a date not covered by our study – and, second, it does not include all the ASEAN member countries. So far, the JACEP has only come into effect in Singapore, Laos, Vietnam and Burma, as the other members have not yet completed the procedure required to implement it.

3. The gravity model: data and methodology

The equation employed² makes it possible to estimate the impact of the various determining factors on bilateral export flows³ between the 12 economies (ten members of ASEAN, South Korea and China) and their 22 main trading partners, over the period 1985 to 2007 (Cf. Annex 1).

X_{iit}, represents export flows from country i to country j on date t,

GDP_{it}, the GDP of country i,

GDP it, the GDP of country j,

Gdppc_{it}, the GDP per capita of country i,

Gdppc_{it}, the GDP per capita of country j,

Dgdppc_{ijt}, the gap in economic development,

Rem_{it}, the distance of country i from alternative markets,

Rem_{it}, the distance of country j from alternative markets,

Distwees_{ijt}, the distance between the two capitals weighted by the proportion of the total population they account for,

ADJ_{iit}, the fact that the countries i and j share a land border,

LangCom_{ijt}, the fact that the countries i and j share a common language,

LangEth_{iit}, the fact the countries i and j share an ethnic language,

Afta_{iit}, the impact of the AFTA on the regional trade

AftaX_{iit}, the impact of the AFTA on the exports to the rest of world

AftaM_{iit}, the impact of the AFTA on the imports from the rest of world

Acfta_{iit}, the impact of the ASEAN-China agreement on the regional trade

 $AcftaX_{ijt}$, the impact of the ACFTA on the exports to the rest of world

AcftaMiit, the impact of the ACFTA on the imports from the rest of world

Akftaiit, the impact of the ASEAN-South Korea agreement on the regional trade

AkftaX_{iit}, the impact of the AKFTA on the exports to the rest of world

AkftaMiit, t the impact of the AKFTA on the imports from the rest of world

 μ_{iit} , the error term

Our equation includes three "standard" variables of the gravity model:

- GDP, which is an indicator of the **economic size of the partner countries**. GDP data is expressed in billions of PPP (purchasing power parity) dollars and was collected from the IMF website⁴.

² This equation is then expressed in log-linear form, so as to interpret the coefficients calculated in the form of export flow elasticities with respect to the explanatory variables.

³ Data concerning the bilateral flows of exports is collected in different numbers of Direction Trade of Statistics Yearbook of the IMF

⁴ http://www.imf.org/external/pubs/ft/weo/2006/02/data/index.aspx

- **Geographical distance**, which represents the influence of transport costs on trade. The geographical variable used here takes into account the distance between the two capital cities weighted by the proportion of the country's population who live in the capital (variable named here distwees)⁵. Unlike the standard geodesic distance, this calculation considers the population's geographic distribution and, therefore, dampens the capital's influence so as to provide a more realistic idea of the distribution of trade flows between the countries.
- **GDP per capita**, which estimates the impact of economic development on trade flows. Data on GDP per capita comes from the IMF⁶ and is measured in billions of PPP dollars.

The equation also includes other variables, namely:

- Relative distance, described in the literature as remoteness (or overall distance), which is based on the theory that the relative distances between partner countries have an influence on trade. Generally speaking, two countries that are geographically remote from other countries tend to trade with each other more than two countries separated by the same absolute distance, but which are geographically closer to other markets (Helliwell, 1998; Deardorff, 1998). This remoteness variable serves the same purpose as the multilateral trade resistance variable used by Anderson and Van Wincoop (2003), thus preventing an overestimation of the regional variables and a bias when estimating the error term. This variable is equal to the sum of the distance between country i and an other importing country (excepted the country j) divided by the GDP of this importing country. This variable measures the influence of remoteness of country i from other importing countries on its trade flows with country j. The same method is applied to the importing countries j.

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\begin{aligned} Rem_{it} &= \Sigma_{n,\,n\neq j} \; (D_{ni} \! / \; Y_{nt}) \\ Rem_{jt} &= \Sigma_{n,\,n\neq i} \; (D_{nj} \! / \; Y_{nt}) \end{aligned}
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D represent the distance between the countries, Y the GDP.

- Gap in economic development, measured in terms of the absolute difference in GDP per capita (Roberts, 2004), which provides an indication of the type of trade between the countries (Linder Hypothesis).
- Cultural proximity: it is assessed by the linguistic factor. The aim is to assess whether sharing an official common language (variable LangCom) or an ethnic language (LangEth) (i.e., a language spoken by at least 9% of the population in both countries, according to the calculations of the CEPII [French research centre for international economics]), can positively influence bilateral trade.
- A common border: sharing a land border (variable ADJ) has a positive influence on trade flows between two countries.
- To measure "regional bias", i.e., the impact of free trade agreements on the direction of trade flows, we use the method employed by Soloaga and Winters (2001). They propose three regional indicator variables, allowing the measurement of both the creation and diversion effects influencing intra-regional and extra-regional trade. Thus, the first variable, **Fta**, tests intra-regional trade. Its value is 1 if countries i and j both signed the same agreement and 0 if this is not the case. The second variable, **FtaX**, reflects the impact of the agreement on exports to the rest of the world. Its value is 1 if country i signs up to an agreement of which country j is not a signatory and 0 if this is not the case. The third variable, **FtaM**, estimates

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⁵ The denomination used here is that of the CEPII, since this variable is available in the latter's database.

