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34. GENERAL EQUILIBRIUM ASSESSMENTS OF TRADE LIBERALIZATION IN APEC COUNTRIES

Hiro Lee, David Roland-Holst and
Dominique van der Mensbrugge

1. INTRODUCTION

Asia-Pacific Economic Cooperation (APEC) countries have embarked on the important liberalization process in recent years. At the 1994 summit, APEC leaders delivered the Bogor Declaration, agreeing to remove trade and investment barriers by 2010 for developed members and 2020 for developing members. In Osaka in 1995, they agreed on the Action Agenda for implementing the objectives. In 1996, APEC leaders adopted the Manila Action Plan for APEC (MAPA), which included the individual and collective action plans to liberalize trade and investment in the region starting in 1997.

The primary impetus behind the APEC process is a vision of open multilateral trade that can more fully realize the immense potential of economies that are home to over 40% of the world's population. Attaining this vision will entail a reorganization of economic activity around the Pacific that more fully exploits the diverse resources, technologies, and tastes of this vast region. At the national level, such a transition may imply dramatic adjustments in specific economic activities and policies, and resistance to such change will pose a challenge to reformers. There is, however, a clear consensus that all

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APEC members will ultimately benefit from this process, and empirical economists can facilitate reform by elucidating the detailed benefits and costs of APEC trade reform.

This chapter contributes the policy dialogue by evaluating the effects of APEC trade liberalization on member country real GDP, sectoral output, exports and imports using an 18-region, 16-sector dynamic calibrated general equilibrium (CGE) model of the global economy. The current work extends our earlier study (Lee et al., 1999) in two respects. First, we have updated all the data used in our model from 1992 to 1995 using the GTAP database, version 4 (McDougall et al., 1998). Second, we have modified our model to allow for imperfect substitutability between domestically produced goods and exported goods within a given sector. The next section provides an overview of APEC countries' trade patterns and summarizes the extent of trade distortions. Section 3 contains a brief description of the APEC model used for quantitative assessments. In Section 4, we present the aggregate and sectoral results of the APEC trade liberalization experiment, and the final section offers conclusions.

2. APEC COUNTRIES' TRADE PATTERNS AND PROTECTION RATES

2.1. Trade Patterns

In this section, we provide an overview of trade patterns within APEC and with respect to the rest of the world. Table 1 presents a world trade matrix, where the world is disaggregated into 15 APEC countries/regions – Australasia (ANZ: Australia and New Zealand), Japan (JPN), China including Hong Kong (CHN), Korea (KOR), Taiwan (TWN), Singapore (SGP), Malaysia (MYS), Thailand (THA), Indonesia (IDN), the Philippines (PHL), Vietnam (VNM), Canada (CAN), the United States (USA), Mexico (MEX), and Chile (CHL) – and 3 non-APEC regions – the rest of Latin America (LAT), Europe (EUR), and the rest of the world (ROW).¹

For the great majority of the APEC members, intra-APEC trade accounted for more than two-thirds of total trade in 1995. On the export side, in addition to Canada and Mexico (which each sold approximately three-quarters of their total exports to the United States), the ratio of intra-APEC to total exports exceeded two-thirds in Australasia and all the Asian members with the exception of Vietnam. On the import side, the ratio of intra-APEC to total imports was particularly large in China (73%), Taiwan (79%), Singapore (74%), Malaysia (74%), and Vietnam (81%). By contrast, Chile has a relatively small presence in Asia-Pacific markets, with intra-APEC trade shares of 50%.

Table 1. World Trade Matrix, 1995 (Millions of U.S. dollars).

Exporting Country	Importing Country										
	ANZ	JPN	CHN	KOR	TWN	SGP	MYS	THA	IDN	PHL	VNM
Australasia (ANZ) ^a	6,957	21,293	4,833	5,944	3,483	2,360	2,205	1,354	1,982	979	138
Japan (JPN)	13,723	...	50,253	36,780	31,573	25,648	16,869	20,731	9,739	7,307	1,080
China (CHN) ^b	5,765	47,455	30,737	9,182	6,923	8,057	2,779	3,448	2,828	2,236	1,054
Korea (KOR)	2,291	25,488	19,120	...	4,336	5,840	2,888	2,618	3,099	1,509	1,303
Taiwan (TWN)	2,531	16,065	31,643	2,896	...	5,548	3,934	3,497	1,879	1,317	1
Singapore (SGP)	3,746	13,549	12,660	3,212	5,951	...	13,587	4,799	2,422	1,921	1,577
Malaysia (MYS)	1,506	10,276	4,930	2,220	2,104	14,480	...	2,683	768	656	258
Thailand (THA)	1,036	14,016	5,425	1,231	1,431	5,916	1,716	...	1,198	560	481
Indonesia (IDN)	1,164	13,979	3,542	3,321	1,809	3,688	1,025	763	...	667	318
Philippines (PHL)	296	4,617	1,529	643	360	1,131	467	638	239	...	121
Vietnam (VNM)	230	2,025	540	217	6	418	115	66	175	49	...
Canada (CAN)	1,337	13,051	3,868	2,514	1,350	515	523	577	579	312	28
United States (USA)	15,310	82,794	26,919	32,821	21,861	17,803	9,889	9,260	3,734	5,928	326
Mexico (MEX)	130	2,689	399	338	63	185	52	355	124	189	1
Chile (CHL)	95	3,664	415	1,073	745	108	98	190	201	52	2
Other Latin Amer (LAT)	826	9,712	4,282	2,577	1,593	934	1,143	1,017	872	587	40
Europe (EUR)	22,314	65,967	46,832	22,338	17,006	19,433	15,179	20,035	12,834	7,129	1,076
Rest of World (ROW)	4,863	66,204	20,601	18,026	3,616	11,733	3,376	7,466	5,290	4,012	425
APEC ^c	56,117	270,961	196,814	102,393	81,994	91,697	56,146	50,979	28,967	23,682	6,689
Non-APEC	28,003	141,882	71,714	42,942	22,215	32,100	19,698	28,519	18,995	11,728	1,541
World	84,120	412,843	268,528	145,335	104,209	123,798	75,844	79,498	47,963	35,410	8,230

These trade flows are evaluated at world export (FOB) prices in millions of 1995 U.S. dollars.

^a Australia and New Zealand.

^b Includes Hong Kong. The figure in the third row and the third column is the sum of China's exports to Hong Kong and Hong Kong's exports to China.

^c Excludes Brunei, Papua New Guinea, Peru, and Russia.

Source: GTAP database, Version 4.

Table 1. Continued.

