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Taiwan's Accession into the WTO and Trade in Services A Computable General Equilibrium Analysis

Ji Chou, Shiu-Tung Wang, Kun-Ming Chen,
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4.1 Introduction

Starting in the mid-1980s, the implementation of a whole range of large-scale tariff reductions was undertaken by the Taiwanese government as a result of the country's huge trade surpluses and subsequent pressure from its trading partners for the opening up of its domestic market. With the realization of the importance of its participation in international economic institutions, Taiwan applied to join the General Agreement on Tariffs and Trade (GATT) in 1990 and subsequently the World Trade Organization (WTO) in 1995. The ensuing bilateral negotiations between Taiwan and WTO members have since provided further impetus for trade liberalization within Taiwan. The average nominal tariff rate has been reduced from 20.6 percent in 1987 to 8.25 percent in 1998, while the average effective tariff rate has also been reduced from 7.02 percent to 3.13 percent during the same period. Along with the liberalization of the agricultural and manufacturing sectors, the liberalization of Taiwan's trade in services has become one of the major issues in bilateral negotiations between Taiwan and the WTO members. Taiwan has made numerous commitments with regard to the liberalization of its trade in services and has also recently begun deregulation of the country's service industries in pursuit of its goal of becoming an Asia-Pacific Regional Operations Center (APROC).

Due mainly to the limitations of data, previous studies regarding the effects of trade liberalization in Taiwan have focused largely upon com-

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modity trade; however, any assessment of trade liberalization that fails to consider trade in services may well underestimate its potential impact. The purpose of this study is therefore twofold. First of all, we apply Hoekman's method to the compilation of tariff equivalents for Taiwan's service sector. This is followed by the application of a global trade analysis project (GTAP) model, a multiregional computable general equilibrium model developed at Purdue University, which provides the means of analyzing the effects of trade liberalization in services as well as commodities. This paper considers technology spillovers—from the developed countries to developing countries—through the imports of intermediate inputs, capital goods, and services, while also investigating the potential differences resulting from WTO accession by both Taiwan and mainland China.

The remainder of this paper is organized as follows: Estimates of barriers to trade in services in Taiwan are carried out in the next section, including a comparison with barriers to service trade existing in other countries. This is followed in section 4.3 by presentation of the structure of the GTAP model and the extension of the model for adoption in this study. The simulation design and simulation results are discussed in the penultimate section, with conclusions being drawn in the final section.

4.2 GATS and Barriers to Trade in Services

4.2.1 GATS and Its Disciplines

Within the world economy, the service sector has invariably played an important role in developed countries, particularly in terms of business and financial services and of trade, transportation, and telecommunications services. As table 4.1 shows, of the total global output in 1995, on average, 58.1 percent was attributable to the service sector. Hong Kong had the highest share with more than half of its total output being generated from transportation services on its assumption of an entrepôt role for China.¹ The shares in Taiwan and Korea were between 40 percent and 50 percent, whereas in the developing countries of China and South Asia, the shares were below 40 percent. In comparison with manufacturing products, however, the proportion of exports or imports in international trade was relatively low (see tables 4.2 and 4.3). On the one hand, this may reflect the fact that a major proportion of service output is for domestic use (or nontradable), whereas on the other hand it may indicate that there are many barriers to trade in services.

1. Singapore's share of services would be similar to that of Hong Kong because it also plays an entrepôt role for Malaysia and Indonesia. To simplify the number of countries for multinational general equilibrium analysis in the next sections, we group Indonesia, Malaysia, the Philippines, Singapore, and Thailand as the Association of Southeast Asian Nations (ASEAN) in this study.

Table 4.1 Country/Regional Composition of Products in 1995, by Sector (%)

Country/Region	Service										Total Sector
	Agriculture and Mining	Non-heavy Manufacturing	Heavy Manufacturing	Subtotal	Utilities	Construction	Trade, Transport and Telecommunications	Business and Financial Services	Social and Personal Services		
Taiwan	4.0	22.2	27.5	46.3	2.1	5.0	13.4	12.8	13.0	100.0	
China	16.4	26.5	23.6	33.6	3.6	7.1	12.6	5.8	4.5	100.0	
Hong Kong	2.8	12.4	8.0	76.9	1.2	7.3	52.9	11.6	3.9	100.0	
Japan	3.0	19.6	19.4	58.0	4.0	9.9	18.7	20.4	5.0	100.0	
Korea	7.1	25.0	24.0	44.1	2.9	10.0	11.0	12.7	7.5	100.0	
ASEAN	13.0	22.3	21.9	42.8	2.0	8.5	18.6	9.4	4.3	100.0	
South Asia	25.9	22.1	12.8	39.3	5.1	6.9	12.4	5.7	9.2	100.0	
Australia and New Zealand	8.1	14.9	9.7	67.2	1.9	6.7	21.9	22.6	14.1	100.0	
United States	3.8	14.8	16.3	65.2	2.7	7.4	18.2	24.9	12.0	100.0	
Canada	7.1	17.8	17.8	57.3	3.6	7.7	19.5	22.1	4.4	100.0	
European Union	3.1	16.8	17.3	62.8	2.0	6.5	15.2	26.9	12.2	100.0	
Rest of world	13.2	22.5	15.7	48.5	3.7	6.5	15.6	13.4	9.3	100.0	
Average	5.9	18.4	17.4	58.1	2.9	7.5	16.8	21.2	9.7	100.0	

Source: GTAP data bank.

Table 4.2 Country/Regional Composition of Exports in 1995, by Sector (%)

Country/Region	Service										Total Sector
	Agriculture and Mining	Non-heavy Manufacturing	Heavy Manufacturing	Subtotal	Utilities	Construction	Trade, Transport and Telecommunications	Business and Financial Services	Social and Personal Services		
Taiwan	0.8	31.1	61.0	6.9	0.0	0.0	3.8	1.6	1.5	100.0	
China	5.0	46.1	40.8	8.1	0.2	0.0	4.3	3.0	0.6	100.0	
Hong Kong	0.3	20.9	20.1	58.6	0.1	1.0	52.3	4.3	0.9	100.0	
Japan	0.3	11.7	76.1	11.7	0.0	0.0	8.1	3.5	0.1	100.0	
Korea	0.7	27.4	55.3	16.2	0.0	0.6	10.2	3.0	2.4	100.0	
ASEAN	9.7	25.6	48.5	16.3	0.0	0.1	12.1	3.5	0.6	100.0	
South Asia	18.1	55.6	12.6	13.7	0.0	0.0	3.5	1.0	9.2	100.0	
Australia and New Zealand	30.2	28.6	19.2	22.2	0.0	0.1	13.8	3.5	4.8	100.0	
United States	6.5	20.9	47.2	25.1	0.0	0.0	10.4	11.3	3.4	100.0	
Canada	13.2	29.7	47.4	9.7	0.4	0.0	5.4	3.2	0.7	100.0	
European Union	4.3	32.0	45.2	18.6	0.2	0.6	7.9	7.4	2.5	100.0	
Rest of world	29.1	25.7	27.6	17.6	0.1	0.7	10.7	2.8	3.3	100.0	
Average	9.4	27.7	44.8	18.1	0.1	0.4	9.4	5.8	2.4	100.0	

Source: GTAP data bank.

