How APEC Affects the Intra-trade of Members: An Empirical Study*

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Abstract

Purpose - The Asia-Pacific Economic Cooperation (APEC) forum has evolved and is actively facilitating free and open trade. It is debated whether APEC has effectively reduced trade barriers in a preferential manner to encourage liberalized trade and whether increased trade between member countries has reduced trade with nonmember countries.

Research designs, data, methodology -This paper empirically tests whether APEC creates or diverts trade, using an extended gravity model with tariff rates, exchange rates, and dummy variables to analyze how APEC affects intra-trade between members.The model utilizes the annual panel data between 1990 and 2007 of 16 selected APEC members and nonmembers.

Results - Results reveal the changing role of APEC only between 2002 and 2007 has it created trade, fostering increasedtrade among trading partners and between membersand nonmembers.

Conclusion - APEC can be expected to demonstrate a stronger trade creating effect once its advanced and developing members complete tariff reductions by 2010 and 2020, respectively.

Keywords : APEC, Trade Creation & Trade Diversion, Gravity Model, Panel Estimation.

JEL Classifications : F10, F12, F13, F15, F19.

1. Introduction

This paper attempts to empirically test whether or not APEC enhances welfare. An econometric gravity model with tax, exchange rate, and dummy variables is used to analyze the effect of APEC on the import trade of both members and nonmembers. We look for evidence of trade creation or trade diversion. Trade creation occurs when the introduction of an RTA allows an importing country to purchase products at lower cost than it did in the past. This benefits both the importing country and the world as a whole. In contrast, trade diversion is the substitution of a more costly source of supply within an RTA for a less costly source outside, which negatively affects welfare. The APEC can have both trade creation and trade diversion effects, either or neither. Therefore, the net effect needs to be assessed when determining whether APEC enhances or hinders welfare.

The rest of this paper is structured as follows. Section two gives a brief background of APEC, and Section three presents the literature review. Section four outlines the empirical methodology and provides the data description, and Section five explains the estimation results. Section six concludes the paper.

2. Background of APEC

APEC was launched in 1989 with the aim of enhancing economic growth and prosperity in the region and strengthening the economic cooperation among the Asia-Pacific community. APEC has 21 members - referred to as member economies - which account for approximately 40.5% of the world's population, approximately 54.2% of world GDP and about 43.7% of world trade by the year of 2007. The member economies include Australia, Brunei Darussalam, Canada, Chile, China, Hong Kong, Indonesia, Japan, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, the Philippines, Russia, Singapore, South Korea, Taiwan, Thailand, the United States and Vietnam.

The Bogor goals were formally adopted as the Bogor Declaration in June 2001, when APEC Trade Ministers endorsed the APEC Trade Facilitation Principles, which were developed by an ad hoc task force led by Hong Kong. The APEC Trade Facilitation Principles reaffirmed the importance of achieving the Bogor goals of free and open trade and investment in the Asia-Pacific region, providing significant benefits for both governments and business and generating welfare gains for the economy as a whole.

3. Literature Review

Regional trade agreements (RTAs) are intended to facilitate free trade and enhance welfare. They aim to reduce trade barriers among members and not to increase trade barriers between members and nonmembers. Viner (1995) proposed that RTAs can lead to both trade creation and trade diversion. Trade creation happens when the for-

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mation of an RTA allows an importing country to purchase products at lower cost than was previously the case. This benefits both the importing country and the whole world. Trade diversion is the substitution of a more costly source of supply within the RTA for a less costly source outside, which can negatively affect welfare. As an RTA can lead to both trade creation and trade diversion effects, its net effect needs to be assessed to decide whether or not it enhances welfare.

Compared with other RTAs, including the Australia and New Zealand Closer Economic Relations (CER) Trade Agreement, Southern Cone Common Market (MERCOSUR) and North American Free Trade Association (NAFTA), which have been established to reduce trade protection among member states, APEC is somewhat different. It is built on the concept of open regionalism, which means that any member reducing its trade barriers to another member should offer the same reductions to nonmembers. Therefore, the APEC can have both trade creation and trade diversion effects, either or neither, and the net effect needs to be assessed when determining whether APEC enhances or hinders welfare.

4. Methodology and the data

The gravity model is popular in the analysis of economic phenomena related to the flow of goods and/or services, and is the empirical tool most commonly used to estimate the effect of RTAs. To examine the effects of APEC within the basic gravity framework, specified dummy variables are then added. The consensus among those using this technique is that RTAs are generally trade creating. For instance, Frankel and Wei (1995) and Frankel (1997) showed trade creation in Asian and North American trading blocs. Rose (2000) also found that RTAs were generally trade creating. However, Hassan (2001) found evidence of trade diversion among South Asian Association for Regional Cooperation (SAARC) members.

