Chapter V

Macroeconomic Impacts in the APEC Region: Measurement by APEC Link Model

Jinichi Uemura
Development Studies Department
Institute of Developing Economies

Introduction

The APEC region consists of 21 economies, each of which is in a different phase of economic development. The APEC region can also be categorized into several sub-groups, tied by economic treaties and/or geographical proximity.

In this paper, we analyse the impact of certain measures which originated in sub-groups, such as the introduction of a free trade treaty on APEC-wide economies, reductions of tariffs, and so on. This type of initial impact may have non-zero effects on the sub-group directly. Nonetheless, through intra- and inter-sub-group trade, the initial impact spreads to the sub-group and the others indirectly.

Toida et al. (1993) measures the economic impact of EC market integration on the Asian Industrializing Region (AIR) in a similar way. Toida links 18 economy-specific models (4 from the EC, 4 from Asian NIES, 4 from ASEAN, 5 industrialized countries and China) with a trade share matrix, and measures the trade creation/diversion effects of EC integration on AIR. In the model, imports are separated into three sub-categories, i.e., agricultural and mining goods, fuels and manufactures. Toida analyses how the change in trade structure in EC economies before and after market integration would lead to an increase in the volume of trade in the EC and would positively affect AIR exports. Toida also concludes, however, that relative import prices to domestic prices would increase in the EC, representing a decrease in EC domestic prices due to the completion of the single EC market. This would have a negative effect on the AIR.

The sub-groupings of economies in APEC and the data integration procedure are discussed in Section 1. Trade data will be compiled and shown based on the discussion in Section 1 to investigate our simulation results based on the primary economic impact. The compiled data will be used in our simulations which measure the total region-wide effect caused by the primary economic impact. Section 2 provides an

overview of trade structures in the APEC region. In Section 3, our model is explained. In Sections 4 and 5, exogenous conditions which will be given to the Link model[1], and simulation results are shown. The last section contains concluding remarks.

The details of the sub-group models and trade link system are shown in the appendix.

1. Sub-Groupings in APEC Region

1.1. Sub-Groups

Sub-grouping of economies is as follows (abbreviation of the name of each sub-group is shown in the parentheses). ASEAN 7 (A7) consists of Brunei, Indonesia, Malaysia, the Philippines, Singapore, Thailand and Vietnam. NIES 3 (N3) includes Korea, Hong Kong and Taiwan. NAFTA contains Canada, Mexico and United States. Oceania (OC) sub-group has three economies, Australia, New Zealand and Papua New Guinea. Latin America (LA) which is treated as a purely exogenous condition consists of Chile and Peru. Japan (JP), China (CN) and Russia (RU) are single country sub-groups. The rest of the world (RW) is also considered as a sub-group although it is exogenous. World total (WL) is a subset of sub-groups although it contains everything.

Brunei and Vietnam in ASEAN 7 as well as Papua New Guinea in Oceania have very poor dataset for their national account related series. Those economies, therefore, are not included in compiling the "Group GDP", an explanation of which will be seen in Section 1.2.

It is almost impossible to compile a "reliable" dataset for Latin America (LA), on the other hand, because of hyperinflation in the last couple of decades. Price and exchange rate data series, especially, are unreliable. In this paper, we have not constructed a Latin-American sub-group model, but have added trade data for this sub-group into the link model exogenously.

[1] The word "Link model" stands for the full model which contains seven sub-group blocks and one trade link block. Each sub-group block includes an exogenously set "domestic demand" part (sum of domestic demand variables of member economies) and an endogenously determined "external demand" part (inter- and intra- sub-group trade are identically managed).

Table 1. Member of Sub-Groups

Sub-Group Name	Abbr.	Members
ASEAN 7	(A7)	Brunei, Indonesia, Malaysia, Philippines Singapore, Thailand, Vietnam
NIES 3	(N3)	Korea, Hong Kong, Taiwan
NAFTA	(NF)	Canada, Mexico, United States
Oceania	(OC)	Australia, New Zealand, Papua New Guinea
Latin America	(LA)	Chile, Peru
Japan	(JP)	Japan
China	(CN)	China
Russia	(RU)	Russia
Rest of the World	(RW)	
World Total	(WL)	

1.2. Data Compiling

For constructing sub-group models, it is critical to integrate the data series of member economies into the SG data set. SG models for Japan, China and Russia are identical with each country model. For the five groups, namely, ASEAN 7, NIES 3, NAFTA, Oceania and Latin America, newly compiled datasets will be required to construct SG models.

Trade data picked up from *Direction of Trade (DOT)* for every single pair of the APEC economies and group-by-group (such as ASEAN 7 to/from NIES 3 and so on) export/import figures have been compiled. For each sub-group model, we need to estimate the 1995 constant price trade data series. We have adopted the export/import deflators in the national account base or export/import unit value for this purpose.

The "GDP" series for each sub-group, on the other hand, is the sum of US dollar based real GDP (1995 price) of the member economies[2]. Nominal GDP will be calculated in the same manner. The GDP deflator is their proportion, i.e., [Nominal GDP]/[Real GDP].

2. Trade Structure in the APEC Region

The following tables show the export and import share of APEC sub-groups. The last columns (to/from the world) in both tables contain their total export/import values (in billion US dollars) based on figures of world share of 100%. Appendix tables A.1 -

[2] As mentioned above, several members are omitted from the total GDP because of the poor quality of available data.

A.9 contain trade figures of all the sub-groups.

Table 2. Export Share Matrix

Exports of	to A7	N3	NF	OC	LA	JP	CN	RU	RW	WL US$ billion
	Share (%)									
A7	23.5	12.6	19.8	2.2	0.1	14.4	2.7	0.3	24.3	317.5
N3	11.0	9.7	23.7	1.6	0.4	9.9	19.3	0.4	24.0	424.4
NF	4.9	7.5	46.2	1.6	0.8	8.7	1.7	0.4	28.4	852.3
OC	13.9	15.5	8.7	11.9	0.3	21.7	3.9	0.3	23.8	69.4
LA	3.2	9.4	17.2	0.4	2.7	15.4	2.9	0.6	48.2	22.2
JP	17.5	19.9	29.7	2.2	0.3	---	5.0	0.3	25.2	443.0
CN	6.6	30.8	17.8	1.3	0.4	19.1	---	1.1	23.0	148.9
RU	2.6	1.4	6.8	0.0	0.1	4.1	4.4	---	80.8	77.6
WL	6.6	7.6	19.3	1.3	0.4	5.9	2.9	1.1	54.9	5069.0

Source: *Direction of Trade*, IMF.

Table 3. Import Share Matrix

Imports of	from A7	N3	NF	OC	LA	JP	CN	RU	RW	WL US$ billion
	Share (%)									
A7	17.3	12	14.9	0.3	2.7	24.3	3.1	0.2	25.2	356.1
N3	9.4	8.9	16.6	0.5	2.6	21.4	18.5	0.5	21.4	434.9
NF	6.9	7.2	37.7	0.4	0.6	13.9	5.2	0.5	27.6	1006.7
OC	8.4	7.1	23	10.1	0.2	15	4.6	0	31.6	22.9
LA	1.6	4.6	30.8	1	3.1	6.1	2.4	0.3	50.1	72.6
JP	14.4	10.2	26.3	1.1	5.3	---	10.7	1.4	30.6	132.1
CN	7.4	25.5	14.4	0.5	2.3	22	---	2.9	25.1	335.9
RU	1	1.5	6.3	0.2	0.5	1.6	1.9	---	87	46.4
WL	6	5.9	17.9	0.4	1.4	9.3	4.6	1.6	52.9	5140.7

Source: *Direction of Trade*, IMF.

ASEAN 7 (A7) As for ASEAN 7's exporting partners, almost 70% of total exports of the group are shared by ASEAN, NAFTA and East Asia including Japan. In particular, exports are heavily weighted to the Asian region (more than 50%) demonstrating that the region is the principal exporting market for ASEAN. More than half of the total imports, on the other hand, originate from East and Southeast Asia including Japan.

NIES 3 (N3) A feature of this sub-group is the sizable share of exports to NAFTA and China. Exports to China, especially, are of great importance, three quarters of which come from Hong Kong. Exports to NAFTA are significantly weighted towards the United States, namely, 90%.

In a similar fashion to the case of ASEAN, imports from Japan make up a large share of the imports of NIES 3. Moreover, the sub-group's import shares from China and NAFTA are 18.5% and 16.6%, respectively. The intra-NIES import share, on the other hand, is less than 10%, revealing a weaker proportion of intra-SG trade compared with ASEAN.

NAFTA (NF) Both Intra-NAFTA export and import have about four-tenths the share of total NAFTA trade, followed by Japan. Relatively smaller proportions come from East and Southeast Asian economies like ASEAN and NIES as NAFTA's trading partners.

Oceania (OC) For Oceania, NAFTA has less than a 10% share as an exporting partner although it has a 20% share as an importing partner. Japan has the reverse image, holding a 22% export share and 15% import share in Oceania's trade. Looking at East and Southeast Asian economies, the sub-group has around 15% export shares and under 10% import shares for both ASEAN and NIES. In terms of the nominal amount base, the Oceania sub-group has a positive net export to Asian economies including Japan. Intra-SG trade, both export and import, amount to around 10%.

Latin America (LA) The Latin America sub-group consists of Peru and Chile both of which are principal trade partners of NAFTA, Japan and non-APEC Latin American countries. The export share of the sub-group to NAFTA is 17%, and that to Japan is 15%. More than 30% of the sub-group import originates from NAFTA. As an importing partner, Japan has a minor share of 6.1%.

Japan (JP) Almost 30% of Japan's exports are destined for NAFTA, among which the United States is the principal trading partner, followed by exports to Asian economies,

20% to NIES and 18% to ASEAN. China receives just 5% of Japan's exports.

As for imports, Japan's main trading partners are the same as in the case of exports except for China's larger share, 11%. All together, imports from NAFTA, ASEAN, NIES and China take up more than 60% of Japan's total imports.

China (CN) China's trade, both exports and imports, have a sizable share, about 30% of NIES 3 followed by Japan and NAFTA. China's share of exports to these three sub-groups is 67.7% and its import share from these three groups is 61.9%.