Exporting Country	Importing Country									
	CAN	USA	MEX	CHL	LAT	EUR	ROW	APEC	Non-APEC	World
Australasia (ANZ)	1,430	6,272	231	165	1,030	11,095	6,587	59,628	18,713	78,341
Japan (JPN)	8,838	131,377	3,932	1,188	9,119	85,504	30,777	359,040	125,400	484,440
China (CHN)	5,613	62,464	767	1,073	7,151	63,327	23,657	190,382	94,135	284,517
Korea (KOR)	2,258	27,108	1,003	652	5,872	19,509	14,527	99,513	39,908	139,421
Taiwan (TWN)	2,181	31,417	717	214	1,949	19,535	4,483	103,838	25,967	129,806
Singapore (SGP)	850	22,816	267	98	1,772	17,792	13,475	87,457	33,039	120,496
Malaysia (MYS)	943	15,644	385	81	856	11,425	5,387	56,936	17,667	74,604
Thailand (THA)	740	12,467	98	84	1,235	12,595	8,718	46,399	22,549	68,948
Indonesia (IDN)	448	7,801	117	110	900	9,264	3,968	38,751	14,132	52,884
Philippines (PHL)	392	7,475	70	47	521	5,482	1,086	18,025	7,089	25,114
Vietnam (VNM)	61	309	16	13	187	1,902	407	4,239	2,496	6,735
Canada (CAN)	...	148,178	1,075	345	3,596	16,166	4,921	174,253	24,683	198,936
United States (USA)	119,100	...	48,597	3,997	47,789	201,219	53,882	398,337	302,890	701,226
Mexico (MEX)	2,867	63,394	...	534	4,838	5,077	2,301	71,319	12,216	83,535
Chile (CHL)	155	1,970	193	...	3,255	4,699	810	8,961	8,764	17,725
Other Latin Amer. (LAT)	2,294	43,371	1,815	3,800	35,266	41,560	12,988	74,865	89,814	164,679
Europe (EUR)	20,482	199,394	7,802	4,135	49,410	1,610,485	313,484	481,955	1,973,379	2,455,334
Rest of World (ROW)	4,063	60,099	1,038	808	12,954	238,539	89,036	211,619	340,528	552,148
APEC	145,876	538,692	57,469	8,602	90,069	484,593	174,986	1,717,079	749,648	2,466,727
Non-APEC	26,839	302,863	10,656	8,743	97,629	1,890,584	415,508	768,440	2,403,721	3,172,160
World	172,716	841,555	68,125	17,346	187,699	2,375,177	590,493	2,485,519	3,153,369	5,638,888

The United States, a country geographically linked to the world's three largest trading regions (East Asia, Europe, and the Americas) had the second lowest intra-APEC export and import ratios (57 and 64%, respectively) in 1995. On average, 70% of APEC countries' exports and imports were intraregional in 1995.

While exports to and imports from the United States and Japan accounted for large percentages of trade for developing-country APEC members, trade among them has also become significant. Singapore accounted for 19.4% of Malaysia's exports, and China (including Hong Kong) accounted for 13.7 and 24.4% of Korea and Taiwan's exports in 1995. In the past several years, China's trade with these neighboring countries has increased dramatically.

2.2. Import Protection and Export Tax/Subsidy Rates

Sectoral rates of nominal import protection and export tax/subsidy rates for the 15 APEC countries/regions are summarized in Tables 2 and 3, respectively. The import protection rates are the sum of sectoral tariff rates and *ad valorem* equivalents of quantitative restrictions (QRs) on imports, which are computed from the GTAP database. The average protection rates in 1995 (the last row of Table 2) range from 1.4% in Singapore to 19.3% in the Philippines, and sectoral protection rates differ significantly across APEC. The most notable sector is rice and wheat, where the rates range from zero or negative in a number of countries to 535% in Japan.² In other agriculture, they are very high in Japan, Korea, Taiwan, and Malaysia, whereas in processed food they are quite high in Vietnam, Thailand, and the Philippines.³

Developing-country members have substantially lowered trade barriers on a variety of manufactured products, yet some of them still maintain relatively high tariff rates. A number of manufacturing sectors, for example, are still highly protected in the Philippines, Thailand, and China. In simple manufactures (e.g. textiles, clothing, and footwear), developed countries tend to impose trade barriers to protect unskilled workers. Nevertheless, the import protection rates on textiles and clothing are higher in developing members than in developed members.

On the export side, Malaysia imposes export taxes on all goods and services with the exception of rice and wheat and processed food (Table 3). Its average export tax rate is 13.2%. Several APEC countries' export subsidy rates on rice and wheat are very high, but these reflect large domestic-world price differentials on the highly protected sector.⁴ It is also worth noting that, although many members rely on heavy export tax and subsidy instruments in the grain sectors, this does not represent a significant macro trade distortion for

Table 2. Import Protection Rates in Major APEC Countries, 1995 (Percent).

Products	ANZ	JPN	CHN	KOR	TWN	SGP	MYS	THA	IDN	PHL	VNM	CAN	USA	MEX	CHL
1 Rice and wheat ^a	0.3	535.0	-14.5	66.0	68.0	34.9	85.2	59.2	0.0	70.8	5.2	0.0	1.2	-17.5	-23.3
2 Other agriculture	2.4	65.9	7.6	45.0	49.2	17.6	45.4	25.7	6.4	18.0	8.5	0.6	4.4	0.9	5.9
3 Coal, oil, and gas	0.1	0.7	3.0	4.2	5.7	2.7	2.8	2.8	3.4	1.1	21.6	6.0	0.6	0.7	8.8
4 Other mining	0.5	0.0	1.4	1.8	0.9	0.0	1.7	1.6	3.7	4.8	1.7	0.0	0.1	3.2	8.4
5 Processed food	4.0	30.9	11.4	26.0	28.9	20.3	34.2	53.1	9.2	45.2	68.3	6.4	9.9	-2.0	10.1
6 Textiles and clothing ^b	14.6	6.8	30.9	6.9	8.6	1.4	17.4	24.1	14.0	23.0	28.1	11.2	9.9	3.4	10.4
7 Wood and paper	6.5	0.7	13.6	5.2	4.0	0.4	9.4	10.9	6.0	21.7	13.1	0.5	0.5	1.1	9.8
8 Chemicals ^c	6.4	2.2	14.6	7.5	5.6	1.3	8.0	16.4	8.0	26.0	4.8	1.5	2.9	2.6	9.9
9 Metals and prod.	7.7	0.9	12.4	5.9	5.8	0.0	9.4	11.5	7.1	20.4	5.8	1.6	2.0	3.0	10.0
10 Machinery and equip.	7.4	0.4	12.7	8.0	6.4	0.0	6.4	9.9	4.5	25.0	4.5	1.0	1.9	3.1	10.5
11 Transport equip.	11.2	1.6	38.4	4.8	18.2	2.8	14.5	37.8	27.2	19.4	25.5	0.8	1.4	3.4	10.5
12 Other manufac.	10.2	1.3	24.8	7.5	7.8	0.1	11.5	25.2	10.4	27.8	18.4	1.3	3.0	7.0	10.2
13 Construction	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14 Electricity	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15 Trade and transp.	0.3	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16 Other services	0.1	2.9	1.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Weighted average	6.1	9.1	14.5	8.1	8.3	1.4	9.0	13.1	6.7	19.3	17.2	1.6	2.4	2.3	8.1

These rates include ad valorem equivalents of quantitative restrictions on imports.