Table 4.3 Country/Regional Composition of Imports in 1995, by Sector (%)

Country/Region	Service										Total Sector
	Agriculture and Mining			Manufacturing			Trade, Transport and Telecommunications			Business and Financial Services	
	Mining	Non-heavy Manufacturing	Heavy Manufacturing	Subtotal	Utilities	Construction	Telecommunications	Financial Services	Business and Financial Services	Social and Personal Services	Total Sector
Taiwan	8.2	24.1	53.0	14.6	0.0	0.0	4.6	3.5	6.5	100.0	
China	6.7	36.4	48.8	8.2	0.0	0.2	5.2	2.3	0.5	100.0	
Hong Kong	6.8	29.6	46.7	16.9	0.4	2.6	7.3	5.6	1.0	100.0	
Japan	22.5	27.5	25.9	24.0	0.0	0.0	18.2	5.7	0.1	100.0	
Korea	18.3	21.2	45.4	15.1	0.0	0.0	7.6	4.0	3.5	100.0	
ASEAN	7.6	19.8	59.1	13.3	0.0	1.2	4.8	5.4	1.9	100.0	
South Asia	16.0	32.3	41.9	9.8	0.0	0.0	6.0	0.2	3.6	100.0	
Australia and New Zealand	4.6	26.3	47.4	21.7	0.0	0.1	15.3	5.1	1.2	100.0	
United States	9.3	23.8	52.6	14.3	0.1	0.0	6.5	5.9	1.8	100.0	
Canada	5.7	24.1	55.9	14.3	0.0	0.0	7.8	5.9	0.6	100.0	
European Union	9.1	31.6	41.4	17.9	0.2	0.3	8.2	6.4	2.8	100.0	
Rest of world	8.5	32.4	42.8	16.1	0.2	0.7	9.5	3.7	2.0	100.0	
Average	10.0	29.0	44.5	16.5	0.1	0.4	8.6	5.3	2.1	100.0	

Source: GTAP data bank.

Prior to the Uruguay Round of GATT talks, trade in services had not been brought under multilateral disciplines, but the issue was subsequently addressed by the General Agreement on Trade in Services (GATS), which came into force in January 1995, with its key provision of nondiscrimination. This is reflected in the application of most-favored nation (MFN) status and national treatment rules. Although MFN is a general obligation for market access, GATS contains an annex that allows countries to invoke exemptions. The coverage for each GATS member is subject to a negative list that applies to all services, apart from those listed by each member. Most-favored nation exemptions are in principle expected to last no longer than ten years and are subject to renegotiation in subsequent trade-liberalization rounds of talks, the first of which must take place within five years of the agreement's entry into force. National treatment is defined as treatment no less favorable than that accorded to like domestic services and service providers.

The introduction of a market access commitment reflects one of the distinguishing characteristics of service markets—the fact that their contestability is frequently restricted by nondiscriminatory measures.² Because national treatment and market access are not general obligations within the context of GATS, the commitment schedules are crucial in determining the extent of market access opportunities resulting from the agreement; therefore, specific commitments form the core of GATS. Each member of GATS first decides which sectors will be subject to these disciplines and then decides, for each of these sectors, which measures violating market access or national treatment are to be kept in place.

The limitations and exceptions must be specified under four general modes of supply: (a) cross-border supply of a service without the physical movement of supplier or consumer; (b) consumption abroad, that is, provision involving movement of the consumer to the country of the supplier; (c) a commercial presence in the territory of another country; and (d) provision of services requiring the temporary movement of natural persons.

In addition to specific commitments, countries may also make horizontal commitments. These are usually laws and policies that restrict the use of a mode of supply to foreigner suppliers, independently of the sector involved.

Hoekman's Method

By mid-1994, more than sixty GATS members had submitted MFN exemptions. For the purpose of evaluating the restrictions of trade in services,

2. In general, there are six types of restrictions that are prohibited: limitations on the number of service suppliers allowed, on the value of transactions or assets, on the total quantity of service output, on the number of employees, on the total quantity of service output, on the type of legal entities through which a service supplier is permitted to operate, and on the participation of foreign capital.

Hoekman's (1995) study counted the specific commitments of each GATS member. This paper extends the Hoekman study to the case of Taiwan, both before and after its accession into the WTO.

Because commitment schedules are constantly subject to change, any direct comparison between Taiwan's case and that of other areas may be misleading, because the timing for compilation of the schedule is inconsistent; nevertheless, information provided by the study is still worthy of reexamination. As table 4.4 shows, generally speaking, the number of commitments in developed countries was quite high, usually over 300, with the notable exception of New Zealand, which had only 276 in 1995. The number of commitments for China, Indonesia, the Philippines, India, and Pakistan was less than 200; Hong Kong was just 200; Malaysia, Thailand, and Singapore were over 200; and in Korea there were already in excess of 300 in 1995. The number of commitments for Taiwan prior to WTO accession was 329, and this is expected to rise to 401, close to the Japanese and Australian levels of 1995 and even higher than the levels of other developed areas in the same

Table 4.4 Number of Scheduled Commitments

Country/Region	No. of Commitments
Taiwan	
Pre-WTO Accession	329
Post-WTO Accession	401
China	196
Hong Kong	200
Japan	408
Korea	311
ASEAN	
Singapore	232
Malaysia	256
Thailand	260
The Philippines	160
Indonesia	140
South Asia	
India	132
Sri Lanka	8
Bangladesh	4
Pakistan	108
Australia	412
New Zealand	276
United States	384
Canada	352
European Union	392

Sources: Data on Taiwan are obtained from the Schedule Concerning Commitments on Trade in Services, 1999; remaining data are obtained from Hoekman (1995).