⁶ http://www.imf.org/external/pubs/ft/weo/2006/02/data/index.aspx

the effect on imports from the rest of the world. Its value is 1 if country i does not belong to the same group as country j, and 0 if this is not the case. For our study, three agreements were selected: the free trade agreement within the ASEAN, known as the AFTA, the ASEAN-China agreement, known as the ACFTA, and the ASEAN-South Korea agreement, known as the AKFTA. If these agreements are not yet in place, the value of these regional variables is 0. Unlike the various studies concerning the impact of the AFTA (Elliot and Ikemoto, 2004; Trotignon, 2009), expansion of the agreements is taken into account. For founding members, the agreement is considered from the year in which it came into force, while for new members, we consider the year they joined.

The two-dimensional nature of our data (individual and temporal) allows for the use of panel-data estimation methods. Our base being balanced, that is to say, it contains the same number of observations for each country over all the studied period, we can more easily set up them. In the same way as Matyas (1997), Egger and Pfaffermayr (2003), Cheng and Wall (2004), Trotignon (2008 and 2009), we decided to make use of the specific-effect estimation technique. The Breusch-Pagan Lagrange Multiplier test (LM) (Cf. Table 2) shows that specific-effect estimation is appropriate: the calculated values are greater than 3.841 with a first-order risk of 5%. In addition, the Hausman test (Cf. Table 2) highlights a correlation between the explanatory variables and the effects, which justifies the use of a fixed-effect model.

To overcome the problem of missing variables in our database⁷, these variables are transformed into null values (Eichengreen and Irwin, (1998); Tayebi and Hortamani, (2007);...). Because the use of the logarithm in the gravity equation is incompatible with this transformation, 1 is added to the export flow values. The logarithm of this sum is then calculated. In other words, this equates to having $\log (1+X_{ijt})$ as the variable to be explained. This means that if $X_{ijt} = 0$, then $\log (1+X_{ijt}) = 0$, since $\log(1) = 0$.

4. Results

The coefficients of the gravity model are presented in Table 2. The first column presents the coefficients of the "standard" variables. The second column includes the estimated coefficients of regional dummies for the East Asia region.

In line with the traditional results of gravity model estimates, **the GDP of the exporting or importing country** has a significant and positive effect on the direction of trade flows between the 34 countries. The presence of regional arrangements in East Asia seems to reinforce the impact of effect size in our database (the coefficient in model 2 is higher). Thus, over the period 1985-2007, a 1% increase in the GDP of the exporting countries leads to a 1.45% increase in trade with importing countries (bearing in mind that our dependent variable is adjusted to equal 1+Exp).

Like the GDP coefficients, the coefficients assigned to the GDP per capita of the exporting and importing countries are positive and significant. The impact of economic development on the bilateral trade flows appears to decrease with the set up of regional agreements. (Cf. coefficients in model (2)).

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⁷ The use of data compiled by the IMF does not allow telling whether this data is unavailable, too insignificant to be listed or whether the countries do not trade with each other.

Table 2 : Assessing the regional bias

Variables	1985-07	1985-07			
	(1)	(2)			
Gdpi	1,23*** (18,91)	1,45*** (21,10)			
Gdpj	0,74*** (12,26)	1,08*** (16,35)			
Gdppci	0,36*** (4,64)	0,24*** (3,09)			
Gdppcj	0,46*** (6,39)	0,24*** (3,26)			
Dgdppc	0,02*** (2,75)	0,03*** (3,23)			
Remi	1,25*** (18,18)	0,99*** (12,88)			
Remj	-0,34*** (-4,27)	0,12 (1,33)			
Distwces	-	-			
Adj	-	-			
LangCom	-	-			
LangEth	-	-			
Regional biais					
Afta	-	1,39*** (8,55)			
AftaX	-	1,77*** (10,77)			
AftaM	-	-0,14*** (-4,17)			
Acfta	-	-0,15*** (-4,01)			
AcftaX	-	-0,09*** (-3,72)			
AcftaM	-	-0,21*** (-8,45)			
Akfta	-	-0,22*** (-3,99)			
AkftaX	-	-0,18*** (-4,89)			
AkftaM	-	-0,16*** (-4,22)			
Adjusted R ²	0,55064	0,55727			
F-Statistic	4319,77***	1940,66***			
LM Test	175430,4	165073,4			
Hausman Test	55,9721 (dof=7)	1020,341 (dof=16)			
N	25806	25806			

^{***, **, *} denote the significance at 1%, 5% and 10% levels, respectively.

The variable that measures the difference in economic development is significant and differs little between the two models. The fact that its coefficient is positive highlights the existence of inter-industrial trade between countries whose degree of development differs (Linder hypothesis). Because its coefficient is small, this result must be put into perspective, since the difference between the levels of development of the countries selected is gradually diminishing.