^a Include processed rice.

^b Includes leather and footwear.

^c Include plastics and rubber products.

Source: GTAP database, Version 4.

Table 3. Export Tax and Subsidy Rates in Major APEC Countries, 1995 (Percent).

Products	ANZ	JPN	CHN	KOR	TWN	SGP	MYS	THA	IDN	PHL	VNM	CAN	USA	MEX	CHL
1 Rice and wheat ^a	-0.1	-83.5	32.7	-51.6	-56.8	0.0	-52.2	-55.7	-0.6	-44.1	4.4	-0.3	-1.5	29.5	13.7
2 Other agriculture	-2.7	-12.5	2.4	-0.3	-0.7	0.0	13.3	-1.0	0.0	-0.3	13.5	-0.6	0.6	3.8	0.0
3 Coal, oil, and gas	1.7	0.0	19.6	0.0	0.0	0.0	13.7	0.0	0.0	0.0	0.7	0.0	6.1	0.0	1.3
4 Other mining	0.0	0.0	-0.9	0.0	0.0	0.0	13.6	0.0	0.0	0.0	3.1	0.2	3.9	0.0	0.0
5 Processed food	-3.0	-4.4	2.2	-1.6	-0.7	0.0	0.0	-5.7	0.0	-0.9	4.7	-3.0	0.0	1.9	0.0
6 Textiles and clothing ^b	0.0	0.0	-1.2	0.3	0.5	0.2	15.5	1.3	0.6	21.5	2.6	0.0	0.3	0.0	0.0
7 Wood and paper	0.3	0.0	-5.5	0.0	0.0	0.0	13.7	0.0	0.0	0.0	5.7	0.1	1.0	0.0	0.0
8 Chemicals ^c	0.2	0.0	-10.8	0.0	0.0	0.0	13.7	0.0	0.0	1.3	1.9	0.0	1.5	0.0	0.0
9 Metals and prod.	0.0	0.0	-7.3	0.0	0.0	0.0	13.7	0.0	0.0	0.0	0.4	0.0	0.7	0.0	0.0
10 Machinery and equip.	1.0	-0.1	-5.0	0.0	0.0	0.0	13.7	0.0	0.0	2.0	1.9	0.1	0.8	0.0	0.2
11 Transport equip.	-0.2	0.1	-0.9	0.4	0.0	0.1	13.0	0.0	0.0	0.0	1.9	0.0	0.5	0.1	0.8
12 Other manufac.	1.5	0.0	30.3	0.0	0.0	0.0	13.7	0.0	0.0	1.1	4.0	0.4	0.5	0.0	0.0
13 Construction	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14 Electricity	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15 Trade and transp.	0.1	0.0	0.0	0.0	0.0	0.0	21.4	0.0	0.0	0.0	3.2	0.2	10.0	0.0	0.0
16 Other services	0.1	0.0	0.0	0.0	0.0	0.0	13.7	0.0	0.0	0.0	26.3	0.1	4.9	0.0	8.9
Weighted average	-0.5	-0.1	-0.8	0.0	0.0	0.0	13.2	-3.2	0.1	2.4	4.4	-0.1	2.2	0.2	0.5

Positive number indicates export taxes and negative numbers indicate export subsidies.

^{a, b, c} See Table 2.

Source: GTAP database, Version 4.

any country. Trade distortions on other agriculture, manufactures, and services are the main determinants of economy wide export bias.

3. BRIEF DESCRIPTION OF THE APEC MODEL

A CGE model is an empirical tool that is well suited to evaluating new trading arrangements for several reasons. First, it captures extensive indirect effects, such as interindustry linkages between sectors and trade linkages between countries and regions. Second, it can evaluate the effect of removing trade barriers on resource allocation and structural adjustment in each country. Third, it can detail the impacts on both member and nonmember countries and thereby better elucidate implications for the negotiating environment.

The APEC model used in this study is a dynamic CGE model of the global economy. It is, to a large extent, based upon OECD's Linkage model (OECD, 1997). One of the key features of the model is that goods are differentiated by region of origin and are modeled as imperfect substitutes. On the import side, this is reflected by the implementation of the so-called Armington assumption where a constant elasticity of substitution (CES) specification is used to incorporate imperfect substitution of imported goods with respect to domestically produced goods. A symmetric specification is used to model export supply, the latter being implemented with constant-elasticity-of transformation (CET) functions.⁵

As defined in Section 2, the APEC model contains 15 APEC and 3 non-APEC regions. The model is calibrated to social accounting matrices (SAMs) of the 18 regions, which are constructed from the GTAP database, version 4. The original database provides 1995 data on input-output, value added, final demand, bilateral trade, transport and protection data for 45 regions and 50 sectors. This has been aggregated into an 18-region, 16-sector data set for the implementation of the APEC model.

The model spans the period 1995–2020. It solves every year from 1995–2010 and every five years from 2010–2020. While the model relies on sequential static computation of equilibria, intertemporal trends are specified for factor growth (labor) and accumulation (capital), as well as changes in productivity. Land is assumed to be price-responsive, however, with no time trend on the supply curve.

All sectors are assumed to be perfectly competitive and operate under constant returns to scale. Production technology is modeled mainly by a nesting of CES functions. The model has three kinds of factors of production: labor, capital, and sector-specific fixed factors (e.g. land in agricultural sectors). Labor supply is assumed to be fixed in all regions and for all time periods, and

the wage rate adjusts to insure equilibrium in the domestic labor market. While we assume no international migration, labor is free to move across all sectors of the economy. Thus, there is a single equilibrium wage rate.

Within each period, capital is classified as being either *old* or *new*. New capital is generated by the previous period's investment. This vintage structure of capital allows for differentiating the substitution possibilities across inputs by the age of capital. Similar to labor, *new* capital is assumed to be perfectly mobile across sectors, and there is a single economy wide rate of return on capital.

All income generated by economic activity is assumed to be distributed to consumers. A single representative consumer allocates optimally his/her disposable income among the consumer goods and saving. The consumption/saving decision is static: saving is treated as a good, and its amount is determined simultaneously with the demands for the other goods. The price of saving is set arbitrarily equal to the average price of consumer goods.

The model is calibrated on exogenous growth rates of real GDP, population, labor productivity, and an autonomous energy efficiency improvement in energy use.⁶ In the baseline scenario, the dynamics are calibrated in each country/region by imposing the assumption of a balanced growth path. This implies that the ratio between labor and the capital/fixed-factor bundle (in efficiency units) is held constant over time.⁷ When the APEC trade liberalization scenario is simulated, the growth of capital is endogenously determined by the saving-investment relation.