Note: The maximum number of commitments is 620 (i.e., 155 activities), multiplied by four modes of supply.

year such as the United States, Canada, New Zealand, and the European Union (EU).³

In addition, to summarize the number of commitments, Hoekman developed a three-category weighting method to quantify GATS schedules, examining all GATS schedules and allocating a weight to each possible schedule entry.⁴ That Hoekman's method reveals valuable information about restrictions on services trade for different countries is undeniable, and it seems that, so far, no more plausible replacement has emerged.

Brown *et al.* (1995) and Robinson, Wang, and Martin (1999) used Hoekman's data as their initial policy parameters to carry out trade liberalization simulations in their multinational computable general equilibrium (CGE) studies. However, Hertel (2000) argued that the idea of modeling protection with revenue-raising tariff equivalents from the work of Brown *et al.* was inappropriate. Although partially solving the problem with the view that the liberalization of restrictions on trade in service reduces the effective import price of services in the domestic market, Hertel conceded that his approach could succeed in capturing only a small part of the whole story of service-sector reform. Furthermore, as noted by Dee, Hanslow, and Phamduc (chap. 1 in this volume), many studies have failed to take account of barriers to commercial presence as an important category of barriers to trade in services in general. Dee used the FTAP model to distinguish *barriers to establishment* from *barriers to ongoing operations* and came up with more convincing results; however, the sector classification in the FTAP model is still too highly aggregated for this study to consider adopting.

Barriers to Trade in Services

Table 4.5 provides Hoekman's calculations of tariff equivalents for trade in services, along with the case of Taiwan calculated for this study, both pre- and post-WTO accession. The results seem consistent with the results in table 4.4, that is, that developed countries tend to show lower tariff equivalents. There are, however, some variations between sectors. The tariff equivalent rates in the sectors of construction, wholesale and retail distribution, and business and financial services are relatively low in developed countries, whereas transportation and telecommunications represent the sectors with high tariff equivalent ratios in all regions, because cabotage, air transportation proper (as opposed to ground services), post services, and basic telecommunications are all sectors in which access tends to be prohibited by most countries and where maximum tariff equivalent ratios are therefore assigned (see table 4A.1).

High-income countries (or regions) such as the EU, Australia, and New

3. The EU is counted as one member of GATS.

4. Readers may refer to Hoekman's paper in the 1995 World Bank Working Paper version (Hoekman 1995) and in a shorter version in the 1996 volume edited by Martin and Winters (Hoekman 1996).

Tables 4.5 Tariff Equivalents for Single-Digit ISIC Service Sectors

Country/Region	ISIC Sector					
	5: Construction	6: Wholesale and Retail Distribution	7: Transport Storage and Communications	8: Business and Financial Services	9: Social and Personal Services	6 + 7: Trade, Transport and Communications
Taiwan						
Pre-WTO Accession	10.0	10.2	134.6	24.3	26.2	85.7
Post-WTO Accession	10.0	10.2	82.2	21.4	25.6	53.9
China	25.0	34.5	150.9	29.9	42.4	105.2
Hong Kong	32.0	30.9	134.7	27.9	43.4	93.9
Japan	5.0	4.5	87.8	17.6	31.1	55.1
Korea	16.0	21.4	141.0	24.3	40.5	94.0
ASEAN	21.2	32.5	135.0	29.1	39.5	94.7
Singapore	12.0	33.2	130.2	25.3	34.8	92.1
Malaysia	10.0	33.6	128.2	24.7	35.3	91.1
Thailand	28.0	31.8	148.7	31.7	39.7	102.8
The Philippines	40.0	30.0	120.3	30.9	43.8	84.8
Indonesia	16.0	33.6	147.5	33.0	43.8	102.8
South Asia	37.0	34.4	151.6	38.8	41.4	105.6
India	34.0	34.5	148.7	37.1	41.2	103.9
Pakistan	34.0	34.1	151.7	36.0	36.4	105.5
Australia and New Zealand	8.5	11.4	140.0	16.0	30.6	89.5
Australia	12.0	8.6	141.1	13.2	25.1	89.1
New Zealand	5.0	14.1	139.0	18.7	36.1	89.9
United States	5.0	4.5	119.0	10.6	31.0	74.0
Canada	6.0	8.6	119.6	13.8	39.4	76.0
European Union	10.0	9.5	140.8	15.7	22.9	89.3
Rest of World	30.4	28.6	137.4	33.2	39.3	94.7

Sources: Details on Taiwan are from this study; details on the remaining countries are obtained from Hoekman (1995).

Zealand demonstrate high tariff equivalents in these sectors. Life insurance services are another highly protected area, but the aggregated services sector may well dilute its influence to some extent.

There are many limitations in Hoekman's method, as pointed out by Warren and Findlay (1999). First of all, it does not distinguish between barriers, in terms of their impact on the economy, with minor impediments receiving the same weighting as an almost complete refusal of access. Second, in many cases the coverage of the GATS schedule does not give an accurate picture of the actual barriers that are in place. Third, there is some evidence to suggest that nations with liberal policies left some services unbound so as to maintain a retaliatory capability in future market access negotiations. Therefore, some industries that are recorded within the ratio as impeded may well be open, at least to suppliers from some economies. Warren and Findlay also proposed a number of suggestions aimed at partially improving Hoekman's method; however, his data are the only estimates currently available to provide an initial consistent basis for analyzing the impact of services trade liberalization across countries. Furthermore, tariff equivalents for different periods will reveal the openness of the service sector in the specific country. In the case of Taiwan, restrictions on trade in services in transportation, storage, and communications are relatively high prior to WTO accession, as shown in table 4.5; however, these will be further rationalized following WTO accession, with particular emphasis on the area of telecommunications. In the basic telecommunications services, no restrictions will be applied to cross-border supply and consumption abroad. In terms of commercial presence, foreign suppliers will basically be allowed to enter into the market with some restrictions.⁵ The presence of natural persons in the basic telecommunications services is unbound, except as indicated in the horizontal section. In addition, further liberalization of the horizontal commitments has been undertaken as follows:

1. Foreign businesses and individuals may directly invest in Taiwan with respect to portfolios in companies whose shares are listed in the securities market of Taiwan, without previous ceiling limitations;
2. The duration of business visits is extended from sixty days to ninety days; and
3. Intracorporate transferees may stay for a two-year initial period renewable each year, compared to the previous period of stay of no more than three years.

5. A service supplier should be a company limited by shares incorporated in Taiwan. Direct investment in a service supplier by non-Taiwanese persons cannot exceed 20 percent. The aggregate of direct and indirect investment by non-Taiwanese persons in service suppliers other than Chunghwa Telecom is limited to 60 percent. The aggregate proportion of shares held by non-Taiwanese persons in Chunghwa Telecom, including both direct and indirect investment, cannot exceed 20 percent.