Thus the basic gravity model is extended to including three dummy variables, which is defined a value of one if the county is a member of APEC and zero otherwise, regardless of the membership status of the trading partner. The logarithms specification is given as below.

$$
\begin{aligned}
\text{Log IMPORT}_{ijt} = {} & \alpha_0 + \alpha_1 \log \text{GDP}_{it} + \alpha_2 \log \text{GDP}_{jt} + \alpha_3 \log \text{POP}_{it} \\
& + \alpha_4 \log \text{POP}_{jt} + \alpha_5 \log \text{DIST}_{ij} + \alpha_6 \log \text{AREA}_i \\
& + \alpha_7 \log \text{AREA}_j + \alpha_8 \log \text{EXR}_{it} + \alpha_9 \log \text{EXR}_{jt} \\
& + \alpha_{10} \text{TARIFF}_{it} + \alpha_{11} \text{TARIFF}_{jt} + \alpha_{12} \text{LANG}_{ij} \\
& + \alpha_{13} \text{APEC}_i \text{APEC}_j + \alpha_{14} \text{APEC}_i + \alpha_{15} \text{APEC}_j. + e_{ijt}
\end{aligned}
$$

$$(1)$$

for $i = 1, 2, ..., N$ (number of cross-sectional units) refers to the importing country

for $j = 1, 2, ..., N$ (number of cross-sectional units) refers to the exporting country

and $t = 1, 2, ..., T$ (number of time periods)

The dummy variable APEC_i stands for the importing country i is an APEC member and zero otherwise, while APEC_j stands for the exporting country j is an APEC member and zero otherwise. A positive coefficient for α_{14} means the countries that are APEC members will import more than an equivalent country that is not a member, which would imply that APEC is trade creating, while α_{15} is positive means countries are importing more from other APEC member countries, which indicates that APEC is trade creating. Thus, a positive coefficient on α_{14} and α_{15} suggests trade creation, a negative coefficient means trade is lower, and the effect of APEC may be trade diverting. When the coefficient of interact dummy variable $\text{APEC}_i \text{APEC}_j$, is positive, $\alpha_{13} > 0$, it means that APEC countries import more within the member countries.

Previous studies commonly use the total trade (imports plus exports) as the dependent variable; however, in this paper, we focus on imports as they more closely substitute for the effects of domestic trade barriers. Total real imports are obtained from the total import deflated by the GDP deflator. GDP_i stands for the real GDP of importing country and GDP_j stands for the exporting one. A GDP deflator is also used to account for inflation and the real GDP is obtained. It is anticipated that richer countries trade more in terms of goods and services. Therefore, we expect a positive relationship between these variables and imports to country i.

POP_i stands for the population of importing country and POP_j stands for the exporting one. It is expected that countries with larger populations both import and export more. Aitken (1973) suggested that the larger is a country's population, the larger is the domestic market compared to the foreign market, so the potential export supply will be smaller. In contrast, Bergstand (1989) argued that a larger population allows for economies of scale, which can increase the price competitiveness of the exporter's production and resultin higher exports. Therefore, the sign on the coefficient of the population of the exporter may be indeterminate, whereas that for the importer is expected to be positive.

DIST_{ij} is the geographical distance between the capital cities of the importing country i and exporting country j. The physical distance between the trading countries represents the transportation cost; therefore, DIST_{ij} is expected to be negatively correlated with trade.

AREA_i and AREA_j are the surface areas of the importing and the exporting country, respectively. It is anticipated that larger countries both import and export more. However, relative size may also be important for comparative advantage reasons. Therefore, the sign on the AREA coefficients may be indeterminate.

EXR isdefined as the local currency value per US dollar divided by the US GDP deflator. EXR_i and EXR_j are the real exchange rates of the importer and exporter, respectively. EXR is defined as the local currency value per \$US divided by the US GDP deflator. For country i, an increase in EXR_i represents a depreciation of the local currency or a fall in that country's relative price; hence, its coefficient is expected to be negative. In contrast, the coefficient of country j is expected to be positive.

TARIFF_i and TARIFF_j are the simple average final bound tariff rates for the importer and exporter, respectively. The simple average final bound is the simple average of final bound duties excluding un-

bound tariff lines. Because all taxes (except lump sum taxes) are distorting, it is expected that both of these variables have a negative relationship with imports to country i.