Russia (RU) Russia has a smaller share of both exports and imports to/from the APEC region. More than 80% of Russia's trade goes to/originates from non-APEC regions, i.e., to/from Europe, especially Eastern Europe.

Among APEC sub-groups, NAFTA has the largest proportion of trade with Russia in terms of export/import share. Trade to/from NAFTA occupies 6-7%. Exports to Japan and China still take up about 4.1% and 4.4% respectively, while imports are insignificant, 1.6% and 1.9%, respectively.

As Russian trading partners, the APEC region seems to be of less importance than elsewhere, notably Europe.

3. The Sub-Group Model and Trade Link

3.1. Structure of Endogenous Variables

Each one of the sub-group models has a simple construction. GDP is defined as the sum of "domestic" demand and "external" demand. "Domestic" demand is defined as the difference between GDP and net exports, i.e., domestic demand contains consumption, investment, change in stocks and statistical discrepancy.

To convert custom-based exports and imports to a national account base, trade data to/from all over the world is connected with national account trade data through simple equations to reflect the changes arising from within the trade block into the sub-group's income, GDP. Export is treated as an exogenous variable in each step of the simulation, but the exogenous condition will be given from the trade model in the first phase, determined as the sum of the other members' imports from the group.

Based on the specification of the SG model, inter-SG trade and intra-SG trade are treated identically to determine the SG exports/imports.

The export price is also determined in each SG model. This variable is used in

the trade model to determine the import prices through a trade share matrix, used in each SG model exogenously.

3.2. An example: ASEAN 7 SG model

As an example, the ASEAN 7 SG model is explained below. This SG model consists of 10 behavioral equations and 2 identities (identical equations).

The abbreviation of ASEAN 7, "A7," here, is put on the top of each variable name to show that the variables are those of ASEAN 7.

3.2.1. Definition of Group GDP

A7YD = A7DDD + A7XD - A7MD (1)

where:

YD	:	Sub-group total GDP in US dollars
DDD	:	"Domestic" demand in the Sub-group
XD	:	"Exports" including both Intra- and Inter- regional trade
MD	:	"Imports" including both Intra- and Inter- regional trade

3.2.2. Group Exports

Group exports on a "national income" basis are connected to the custom-clearance based exports to the world (WLA7)[3], which are determined in the Link Model as world imports from ASEAN 7.

A7XD = f[WLA7] (2)

where:

WLA7	:	World Imports from ASEAN 7 in US dollars

3.2.3. Group Imports

A7MD = f[A7WL] (3)

where:

A7WL	:	Imports of ASEAN 7 from World in US dollars

3.2.4. Group Export Price

A7PXD = f[A7PY, A7PXD(-1)] (4)

[3] When two SG abbreviations are connected in this fashion, it stands for the import of the first SG from the next SG.

where:

A7PXD : Export price of ASEAN 7
A7PY : "GDP deflator" of ASEAN 7

3.2.5. Import Functions

The import function of a sub-group from other regions is basically specified as follows.

$$A7ZZ = f[A7YD*ZZYD,\ A7PMD/A7PY\ ] \qquad (5)$$

where:

A7ZZ : Import of ASEAN 7 from another sub-group, ZZ
A7YD : GDP of ASEAN 7
ZZYD : GDP of ZZ
A7PMD : Import price of ASEAN 7
A7PY : GDP deflator of ASEAN 7

This specification shows that the imports of ASEAN 7 are a product of the GDP of two SG's and the import price relative to the domestic price of the importer's side. It can be considered as a subset of the gravity trade model family. For intra-SG trade, it is not necessary to make the product of its income explanatory (squared GDP, of course) since we adopt a log-linear specification.

That is,

$$A7A7 = f[\ A7YD, A7PMD/A7PY\ ]$$

3.2.6. Linking Equations

In the Link block, we have an identical equation that connects ASEAN 7's imports with the other SG's exports. In the ASEAN 7 SG model, we determine ASEAN 7's imports from other APEC sub-groups. Similarly, other SG models have equations to determine imports from one another e.g., ASEAN 7's intra-SG imports are A7A7 delineated in the ASEAN 7 SG model, NIES 3's imports from ASEAN 7, N3A7, are determined in the NIES 3 SG model, NAFTA's imports from ASEAN 7, NFA7, in the NAFTA SG model and so on.

The Link block, therefore, functions to sum up world imports from ASEAN 7.

$$WLA7 = \Sigma\, SG_iA7, \quad i = 1, \ldots, 9$$

where: SG_i represents the i^{th} sub-group and the 9^{th} one is Rest of the World (RW) given in the equation exogenously.

As noted earlier, two consecutive sub-group names stand for the import of the first sub-group from the next one.

This variable will be the new condition on the next stage of iteration in the ASEAN 7 SG model which is connected with ASEAN 7 total exports in equation (2).

4. Exogenous Conditions

According to Okuda (2000) assuming the effect of APEC's investment-related activities, we set two exogenous conditions which will be given to the Link Model.

Table 4. Foreign Origin Capital Stock

(US $ million, 1998)

Indonesia	18,559
Malaysia	45,676
Philippines	8,609
Singapore	50,038
Thailand	21,102
Korea	15,140
Hong Kong	25,259
Taiwan	10,166
China	197,653

Source: Calculated by Okuda

Okuda assumes that APEC's investment-related activities induced the flow of new foreign investment into selected developing economies in proportion to the capital stock, i.e., the amount already invested. Okuda also assumes 0.1% as the proportion. Table 4 shows estimated inward FDI stock of selected economies in 1998. Multiplying by 0.001 (=0.1%) and deflating by the US. capital formation deflator, we get the exogenous conditions for 1995 as follows:

Table 5. Capital Formation Increase

(Primary impact on the model)

(US $ million)

Indonesia	18.445		
Malaysia	45.395		
Philippines	3.556	ASEAN 7	143.1
Singapore	49.730		
Thailand	20.972		
Korea	15.046		
Hong Kong	25.103	NIES 3	50.3
Taiwan	10.103		
China	196.435		196.4
TOTAL			389.8

5. Simulation Results

We conducted three simulations according to Okuda's scenarios. The first simulation aims to measure the effect of a domestic demand increase caused by extra investment.

Another scenario contains an additional condition, i.e., that those investments push up the productivity of the economy (sub-group). The impact is supposed to be reflected in a lower domestic price (by 0.1%) in the sub-group.

In the remaining scenario, an export increase will be added. According to Okuda, the export elasticity of FDI into developing economies is estimated to be 0.09. Proportional (10%) to the additive investment mentioned above, exports increase.

The first simulation is done with the first condition (FDI increase), the next simulation with two conditions (FDI increase + a fall in price), and the last one with all of the conditions (FDI increase + a fall in price + export effect of FDI).

Simulation results are compared to the base case. The following three tables contain the difference between the simulated values and the base case solutions. Any positive/negative numbers in the table indicate positive/negative impacts of the exogenous conditions on the variable through the overall trade linkage.

Exogenous Conditions Given in the System

Scenario 1	A7DDD	←	A7DDD	+	143.1
	N3DDD	←	N3DDD	+	50.3
	CNDDD	←	CNDDD	+	196.4
Scenario 2	(Scenario 1) +				
	A7PY	←	A7PY	*	0.999
	N3PY	←	N3PY	*	0.999
	CNPY	←	CNPY	*	0.999
Scenario 3	(Scenario 2) +				
	A7XD	←	A7XD	+	14.31
	N3XD	←	N3XD	+	5.03
	CNXD	←	CNXD	+	19.64

Simulation 1: *Effects of Investment Increase*

The first shock in the model is higher capital formation in ASEAN 7, NIES 3 and China, which produces as its final impact the effects shown in 5.1. The largest such impact in percentage terms is seen in NAFTA's imports from China and China's imports from NIES 3 (+0.07% boost for both sub-groups compared to the base case). ASEAN 7 obtains +0.05% increase in intra-sub-group imports, and in those from NIES 3 and China. On the other hand, NIES 3 imports from ASEAN 7 and China will see a +0.05% increase while intra-NIES imports increase by just +0.01%.

China will see an increase in GDP of +US$ 206.30 million under this scenario while that of ASEAN 7 will increase by +US$ 180.10 million and NIES 3, by +US$ 68.20 million. The total APEC GDP increase is +US$ 427.40 million.

Simulation 2: *Combined effects of Investment Increase and Higher Productivity*

Simulation results are shown in 5.2. By employing an additional exogenous condition, a lower domestic price, ASEAN 7's intra-sub-group imports will decrease by US$ 90.02 million (-0.16%), and imports from NAFTA will drop by US$ 25.42 million (-0.06%). NIES 3's imports from ASEAN 7 will see a US$16.95 million decline compared with the base case (-0.05%), imports from Japan, -US$ 48.03 million (-0.06%) and from China -US$ 94.39 million (-0.13%).

China's imports from NAFTA and Japan will diminish by 0.08% and 0.1%, respectively. However, China's imports from NIES 3 show a reverse trend increasing to US$ 24.00 million (+0.08%). This amount is larger than that seen in scenario 1 (US$ 21.10 million, +0.07%). This peculiar characteristic of China's imports arises

because China cannot reduce imports from NIES 3 despite domestic price decreases whereas imports from ASEAN 7 and Japan can be reduced. The special relationship between China and Hong Kong in particular, should be noted. ASEAN 7 and NIES 3 on the other hand, will face an import substitution effect when their domestic prices decline.

ASEAN 7 and China have higher GDP increments of US$102.00 million and US$ 173.00 million, respectively. These figures are smaller than those in scenario 1. NIES 3, however, will enjoy a much higher positive impact on GDP, US$ 433.70 million, than US$ 68.20 million seen in scenario 1.

Among the overall endogenous APEC sub-groups, those consisting of developing economies, i.e., ASEAN 7, NIES 3 and China experience higher GDP under this scenario. Developed economies like NAFTA, Oceania and Japan on the other hand will see lower GDP. When compared to scenario 1, where exports of the three developing sub-groups decline rather sharply, and imports of NAFTA and Japan increase at the same time, it can be concluded that the downward movement of domestic price, based on a higher productivity brought by additional capital formation flow into developing sub-groups, accompanies not only import substitution against developed economies but also export enhancement.