4.3 Model Specifications

This paper employs the GTAP model of Hertel (1997), which has been widely used to analyze the impact of trade liberalization; however, in order to assist in determining the gains from import-embodied technology spillover, an equation that links the technology transfer and imports of capital goods, intermediate inputs, and services is also incorporated into the model.⁶ One distinguishing feature of this model is that there is an international shipping sector that acts as an intermediary between the supply of, and demand for, international transport services, the demand for transport services being generated by international trade. These services account for the difference between free on board (f.o.b.) and cost plus insurance and freight (c.i.f.) values for a particular commodity shipped along a specific route. The supply of these services is provided by means of a Cobb-Douglas production function in which the service exports from each region are used as inputs. The production functions associated with these services are commodity or route specific. This formulation allows us to introduce commodity or route technical changes in international transport services. For instance, following Taiwan's accession into the WTO, it is highly likely that the current trade regulations between Taiwan and mainland China will be removed; thus, Taiwan's accession into the WTO will generate an efficiency increase in the international transport services for trade between Taiwan and mainland China.

Another distinguishing feature of this model is that there is a global bank that enables us to endogenize the balance of trade, so that it is unnecessary to adjust regional investment in line with regional changes in saving. The existence of this bank ensures that the global demand for saving equates to the global demand for investment in the postsimulation equilibrium. The global bank uses receipts from the sale of a homogeneous saving commodity to the individual regional households in order to purchase shares in a portfolio of regional investment goods. The size of this portfolio will adjust to accommodate changes in global saving. There are two alternative mechanisms for the allocation of investment across regions. One formulation assumes that investors behave in such a way that any changes in regional rates of return are equalized across regions; the other formulation assumes that the regional composition of capital stocks will not change in the postsimulation equilibrium. The first formulation would seem to be more appropriate in determining the efficiency gains from trade liberalization, particularly in trade in services, which often involves capital movement between regions; thus, the first formulation is adopted in this paper.

It is suggested that there are two distinct types of gains from trade liberal-

6. Values of elasticity parameters used in the model are all based on the original GTAP database developed at the Center for Global Trade Analysis, Purdue University. Readers who are interested in the data should refer to McDougall, Elbehri, and Truong (1998).

ization: (a) gains from more efficient utilization of resources, and (b) gains from technology spillover effects via expansion in the importation of capital goods, intermediate inputs, and services (see Robinson, Wang, and Martin 1999, 4–5). In order to quantify the first effect, we specify a macro closure that allows average rental rate adjustment to ensure that global capital is fully utilized and efficiently allocated, not only across sectors within each region, but also across different regions in the world, as discussed earlier. In order to capture the technology spillover effect of trade liberalization, following Robinson, Wang, and Martin (1999), we introduce an equation that links total factor productivity (TFP) to the imports of capital goods, intermediate inputs and services. A TFP shift variable in the model is specified as

$$\text{ITFP}_{ir} = 1 + \text{IMS}_{ir} \times \left[\frac{\text{NX}_{ir}}{\text{NX}_{ir} + \text{VA}_{ir}} \times \left(\frac{\sum_{j \in \text{IM}} \sum_{s \in R} X_{jsr}}{\sum_{j \in \text{IM}} \sum_{s \in R} X0_{jsr}} \right)^{\sigma_{ir}} + \frac{\text{NX}_{ir}}{\text{NX}_{ir} + \text{VA}_{ir}} - 1 \right]$$

where ITFP_{ir} is the total factor productivity shift variable; IMS_{ir} is the share of imported products embodied with advanced technology and used as intermediate products in total imports of i product at region r ; NX_{ir} and VA_{ir} are intermediate inputs and primary inputs, respectively; $X0_{jsr}$ is trade flows in the base year; IM is the subset of i referring to those products embodied with advanced technology; and σ_{ir} is the elasticity. It is assumed that technology transfer flows in one direction only: from the more developed to the less developed regions. The improvements in income levels in the less developed countries, stemming from technological transfer, enhance their import demand for the exported products from the developed countries. This indirect effect of technology transfer helps to support export expansion in developed countries and might result in gross domestic product (GDP) and welfare gains in all countries throughout the world.

In equilibrium, the domestic commodity and factor prices will equalize the quantities supplied and demanded in all goods and factor markets within each region, and world prices will equalize the total supply of, and demand for, sectoral exports across the world economy.

4.4 Simulation Analysis

4.4.1 Simulation Design

In order to evaluate the economic impacts of global trade liberalization, a total of five simulations are carried out, the design of which is shown in table 4.6. In scenario A, the effects of global trade liberalization in commodity trade are investigated, whereas scenario B considers the effects of trade liberalization in goods as well as services. A comparison of the results

Table 4.6 Simulation Design

Scenario	Simulation Specification				
	Liberalization of Commodity Trade ^a	Liberalization of Services Trade ^a	Technology Spillover Effects	40% Cut in Shipping Costs ^b	Taiwan's WTO Accession ^c
A	✓				✓
B	✓	✓			✓
C	✓	✓	✓		✓
D	✓	✓	✓	✓	✓
E	✓	✓	✓		

^aLiberalization of Commodity Trade and Liberalization of Services Trade refer to the reductions of barriers to commodity trade and services trade, respectively, in all regions, including Taiwan and mainland China, during the period 1995–2000.

^b40% Cut in Shipping Costs refers to the reduction in trade transportation costs between Taiwan and Mainland China during the period 2001–2005.

^cTaiwan's WTO Accession refers to the further liberalization of Taiwan and China during the period 2001–2005.

of scenario A with those of scenario B reveals the effects of trade liberalization in the services sectors.

It has been suggested that as a result of the technology spillover effects, access to imported capital goods, to intermediate durable goods, and to the services provided by the developed countries is crucial for increases in productivity in developing countries; see, for example, Robinson, Wang, and Martin (1999) and Markusen and Rutherford (1999). In addition to the liberalization of global trade in scenario B, scenario C introduces the technology spillover mechanism contained within our simulation. A comparison of the simulation results from scenarios B and C will reflect the technology spillover effect. Prior to the accession of both Taiwan and mainland China into the WTO, direct shipments across the Taiwan Strait continue to be prohibited for political reasons, but this transportation barrier may have to be eliminated once they both become full-fledged WTO members. If that is the case, then it is estimated that transportation costs can be reduced by 40 percent. Thus, in scenario D it is assumed that shipping costs for trade between Taiwan and mainland China will be cut by 40 percent.