4. EMPIRICAL ASSESSMENTS

In this section, we examine both aggregate and sectoral effects of APEC trade liberalization. To assess the implications of regional trade liberalization, we first establish a baseline scenario that assumes no trade liberalization during the 2000–2020 period. We then run a simulation on nondiscriminatory APEC trade liberalization; i.e. developed members remove import and export distortions by 2010, and developing members remove them by 2020 on a Most-Favored Nation (MFN) basis.⁸

In contrast to a free trade area where each member country removes bilateral trade barriers on imports from other members, trade liberalization by APEC members is nondiscriminatory toward the rest of the world. Each member submits individual action plans (IAPs) every year, which provide a blueprint for implementing liberalization and facilitation in APEC (Yamazawa, 1997). The general perception among the APEC leaders is that regional integration should be nondiscriminatory toward the rest of the world, which is consistent

with the process of multilateral trade liberalization as envisioned under the World Trade Organization (WTO).⁹

Three caveats should be mentioned with regard to the APEC scenario. First, it is assumed that APEC countries' liberalization coincides with the Uruguay Round (UR) commitments during 1995–2000. However, a number of countries (e.g. Chile, China, Indonesia, and the Philippines) have committed to tariff reductions that are significantly larger than the UR commitments (Yamazawa, 1997). Second, the baseline scenario does not incorporate conceivable reductions in trade distortions beyond the year 2000 under the new WTO Round. The first caveat would underestimate the impact of APEC trade liberalization while the second would overestimate it. Third, the assumption that all members remove trade barriers on agricultural products by 2010/2020 might be too optimistic. For example, Japan, Korea, and the Philippines have excluded liberalization of rice and some other agricultural products from their IAPs. In particular, it is highly unlikely that Japan would liberalize its rice market by 2010. Thus, these caveats must be borne in mind when interpreting the simulation results.

4.1. Impact of APEC Trade Liberalization on Real GDP Growth

Table 4 summarizes the impact of APEC trade liberalization, on an MFN basis, on real GDP. It indicates percentage changes in real GDP relative to the baseline in 2005, 2010, 2015, and 2020, as well as absolute changes (billions of 1995 U.S.\$) in 2020. By the year 2020, real GDP of developed and developing APEC members would increase by \$42 billion and \$83 billion, respectively (the last column of the table). In addition, since there would be no trade diversion under nondiscriminatory liberalization, the non-APEC regions would also be able to capture nontrivial gains in real GDP (\$16 billion). The gains in real GDP are distributed very unevenly, however. In 2020, the Philippines would realize a 3.8% increase in real GDP over the baseline projection, followed by Thailand (1.6%), Vietnam (1.4%), Singapore (1.3%), and Taiwan (1.1%). In percentage terms, an increase in real GDP is very small in Japan, Canada, the United States, and Mexico.¹⁰

The real GDP gains reported in this chapter are significantly smaller than those obtained in our earlier study (Lee et al., 1999) for two major reasons. First, the model used here is calibrated to the 1995 database, whereas we used the 1992 database in the previous study. During the three-year period, some APEC countries reduced trade barriers significantly, resulting in much lower trade distortions in the base year. For example, Thailand lowered its average tariff rate from 31.6 to 13.1%, and Indonesia from 12.3 to 6.7% during

Table 4. Changes in Real GDP relative to the Baseline Values.

Country/Region	Percentage changes				Absolute changes in 2020 ^a
	2005	2010	2015	2020	
Australasia	0.1	0.2	0.5	0.7	5.8
Japan	0.1	0.2	0.2	0.2	13.0
China (incl. Hong Kong)	0.2	0.4	0.7	0.9	38.8
Korea	0.1	0.3	0.4	0.5	6.6
Taiwan	0.2	0.5	0.8	1.1	11.8
Singapore	0.2	0.6	1.0	1.3	3.4
Malaysia	0.3	0.6	0.8	0.9	3.2
Thailand	0.3	0.7	1.2	1.6	6.9
Indonesia	0.0	0.1	0.3	0.4	2.1
Philippines	0.4	1.2	2.4	3.8	8.2
Vietnam	0.3	0.7	1.1	1.4	0.7
Canada	0.0	0.0	0.0	0.1	0.6
United States	0.0	0.1	0.1	0.2	22.8
Mexico	0.0	0.0	0.0	0.0	0.2
Chile	0.0	0.2	0.3	0.5	1.2
Other Latin America	0.0	0.0	0.0	0.1	2.4
Europe	0.0	0.0	0.0	0.1	9.2
Rest of World	0.0	0.0	0.0	0.1	4.2
Developed APEC	0.0	0.1	0.2	0.2	42.2
Developing APEC	0.1	0.3	0.5	0.7	83.0
Non-APEC Countries	0.0	0.0	0.0	0.1	15.9

^a Billions of 1995 U.S. dollars.

1992–1995. Second, some modifications in the structure of the APEC model would affect simulation results. Most importantly, the newly incorporated assumption of imperfect substitutability between domestically produced goods and exported goods, which are represented by CET functions, would reduce the impact of the removal of trade distortions.

While countries with higher initial protection rates generally achieve greater efficiency gains from trade reform, the extent of welfare gains depends upon several other factors. Singapore has the lowest average rate of protection (with the exception of Hong Kong which is aggregated into China), but its real GDP gains are relatively large. This is because its export to GDP ratio and intra-APEC trade share are both extremely high, and an APEC-wide trade liberalization would enable it to capture a relatively large gain through export expansion.

Canada and Mexico gain very little from APEC trade liberalization. This is because about three-quarters of Canadian and Mexican exports were destined to the United States in 1995, and the U.S. tariff rates on Canadian and Mexican products were already quite low.¹¹ Thus, the benefits for Canada and Mexico are expected to be very small because of their low trade shares with non U.S. APEC members.

A major reason why the U.S. gains (in percentage terms) are small might be because liberalization of service trade is excluded from our experiment. The frequency of NTBs in various categories of services in APEC countries suggests that the magnitude of barriers to trade in services may be extremely large (APEC & PECC, 1995). However, there is no proper method to convert frequency ratios into *ad valorem* equivalents, and no attempt has been made in the present study. Service exports accounted for approximately one-quarter of U.S. exports in 1995, and its share in total exports would have been much greater in the absence of regulations in its trading partners. Since the U.S. has comparative advantage in services, service trade liberalization is expected to bring substantial benefits.

Another limitation of this study is that we have only considered trade liberalization. Liberalization on foreign direct investment (FDI) is expected to bring additional gains. Lee and Roland-Holst (1998) show that, in the context of U.S.-Japan trade, capital mobility increases the welfare gains to both countries that accrue from bilateral trade liberalization. Petri (1997) conducts APEC trade and FDI liberalization experiments and finds that an exclusion of FDI liberalization would diminish global welfare gains resulting from APEC liberalization by \$60 billion, or 23% of full liberalization.¹² These results confirm our *a priori* expectation that the removal of investment barriers would lead to additional real output and income gains, which could be substantial for developing members.