Simulation 3: *Combined effects of Investment Increase, Higher Productivity and Trade Creation*

Our last scenario contains further export expansion. Similar features are seen in this case to those in scenario 2. Exports of ASEAN 7, NIES 3 and China increase somewhat. GDP of the three sub-groups expands a little more to add +US$ 583.70 million to overall APEC GDP. This amount pushes up the APEC GDP by 0.004 percentage points on a growth rate basis.

5.1. Effects of Investment Increase

(million US$)

	Imports from							
	A7	N3	NF	OC	LA	JP	CN	RU
ASEAN 7	26.05	19.39	12.88	1.23	0.91	9.49	4.32	---
NIES 3	16.20	4.77	3.83	0.58	0.19	3.15	39.27	---
NAFTA	22.09	0.00	-0.20	-0.01	-0.03	-1.20	32.23	---
Oceania	2.18	0.16	-0.03	0.01	0.00	0.00	0.55	---
Latin Am.	---	---	---	---	---	---	---	---
Japan	0.00	0.07	-0.06	0.03	0.00	---	0.00	---
China	0.94	21.10	2.94	0.55	0.21	4.87	---	---
Russia	---	---	---	---	---	---	---	---
APEC	67.46	45.49	19.36	2.39	1.28	16.31	76.37	---
RestWld	---	---	---	---	---	---	---	---
World	67.40	45.40	19.50	2.40	1.28	16.20	76.40	0.00

	Imports from			National Account				
	WL	RUV	WLV	YD	DDD	XD	MD	PY
ASEAN 7	74.30	---	---	180.10	143.10	79.00	42.00	0.00
NIES 3	68.00	---	---	68.20	50.30	102.60	84.70	0.00
NAFTA	53.00	---	---	-37.00	---	21.00	58.00	---
Oceania	2.87	---	---	0.80	---	2.30	1.54	---
Latin Am.	---	---	---	---	---	---	---	---
Japan	0.00	---	---	9.00	---	9.50	0.00	---
China	30.60	---	---	206.30	196.40	56.00	46.10	0.00
Russia	0.00	---	0.00	---	---	---	---	---
APEC	228.77	---	224.00	427.40	389.80	270.40	232.34	---
RestWld	---	---	-225.00	---	---	---	---	---
World	---	0.00	---	---	---	---	---	---

5.2. Combined effects of Investment Increase and Higher Productivity

(million US$)

	Imports from							
	A7	N3	NF	OC	LA	JP	CN	RU
ASEAN 7	-90.02	36.25	-25.42	-5.59	-1.37	-8.48	-10.49	---
NIES 3	-16.95	6.60	1.63	-13.24	-7.06	-48.03	-94.39	---
NAFTA	16.84	3.84	5.10	0.18	2.93	-1.40	32.63	---
Oceania	1.36	0.88	-0.29	0.07	0.00	0.35	0.47	---
Latin Am.	---	---	---	---	---	---	---	---
Japan	4.54	3.59	3.99	1.49	0.18	---	0.90	---
China	-1.51	24.00	-13.59	-1.70	-0.84	-25.47	---	---
Russia	---	---	---	---	---	---	---	---
APEC	-85.74	75.16	-28.58	-18.79	-6.15	-83.03	-70.88	---
RestWld	---	---	---	---	---	---	---	---
World	-85.80	75.10	-28.50	-18.79	-6.16	-83.10	-70.90	0.00

	Imports from			National Account				
	WL	RUV	WLV	YD	DDD	XD	MD	PY
ASEAN 7	-105.20	---	---	102.00	143.10	-100.50	-59.40	-0.10
NIES 3	-171.50	---	---	433.70	50.30	169.90	-213.50	-0.10
NAFTA	60.00	---	---	-95.00	---	-30.00	66.00	---
Oceania	2.82	---	---	-19.60	---	-18.07	1.51	---
Latin Am.	---	---	---	---	---	---	---	---
Japan	14.60	---	---	-53.00	---	-48.70	4.60	---
China	-19.10	---	---	173.00	196.40	-52.20	-28.80	-0.10
Russia	2.31	---	0.00	---	---	---	---	---
APEC	-216.07	---	-371.00	541.10	389.80	-79.57	-229.59	---
RestWld	---	---	370.00	---	---	---	---	---
World	---	0.00	---	---	---	---	---	---

5.3. Combined effects of Investment Increase, Higher Productivity and Trade Creation

(million US$)

	Imports from							
	A7	N3	NF	OC	LA	JP	CN	RU
ASEAN 7	-87.42	38.19	-24.14	-5.47	-1.27	-7.54	-10.06	---
NIES 3	-15.33	7.08	2.02	-13.19	-7.04	-47.71	-90.47	---
NAFTA	19.05	3.84	5.10	0.18	2.93	-1.50	35.85	---
Oceania	1.58	0.89	-0.29	0.07	0.00	0.35	0.52	---
Latin Am.	---	---	---	---	---	---	---	---
Japan	4.54	3.59	3.97	1.49	0.18	---	0.90	---
China	-1.42	26.11	-13.30	-1.65	-0.82	-24.98	---	---
Russia	---	---	---	---	---	---	---	---
APEC	-79.00	79.70	-26.64	-18.57	-6.03	-81.38	-63.26	---
RestWld	---	---	---	---	---	---	---	---
World	-79.00	79.60	-26.50	-18.55	-6.03	-81.50	-63.30	0.00

	Imports from			National Account				
	WL	RUV	WLV	YD	DDD	XD	MD	PY
ASEAN 7	-97.70	---	---	120.00	143.10	-78.30	-55.20	-0.10
NIES 3	-164.70	---	---	440.60	50.30	185.20	-205.10	-0.10
NAFTA	65.00	---	---	-99.00	---	-28.00	72.00	---
Oceania	3.12	---	---	-19.50	---	-17.84	1.67	---
Latin Am.	---	---	---	---	---	---	---	---
Japan	14.60	---	---	-52.00	---	-47.70	4.60	---
China	-16.00	---	---	193.60	196.40	-26.90	-24.20	-0.10
Russia	2.31	---	0.00	---	---	---	---	---
APEC	-193.37	---	-349.00	583.70	389.80	-13.54	-206.23	---
RestWld	---	---	348.00	---	---	---	---	---
World	---	0.00	---	---	---	---	---	---

Conclusion

The APEC Link model is constructed and simulated to measure the economic impact of additional capital formation flows into developing Asian economies.

The model separates the APEC region into eight sub-groups. Each sub-group model is a demand-oriented model that determines its GDP by summing up "domestic" demand and "external" demand. Trade blocks determine import price and export value for each sub-group using export prices and import values from all the sub-groups. The total APEC Link Model consists of the sub-group model block and the trade link block.

Initial economic impacts are given in the ASEAN 7, NIES and China SG models. Initial impact is assumed to be FDI increase, totaling US$ 390 million, region-wide. The first simulation assigns an increase in domestic capital formation mainly assumed to be foreign direct investment (FDI) to these three sub-groups. Final economic effects caused by this initial shock into the APEC region through the link system are measured.

In the second simulation, we assumed that FDI would bring about higher productivity in industry resulting in a lower domestic price. The last simulation assumes a further export boost as a result of the higher productivity.

The first simulation concludes that the initial impact, which makes the "domestic" demand in ASEAN 7, NIES 3 and China larger, generates sizable intra- and inter-SG trade among these three sub-groups as well as trade with other sub-groups. Consequently, total APEC GDP increases by US$ 427.4 million.

The result of the second case, which contains an additional assumption of lower domestic prices, reflects the differences in trade structures (and/or trade behaviors) among the three initially affected sub-groups. A decline in domestic prices does not necessarily lead to import substitution. The results suggest China has a strong import dependency on NIES 3. Total APEC GDP enlarges by US$ 541.10 million in simulation 2.

For the final simulation we incorporated an additional assumption that a rise in domestic productivity would be accompanied by a boost in exports. The results further substantiate those of simulation 2. In the last two simulations, results show that the three Asian developing sub-groups in APEC, namely ASEAN 7, NIES 3 and China, will enjoy higher GDP than the base case while the developed sub-groups, NAFTA, Oceania and Japan will see lower GDP figures. As a total income effect, APEC GDP in simulation 3 increases by US$ 583.70 million compared to the base case.

The APEC Link Model constructed here has a large Link block and small SG models. "Domestic" demand in a SG model can be broken down into sub-categories to analyze the APEC region as well as the single sub-group more precisely.

The APEC region consists of economies in different stages of development and some of them have been constructing or are planning to construct more open economic relationships through such things as free trade schemes. Under these circumstances, it will be increasingly necessary to analyze their economic linkage through trade and/or capital flows.

Appendix

A. Trade Structure in APEC Region

A.1. ASEAN 7 (A7)

Export of	ASEAN 7			(million US$)	
to	1992	1993	1994	1995	1996
A7	36173	43724	59261	74543	74890
N3	21594	25729	32370	40115	44953
NF	38754	44861	54762	63020	65793
OC	4480	4600	5772	6890	7887
LA	252	197	250	412	378
JP	30485	33146	37247	45763	50716
CN	3882	5091	6840	8562	9833
RU	105	135	938	1061	1107
RW	50141	54315	61835	77146	81460
WL	185866	211798	259275	317512	337017

Import of	ASEAN 7			(million US$)	
from	1992	1993	1994	1995	1996
A7	33454	40183	48852	61730	63184
N3	22384	25749	32615	42724	45537
NF	31788	36117	41951	53202	57820
OC	6015	6667	7837	9624	10749
LA	422	467	669	1005	908
JP	47001	56021	69290	86436	81831
CN	5426	5621	7333	10925	11462
RU	100	144	532	853	535
RW	53168	58243	69383	89594	103819
WL	199758	229212	278462	356093	375845

A.2. NIES 3 (N3)

Export of	NIES 3			(million US$)	
to	1992	1993	1994	1995	1996
A7	26575	29122	35358	46770	49808
N3	26886	28186	32535	41226	41105
NF	79247	83416	92189	100695	99393
OC	4911	5204	5965	6603	6993
LA	924	943	1116	1588	1581
JP	27310	28220	32678	42013	42799
CN	43956	61769	69956	81838	89652
RU	203	869	1402	1810	2441
RW	74804	76406	82330	101817	107707
WL	284816	314135	353529	424360	441479