In scenarios A through D, it was assumed that Taiwan and China would have joined the WTO by the end of 2000. However, both Taiwan and China had already carried out trade liberalization to some degree prior to their expected accession into the WTO, through bilateral negotiations with other countries. After their expected accession into the WTO, these liberalization actions would continue and expand further. Thus, the year 2000 was regarded as a crucial time point. In order to highlight the effects of both Taiwan's and China's accession into the WTO, in simulation E it was assumed that neither of them would carry out any further liberalization actions after 2000 and that there would be no shipping cost reductions. A comparison of

the results of scenarios D and E will reveal the impacts of WTO accession by Taiwan and China on their domestic economies and on the world economy as a whole.

In all simulations, the degree of trade liberalization for all regions, with the exceptions of Taiwan and China, is based on the Uruguay Round agreement as summarized by Francois, McDonald, and Nordstrom (1995). Within the agricultural sector, six years after the Uruguay Round of talks, tariffs and tariff equivalents for nontariff barriers are reduced by 36 percent for developed countries, whereas production subsidies are calculated as aggregate measure of support (AMS) and reduced by 20 percent over six years. For the developing countries, the reductions in tariffs and nontariff barriers are moderately light, with a 24 percent reduction carried out over a ten-year period; the AMS reduction is 13.3 percent over ten years. Within the manufacturing sector most advanced countries have already exceeded the one-third reduction in tariff rates, a requirement of the Uruguay Round agreement by the year 2000.

In our simulations, the tariff rate reduction for the manufacturing sector is assumed to be 38 percent. For the service sector, we adopt the figure used by Robinson, Wang, and Martin (1999); thus, the tariff equivalent reduces to 50 percent by 2005. The degree of trade liberalization within the agricultural and manufacturing sectors in Taiwan is calculated based on the data provided by the Department of Customs Administration, Ministry of Finance, Taiwan. Table 4A.3 shows the degree of trade liberalization in the agricultural and manufacturing sectors with details provided of the reduction in both tariffs and tariff equivalents of nontariff barriers. The degree of trade liberalization for the service sector is calculated based on Hoekman's method, as described earlier, with the reduction in tariff equivalents for the service sector being shown in table 4A.4.

The degree of trade liberalization for China prior to 2000 is calculated by comparing the published tariff schedules for 1995 and 2000 based on data provided by the Industrial Development Bureau, Ministry of Economic Affairs, Taiwan. For the scope of trade liberalization beyond 2000, we collect information on reduction targets announced by Chinese leaders on various occasions and carry out calculations based on a comparison with the 2000 tariff schedule. The degree of tariff reductions for mainland China is shown in Table A-5.

4.4.2 Simulation Results

A comparison between the classifications of twenty seven subsectors and eight classes is provided in table 4.7.⁷ Tables 4.8 to 4.13 summarize the re-

7. The classification of "heavy manufacturers" and "nonheavy manufacturers" is somewhat arbitrary here in order to provide readers with a more precise perception of Taiwan's structural change. We provide an additional three tables in the appendix showing the more detailed sectoral changes in Taiwan's output, exports, and imports (see tables 4A.6–4A.8).

Table 4.7 Regional and Industrial Sector Classifications

Regional and Industrial Sector Classifications		
Regions		
Taiwan	Korea	United States
China	ASEAN	Canada
Hong Kong	South Asia	European Union
Japan	Australia and New Zealand	Rest of world
Industrial Sectors		
Agriculture and mining:	Agriculture	
	Livestock	
	Forestry	
	Fishery	
	Mining	
Non-heavy manufacturing industries:	Processed foods	
	Beverages and tobacco products	
	Textiles	
	Garments and apparel	
	Leather and leather products	
	Wood and wood products	
	Paper and paper products	
	Plastic and chemical products	
	Other mineral products	
	Other manufactured products	
Heavy manufacturing industries:	Petroleum and petroleum products	
	Steel	
	Non-iron metals	
	Metal products	
	Motor vehicles	
	Other transportation equipment	
	Electronics, electrical and other machinery	
Utility		
Construction		
Trade, transportation and communications		
Business and financial services		
Other services		

sults of our simulations. To highlight the effects on the subsectors within the service sector, in tables 4.11 to 4.13, the subsectors are aggregated further into eight classes.

The Impact on World Trade

Table 4.8 shows the impact on world trade of trade liberalization in different simulations. The results of simulation A show that for sole trade liberalization in the agricultural and manufacturing sectors, the world trade volume increases by 3.96 percent, while the value of world trade increases by 4.12 percent, which includes a 0.15 percent element for price inflation stemming from liberalization. Simulation B shows that by adding service-sector liberalization, world trade volume increases by 10.99 percent, whereas the value of world trade increases by 11.33 percent. Comparing

Table 4.8 Impact on World Trade (%)

World Trade	Simulation				
	A	B	C	D	C1
World trade volume	3.96	10.99	11.39	11.40	11.00
World price index	0.15	0.30	0.18	0.18	0.17
Value of world trade	4.12	11.33	11.59	11.60	11.19

simulations B and A, we find that trade liberalization in the service sector has a much greater impact on world trade than agricultural and manufacturing trade liberalization. These results partly reveal the truth that trade in services is currently much more restrictive than trade in the agricultural and manufacturing sectors. A 50 percent cut in service trade barriers means a significantly larger cut in barriers in absolute terms and reflects the larger impact on the world economy. These results also highlight the importance of trade negotiations within the service sector.

We incorporate the spillover effect and technology links into our operation in simulation C, where we find that world trade volume grows by 11.39 percent, with an increase in value of 11.59 percent. Compared with simulation B, these results show that spillover and technology links contribute to the volume of world trade by a mere 0.4 percent; however, the effect on world price levels is much more significant. A comparison of the global price inflation rates of 0.30 percent in simulation B and 0.18 percent in simulation C seems to imply that the expansion of production due to technology transfusion is helpful in smoothing out world price inflation.

In simulation D, a 40 percent cut in transportation costs is assumed in trade between Taiwan and China. Simulation D shows that the world trade volume expands by 11.40 percent and that the value of world trade increases by 11.60 percent. When we compare this with simulation C, the 40 percent cut in transportation costs between Taiwan and mainland China does not appear to contribute significantly to world trade; the increase in world trade volume is a mere 0.01 percent. We regard this result as reasonable; after all, trade between Taiwan and mainland China does not occupy a significant share in terms of the total volume of world trade.