4.2. Sectoral Results

Although the real GDP results of the liberalization scenarios indicate the overall gains in the standard of living resulting from the removal of trade distortions, economy wide efficiency gains are rarely distributed uniformly across sectors. Trade liberalization might lead to a sharp contraction of output and employment in highly protected activities, and the adversely affected sectors are likely to strongly oppose trade reform.

In many of the previous studies assessing the impact of APEC trade liberalization (e.g. APEC, 1997; McKibbin, 1998; Yang et al., 1998), sectoral effects are not evaluated. However, aggregate results reveal only part of the

story and can give misleading signals about the political feasibility of trade accords. Since trade policy is often formulated from the bottom up, a modern view of national interest, such as that based on trade reciprocity and open multilateralism, might encounter conflicts with established domestic interests.

Table 5 provides absolute and percentage changes in sectoral output, exports, and imports resulting from APEC liberalization compared with the projected baseline values in 2020. Since rice and wheat are the most protected products in many East Asian members, the removal of trade distortions in these products can lead to extreme adjustments. In particular, Japan's output of rice and wheat is estimated to contract by 56% while its imports would rise by almost 700% compared with the baseline values in 2020. By contrast, countries that export relatively large shares of rice and wheat would experience sharp increases in output. Driven by a surge in exports, the output of rice and wheat in Australasia, Canada, and the United States is expected to rise by 108, 69, and 49%, respectively.

The agricultural exporters would generally experience reductions in manufacturing output because labor and capital are drawn into the agricultural sectors.¹³ For example, the United States would experience reductions in growth rates of manufactures with the exception of processed food, wood and paper, and chemicals. However, increases in output of agricultural sectors and service-oriented sectors (sectors 13–16) would more than offset the reductions in manufacturing output.

In China, Asian NIEs (Korea, Taiwan, and Singapore), and the ASEAN-4 countries (Malaysia, Thailand, Indonesia, and the Philippines), exports and imports increase in all manufacturing sectors. Not only would they expand production of labor-intensive manufactures (e.g. textiles and clothing), but most of the Asian developing countries also increase output of the great majority of capital-intensive manufactures.

Korea and Taiwan's results are somewhat similar to Japan's as agricultural sectors contract (relative to the baseline case) and all manufacturing sectors expand except transport equipment in Taiwan. One notable difference is that the reductions in agricultural output in these two countries are significantly smaller than in Japan mainly because of their much lower initial protection rates on agricultural products.

In China, removing the trade distortions would result in a fall in agricultural output, posing a potential problem on food supply in the long run. Real output of a number of manufacturing and service-oriented sectors would increase over the baseline level, where Hong Kong's comparative advantage in manufactures and services might be contributing significantly to these results.

Table 5. Changes in Sectoral Output, Exports, and Imports relative to the Baseline, 2020 (Billions of 1995 U.S. Dollars, Percent).

	Australasia						Japan						China (incl. Hong Kong)					
	Output		Exports		Imports		Output		Exports		Imports		Output		Exports		Imports	
	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)
1 Rice and wheat	6.2	108.4	5.2	182.4	0.0	-6.5	-61.8	-55.7	-0.1	-89.0	74.4	691.9	-1.6	-0.7	0.0	17.4	-0.8	-17.1
2 Other agriculture	2.3	3.8	-0.1	-0.7	0.3	11.6	-28.2	-11.1	-0.1	-9.3	36.1	57.2	-9.0	-1.2	0.5	2.5	0.2	0.7
3 Coal, oil, and gas	0.5	1.0	-0.1	-0.4	0.3	3.1	1.4	1.9	0.2	8.6	-1.2	-0.7	13.0	2.7	2.7	11.9	-0.7	-3.7
4 Other mining	-0.5	-2.5	-0.4	-3.2	0.0	1.1	0.6	1.8	0.0	4.0	0.1	0.4	4.3	2.5	1.0	8.7	-1.0	-5.8
5 Processed food	7.0	8.8	5.4	22.5	0.4	7.1	-8.7	-1.3	0.4	14.1	19.9	23.2	-1.2	-0.3	4.2	15.5	1.7	5.4
6 Textiles, clothing	-1.4	-7.0	-0.2	-4.1	2.9	17.7	0.9	0.3	3.1	21.0	11.3	11.0	34.4	4.0	50.0	15.2	38.0	21.7
7 Wood and paper	-0.5	-0.9	-0.1	-2.1	0.9	8.4	3.6	0.6	0.5	7.2	-0.4	-0.7	1.5	0.4	2.7	6.4	2.2	5.6
8 Chemicals	-0.4	-0.7	0.1	0.4	1.8	7.2	7.5	0.8	5.1	7.2	-0.4	-0.6	-10.4	-1.1	2.2	2.0	9.7	6.9
9 Metals and prod.	-1.1	-1.6	-0.2	-0.9	0.8	8.1	16.9	2.1	4.2	7.8	-0.1	-0.1	-0.1	0.0	4.0	3.6	3.6	4.6
10 Machinery	-1.6	-3.6	-0.3	-2.1	3.5	6.3	40.4	2.2	27.0	5.8	0.5	0.3	13.8	0.8	29.7	7.1	13.1	3.8
11 Transport equip.	-1.5	-4.4	-0.1	-2.0	2.7	10.7	22.0	4.7	17.8	11.8	-0.8	-2.1	-23.7	-7.0	1.2	5.1	13.2	21.1
12 Other manufac	-0.7	-3.7	0.0	-1.5	1.4	13.9	3.6	1.0	2.4	6.5	1.5	3.2	12.8	1.9	18.3	14.0	7.0	17.5
13 Construction	3.8	3.2	...	...	...	...	8.7	0.4	...	...	...	...	5.3	0.6	...	...	...	...
14 Electricity	0.3	1.6	...	...	...	...	1.6	0.7	...	...	...	...	3.7	1.0	...	...	...	...
15 Trade and transp.	1.3	0.3	0.0	-0.1	1.2	3.2	8.5	0.3	3.4	4.1	4.7	1.7	28.5	1.2	23.9	7.8	-2.6	-3.1
16 Other services	1.7	0.3	-0.2	-1.1	0.2	1.7	-0.7	0.0	0.5	1.7	0.6	0.9	8.4	0.6	4.3	6.6	-1.5	-4.0

Table 5. Continued.