The significance and sign of the coefficients of the remoteness variables Remi and Remj vary depending on whether the country is an exporter or an importer. In the case of exporting countries, relative distance generates an attractive force. The country i exports more towards the country j, if other importing countries are geographically far. For the importing countries in model (1), variable Remj is significant and negative. The imports of country j are not influenced by the distance relative. In model (2), this variable becomes insignificant. Increasing the distance from alternative trade partners has no influence on bilateral trade. We can therefore assume that the presence of FTAs between Asian countries influences the impact of relative distance on exports (the coefficient decreases) and on imports (the coefficient becomes insignificant).

Given our estimation method (fixed effect), the influence of variables with no temporal dimension, i.e., distance, adjacency, common language and ethnic language, cannot be

estimated and the country-specific effect is absorbed. In the literature, the coefficients of these variables are significant – they have an impact on the direction of trade flows – and negative for the first variable and positive for the three others.

The coefficients of the three variables relating to the East-Asian free trade agreements allow estimating the impact of regionalism in East Asia. In the case of the AFTA, this is an agreement that stimulates intra-regional and extra-regional exports. Two countries that belong to the AFTA will trade 300% more than two countries that do not. The impact of this arrangement on trade between South-East Asian countries is therefore very high. Exports to the rest of the world are almost six times higher than the values predicted by the model. This agreement therefore favours trade flows to the other countries. Conversely, this FTA diverts imports from abroad. Indeed, the coefficient of variable AftaM is significant and negative. Imports into ASEAN countries from abroad are 15% lower than the values expected when no agreement is present. The AFTA has therefore favoured integration through supply rather than demand, a typical characteristic of all East-Asian trade (Urata, 2004; Guilhot, 2008). Ultimately, the question we must answer is this: is the AFTA a building block or a stumbling block? According to Trotignon's typology [2009] (Cf. Table 3), the AFTA would appear to be a building block ($d_X > /d_M / /$), as it generates more trade than it diverts. This agreement therefore favours regionalisation, but also multilateral trade in general.

Table 3: creations / diversions and typology

Sign o	of regional coe	fficients			
d ₁	d_{X}	d_{M}			
intra-zone	extra-zone	extra-zone	Building/		
trade	exports	imports	STUMBLING BLOCK		
+	+	+	Building block		
			Building block whether $d_X > / d_M /$		
+	+	-	Or stumbling block whether $/ d_M / > d_X$		
			Building block whether $d_M > / d_X /$		
+	-	+	Or stumbling block whether $d_X / > d_M$		
+	-	-	Stumbling Block		

Source: from Trotignon (2009:24)

The significant and negative coefficients that measure the impact on intra-regional trade of the ASEAN-China and ASEAN-South Korea agreements highlight the fact that these agreements do not favour intra-regional trade between these economies. Therefore, they do not allow us to conclude that they create or divert extra-regional trade. Negative coefficients for FTAs are very rare in the literature. In the case of the AKFTA, this result can be explained by the fact that it took effect only recently – so that its impact on bilateral exports is yet to be felt – and, for the ACFTA, by China's growing importance in the region. Indeed, since its opening, China's place in the region and in the world has become no greater than its size and level of economic development would warrant (Figuière and Guilhot, 2008). The agreement with the ASEAN countries is not, as yet, an element that favours intra-regional trade, unlike so-called "natural" factors.

5. Conclusion

Two conclusions can be drawn from our gravity model panel-data estimates. First, the AFTA stimulates intra-regional trade and its impact on trade with the rest of the world varies according the type of trade flow: it is positive in the case of exports and negative in the case of imports. Trotignon's typology (2009) makes it possible to conclude that given its coefficients, the overall impact of the AFTA on multilateral trade is positive. It can therefore be considered a building block. Second, the free trade agreements signed between the ASEAN economies, China and South Korea are not yet a factor favouring intra-regional trade, with so-called "natural" factors maintaining their dominance over institutional measures. The regional division of labour – introduced by Japanese companies in the 1980s and pursued by the newly industrialised countries – and the regulatory context governing the current international trade system (i.e., the rules set by the WTO) currently allow the major Asian economies (China, Japan and South Korea) to trade freely with their neighbours. Only time will tell whether these FTAs will have a significant influence on trade flows.

Annex

Table 4: The 34 countries of gravity model

Region	Countries
East Asia	ten members of the ASEAN, China, South Korea, Japan, Hong Kong and
	Taiwan
European Union	Germany ⁸ , Austria, Denmark, Spain, Finland, France, Greece, Ireland,
	Italy, Netherlands, Portugal, United Kingdom, Sweden
North America	United States, Canada, Mexico
South Asia	India
Oceania	Australia, New Zealand

<u>Note</u>: 13 countries for the European Union will be kept here only. Belgium and Luxemburg are excluded because IMF's data do not differentiate them until 1999. The last enlargement of Europe will not be taken into account and

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⁸ Prior to 1990, data refer to the former Federal Republic of Germany. Data from 1990 refer to United Germany.

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