In order to highlight the impacts of Taiwanese and Chinese accession into the WTO, we add simulation E for global trade liberalization without their accession. In simulation E, we assume that Taiwan and China are not members of the WTO; thus, they will not carry out further liberalization actions, and there will be no shipping cost savings on trade between Taiwan and China. This assumption results in an 11.00 percent increase in world trade volume and an 11.18 percent increase in the value of world trade. In a comparison with simulation D, the results show that the effects on the world economy from Taiwanese and Chinese accession into the WTO are a 0.40

percent increase in world trade volume and a 0.42 percent increase in the value of world trade.

These results indicate that the effects of liberalization on the world economy after 2000 are significantly lower than the effects prior to 2000. This result does not surprise us, however, because almost all of the necessary liberalization actions for most of the developed countries had already been completed by 2000, as discussed earlier. After 2000, only the new members, Taiwan and China, will continue to carry out their commitments. The fact that simulation D gave no significant differences, as compared to simulation E, was therefore foreseeable.

In all five simulations, world prices increased, a result that we regard as quite feasible. Although the immediate impact of trade liberalization is to bring down import prices, it is possible that the induced increase in demand from both lower prices and higher income will boost the price as long as the resources for production are fixed. In this case, one way to bring down the price is to improve technology. This becomes obvious when we compare simulations C and B; the technology transfusion from advanced countries to less developed countries helps to bring down the world price.

The Effects on Regional Economies

Tables 4.9 and 4.10 summarize the effects of trade liberalization on regional economies. Table 4.9 shows the effects of liberalization on regional GDP, and in percentage terms the country that stands to gain the most is China. This is understandable given that, in absolute terms, China is the country that is probably liberalizing the most. Southern Asian countries also show significant improvements in their GDP. Hong Kong's GDP increases by 5.11 percent in both C and D simulations, and Hong Kong is the second highest beneficiary in world trade liberalization. This is quite pos-

Table 4.9 Effects on GDP, by Country/Region (%)

Country/Region	Simulation				
	A	B	C	D	E
Taiwan	0.46	0.72	1.51	1.53	1.03
China	2.41	2.75	7.39	7.41	6.24
Hong Kong	0.06	2.01	5.11	5.11	5.06
Japan	0.24	0.45	1.60	1.60	1.59
Korea	0.49	1.03	2.84	2.83	2.82
ASEAN	0.51	1.87	2.77	2.77	2.75
South Asia	1.54	2.02	3.55	3.55	3.54
Australia and New Zealand	0.18	0.89	2.31	2.31	2.32
United States	0.02	0.26	0.60	0.60	0.60
Canada	0.00	0.47	0.81	0.80	0.81
European Union	0.03	0.61	1.53	1.53	1.53
Rest of world	0.24	0.80	2.12	2.12	2.12

sibly the result of the promotion of mainland China's position in world trade. As the most active commercial port, and the biggest window for world connections into China, the liberalization of China will surely benefit Hong Kong.

However, when we look at other simulation results, in simulation A, Hong Kong has only a 0.06 percent improvement in its GDP. This shows that the sole liberalization of the agricultural and manufacturing sectors is of little help to Hong Kong. Simulations B and C show that in the liberalization of the service sectors, the technology spillover effects play very important roles. This probably has something to do with Hong Kong's role as a commercial port and financial services center. In simulations C and D, South Korea, the Association of Southeast Asian Nations (ASEAN), Australia and New Zealand, and the Rest of world all have more than a 2 percent improvement in their GDP. Asian countries benefit the most from trade liberalization in the agricultural and manufacturing sectors (see simulation A), and with the exception of Hong Kong, they show much more significant improvements in GDP than all other regions. This reflects exactly the comparative advantage of Asian countries in the manufacturing sectors.

Of course, liberalization of the service sectors also plays a very important role. As our model design shows, the less developed countries benefit from the advanced countries via spillover effects and the technology transfusion from the importation of services, capital goods, and durable intermediate goods. Countries with the ability to import more, and those that currently have greater technology gaps, vis-à-vis their advanced trading partners, stand to benefit the most; Asian countries tend to be the countries with these characteristics. Compared to the benefits for China, the benefits for Taiwan from trade liberalization are much more moderate, and this is of course due to the fact that Taiwan is already much more liberalized than China. In terms of further trade liberalization, the improvements in efficiency of resource allocation that are available to Taiwan are therefore much lower than those available to China. The results of simulations D and E show that the effects on other regions from Taiwanese and Chinese accession into the WTO are rather insignificant; however, trade liberalization improves Taiwan's GDP by 0.5 percent and China's by 1.17 percent. This seems to suggest that, even though Taiwan and China's accession into the WTO is unlikely to contribute very much to the world economy, it is nevertheless an important event for their own benefit.

Table 4.10 shows the welfare improvements for regions under different simulations in terms of Hicksian Equivalent Variation. The greatest figures shown are for the EU and Japan, with the respective welfare improvements for the two regions in simulation D being US\$126,493 million and US\$86,909 million. The United States and the Rest of world follow. In terms of absolute values, the size of economy plays an important part, and

Table 4.10 Effects on Welfare, by Country/Region (US\$ millions)

Country/Region	Simulation				
	A	B	C	D	E
Taiwan	3,869	4,767	6,358	6,893	5,653
China	6,031	7,207	40,632	41,161	36,471
Hong Kong	2,442	10,354	13,454	13,425	12,957
Japan	23,431	27,534	86,981	86,909	85,089
Korea	5,491	8,729	17,388	17,324	16,581
ASEAN	3,758	13,613	19,393	19,337	19,119
South Asia	2,978	4,045	11,261	11,253	11,321
Australia and New Zealand	2,455	4,052	10,245	10,233	10,160
United States	1,072	22,995	45,084	45,031	44,728
Canada	-663	950	2,264	2,258	2,249
European Union	273	50,668	126,506	126,429	125,594
Rest of world	6,411	24,545	80,987	80,923	81,197

Note: Hicksian equivalent variation is used to measure changes in welfare.

in simulation D, Taiwan, with a relatively smaller economy size, has only a US\$6,893 million welfare improvement, whereas the figure for China is US\$41,161 million.

Similar to the case of GDP improvement, simulations D and E in table 4.10 also show that Taiwan's and China's accession into the WTO has only a limited contribution to other regions in terms of welfare improvement; however, there are significant welfare improvements to be gained by Taiwan and China themselves through accession and continued liberalization after 2000. For other regions, although Taiwan's and China's accession again does not bring much in the way of benefits, Japan's improvement in welfare reaches US\$1,820 million. In absolute terms, this is almost the sort of improvement that Taiwan has gained from its continued liberalization. Japan's benefit from Taiwan's and China's accession into the WTO and liberalization is both understandable and foreseeable from their geographical position and trading relationship.