		Korea						Taiwan						Singapore					
		Output		Exports		Imports		Output		Exports		Imports		Output		Exports		Imports	
		(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)
1	Rice and wheat	-3.4	-4.5	0.0	-63.1	2.0	101.5	-1.4	-7.1	-0.2	-71.4	0.6	116.6	0.0	88.1	0.0	67.6	0.0	-0.4
2	Other agriculture	-5.2	-5.5	0.0	0.1	8.5	36.4	-3.0	-6.9	-0.1	-4.5	5.1	44.5	-0.4	-4.8	0.0	-0.7	0.5	8.3
3	Coal, oil, and gas	1.6	1.5	0.3	3.1	1.3	2.5	1.0	3.0	0.0	0.4	1.4	11.4	0.7	1.4	0.4	1.4	1.5	6.2
4	Other mining	0.3	1.6	0.0	2.3	0.1	1.6	0.2	2.6	0.0	3.9	0.1	4.5	0.0	1.4	0.0	0.3	0.1	3.5
5	Processed food	0.5	0.3	0.4	10.4	2.3	18.6	3.8	7.5	2.4	34.7	2.1	23.4	1.8	10.6	1.9	19.5	1.0	11.1
6	Textiles, clothing	22.8	15.1	14.3	23.0	2.0	9.2	30.8	25.5	21.3	31.7	2.7	20.1	0.8	7.3	0.7	9.1	0.9	7.6
7	Wood and paper	0.4	0.4	0.5	6.7	0.5	3.4	0.5	0.7	0.8	4.5	0.9	6.9	0.4	1.7	0.2	2.4	0.3	5.0
8	Chemicals	8.8	3.6	4.2	9.7	2.1	5.1	16.1	7.9	7.5	12.6	3.9	9.4	2.2	3.6	2.0	4.2	1.4	3.8
9	Metals and prod.	4.8	1.7	2.3	6.9	2.2	4.8	0.7	0.3	2.1	5.2	2.4	7.1	1.4	5.0	0.8	5.1	0.9	3.7
10	Machinery	6.7	1.6	9.1	5.4	5.5	4.1	1.4	0.4	4.6	2.2	8.2	5.7	8.3	3.3	7.9	3.4	7.2	3.4
11	Transport equip.	5.1	4.2	4.6	10.6	0.0	0.3	-1.5	-2.0	0.6	3.4	3.5	14.7	0.4	2.8	0.4	3.8	0.5	2.8
12	Other manufac	1.5	1.5	1.6	7.8	0.8	7.7	3.5	5.3	3.3	12.6	1.0	10.2	0.7	3.1	0.6	3.3	1.0	4.3
13	Construction	1.5	0.4	...	...	...	...	3.9	3.0	...	...	...	...	1.6	5.2	...	...	...	...
14	Electricity	0.2	0.6	...	...	...	...	1.3	3.4	...	...	...	...	0.2	4.3	...	...	...	...
15	Trade and transp.	-3.4	-0.9	1.4	2.3	-0.3	-0.8	-4.3	-1.3	-0.6	-2.4	0.9	4.9	1.3	0.6	0.2	0.2	0.6	7.9
16	Other services	-5.9	-0.8	0.3	1.4	-0.6	-2.0	-3.4	-0.5	-0.3	-2.2	0.5	1.7	1.7	1.2	-0.1	-0.6	0.7	2.3

Table 5. Continued.

		Malaysia						Thailand						Indonesia					
		Output		Exports		Imports		Output		Exports		Imports		Output		Exports		Imports	
		(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)
1	Rice and wheat	-1.8	-10.2	0.0	-35.6	1.9	95.5	-9.4	-44.0	-5.1	-63.6	0.3	62.8	-0.1	-0.2	0.0	3.0	-0.4	-12.3
2	Other agriculture	-1.8	-4.7	0.0	0.3	2.7	36.8	1.0	2.4	1.1	12.8	0.6	11.4	0.0	0.0	0.2	2.2	0.0	-0.4
3	Coal, oil, and gas	-2.3	-4.3	-1.1	-4.5	0.1	2.6	-0.3	-1.6	0.1	6.8	-0.7	-4.0	1.7	2.6	1.3	3.8	0.2	2.0
4	Other mining	-0.3	-3.9	-0.1	-3.8	0.0	2.1	0.3	4.9	0.3	7.5	-0.2	-5.4	0.2	0.9	0.1	1.1	0.0	2.4
5	Processed food	0.9	2.5	1.8	11.4	1.0	16.9	1.3	2.7	2.3	13.2	2.1	32.7	-0.6	-1.1	0.1	2.0	0.3	9.3
6	Textiles, clothing	2.2	11.5	2.0	18.8	1.0	12.7	5.3	8.4	4.5	17.3	1.3	20.1	3.9	9.6	3.3	13.3	1.4	18.2
7	Wood and paper	1.7	5.0	1.7	9.1	0.1	2.5	0.0	0.0	0.4	7.2	0.2	3.9	1.3	2.8	1.1	5.0	0.2	4.1
8	Chemicals	3.2	10.1	2.5	17.7	0.4	1.9	0.5	1.7	1.2	10.1	1.2	4.8	0.3	0.7	0.5	5.6	1.2	5.8
9	Metals and prod.	-0.1	-0.4	0.5	4.7	1.0	4.8	0.1	0.8	0.4	9.0	0.8	2.9	-0.1	-0.3	0.3	4.6	0.5	3.7
10	Machinery	13.6	9.0	13.3	9.5	3.7	2.5	7.0	6.7	6.5	9.8	2.8	3.6	0.6	1.1	0.6	5.2	0.4	0.9
11	Transport equip.	-1.0	-3.3	0.6	6.2	0.5	3.6	-4.5	-10.6	0.2	6.1	4.6	21.6	-1.6	-11.8	0.0	0.9	1.7	15.5
12	Other manufac	1.1	3.5	1.4	7.7	0.6	6.0	0.4	1.3	1.1	8.7	1.1	16.5	0.0	-0.1	0.2	3.5	0.4	10.2
13	Construction	-1.5	-2.4	...	...	...	...	1.5	2.7	...	...	...	...	1.7	1.2	...	...	...	...
14	Electricity	0.1	1.1	...	...	...	...	0.2	1.5	...	...	...	...	0.0	0.1	...	...	...	...
15	Trade and transp.	-1.7	-1.5	0.4	1.4	0.1	5.1	2.5	1.7	3.6	8.6	-1.6	-7.9	-0.7	-0.4	0.3	2.6	-0.1	-0.9
16	Other services	-1.8	-2.1	0.0	-0.6	-0.4	-1.8	0.2	0.2	0.3	5.3	-0.6	-5.0	-0.7	-0.5	0.1	1.2	0.0	-1.7

Table 5. Continued.