In this paper, we estimate a pooled cross-sectional and time-series model in which error terms can be correlated across time and individual units. Thus a random-effect is also considered in the Equation (1), in which the error terms are divided into three components as below:

$e_{it} = u_i + v_t + w_{it}$,

where $u_i \sim N(0, \sigma_u^2)$ = cross-sectional error component,

$v_t \sim N(0, \sigma_v^2)$ = time-series error component, and

$w_{it} \sim N(0, \sigma_w^2)$ = combined error component.

Here, the individual error components are assumed to be uncorrelated with each other and not autocorrelated across both cross-sectional units and time periods. Thus the intercept term in the model is treatedand decomposed into two random variables, a time series and a cross-sectional variable.

This study uses the data of ten APEC member countries (Australia, Canada, China, Japan, Malaysia, New Zealand, the Philippines, Singapore, South Korea and the United States) and six nonmember countries (Brazil, Egypt, France, Germany, India and the United Kingdom) over a period of 18 years from 1990 to 2007.

The GDP, population and exchange rate data are obtained from International Financial Statistics (IFS) of the International Monetary Fund, and the import data are from the Direction of Trade Statistics of the International Monetary Fund. The other variables, definitions and sources are listed in the Appendix Table.

5. Estimation Results and explanations

The data used in this paper cover a period of 18 years from 1990 to 2007 and include those of 16 countries that are APEC members

and nonmembers. The gravity model is also estimated for three sub-periods: 1990-1995, 1996-2001 and 2002-2007. We use the pooled data to estimate a single regression equation, which allows the coefficients to be different in the three group periods. The model is also estimated for the entire period using the full panel. The results are given in Tables 1 and 2.

Table 1 reports thebasic gravity model results using the panel data for the three groups of observations and the entire sample (1990-2007). In general, the models fit the data well, most of the individual coefficients are statistically significant, and most of the signs correspond to the theoretical estimations, indicating that the proposed explanatory variables are significantly related to bilateral trade. The adjusted R^2range between 31% and 90%.The t-statistics results show that collectively the models are highly significant. These results are consistent with the usual gravity model findings of other papers.

Table 2 shows that the coefficients on GDP$_i$ and GDP$_j$ and those on the population variables are significant and positive, which indicates that richer and more populated countries tend to trade more. Also, as expected, the coefficients on the distance variable, DIST$_{ij}$, are significant and negative, which indicates that transportation costs play an important role in the volume of trade between countries.

The coefficients on AREA$_i$ and AREA$_j$ are negative and almost always significant, consistent with the finding of Frankel (1997), who suggested that large countries tend to have more natural resources and often trade less with others. The coefficients on LANG$_{ij}$ are significant and positive, which implies that countries with a common language have cultural similarities, so trade between them will be more easily conducted.

In considering the exchange rates, recall that an increase in EXR$_i$ and EXR$_j$ indicates a depreciation of the real exchange rate. In line with our expectations, the coefficients associated with the importing country EXR$_i$ are negative and almost always significant, whereas those of EXR$_j$ are mostly positive and significant for 1990-1995, 1996-2001 and the whole sample period 1990-2007. The coefficients on taxes are negative and significant, which implies that higher taxes result in reduced trade between countries, in line with our

<Table 1> Basic gravity model estimates - Panel regression analysis Dependent variable: IMPORTij

Variable	Expected signs	1990-1995		1996-2001		2002-2007		1990-2007	
C		3.999***		4.917***		3.897***		2.799***	
GDPi	+	0.323***		0.194***		0.281***		0.405***	
GDPj	+	0.076***		0.067***		0.212***		0.155***	
TARIFFj	-	-0.035***		-0.033***		0.167***		-0.028***	
R^2		0.895		0.318		0.543		0.812	
Adjusted R^2		0.894		0.312		0.539		0.812	
DW stat		1.270		1.299		0.828		0.550	
Cross-sections		240		240		240		240	
Total pool observations		1440		1440		1440		4320	

*, **, and *** represent the t-values arestatistically significant at the 10%, 5% and 1% level, respectively.

* Base on the personal judgment, import data has been calculated by two ways, one is to deflate import by the GDP deflator of the country in question, and the other one is to deflate import by the US GDP deflator. Since we have done a lot of trial and error, the results of using the GDP deflator of the country in question shows the best result, and we believe that this way of calculating the import data fit the model the most, so we choose this to present in the paper. The results of using the US GDP deflator are shown in Appendix 2 for comparison.