The Effects on Taiwan's Structural Changes

In tables 4.11 to 4.13, we focus our attention on Taiwan's economy. Table 4.11 shows the changes in Taiwan's output by industry. As shown in simulation A, with agricultural and manufacturing liberalization there is expansion in only the nonheavy manufacturing industries, utilities, and construction, whereas all other sectors experience contraction. With the utilities and construction sectors both being nontradable sectors, these results seem to indicate that Taiwan's comparative advantage still relies heavily on the nonheavy manufacturing industries.

Simulation B adds the effects of service trade liberalization, with the re-

Table 4.11 Effects on Taiwan's Output, by Sector (%)

Sector	Simulation				
	A	B	C	D	E
Agriculture and mining	-0.05	-0.06	-0.33	-0.34	-0.27
Non-heavy manufacturing industries	1.03	1.09	0.90	1.00	0.81
Heavy manufacturing industries	-0.64	-0.61	-0.14	-0.23	-0.37
Utility	1.14	1.16	1.07	1.20	0.90
Construction	2.53	2.02	2.03	2.27	0.75
Trade, transportation and communications	-0.20	0.34	0.39	0.31	0.50
Business and financial services	-0.20	-0.84	-0.82	-0.84	-0.75
Other services	-0.59	-0.72	-0.269	-0.25	0.06
Total	0.36	0.39	0.46	0.47	0.20

sults showing that agricultural and mining, heavy manufacturing industries, business and financial services, and the other services sector are still not comparatively advantageous. The output of the nonheavy manufacturing industries increases by 1.09 percent; the trade, transportation, and communications sector expands by 0.34 percent, whereas transportation and communications is the only service sector that increases output due to liberalization. When we add in technology spillover effects and cuts in transportation costs, the pattern of Taiwan's output change remains the same. The utilities sector and the construction sector both expand, whereas the heavy manufacturing industries contract, as do the service subsectors such as business and financial services and other services. The nonheavy manufacturing industries sector and the trade, transportation, and communications sector are the two sectors that have comparative advantage.

In simulation D, the output from the nonheavy manufacturing industry increases by 1 percent, whereas the trade, transportation, and communications sector expands by 0.31 percent. When we compare simulations D and E, the continuation of liberalization in Taiwan and China beyond 2000 increases the output from Taiwan's nonheavy manufacturing industries by 0.18 percent; however, it does not help in terms of expansion of the trade, transportation, and communications sector. It seems that resources are largely shifted to the relatively non-trade-related sectors, such as utilities and construction.

Tables 4.12 and 4.13 report the changes in Taiwan's exports and imports. Simulation A in table 4.12 shows that liberalization of the agricultural and manufacturing sectors increases exports in the agriculture and mining sector by 0.02 percent, the nonheavy manufacturing industries increase by 4.92 percent, and the utilities sector increases by 0.53 percent. Exports in the heavy manufacturing industries and in all service subsectors decrease. This seems to be consistent with the results of output changes in table 4.11.

Table 4.12 Effects on Taiwan's Exports, by Sector (%)

Sector	Simulation				
	A	B	C	D	E
Agriculture and mining	0.02	0.02	-0.09	-0.08	-0.15
Non-heavy manufacturing industries	4.92	5.16	4.66	5.12	3.93
Heavy manufacturing industries	-0.37	-0.15	1.48	1.25	-0.27
Utility	0.53	0.37	0.73	0.85	0.71
Construction	-9.18	4.49	8.24	7.06	8.12
Trade, transportation and communications	-4.39	46.02	46.46	44.85	48.85
Business and financial services	-11.48	8.73	9.64	8.04	12.23
Other services	-10.61	25.29	27.66	26.02	30.01
Total	4.06	7.30	8.38	8.52	6.01

Table 4.13 Effects on Taiwan's Imports, by Sector (%)

Sector	Simulation				
	A	B	C	D	E
Agriculture and mining	1.14	1.13	0.96	1.01	0.76
Non-heavy manufacturing industries	3.57	3.68	3.71	4.01	2.47
Heavy manufacturing industries	3.02	3.00	3.11	3.28	1.30
Utility	0.53	0.37	0.73	0.85	0.71
Construction	4.01	13.12	12.03	12.62	12.51
Trade, transportation and communications	3.99	72.40	72.93	74.06	71.42
Business and financial services	6.43	29.71	29.71	30.66	28.00
Other services	2.47	15.98	15.93	16.38	15.66
Total	8.30	13.22	13.21	13.83	9.82

When we add trade liberalization in the service sectors, exports expand in all sectors, with the exception of the heavy manufacturing industries in simulation B. This expansion is most significant in the service sector. Exports in the trade, transportation, and communications sector and the other services sector expand by 46.23 percent and 25.29 percent, respectively.

Combined with the decrease in output (see table 4.11) and increase in imports (see table 4.13), export expansion in the service sector indicates the prosperity of service trade after liberalization in that area. Simulations C and D in table 4.12 demonstrate the same pattern of change as simulation B. When we compare simulations D and E, the continuation of trade liber-

alization in Taiwan and China after accession into the WTO does not benefit exports in the service sector; however, it does benefit the manufacturing sector. Exports in the nonheavy manufacturing industries and the heavy manufacturing industries expand by 1.19 and 1.52 percent, respectively.

Following trade liberalization, imports in all sectors increase in Taiwan. In terms of proportional change, imports in the trade, transportation, and communications sector increase the most, expanding by 74.06 percent. In tables 4.12 and 4.13, simulations B, C, and D, both exports and imports expand in all sectors, with the single exception of the agricultural and mining sector. The results obviously reveal the tremendous effect of liberalization on trade expansion. Trade becomes more vibrant, and this is shown not only in the expansion of total trade volume but also in the volume of intraindustry trade. In all five simulations, the nontradable sectors, utility and construction, seem to expand significantly. Although these are actually very small sectors in comparison to the other sectors included in our model, the expansion of these sectors might be attributed to the resource reallocation effect resulting from trade liberalization. Trade liberalization causes an increase in imports and thus squeezes the market for domestic products in import-competing sectors. Due to the shrinkage of the import-competing sectors, some resources are then released from these sectors and transferred to nontradable sectors as well as export-expanded sectors. In addition, the increase in GDP resulting from trade liberalization creates a rise in domestic demand for the services of the utility and construction industries.

4.5 Conclusions

This study employs Hoekman's method to estimate the barriers to trade in services in Taiwan, followed by the application of a multiregional computable general equilibrium model to analyze the impacts of trade liberalization in services as well as commodities. The technology spillovers from the developed countries to the developing countries are considered through the import of intermediate inputs, capital goods, and services, along with an investigation of the potential differences resulting from the accession of Taiwan and China into the WTO.