		Philippines						Vietnam						Canada					
		Output		Exports		Imports		Output		Exports		Imports		Output		Exports		Imports	
		(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)
1	Rice and wheat	-2.1	-11.8	0.0	-45.7	1.0	55.8	1.1	22.1	0.8	59.2	0.0	14.1	4.5	68.9	4.3	79.0	0.0	-18.1
2	Other agriculture	-0.1	-0.2	0.4	23.1	0.0	1.2	-0.8	-5.2	0.0	0.4	0.0	4.5	0.0	0.0	0.2	2.2	0.2	2.6
3	Coal, oil, and gas	1.7	14.0	0.4	27.5	-0.4	-5.6	1.5	19.7	1.3	21.9	0.6	20.1	0.1	0.1	0.1	0.4	0.8	6.7
4	Other mining	1.4	22.4	0.6	25.2	0.0	0.9	0.0	-1.9	0.0	4.3	0.0	-4.6	0.0	-0.2	0.0	-0.1	0.0	-0.3
5	Processed food	-1.7	-3.4	1.1	21.1	1.0	15.3	-1.3	-16.5	-0.1	-2.3	1.9	51.4	-0.6	-0.9	0.1	0.8	0.6	5.9
6	Textiles, clothing	6.4	42.1	4.4	54.5	1.3	19.0	2.1	24.2	1.7	30.4	0.9	23.9	-1.5	-6.1	-0.2	-3.3	2.9	14.1
7	Wood and paper	0.9	9.1	0.5	25.7	0.1	5.1	-0.1	-1.5	0.0	5.5	0.1	7.5	-0.7	-0.5	-0.3	-0.5	0.2	0.8
8	Chemicals	0.8	4.1	0.5	20.7	0.8	6.7	0.2	6.6	0.1	16.1	0.1	1.5	0.7	0.8	0.2	0.7	0.8	2.0
9	Metals and prod.	2.5	26.5	0.9	28.9	1.5	18.7	0.0	-1.9	0.0	5.1	0.0	-1.6	-0.4	-0.5	0.0	-0.2	0.3	1.1
10	Machinery	9.7	32.6	9.2	33.1	6.7	18.9	0.0	0.5	0.0	4.9	0.0	0.6	-0.8	-0.8	-0.4	-0.7	0.7	0.6
11	Transport equip.	0.6	27.9	0.4	41.7	0.4	5.8	-0.2	-15.0	0.0	4.1	0.3	8.3	0.4	0.3	0.5	0.5	0.4	0.6
12	Other manufac.	1.1	22.6	1.0	32.6	0.3	10.1	0.0	-0.7	0.0	8.1	0.1	10.9	-0.3	-1.6	0.0	-0.7	0.5	3.0
13	Construction	1.4	9.7	...	...	...	...	0.2	1.2	...	...	...	...	0.4	0.2	...	...	...	...
14	Electricity	0.1	1.6	...	...	...	...	0.0	-0.2	...	...	...	...	-0.1	-0.2	...	...	...	...
15	Trade and transp.	1.6	1.6	3.3	19.8	-1.9	-17.0	0.2	0.8	0.5	5.0	0.0	-0.7	-0.4	-0.1	0.3	1.0	0.3	0.8
16	Other services	2.2	2.2	2.8	14.0	-0.4	-13.2	-0.4	-2.6	0.0	0.7	0.0	-2.6	-0.9	-0.2	0.0	-0.1	0.0	0.0

Table 5. Continued.

		United States						Mexico						Chile					
		Output		Exports		Imports		Output		Exports		Imports		Output		Exports		Imports	
		(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)	(\$b)	(%)
1	Rice and wheat	12.8	48.8	10.3	80.7	-0.1	-11.2	0.0	-2.4	0.0	2.9	0.0	9.2	0.0	-0.5	0.0	7.1	0.0	2.1
2	Other agriculture	34.2	7.6	23.1	40.9	1.9	5.7	0.1	0.2	0.2	3.3	0.0	0.7	0.2	0.7	0.2	4.4	0.0	1.5
3	Coal, oil, and gas	2.8	0.6	0.2	1.2	1.5	1.0	1.3	1.2	0.7	3.0	0.0	-0.1	0.1	1.4	0.0	9.1	0.1	3.4
4	Other mining	-0.1	-0.1	0.0	-0.3	0.0	0.0	0.1	0.7	0.0	1.8	0.0	1.5	1.1	5.7	0.7	6.7	0.0	4.8
5	Processed food	4.0	0.5	3.1	6.8	4.8	10.9	0.1	0.1	0.2	4.9	-0.2	-5.3	-0.1	-0.2	0.2	3.3	0.1	4.0
6	Textiles, clothing	-15.1	-4.1	-0.4	-1.2	31.9	15.9	-0.8	-1.3	-0.2	-2.1	0.3	3.8	-0.4	-2.2	0.0	6.2	0.4	9.3
7	Wood and paper	1.6	0.2	0.1	0.1	1.2	1.3	0.2	0.4	0.1	2.0	0.0	-0.2	0.7	2.8	0.6	5.7	0.1	3.6
8	Chemicals	1.1	0.1	1.7	1.1	5.0	3.4	0.3	0.3	0.4	2.5	0.2	0.9	0.0	-0.1	0.2	5.8	0.2	3.4
9	Metals and prod.	-3.5	-0.4	0.1	0.2	2.7	2.3	0.7	1.1	0.4	2.7	0.2	1.4	2.2	6.4	1.8	9.1	0.1	3.8
10	Machinery	-19.8	-1.2	-3.1	-0.6	26.7	4.2	1.3	1.3	1.4	1.9	0.7	1.0	-0.1	-2.1	0.0	4.3	0.4	3.3
11	Transport equip.	-0.2	0.0	0.3	0.2	8.4	3.5	1.1	1.7	1.0	2.8	0.3	1.6	0.0	-1.0	0.0	7.4	0.3	2.8
12	Other manufac	-3.7	-1.4	0.1	0.4	8.3	7.0	-0.3	-1.0	0.0	0.5	0.5	8.3	-0.1	-2.0	0.0	4.5	0.2	8.1
13	Construction	13.5	0.6	...	...	...	...	0.1	0.2	...	...	...	...	0.5	1.3	...	...	...	...
14	Electricity	0.8	0.3	...	...	...	...	0.0	-0.1	...	...	...	...	0.0	0.4	...	...	...	...
15	Trade and transp.	6.4	0.2	1.7	0.9	5.1	3.0	-0.7	-0.2	0.7	2.0	-0.1	-1.2	0.0	0.0	0.5	5.6	-0.1	-2.9
16	Other services	16.1	0.2	0.4	0.2	0.3	0.2	-1.0	-0.4	0.0	1.0	-0.1	-1.3	-0.8	-0.7	0.1	3.0	-0.1	-3.1

Large structural adjustments occur in ASEAN countries, particularly in the Philippines. Textile and clothing output would increase in all six ASEAN countries reported in Table 5, ranging from 7.3% in Singapore to 42.1% in the Philippines. Machinery is another sector that expands in all the ASEAN countries. In the Philippines APEC trade liberalization would lead to output increases in all manufacturing sectors in excess of 20% over the baseline values in 2020.

Relatively small structural adjustments are predicted to occur in Mexico and Chile. In Mexico, output growth is higher in fossil fuels, metals and products, machinery, and transport equipment over baseline projections, whereas it is lower in rice and wheat, textiles and clothing, and other manufactures. The sectoral results for Chile are consistent with our *a priori* expectations on output adjustments for a resource-abundant country. Real output growth is faster under the liberalization scenario in other agriculture, fossil fuels, other mining, wood and paper, and nonferrous metals (aggregated into metals and products), largely driven by new export demand. Real output growth becomes slower in textiles and clothing, machinery, and other manufactures.