Import of	NIES 3			(million US$)	
from	1992	1993	1994	1995	1996
A7	23574	26338	32365	40989	45584
N3	26186	27256	30861	38923	38429
NF	4739	49510	56060	72245	74903
OC	7453	7918	8888	11319	13160
LA	1237	1261	1570	2154	2186
JP	6421	67433	76797	93081	86905
CN	50277	57523	68793	80537	85374
RU	75	975	1394	2387	2460
RW	58224	60485	74791	93269	103713
WL	278636	298699	351519	434904	452713

A.3. NAFTA (NF)

Export of	NAFTA			(million US$)	
to	1992	1993	1994	1995	1996
A7	25414	29887	33403	41737	45854
N3	41674	43584	49919	63960	63463
NF	273695	301531	352335	393561	436805
OC	11000	10296	12128	13498	14703
LA	3874	4179	4775	6436	7140
JP	54630	55069	61326	73757	76370
CN	9278	10112	10913	14079	14083
RU	2098	2967	2700	3194	3536
RW	205346	200236	207049	242032	257128
WL	627009	657861	734548	852254	919082

Import of	NAFTA			(million US$)	
from	1992	1993	1994	1995	1996
A7	39941	47336	58226	69095	73690
N3	59640	57506	65012	72966	71707
NF	264010	292491	343675	379191	424137
OC	6461	6264	6506	6540	7270
LA	2923	3014	3646	4158	4781
JP	111436	122038	134508	139575	129528
CN	29454	33924	44610	52426	58779
RU	511	1847	3686	4636	4070
RW	225182	235866	260305	278100	303325
WL	739558	800286	920174	1006687	1077287

A.4. Oceania (OC)

Export of	Oceania			(million US$)	
to	1992	1993	1994	1995	1996
A7	6766	6748	7994	9621	10060
N3	7221	7689	8669	10760	12415
NF	6084	6008	6005	6005	6675
OC	5440	6153	7328	8255	9082
LA	101	158	181	237	278
JP	12567	12603	14147	15073	14777
CN	1654	1846	2511	2711	3486
RU	16	214	274	223	182
RW	13949	13773	14670	16490	20916
WL	53798	55192	61779	69375	77871

Import of	Oceania			(million US$)	
from	1992	1993	1994	1995	1996
A7	4123	4155	5026	6068	7276
N3	3779	3936	4403	5123	5377
NF	12019	11860	14477	16709	18469
OC	5302	5722	6702	7296	8260
LA	54	52	74	114	124
JP	8895	9839	10874	10917	10254
CN	1953	2291	2879	3370	3803
RU	2	20	27	31	17
RW	15129	15543	18947	22946	24167
WL	51256	53418	63409	72574	77747

A.5. Latin America (LA)

Export of	Latin America			(million US$)	
to	1992	1993	1994	1995	1996
A7	244	319	506	706	709
N3	1129	1137	1513	2094	1963
NF	2686	2764	3317	3818	4268
OC	47	54	75	90	118
LA	216	268	416	591	445
JP	2057	1853	2440	3407	2886
CN	465	309	418	643	776
RU	0	0	75	141	140
RW	6807	6194	7532	10693	9945
WL	13651	12898	16292	22183	21250

Import of	Latin America			(million US$)	
from	1992	1993	1994	1995	1996
A7	230	214	240	370	359
N3	668	707	726	1059	1127
NF	3497	4262	4957	7054	8180
OC	105	173	209	229	323
LA	240	261	494	714	553
JP	1252	1152	1365	1395	1230
CN	161	283	346	552	601
RU	0	0	52	62	41
RW	7444	7892	8747	11458	12562
WL	13597	14944	17136	22893	24976

A.6. Japan (JP)

Export of	Japan			(million US$)	
to	1992	1993	1994	1995	1996
A7	41206	50332	61014	77649	73167
N3	59731	64204	73894	88056	80719
NF	107597	117206	128791	131434	121956
OC	8337	9202	10438	9851	9240
LA	1183	1003	1225	1216	1115
CN	11967	17353	18687	21934	21827
RU	1079	1508	1167	1170	1022
RW	108764	101775	99985	111695	102196
WL	339864	362583	395201	443005	411242

Import of	Japan			(million US$)	
from	1992	1993	1994	1995	1996
A7	32368	35273	39118	48273	52502
N3	23091	23436	26389	34395	33525
NF	61583	65169	73297	88259	91909
OC	14521	14681	16366	17790	17287
LA	2196	2182	2518	3749	3286
CN	16972	20651	27569	35922	40405
RU	2402	2777	3481	4752	3922
RW	79676	77435	85385	102797	106672
WL	232809	241604	274123	335937	349508

A.7. China (CN)

Export of	China			(million US$)	
to	1992	1993	1994	1995	1996
A7	4366	4961	6726	9757	9710
N3	40646	26388	38983	45786	43235
NF	9410	18328	23019	26472	28568
OC	762	1214	1692	1874	1932
LA	163	266	371	557	602
JP	11699	15782	21490	28466	30888
RU	2337	2692	1578	1674	1693
RW	16109	21980	26963	34306	34465
WL	85492	91611	120822	148892	151093

Import of	China			(million US$)	
from	1992	1993	1994	1995	1996
A7	4279	6114	7020	9735	10718
N3	29052	28795	30890	33672	36509
NF	10944	12128	15902	18999	19035
OC	2049	2315	2903	3009	3940
LA	720	531	567	690	978
JP	13686	23303	26319	29007	29190
RU	3512	4986	3466	3799	5156
RW	17601	25380	28562	33152	33296
WL	81843	103552	115629	132063	138822

A.8. Russia (RU)

Export of	Russia			(million US$)	
to	1992	1993	1994	1995	1996
A7	565	677	1126	1982	1210
N3	276	627	692	1058	874
NF	887	2273	3994	5241	4697
OC	12	12	40	31	9
LA	26	30	30	54	23
JP	1569	2005	2267	3173	2882
CN	2737	3068	2838	3377	4670
RW	33670	35355	52091	62679	67073
WL	39742	44047	63078	77595	81438

Import of	Russia			(million US$)	
from	1992	1993	1994	1995	1996
A7	866	725	396	467	461
N3	976	893	688	682	585
NF	3962	2612	2265	2902	2619
OC	55	115	299	246	158
LA	14	12	45	94	53
JP	1680	1367	1114	763	963
CN	1669	2335	952	865	993
RW	25511	18692	32841	40380	37486
WL	34733	26751	38600	46399	43318

A.9. World Total (WL)

Export of	World				(billion US$)
to	1992	1993	1994	1995	1996
A7	183.6	213.0	259.9	335.8	349.5
N3	253.8	259.5	311.7	384.5	390.9
NF	721.3	781.3	893.5	977.6	1041.3
OC	49.2	50.8	60.7	67.9	72.0
LA	13.7	14.1	16.3	21.9	23.1
JP	207.0	213.7	244.6	299.4	316.6
CN	82.1	108.3	120.6	146.1	157.6
RU	13.7	30.0	41.2	54.6	56.9
RW	2226.7	2047.8	2298.2	2781.2	2858.1
WL	3751.1	3718.5	4246.8	5069.0	5265.8

Import of	World				(billion US$)
from	1992	1993	1994	1995	1996
A7	185.5	210.3	248.3	308.0	336.0
N3	221.0	221.0	247.9	303.0	315.2
NF	664.0	692.2	789.7	919.6	998.7
OC	57.3	57.0	64.8	72.8	80.9
LA	14.8	14.1	17.0	22.6	22.6
JP	363.7	388.2	426.7	480.1	457.2
CN	137.4	157.7	192.7	234.0	254.4
RU	19.8	45.3	63.5	82.9	82.1
RW	2218.2	1991.8	2259.7	2717.7	2853.7
WL	3882.0	3777.5	4310.4	5140.7	5401.0

B. Macro Performance of the Model

By using an in-sample simulation, we can grasp the macro performance of the model. First, each SG model performance is evaluated. Next, the total link model through trade block macro-performance s measured. We adopt the years 1995 and 1996 for the simulation period since the import share matrix used in the trade block consists of 1995 figures, and because of the availability of data for that year.

One of the measures that is most often used to evaluate a simulation model is called the Root Mean Squared Percent Error (RMSPE). This criterion measures the accuracy of the individual variables in a *simulation context*. A desirable model would lead us to expect the results of a historical simulation to match the behavior of the real world rather closely. RMSPE is a measure of how closely each endogenous variable tracks the historical data and is defined as

$$RMSPE = \{ (1/T) \Sigma [(Y_t^s - Y_t^a)/ Y_t^a]^2 \}^{1/2} * 100 (\%) \quad (8)$$

where:

Y_t^s	:	Simulated value of Y_t
Y_t^a	:	Actual value
T	:	Number of periods in the simulation

B.1. Each SG Model Performance

Variable Name	Sub-Group Name						
	ASEAN 7	NIES 3	NAFTA	Oceania	Japan	China	Russia
	RMSPE						
A7	13.592	2.289	3.720	0.638	7.063	4.665	---
N3	11.032	0.494	5.642	1.327	7.690	5.225	---
NF	7.709	4.313	1.624	2.527	3.457	4.975	---
OC	7.049	5.041	4.385	1.963	3.971	15.407	---
JP	5.916	2.324	1.911	4.415	---	2.094	---
CN	14.015	9.443	19.993	10.978	7.651	---	---
LA	26.654	10.547	5.226	17.283	1.348	6.813	---
WL	6.124	2.169	0.578	0.800	2.807	0.691	9.190
WLV	---	---	---	---	---	---	9.192
MD	12.167	3.196	2.296	13.608	42.927	14.074	---
XD	2.172	1.731	2.390	8.815	5.593	22.634	---
YD	8.044	2.509	1.246	1.084	4.173	4.319	---
YDV	---	---	---	---	---	---	1.103
PXD	3.422	2.563	2.733	0.650	3.266	0.686	---