<Table 2> Extended gravity model estimates on APEC - Panel regression analysis Dependent variable: IMPORTij

Variable	Expected signs	1990-1995		1996-2001		2002-2007		1990-2007	
C		3.796***		3.924***		3.159***		2.764***	
GDPi	+	0.313***		0.221***		0.250***		0.366***	
GDPj	+	0.067***		0.089***		0.192***		0.120***	
POPi	+	0.067**		0.127***		0.119***		0.092***	
POPj	?	0.148***		0.217***		0.200***		0.238***	
DISTij	-	-0.228***		-0.221***		-0.265***		-0.209***	
AREAi	- /?	-0.105***		-0.085***		-0.077***		-0.118***	
AREAj	- /?	-0.020		-0.064***		-0.083***		-0.069***	
LANGij	+	0.107*		0.161**		0.020***		0.226***	
EXRi	-	-0.102***		-0.071***		-0.062		-0.058***	
EXRj	+	0.054***		0.004		-0.044**		0.098***	
TARIFFi	-	0.002		-0.004		0.002		0.006***	
TARIFFj	-	-0.034***		-0.027***		-0.006**		-0.027***	
APECi	+	0.211***		0.204**		0.317**		0.368***	
APECj	+	0.052		0.016		0.317***		0.228***	
APECij	+	0.104**		0.467***		0.427***		0.096***	
R^2		0.896		0.402		0.611		0.816	
Adjusted R^2		0.895		0.395		0.607		0.815	
DW		1.281		1.292		0.860		0.565	
Cross-sections		240		240		240		240	
Total pool observations		1440		1440		1440		4320	

*, **, and *** represent the t-values are statistically significant at the 10%, 5% and 1% level, respectively.

expectations.

The results for the gravity model including the dummy variable of APEC in Table 2 show that the APEC had a mostly positive effect for most countries considered during the 1990-2007 period. However, the main purpose of this paper is to look into the details of different subperiods. For the 1990-1995 and 1996-2001 subperiods, the co-efficients on APECi, APECj and APECi APECj are positive, however that for APECj is not significant. This indicates that the effect of APEC on the selected countries was not obvious when the APEC was initially formed. We cannot conclude whether APEC was trade creating or trade diverting for the following two reasons.

First, APEC began as an informaldialogue group, or forum, for Pacific Rim countries in 1989. It took APEC a few years to establish its vision, which is articulated in the Bogor goals, promotion of free and open trade among members, and annual Individual Action Plans. Second, although APEC shares the aim of the WTO to encourage trade liberalization, it is based on the voluntary commitment of mem-ber countries to APEC goals.

This may result from the formal adoption of the Bogor Declaration in June 2001 when APEC Trade Ministers endorsed theAPEC Trade Facilitation Principles, and an APEC Trade Facilitation Action Plan, which promoted the application of the APEC Business Travel Card (ABTC). The APEC travel card was trialed in 1997 but only a few members joined the scheme. However, in 2001, the scheme was ex-panded, with most members joining. There are currently 19 econo-mies participating in the ABTC scheme: Australia, Brunei Darussalam, Chile, China, Hong Kong, Indonesia, Japan, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, the Philippines, Singapore, South Korea, Taiwan, Thailand and Vietnam. The ABTC aims to provide fast and efficient travel for business people within the APEC region.

The effect of APEC may change over time. It is believed that the trade-creating effect of APEC will become stronger in the future. For example, advanced APEC members are to have completed their tariff reductions by 2010, while developing members are to have done so by 2020.

6. Conclusion

This paper examines the effect of APEC on bilateral trade with a gravity model, using the data of 16 countries - 10 APEC members and six nonmembers - from 1990 to 2007. We analyze the effect of APEC in three subperiods: 1990-1995, 1996-2001 and 2002-2007. The estimated coefficients show that GDP, population, distance between capital cities of trading partners, cultural similarity (a common official language) and physical area explain much cross-country trade.

Other variables including taxes and the real exchange rate are also used. Consistent with prior expectations, taxes have a negative effect on free trade. Real exchange rate movements mostly have the ex-pected effect: the depreciation of an economy's currency encourages exports while discouraging imports.

The regression results indicate that APEC did not have a significant effect on either members or nonmembers in the 1990-1995 and 1996-2001 subperiods. Hence, it cannot be concluded whether APEC was trade creating or trade diverting then. This is because APEC acted as a forum in the early years and was established based on voluntary commitment to goals.

However, we can see significant trade creation among APEC members and nonmembers during the 2002-2007 subperiod, following the adoption of the APEC Trade Facilitation Principles and e-APEC Strategy in 2001. The expandedapplication of the APEC Business Travel Card and other preferential policies may also have contributed to this effect.

We expect that the trade-creating effect of APEC will become stronger in the future as advanced APEC members will have completed their tariff reductions by 2010 and developing members by 2020.

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