Although not reported in this chapter, we also conducted a discriminatory liberalization experiment. Standard deviations of changes in real output relative to the baseline are not significantly different between the discriminatory and nondiscriminatory scenarios in most of the APEC countries/regions. For products with comparative disadvantage, such as agriculture and processed food in Japan and clothing in developed members, the shares of intra-APEC imports are extremely high. Thus, even though these products suffer greater output losses under nondiscriminatory liberalization, additional contractions are relatively small.

5. CONCLUSION

At the turn of this millennium, most of the nations bordering the Pacific have embarked upon an ambitious plan for open multilateralism. Although the aggregate benefits from more efficient regional specialization are readily apparent, more detailed adjustment costs en route to Pan-Pacific free trade are more difficult to ascertain but unlikely to be negligible in domestic policy agendas. For this reason, implementation of this trade reform agenda can be facilitated by a deeper understanding of these adjustment patterns, including the magnitude and incidence of their economic costs.

In that spirit, this chapter has provided general equilibrium estimates of the impact of APEC trade liberalization on real GDP, sectoral output, exports and imports. Compared with the baseline scenario where no trade liberalization is

assumed during 2000–2020, real GDP of developed and developing APEC members is predicted to increase by \$42 billion and \$83 billion, respectively, by the year 2020 while that of non-APEC members would increase by \$16 billion. The estimates based on our dynamic CGE model are not forecasts, however. They depend upon the model structure, parameter values, and policy scenarios. The present model does not incorporate such features as scale economies or human capital in the production function. The inclusion of these factors with dynamic specification is likely to result in a substantially larger impact of liberalization.¹⁴ In addition, we have only considered liberalization of merchandise trade and did not include liberalization of service trade or investment in this study. Thus, our results may be considered a lower end of the full impact of APEC liberalization.

APEC members submit individual action plans (IAPs) each year, providing their own liberalization and facilitation plans for the short-, medium- and long-term horizons and unilaterally reduces its trade barriers accordingly. However, the implementation of IAPs is non-binding and several member governments are thus reluctant to remove trade barriers on politically sensitive sectors, particularly when the domestic economy is experiencing a recession or crisis. Nonetheless, if each government implements an adjustment program, including the training of workers in depressed sectors, the social costs of economic transition could be mitigated. Overall, APEC trade liberalization would produce trade expansion in most product categories, especially inexpensive imports at the expense of high-priced domestic products.

Although the assessments of APEC liberalization would be enhanced by extension of our model, as well as by more careful evaluation of IAPs, our results provide some important policy implications. First, despite large disparities in per capita income, nondiscriminatory liberalization promises substantial benefits to the APEC member countries and people in the Pacific Basin. These benefits appear to outweigh the adjustment costs of attaining a higher and more sustainable growth trajectory. Second, while the adjustments may be difficult for some groups, they are necessary if each of the member economies and the region as a whole is to realize its full economic potential. A dynamic economy cannot avoid experiencing structural adjustments, inasmuch as technological innovation and growth-induced changes in consumption and production patterns would require such adjustments. Finally, while APEC liberalization is a good long-term prescription for regional growth, speeding up the process would also be good first aid for the East Asian economies that are currently experiencing economic crisis. Economies dealing with both recession and the prospect of globalization should focus their

resources on the recovery of export-oriented activities to secure a more sustainable basis for economic recovery and future growth.

NOTES

1. These data are based on the Global Trade Analysis Project (GTAP) database. See Gehlhar et al. (1997) and McDougall et al. (1998) for detailed descriptions of the GTAP database. Due to the data limitations, Brunei, Papua New Guinea, and Peru are aggregated into ROW. Russia, which is newly admitted to APEC in 1998, is also aggregated into ROW.

2. In version 4 of the GTAP database, the observed domestic-world price gap is applied at the commodity level to estimate import protection and export tax/subsidy rates. Thus a negative protection rate might result (e.g. rice and wheat in China, Mexico, and Chile) when the domestic price is lower than the world price.

3. These are largely caused by the imposition of import quotas on a number of agricultural products in these countries.

4. Japan's export subsidy rate of 83.5% on rice and wheat is significantly smaller than its import protection rate of 535%. This is because heavily protected paddy rice and wheat have negligible amount of exports compared to processed rice. In GTAP database, Japan's export subsidy rate on processed rice is set to zero whereas its import protection rates on processed rice is the same as that on paddy rice.

5. Note that the CET export specification was not implemented in the *Linkage* Model. Hence, differences in model results can partially be attributed to this change in model specification. Further, the trade elasticities used in this analysis were somewhat reduced from those used in the previous study.

6. Real GDP and population growth rates are based on the World Bank's latest projections (as of May 1999).

7. This involves computing in each period a measure of Harrod-neutral technical progress in the capital/fixed-factor bundle as a residual, given that the growth of the labor force (in efficiency units) is pre-determined. This is a standard calibration procedure in dynamic CGE modeling.

8. Only positive tariffs and negative export distortions (i.e. subsidies) are phased out.

9. See, e.g. Lloyd (1996), Oxley (1996), Tan (1998), and Yamazawa (1996).

10. Studies evaluating the effects of alternative trade liberalization scenarios among Asia-Pacific countries include Brown et al. (1996), Lee and Woodall (1998), Lee et al. (1999), Lewis et al. (1995), Yang et al. (1998), and Young and Chye (1997). These studies generally find that, in percentage terms, both discriminatory and non-discriminatory liberalization by East Asian or APEC countries would lead to welfare gains to developing countries (e.g. China and ASEAN) that are significantly greater than those to developed countries. Recent studies assessing the impact of the Uruguay Round (e.g. Francois et al., 1996, 1997; Goldin et al., 1993; Harrison et al., 1996; Hertel et al., 1996; Yang et al., 1997) also show substantial variations in the distribution of world welfare gains across regions.

11. While we only summarize APEC countries' average protection rates by commodity in Table 2, the GTAP database provide protection rates by trading partner and by commodity.

12. Other relevant work in this area includes Walmsley (1999), who modifies the standard GTAP model and incorporates the existence of foreign ownership of capital and land. She finds that the foreign ownership of assets has a significant effect on the results of trade liberalization in the Asia-Pacific region.

13. This result crucially depends upon the assumption that labor is homogeneous and perfectly mobile across sectors. Had we disaggregated labor by type and skill, labor mobility would have been limited and many of the manufacturing sectors might not have contracted.

14. Francois et al. (1997) show that the welfare gains resulting from the Uruguay Round agreement under increasing returns to scale and monopolistic competition could be almost three times as large as those when constant returns and perfect competition are assumed.

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