B.2. APEC Link Model Performance

Variable Name	Sub-Group Name					
	ASEAN 7	NIES 3	NAFTA	Oceania	Latin Am.	Japan
	RMSPE					
A7	22.140	13.990	16.180	16.560	---	5.730
N3	17.050	3.100	8.410	0.880	---	6.530
NF	11.960	2.750	2.300	1.980	---	3.020
OC	11.150	2.490	5.230	4.150	---	5.030
LA	44.480	8.970	21.490	17.990	---	1.240
JP	10.420	2.530	1.590	4.760	---	---
CN	13.230	7.410	22.570	7.940	---	7.450
WL	10.150	2.110	1.550	2.270	---	2.090
MD	10.110	5.300	4.020	12.810	---	42.720
XD	11.080	6.310	3.450	6.790	---	6.760
YD	12.430	1.810	0.110	1.400	---	4.310
PXD	3.420	2.560	2.730	0.650	---	10.170
WLV	---	---	---	---	---	---
YDV	---	---	---	---	---	---
PMD	1.210	1.240	1.950	1.540	1.870	0.820

	China	Russia	APEC	RestWld	World
	RMSPE				
A7	4.920	---	---	---	9.100
N3	5.490	---	---	---	4.130
NF	4.830	---	---	---	0.950
OC	15.490	---	---	---	2.950
LA	7.300	---	---	---	5.540
JP	3.770	---	---	---	2.260
CN	---	---	---	---	8.170
WL	1.420	8.860	---	---	---
MD	13.630	---	---	---	---
XD	25.650	---	---	---	---
YD	5.460	---	---	---	---
PXD	0.690	---	---	---	---
WLV	---	9.190	1.600	1.420	---
YDV	---	1.100	1.270	---	---
PMD	1.960	1.700	---	---	---

Finally, for the purpose of the simulation, we investigate the RMSPEs of variables in the APEC link model. The macro performance of the model for ASEAN 7 is

poor compared to other sub-groups. This can be seen in the first table, especially RMSPEs for each SG model. Imports of ASEAN 7 from Latin America demonstrate poor correspondence to the model. However, as shown in Table 2 and Table 3, ASEAN 7's trade share to/from the sub-group is relatively small (0.1% and 2.7% for export and import, respectively), therefore this problem is negligible.

Another poor-performing variable is Japan's national account based import. Otherwise, although several RMSPEs are in the 10-20% range, most of the rest show feasible performances for simulation.

C. Roles in the Trade Link Block

C.1. Determining Exports

Import values are determined group by group in each sub-group model. As previously mentioned, Latin American import functions are not estimated. Nor are Russian group-by-group import functions. Export values for each sub-group are determined in the Link block of the model. Import values of all the sub-groups from any particular group are summed up to determine the export value of the group. Since this figure is NOT identical to the original export value of the group, each SG model has a simple equation to convert the export value from the Link system to their national account base exports.

C.2. Determining Import Prices

Each SG model has an equation to determine the export price. ASEAN 7's import price, for example, is determined by taking the weighted sum of trade partners' export prices derived in each SG model. The weight used is ASEAN 7's import share, namely,

$$A7PMD = \Sigma_{SGj \in \Omega} r^{A7}_{j} SG_jPXD \qquad (9)$$

where:

SG_j	:	The j^{th} Sub-group
SG_jPXD	:	Export price of SG_j
Ω	:	Set of Sub-groups
r^{A7}_{j}	:	Import share of ASEAN 7 from SG_j

The rest of the world's (RW) proportion of import share is derived by multiplying an adequate proportion, which is settled *a priori*.

We employ the import share matrix shown below.

Import Share Matrix (a part of Table 3)

Imports of	from A7	N3	NF	OC	LA	JP	CN	RU	RW
A7	17.3	12.0	14.9	0.3	2.7	24.3	3.1	0.2	25.2
N3	9.4	8.9	16.6	0.5	2.6	21.4	18.5	0.5	21.4
NF	6.9	7.2	37.7	0.4	0.6	13.9	5.2	0.5	27.6
OC	8.4	7.1	23.0	10.1	0.2	15.0	4.6	0.0	31.6
LA	1.6	4.6	30.8	1.0	3.1	6.1	2.4	0.3	50.1
JP	14.4	10.2	26.3	1.1	5.3	---	10.7	1.4	30.6
CN	7.4	25.5	14.4	0.5	2.3	22.0	---	2.9	25.1
RU	1.0	1.5	6.3	0.2	0.5	1.6	1.9	---	87.0

C.3. Back to SG Models

These export values and import price indices determined in the Link block will be returned back into each SG model "exogenously" to resolve the import values and export price indices on the next stage.

C.4. Diagrams to Determine Export Values and Import Prices

Determining Export Value of an Exporting Group

Import Value of / from	A7	N3	NF	⋯
ASEAN 7	A7A7	A7N3	A7NF	⋯
	+	+	+	
NIES 3	N3A7	N3N3	N3NF	⋯
	+	+	+	
NAFTA	NFA7	NFN3	NFNF	⋯
	+	+	+	
⋯	⋯	⋯	⋯	
	↓	↓	↓	
	WLA7	WLN3	WLNF	
	↓	↓	↓	
	Export of ASEAN 7	Export of NIES 3	Export of NAFTA	

Determining Import Price for an Importing Group

Export Price of	ASEAN 7		NIES 3		NAFTA		⋯		
	↓		↓		↓				
	A7PXD		N3PXD		NFPXD				
	×		×		×				
Import Share of Sub-Group A	Share		Share		Share				
	↓		↓		↓				
	Value	+	Value	+	Value	+	⋯	→	Import Price of Group A

D. Variable List

All of the variable names included in the model are separated into two parts. The first part consists of a two character variable name describing the sub-groups while the second part consists of descriptive variables.

Sub-Group Abbreviation (First two characters)

Code	Sub-Group Name
A7	ASEAN 7
N3	NIES 3
NF	NAFTA
OC	Oceania
LA	Latin America
JP	Japan
CN	China
RU	Russia
AP	APEC Region
RW	Rest of the World
WL	World Total

Variable Description (From the third character to the tail)

Variable Name	Description	Unit
A7	Imports from ASEAN 7	US$ million
N3	Imports from NIES 3	US$ million
NF	Imports from NAFTA	US$ million
OC	Imports from Oceania	US$ million
LA	Imports from Latin America	US$ million
JP	Imports from Japan	US$ million
CN	Imports from China	US$ million
RU	Imports from Russia	US$ million
RW	Imports from Rest of the World	US$ million
WL	Imports from World	US$ million
RUV	Imports from Russia (Nominal)	US$ million
WLV	Imports from World (Nominal)	US$ million
YD	Gross Domestic Product	US$ million
DDD	Domestic Demand	US$ million
XD	Exports	US$ million
MD	Imports	US$ million
YDV	Gross Domestic Product (Nominal)	US$ million
DDDV	Domestic Demand (Nominal)	US$ million
PY	GDP Deflator	index 1995=100
PXD	Export Deflator	index 1995=100
PMD	Import Deflator	index 1995=100

E. APEC Link Model

E.1. ASEAN 7 SG Model

E.1.1. Import Functions

A7-1. &LOG A7A7 [1979-1996]

```
 &LOG A7A7  = -13.2962 + 1.2879 *(&LOG A7YD )
                        (-7.8227)  (6.4299)
                       + .5450 *(1 &LAG &LOG A7YD )
                       (2.4167)
                       - 1.5211 *(&LOG A7PMD/A7PY ) -.2153 *(D85+D86 )
                       (-23.1121)                          (-4.3428)
                       - .2313 *(D96 )
                        (-3.0828)
 SE=.0581  DW=2.7918  R-SQ(ADJ)=.9825  F-STAT=192.1322
```

A7-2. &LOG A7N3 [1986-1996]

```
 &LOG A7N3  = -20.4961 + 1.1542 *(&LOG A7YD * N3YD )
                       (-47.0400)  (70.1032)
                       + .0615 *(D90+D91 )
                       (3.4824)
 SE=.0226  DW=1.8403  R-SQ(ADJ)=.9980  F-STAT=2458.3897
```

A7-3 . &LOG A7NF [1978-1996]

```
 &LOG A7NF  = -14.3800 + .8642 *(&LOG A7YD * NFYD )
                       (-8.5351)  (14.7868)
                         - .6239 *(&LOG A7PMD/A7PY ) - .1778 *(D85+D86 )
                       (-11.7443)                          (-3.5490)
 SE=.0567  DW=2.0323  R-SQ(ADJ)=.9869  F-STAT=454.6252
```

A7-4. &LOG A7OC [1979-1996]

```
&LOG A7OC  = -7.4620 + .4581 *(&LOG A7YD * OCYD )
                     (-3.0817) (3.4264)
                     + .5073 *(1 &LAG &LOG A7OC )
                      (3.8240)
                      - .6637 *(&LOG A7PMD/A7PY ) - .1978 *(D86 )
                     (-3.9626)                          (-3.5330)
SE=.0495  H-STAT=.8895  R-SQ(ADJ)=.9868  F-STAT=317.5248
```

A7-5. &LOG A7JP [1979-1996]

```
&LOG A7JP  = - 6.2123 + .3779 *(&LOG A7YD * JPYD )
                     (-4.6520)  (4.8162)
                    + .5990 *(1 &LAG &LOG A7JP )
                     (6.1407)
                     - .1585 *(&LOG A7PMD/A7PY ) - .1568 *(D96 )
                    (-2.5857)                          (-2.5689)
SE=.0508  H-STAT=.5205  R-SQ(ADJ)=.9911  F-STAT=472.8924
```

A7-6. &LOG A7CN [1978-1996]

```
&LOG A7CN  = -13.7692 + .8503 *(&LOG A7YD * CNYD )
                      (-2.1194)  (3.4819)
                       -1.6685 *(&LOG A7PMD/A7PY )
                      (-12.0771)
SE=.1642  DW=1.8534  R-SQ(ADJ)=.9086  F-STAT=90.4171
```

A7-7. &LOG A7LA [1979-1996]

```
&LOG A7LA  = -9.8926 + 2.9413*(&LOG A7YD )
                     (-1.1451) (2.8054)
                      - 1.9247*(1 &LAG &LOG A7YD )
                     (-2.0144)
                     + .4459 *(1 &LAG &LOG A7LA )
                     (2.1547)
                     -1.7791*(&LOG A7PMD/A7PY )
                    (-2.1326)
SE=.2582  H-STAT=-1.5815  R-SQ(ADJ)=.9540  F-STAT=89.0779
```

A7-8. A7WL [1992-1996]

A7WL = A7A7 + A7CN + A7JP + A7LA + A7N3 + A7NF + A7OC + A7RU
+ A7RW

E.1.2. National Accounts

A7-9. &LOG A7MD [1978-1996]

&LOG A7MD = 4.5653 + .6357 *(&LOG A7WL)
(5.1328) (8.5512)

SE=.1600 DW=.1976 R-SQ(ADJ)=.8003 F-STAT=73.1236

A7-10. &LOG A7XD [1979-1996]

&LOG A7XD = .4171 + .9811*(&LOG WLA7)
(.8916) (24.7658)

SE=.0815 DW=.8818 R-SQ(ADJ)=.9730 F-STAT=613.3431

A7-11. A7YD [1979-1996]

A7YD = A7DDD + A7XD - A7MD

E.1.3. Export Price Index

A7-12. &LOG A7PXD [1979-1996]

&LOG A7PXD = -1.0156 + .2301 *(&LOG A7PY)
(-1.8288) (1.8436)
+ .6401 *(1 &LAG &LOG A7PXD) + .1764 *(D84)
(5.5616) (2.6888)

SE=.0634 H-STAT=-.4121 R-SQ(ADJ)=.9769 F-STAT=240.6999

E.2. NIES 3 SG Model

E.2.1. Import Functions

N3-1. &LOG N3A7 [1986-1996]

```
 &LOG N3A7  = -16.8065 + 1.0155 *(&LOG N3YD * A7YD )
                    (-11.3455) (18.3177)
                     -1.1048 *(&LOG N3PMD/N3PY )
                    (-5.6654)
 SE=.0465  DW=2.1919  R-SQ(ADJ)=.9930  F-STAT=710.8599
```

N3-2. &LOG N3N3 [1986-1996]

```
 &LOG N3N3  = -10.3477 + 1.5290 *(&LOG N3YD )
                    (-10.4870)  (20.9397)
                    -.6370 *(&LOG N3PMD/N3PY )
                    (-4.0461)
 SE=.0438  DW=2.1580  R-SQ(ADJ)=.9912  F-STAT=564.3147
```

N3-3. &LOG N3NF [1986-1996]

```
 &LOG N3NF  = -10.3846 + .7290 *(&LOG N3YD * NFYD )
                    (-6.6330)   (13.6442)
                       -.3550 *(&LOG N3PMD/N3PY )
                      (-1.9007)
 SE=.0485  DW=1.9137  R-SQ(ADJ)=.9809  F-STAT=258.2351
```

N3-4. &LOG N3OC [1986-1996]

```
 &LOG N3OC  = -7.5493 + .6336 *(&LOG N3YD * OCYD )
                     (-6.4352) (14.2346)
                       -1.5519*(&LOG N3PMD/N3PY )
                       (-11.2124)
 SE=.0415  DW=1.7852  R-SQ(ADJ)=.9890  F-STAT=450.8513
```

N3-5. &LOG N3JP [1986-1996]
&LOG N3JP = -.8205 + .4198*(&LOG N3YD * JPYD)
(-.9677) (14.2332)
-.7771*(&LOG N3PMD/N3PY)
(-6.2641)
SE=.0320 DW=2.2059 R-SQ(ADJ)=.9885 F-STAT=430.4783

N3-6. &LOG N3CN [1986-1996]
&LOG N3CN = -27.1598 + 1.4128 *(&LOG N3YD * CNYD)
(-4.4583) (6.2648)
-2.5336 *(&LOG N3PMD/N3PY)
(-5.1546)
SE=.1590 DW=1.9165 R-SQ(ADJ)=.9361 F-STAT=74.2126

N3-7. &LOG N3LA [1991-1996]
&LOG N3LA = -23.4204 + 1.2177 *(&LOG N3YD * LAYD)
(-2.1125) (2.7829)
-4.4730 *(&LOG N3PMD/N3PY)
(-3.8571)
SE=.1178 DW=2.4190 R-SQ(ADJ)=.7209 F-STAT=7.4571

N3-8. N3WL [1992-1996]
N3WL = N3A7 + N3CN + N3JP + N3LA + N3N3 + N3NF + N3OC + N3RU
+ N3RW

E.2.2. National Accounts

N3-9. &LOG N3MD [1986-1996]
&LOG N3MD = -.8112 + 1.0739*(&LOG N3WL)
(-1.7541) (28.9850)
SE=.0490 DW=.6099 R-SQ(ADJ)=.9882 F-STAT=840.1285

N3-10. &LOG N3XD [1986-1996]
&LOG N3XD = -4.1122 + 1.3651*(&LOG WLN3)
(-6.3780) (26.0199)
SE=.0443 DW=1.6585 R-SQ(ADJ)=.9854 F-STAT=677.0348

N3-11. N3YD [1986-1996]

N3YD = N3DDD + N3XD - N3MD

E.2.3. Export Price Index

N3-12. &LOG N3PXD [1987-1996]

```
&LOG N3PXD  = -.7751 + .1678*(&LOG N3PY )
                      (-3.3554) (3.3101)
                        + .5922*(1 &LAG &LOG N3PXD )
                         (3.1448)
SE=.0244  H-STAT=-1.1614  R-SQ(ADJ)=.7748  F-STAT=16.4831
```

E.3. NAFTA SG Model

E.3.1. Import Functions

NF-1. &LOG NFA7 [1978-1996]

```
 &LOG NFA7  = -21.7686 + 1.1250 *(&LOG NFYD * A7YD )
                    (-8.0482)    (11.9901)
                     -1.4298 *(&LOG NFPMD/NFPY )
                    (-5.1355)
 SE=.1016  DW=1.6408  R-SQ(ADJ)=.9633  F-STAT=237.1407
```

NF-2. &LOG NFN3 [1979-1996]

```
 &LOG NFN3  = 2.3241 + .7966 *(1 &LAG &LOG NFN3 )
                    (2.5286)  (9.6907)
                    -1.0829*(&LOG NFPMD/NFPY ) + .5515 *(D85 )
                    (-2.2767)                    (4.9817)
 SE=.1007  H-STAT=2.1814  R-SQ(ADJ)=.9783  F-STAT=256.9861
```

NF-3. &LOG NFNF [1979-1996]

```
 &LOG NFNF  = -.3549 + .0851*(&LOG NFYD )
                    (-.2005)  (.5025)
                       + .9285*(1 &LAG &LOG NFNF )
                         (7.6978)
                       -.2976*(&LOG NFPMD/NFPY ) +.1538*(D84 )
                      (-1.0632)                    (2.6399)
 SE=.0528  H-STAT=-1.9142  R-SQ(ADJ)=.9795  F-STAT=203.9214
```

NF-4. &LOG NFOC [1980-1996]

```
 &LOG NFOC  = .7611 + .3968*(&LOG NFYD )
                    (.9541)  (4.1111)
                    +.5390*(1 &LAG &LOG NFOC ) -.6456*(&LOG NFPMD )
                    (-1.8080)                    (2.6138)
                    +.1443*(D90 )
                    (3.9468)
 SE=.0514  H-STAT=.8335  R-SQ(ADJ)=.9064  F-STAT=39.7182
```

NF-5. &LOG NFJP [1981-1996]

```
 &LOG NFJP  = -7.6081 + 1.8499*(&LOG NFYD )
                      (-2.1397) (4.5089)
                       +.6833 *(1 &LAG &LOG NFJP )
                        (3.5174)
                       -.5385 *(1 &LAG &LOG NFYD * JPYD )
                      (-1.9049)
                        -.2601 *(&LOG NFPMD )-.1003 *(D90 ) -.1128 *(D96 )
                       (-.2220)                      (-1.6610)       (-2.0897)
 SE=.0466  H-STAT=-.6318  R-SQ(ADJ)=.9813  F-STAT=131.9571
```

NF-6. &LOG NFCN [1978-1996]

```
 &LOG NFCN  = -76.0749 + 2.9510 *(&LOG NFYD * CNYD )
                        (-6.7667)  (7.6769)
                        -3.6833 *(&LOG NFPMD/NFPY )
                       (-3.6173)
 SE=.3398  DW=1.4442  R-SQ(ADJ)=.9330  F-STAT=126.3971
```

NF-7. &LOG NFLA [1991-1996]

```
 &LOG NFLA  = -30.1543 + 1.3916 *(&LOG NFYD * LAYD )
                       (-3.6634)  (4.6610)
                       -12.1051*(&LOG NFPMD/NFPY )
                       (-6.1305)
 SE=.0641  DW=2.6822  R-SQ(ADJ)=.8771  F-STAT=18.8492
```

NF-8. NFWL [1992-1996]

```
   NFWL = NFA7 + NFCN + NFJP + NFLA + NFN3 + NFNF + NFOC + NFRU
          + NFRW
```

E.3.2. National Accounts

NF-9. &LOG NFMD [1978-1996]

```
 &LOG NFMD  = .5605 + .9679*(&LOG NFWL )
                     (1.8946) (43.6076)
 SE=.0308  DW=.5998  R-SQ(ADJ)=.9906  F-STAT=1901.6240
```

NF-10. &LOG NFXD [1978-1996]

```
 &LOG NFXD  = 1.2265 + .9204 *(&LOG WLNF )
                      (2.3228) (22.9942)
 SE=.0579  DW=.6322  R-SQ(ADJ)=.9670  F-STAT=528.7334
```

NF-11. NFYD [1978-1996]

```
   NFYD = NFDDD + NFXD - NFMD
```

E.3.3. Export Price Index

NF-12. &LOG NFPXD [1979-1996]

```
 &LOG NFPXD  = -1.6674 + .3598 *(&LOG NFPY )
                       (-6.0370) (6.0113)
                        +.3934 *(1 &LAG &LOG NFPXD ) +.0502 *(D80+D81 )
                        (5.2672)                     (3.8469)
                        - .0416 *(D90+D91+D92 )
                       (-3.9035)
 SE=.0150  H-STAT=.1248  R-SQ(ADJ)=.9849  F-STAT=277.4880
```

E.4. Oceania SG Model

E.4.1. Import Functions

OC-1. &LOG OCA7 [1980-1996]

```
 &LOG OCA7  = -22.1630 + 1.1748 *(&LOG OCYD * A7YD )
                      (-11.9074) (16.3206)
                       -1.3661 *(&LOG OCPMD/OCPY )
                      (-15.9246)
 SE=.0773  DW=2.2630  R-SQ(ADJ)=.9581  F-STAT=183.8404
```

OC-2. &LOG OCN3 [1986-1996]

```
 &LOG OCN3  = -1.7035 + .3845 *(&LOG OCYD * N3YD )
                      (-1.2553) (7.4151)
 SE=.0629  DW=2.0331  R-SQ(ADJ)=.8437  F-STAT=54.9842
```

OC-3. &LOG OCNF [1978-1996]

```
 &LOG OCNF  = -7.6322 + .6015 *(&LOG OCYD * NFYD )
                      (-4.7474) (10.6249)
                      -.3265 *(&LOG OCPMD/OCPY )
                      (-4.2597)
 SE=.0623  DW=2.0162  R-SQ(ADJ)=.9556  F-STAT=194.5483
```

OC-4. &LOG OCOC [1979-1996]

```
 &LOG OCOC  =  -6.5427 + .8925 *(&LOG OCYD )
                       (-3.1499) (4.0532)
                         + .4381 *(1 &LAG &LOG OCOC )
                          (3.5782)
                         - .9382 *(&LOG OCPMD/OCPY )
                        (-4.6434)
 SE=.0657  H-STAT=-.1597  R-SQ(ADJ)=.9746  F-STAT=218.2385
```

OC-5. &LOG OCJP [1981-1996]

&LOG OCJP = 7.6951 + .0556 *(&LOG OCYD*JPYD)
(6.3769) (1.2783)
-.6559 *(&LOG OCPMD/OCPY) - .1202 *(D87) - .1424 *(D91)
(-5.4130) (-1.6086) (-1.8876)

SE=.0716 DW=2.5684 R-SQ(ADJ)=.8104 F-STAT=17.0234

OC-6. &LOG OCCN [1979-1996]

&LOG OCCN = -12.8544 + .5229 *(&LOG OCYD * CNYD)
(-2.3435) (2.4123)
+ .8962 *(1 &LAG &LOG OCCN)
(17.1288)
-.4988 *(&LOG OCPMD/OCPY) - .4200 *(D83)
(-2.4135) (-4.2978)

SE=.0935 H-STAT=-.5920 R-SQ(ADJ)=.9880 F-STAT=352.1277

OC-7. &LOG OCLA [1980-1996]

&LOG OCLA = - 49.5756 + 4.1842 *(&LOG OCYD)
(-7.1005) (7.6551)
-3.4210 *(&LOG OCPMD/OCPY)
(-11.9206)

SE=.2708 DW=1.1697 R-SQ(ADJ)=.9081 F-STAT=80.0887

OC-8. OCWL [1992-1996]

OCWL = OCA7 + OCCN + OCJP + OCLA + OCN3 + OCNF + OCOC + OCRU
+ OCRW

E.4.2. National Accounts

OC-9. &LOG OCMD [1978-1996]

&LOG OCMD = 5.9210 + .4812 *(&LOG OCWL)
(5.0078) (4.3835)

SE=.1349 DW=.4732 R-SQ(ADJ)=.5030 F-STAT=19.2149

OC-10. &LOG OCXD [1978-1996]
&LOG OCXD = 1.6776 + .8605 *(&LOG WLOC)
(2.0013) (11.0940)
SE=.0902 DW=.6298 R-SQ(ADJ)=.8715 F-STAT=123.0774

OC-11. OCYD [1978-1996]
OCYD = OCDDD + OCXD - OCMD

E.4.3. Export Price Index

OC-12. &LOG OCPXD [1979-1996]
&LOG OCPXD = -1.1779 + .2602 *(&LOG OCPY)
(-1.3145) (1.3183)
+ .6499 *(1 &LAG &LOG OCPXD) + .2316 *(D85)
(4.0893) (4.0626)
- .1108 *(D96)
(-1.8275)
SE=.0551 H-STAT=-.8879 R-SQ(ADJ)=.9734 F-STAT=156.3221

E.5. Japan SG Model

E.5.1. Import Functions

JP-1. &LOG JPA7 [1979-1996]

```
 &LOG JPA7  = -5.6387 + .5709 *(1 &LAG &LOG JPYD*A7YD )
                    (-1.4691) (4.2529)
                     -1.1244*(&LOG JPPMD/JPPY )
                    (-4.9785)
 SE=.1137  DW=1.3642  R-SQ(ADJ)=.5773  F-STAT=12.6095
```

JP-2. &LOG JPN3 [1980-1996]

```
 &LOG JPN3  = -12.0959 + 1.0641 *(&LOG JPYD )
                    (-2.9359)    (2.8909)
                     + .5791 *(1 &LAG &LOG JPN3 )
                       (2.9546)
                     -1.3160 *(&LOG JPPMD/JPPY )
                     (-3.2553)
 SE=.1513  H-STAT=1.4248  R-SQ(ADJ)=.9247  F-STAT=66.4810
```

JP-3. &LOG JPNF [1980-1996]

```
 &LOG JPNF  = 4.0168 + .2334 *(&LOG JPYD * NFYD )
                    (2.7245)  (4.9880)
                     -.5736 *(&LOG JPPMD/JPPY ) - .1673 *(D87 ) + .1741 *(D96 )
                       (-4.4774)                 (-2.5140)          (2.4594)
 SE=.0644  DW=1.7936  R-SQ(ADJ)=.6913  F-STAT=9.9579
```

JP-4. &LOG JPOC [1980-1996]

```
 &LOG JPOC  = -4.8318 + .5147 *(&LOG JPYD * OCYD )
                     (-2.0735)  (6.2948)
                      -1.2110*(&LOG JPPMD/JPPY ) - .1595 *(D86+D87 )
                      (-7.7515)                 (-5.3813)
 SE=.0388  DW=1.2098  R-SQ(ADJ)=.8728  F-STAT=37.5977
```

JP-5. &LOG JPCN [1979-1996]
```
 &LOG JPCN  = -2.2103 + .3549 *(1 &LAG &LOG JPYD )
                    (-1.3071) (1.8233)
                     + .8190 *(1 &LAG &LOG JPCN ) - .2765 *(&LOG JPPMD )
                       (8.2485)                          (-1.1189)
                     -.2485 *(D86+D87 )
                    (-3.3616)
 SE=.0939  H-STAT=-.7152  R-SQ(ADJ)=.9535  F-STAT=88.1229
```

JP-6. &LOG JPLA [1980-1996]
```
 &LOG JPLA  = .2696 + .4428*(1 &LAG &LOG JPYD )
                   (.1456) (2.3750)
                   + .4085*(1 &LAG &LOG JPLA )-.5094*(&LOG JPPMD )
                    (3.2931)                          (-1.8546)
                   - .2947*(D86+D87 ) +.2403*(D95 )
                   (-3.9884)              (2.2187)
 SE=.0891  H-STAT=-.1148  R-SQ(ADJ)=.8147  F-STAT=15.0712
```

JP-7. JPWL [1992-1996]
```
   JPWL = JPA7 + JPCN + JPLA + JPN3 + JPNF + JPOC + JPRU + JPRW
```

E.5.2. National Accounts

JP-8. &LOG JPMD [1978-1996]
```
 &LOG JPMD  = 6.6883 + .4453 *(&LOG JPWL )
                    (.6027)   (.5110)
 SE=.3781  DW=.0589  R-SQ(ADJ)=-.0428  F-STAT=.2612
```

JP-9. &LOG JPXD [1978-1996]
```
 &LOG JPXD  = 6.0011 + .5472 *(&LOG WLJP )
                   (10.3357)  (11.8051)
 SE=.0794  DW=.5261  R-SQ(ADJ)=.8849  F-STAT=139.3614
```

JP-10. JPYD [1978-1996]
```
   JPYD = JPDDD + JPXD - JPMD
```

E.5.3. Export Price Index

JP-11. &LOG JPPXD [1981-1996]

```
 &LOG JPPXD  =  .4148 + 2.1536*(&LOG JPPY )
                      (.3921)  (2.0842)
                       - 2.2495*(1 &LAG &LOG JPPY )
                       (-2.3832)
                       + .8348 *(1 &LAG &LOG JPPXD )
                       (6.2338)
                       - .1579 *(D86 ) + .1048 *(D96 )
                       (-4.0769)           (2.6106)
 SE=.0353  H-STAT=-.8504  R-SQ(ADJ)=.8986  F-STAT=27.5764
```

E.6. China SG Model

E.6.1. Import Functions

CN-1. CNA7 [1979-1996]

```
CNA7  = 1737.8270 + .0045 *(CNYD ) + .9852 *(1 &LAG CNA7 )
          (.8699)       (2.5216)              (6.9444)
        -2536.0693*(CNPMD/CNPY )
          (-2.9998)
```

SE=485.8336 H-STAT=.5642 R-SQ(ADJ)=.9800 F-STAT=278.3924

CN-2. &LOG CNN3 [1986-1996]

```
&LOG CNN3  = -31.1765 + 1.5360 *(&LOG CNYD * N3YD )
                (-3.7134)  (4.9642)
                - .5218 *(&LOG CNPMD/CNPY ) - .4800 *(D89 )
                (-2.0867)                          (-2.3633)
```

SE=.1765 DW=1.8615 R-SQ(ADJ)=.9082 F-STAT=33.9861

CN-3. &LOG CNNF [1979-1996]

```
&LOG CNNF  = -6.3639 + .5507 *(&LOG CNYD * NFYD )
                (-1.0705) (2.7233)
                  - .9516 *(&LOG CNPMD/CNPY )
                 (-5.4129)
```

SE=.1522 DW=1.5613 R-SQ(ADJ)=.8785 F-STAT=62.4402

CN-4. CNOC [1980-1996]

```
CNOC  = 4000.7989 + .0026 *(CNYD ) - 2382.9886*(CNPMD/CNPY )
          (4.8970)    (2.1639)          (-10.8759)
        + 796.3540 *(D80 ) + 822.8817 *(D86+D87 )
          (2.3446)           (3.2894)
```

SE=293.0736 DW=2.1752 R-SQ(ADJ)=.8972 F-STAT=35.8920

CN-5. &LOG CNJP [1978-1996]

```
&LOG CNJP  = -5.5602 + .5468 *(&LOG CNYD * JPYD )
                    (-1.1925) (3.3891)
                    - 1.0752*(&LOG CNPMD/CNPY ) + .7902 *(D85+D86 )
                    (-4.2866)                              (4.5818)
SE=.2245  DW=1.5418  R-SQ(ADJ)=.8553  F-STAT=36.4759
```

CN-6. &LOG CNLA [1980-1996]

```
&LOG CNLA  = -5.5547 + .9038 *(&LOG CNYD )
                     (-.7950)   (1.7452)
                      - 1.4347*(&LOG CNPMD/CNPY ) - .9243 *(D90 )
                       (-8.4525)                          (-4.6792)
                        + .6212 *(D92 )
                        (3.3373)
SE=.1790  DW=1.9766  R-SQ(ADJ)=.8889  F-STAT=32.9965
```

CN-7. CNWL [1992-1996]

```
CNWL = CNA7 + CNJP + CNLA + CNN3 + CNNF + CNOC + CNRU + CNRW
```

E.6.2. National Accounts

CN-8. &LOG CNMD [1978-1996]

```
&LOG CNMD  = 1.2470 + .9348 *(&LOG CNWL )
                    (2.9762) (24.2349)
SE=.1037  DW=.4387  R-SQ(ADJ)=.9702  F-STAT=587.3328
```

CN-9. &LOG CNXD [1978-1996]

```
&LOG CNXD  = 3.3807 + .7251 *(&LOG WLCN )
                    (8.1620) (19.3821)
SE=.1416  DW=.4908  R-SQ(ADJ)=.9542  F-STAT=375.6666
```

CN-10. CNYD [1978-1996]

```
CNYD = CNDDD + CNXD - CNMD
```

E.6.3. Export Price Index

CN-11. &LOG CNPXD [1981-1996]

```
 &LOG CNPXD  = -.4770 + .1107*(&LOG CNPY )
                       (-1.7589) (1.7510)
                        + .6985*(1 &LAG &LOG CNPXD ) + .0965*(D90 )
                         (4.0211)                          (1.8815)
                       - .1968*(D96 )
                         (-3.3020)
 SE=.0493  H-STAT=1.5599  R-SQ(ADJ)=.8521  F-STAT=22.6090
```

E.7. Russia SG Model

E.7.1. Import Function

RU-1. RUWLV [1993-1996]

RUWLV = 17246.6419 + .0700 *(RUYDV)
(2.0338) (2.6543)

SE=4969.4206 DW=2.1545 R-SQ(ADJ)=.6683 F-STAT=7.0451

RU-2. RUWL [1992-1996]

RUWL = RUWLV / RUPMD / 100

E.7.2. National Accounts

RU-3. RUYDV [1992-1996]

WLRUV = WLRU * WLRUP

RU-4. RUYDV [1993-1996]

RUYDV = RUDDDV + (WLRUV - RUWLV)

E.8. APEC Total

E.8.1. Imports

AP-1. APWLV [1992-1996]

APWLV =(((A7WL*A7PMD) + (N3WL*N3PMD) + (JPWL*JPPMD) +
(CNWL*CNPMD) + (NFWL*NFPMD) + (OCWL*OCPMD) +
(LAWL*LAPMD)) / 100) + RUWLV

AP-2. APYDV [1993-1996]

APYDV =(((A7YD*A7PY) + (N3YD*N3PY) + (JPYD*JPPY) + (CNYD*CNPY) +
(NFYD*NFPY) + (OCYD*OCPY) + (LAYD*LAPY)) / 100) +
RUYDV

E.9. Rest of the World

E.9.1. Imports of Rest of the World

RW-1. RWWLV [1992-1996]

RWWLV = WLWLV - APWLV

E.10. Trade Model

E.10.1. World Import Definitions

TR(WL)-1. WLA7 [1992-1996]
WLA7 = A7A7+CNA7+JPA7+LAA7+N3A7+NFA7+OCA7+RUA7+RWA7

TR(WL)-2. WLCN [1992-1996]
WLCN = A7CN+JPCN+LACN+N3CN+NFCN+OCCN+RUCN+RWCN

TR(WL)-3. WLJP [1992-1996]
WLJP = A7JP+CNJP+LAJP+N3JP+NFJP+OCJP+RUJP+RWJP

TR(WL)-4. WLLA [1992-1996]
WLLA = A7LA+CNLA+JPLA+LALA+N3LA+NFLA+OCLA+RULA+RWLA

TR(WL)-5. WLN3 [1992-1996]
WLN3 = A7N3+CNN3+JPN3+LAN3+N3N3+NFN3+OCN3+RUN3+RWN3

TR(WL)-6. WLNF [1992-1996]
WLNF = A7NF+CNNF+JPNF+LANF+N3NF+NFNF+OCNF+RUNF+RWNF

TR(WL)-7. WLOC [1992-1996]
WLOC = A7OC+CNOC+JPOC+LAOC+N3OC+NFOC+OCOC+RUOC+RWOC

TR(WL)-8. WLRU [1994-1996]
WLRU = A7RU+CNRU+JPRU+LARU+N3RU+NFRU+OCRU+RWRU

TR(WL)-9. WLRUV [1994-1996]
WLRUV = (WLRU*WLRUM)*WLRUP

E.10.2. Import Price Definitions

TR(A7)-1. APA7P [1986-1996]

APA7P = ((0.1933*A7PXD) + (0.1196*N3PXD) + (0.1512*NFPXD) +
(0.0233*OCPXD) + (0.2424*JPPXD) + (0.0296*CNPXD) +
(0.0022*LAPXD) + (0.0027*RUPXD)) * 100

TR(A7)-2. A7PMD [1986-1996]

A7PMD = APA7P*(1+A7RWI)

TR(N3)-1. APN3P [1986-1996]

APN3P = ((0.0942*A7PXD) + (0.0895*N3PXD) + (0.1661*NFPXD) +
(0.0260*OCPXD) + (0.2140*JPPXD) + (0.1852*CNPXD) +
(0.0050*LAPXD) + (0.0055*RUPXD)) * 100

TR(N3)-2. N3PMD [1986-1996]

N3PMD = APN3P*(1+N3RWI)

TR(NF)-1. APNFP [1986-1996]

APNFP = ((0.0686*A7PXD) + (0.0725*N3PXD) + (0.3767*NFPXD) +
(0.0065*OCPXD) + (0.1386*JPPXD) + (0.0521*CNPXD) +
(0.0041*LAPXD) + (0.0046*RUPXD)) * 100

TR(NF)-2. NFPMD [1986-1996]

NFPMD = APNFP*(1+NFRWI)

TR(OC)-1. APOCP [1986-1996]

APOCP = ((0.0836*A7PXD) + (0.0706*N3PXD) + (0.2302*NFPXD) +
(0.1005*OCPXD) + (0.1504*JPPXD) + (0.0464*CNPXD) +
(0.0016*LAPXD) + (0.0004*RUPXD)) * 100

TR(OC)-2. OCPMD [1986-1996]

OCPMD = APOCP*(1+OCRWI)

TR(JP)-1. APJPP [1986-1996]

APJPP = ((0.1437*A7PXD) + (0.1024*N3PXD) + (0.2627*NFPXD) +
(0.0530*OCPXD) + (0.0000*JPPXD) + (0.1069*CNPXD) +
(0.0112*LAPXD) + (0.0141*RUPXD)) * 100

TR(JP)-2. JPPMD [1986-1996]

JPPMD = APJPP*(1+JPRWI)

TR(CN)-1. APCNP [1986-1996]

APCNP = ((0.0737*A7PXD) + (0.1771*N3PXD) + (0.1439*NFPXD) +
(0.0228*OCPXD) + (0.2196*JPPXD) + (0.0000*CNPXD) +
(0.0052*LAPXD) + (0.0288*RUPXD)) * 100

TR(CN)-2. CNPMD [1986-1996]

CNPMD = APCNP*(1+CNRWI)

TR(LA)-1. APLAP [1986-1996]

APLAP = ((0.0162*A7PXD) + (0.0463*N3PXD) + (0.3081*NFPXD) +
(0.0100*OCPXD) + (0.0609*JPPXD) + (0.0241*CNPXD) +
(0.0312*LAPXD) + (0.0952*RUPXD)) * 100

TR(LA)-2. LAPMD [1986-1996]

LAPMD = APLAP*(1+LARWI)

TR(RU)-1. APRUP [1992-1996]

APRUP = (0.0101*A7PXD) + (0.0147*N3PXD) + (0.0625*NFPXD) +
(0.0053*OCPXD) + (0.0164*JPPXD) + (0.0186*CNPXD) +
(0.0020*LAPXD) + (0.0000*RUPXD)) * 100

TR(RU)-2. RUPMD [1992-1996]

RUPMD = APRUP*(1+RURWI)

References

[1] IDE ELSA Group and IBM-TSC ELSA Group (1985) *The ELSA Link Model: Structure, Simulations, and Estimated Models*, ELSA Monograph, Institute of Developing Economies.

[2] Institute of Developing Economies and Tokyo Scientific Center, IBM Japan eds, (1984) *Econometric Link System for ASEAN, Overview*.

[3] Okuda, S.D. (2000) “Industrial Linkage and Direct Investment in APEC,” *Chapter I of this publication.*

[4] Osada, H. (1998) "Deepening economic interdependence in the APEC region - Boom and vulnerability through trade linkages," in *The Deepening Economic Interdependence in the APEC Region*, APEC Study Center, Institute of Developing Economies.

[5] Statistics Department of Institute of Developing Economies, ed. (1985) *Econometric Link System for ASEAN (ELSA), Final Report Volumes I and II*, Institute of Developing Economies.

[6] Toida, M., C. Yamaji and J. Uemura (1994) "Economic impact of EC integration on Asian Industrializing Region: Measurement by PAIR link model," in *Impact of EC Integration on Asian Industrializing Region*, Institute of Developing Economies.