The tariff equivalents compiled show that Taiwan's barriers to service trade are lower than those in most developing countries and are close to the levels of Japan, Hong Kong, and Korea. Following the accession of both Taiwan and mainland China into the WTO, trade in commodities and services will be further liberalized. The tariff equivalent in trade, transportation, and communications services will be reduced much further, so that it will become even lower than the average rate in the developed countries.

Our simulation results indicate that the developed countries benefit more from global trade liberalization in services, whereas developing countries benefit from the liberalization in manufacturing goods. With Taiwan's ac-

cession into the WTO and global trade liberalization, its GDP will increase by 1.53 percent; outputs of nonheavy industries, utility, construction, and trade, transportation, and communications increase, whereas outputs of heavy industries and service subsectors such as business and financial services and other services decrease, indicating that Taiwan's comparative advantage still relies heavily on the nonheavy manufacturing industries. The decrease in outputs, combined with import and export expansion in the service sector, indicates the prosperity of trade in services in Taiwan after liberalization. Our results also show that Taiwan and China's WTO accession contributes very little to the world economy but that trade liberalization improves Taiwan and China's respective GDP by 0.5 percent and 1.17 percent. This seems to suggest that liberalization is very important for their own benefit.

There are two limitations to this study, the first of which is that the Hoekman method still leaves much to be desired. The need to develop a more reliable measure of barriers in trade in services seems clear, and Warren and Findlay (1999) have made some progress in this area. The other limitation is that our simulation model does not incorporate the linkage between trade liberalization and commercial presence, and the movement of natural persons. Instead, it is assumed that the shocks from trade liberalization in four modes of service trade can be determined by changes in tariffs equivalents. Further research aimed at developing much more sophisticated models therefore seems warranted.

Appendix

Table 4A.1 Tariff Equivalents for Two-Digit ISIC Services Sectors

ISIC	ISIC Sectors	Benchmark Tariff Equivalent											
		Taiwan (Pre-WTO Accession)	Taiwan (Post-WTO Accession)	China	Hong Kong	Japan	Korea	ASEAN 5	Singapore	Indonesia	Malaysia	The Philippines	Thailand
5	Construction	40.0	10.0	10.0	25.0	32.0	5.0	16.0	12.0	16.0	10.0	40.0	28.0
61	Motor vehicle repair	40.0	5.0	5.0	40.0	40.0	5.0	40.0	40.0	40.0	40.0	0.0	40.0
62	Wholesale	40.0	16.7	16.7	40.0	40.0	5.0	27.5	40.0	40.0	40.0	40.0	32.5
63	Retail	40.0	5.0	5.0	40.0	30.0	5.0	20.0	40.0	40.0	40.0	40.0	40.0
64	Hotels and restaurants	20.0	10.0	10.0	10.0	10.0	2.5	2.5	2.5	5.0	5.0	5.0	10.0
71	Land transport	50.0	35.8	35.8	47.5	50.0	37.5	46.3	50.0	50.0	50.0	21.3	40.0
72A	Maritime/waterway transport	50.0	50.0	50.0	43.2	39.6	35.4	38.0	39.1	43.8	37.5	39.1	39.1
72B	Maritime cabotage	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0
73A	Supporting air transport	50.0	39.6	39.6	50.0	50.0	33.8	42.5	50.0	50.0	50.0	31.3	41.3
73B	Air transport proper	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0
74	Auxiliary transport	50.0	42.4	25.0	27.5	50.0	32.5	41.3	50.0	50.0	50.0	20.0	45.0
75A	Postal (incl. courier)	200.0	150.0	150.0	200.0	100.0	200.0	200.0	140.0	200.0	200.0	25.0	200.0
75B	Basic telecommunications	200.0	200.0	75.0	200.0	200.0	75.0	200.0	191.4	200.0	157.1	200.0	200.0
75C	VA telecommunications	100.0	12.5	12.5	100.0	50.0	12.5	12.5	53.9	57.1	46.4	46.4	82.1
81 + 82	Financial services	50.0	45.2	35.3	38.3	27.9	25.0	35.4	25.3	27.5	27.1	13.8	35.4
81 + 82	Life insurance	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0
83	Real estate	50.0	37.5	37.5	25.0	37.5	18.8	50.0	50.0	50.0	50.0	50.0	50.0
84	Rental	40.0	19.0	15.0	40.0	28.0	19.0	21.0	32.8	40.0	22.0	26.0	36.0
85	Computers	20.0	2.5	2.5	10.0	6.0	2.5	2.5	13.0	16.0	11.0	20.0	12.0
86A	R&D (social sciences)	20.0	2.5	2.5	20.0	20.0	14.2	17.5	17.2	16.7	15.0	20.0	20.0
86B	R&D (hard)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
89	Business	40.0	17.4	16.7	29.3	30.9	17.0	18.7	29.0	34.1	21.3	38.7	29.1
92	Sewage	50.0	12.5	12.5	50.0	50.0	6.3	26.6	45.0	50.0	50.0	50.0	25.0
93	Education	50.0	30.0	30.0	46.3	50.0	22.5	50.0	47.8	50.0	50.0	50.0	38.8
94	Health/society	50.0	31.3	31.3	47.9	50.0	44.8	50.0	44.8	50.0	37.5	50.0	50.0
96	Recreation and culture	20.0	16.0	12.9	20.0	17.1	6.9	14.4	16.6	18.8	13.8	19.0	16.7

ISIC	ISIC Sectors	South Asia	India	Sri Lanka	Bangladesh	Pakistan	Australia and New Zealand	Australia	New Zealand	United States	Canada	European Union	Rest of World
5	Construction	37.0	34.0	40.0	40.0	34.0	8.5	12.0	5.0	5.0	6.0	10.0	30.4
61	Motor vehicle repair	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	5.0	5.0	5.0	33.3
62	Wholesale	40.0	40.0	40.0	40.0	40.0	5.0	5.0	5.0	10.0	10.0	12.5	35.0
63	Retail	40.0	40.0	40.0	40.0	40.0	15.0	7.5	22.5	5.0	10.0	10.0	32.4
64	Hotels and restaurants	9.4	10.0	10.0	10.0	7.5	2.5	2.5	2.5	2.5	5.0	5.0	5.7
71	Land transport	50.0	50.0	50.0	50.0	50.0	33.8	43.8	23.8	27.5	21.9	31.9	47.0
72A	Maritime/waterway transport	50.0	50.0	50.0	50.0	50.0	38.8	37.5	40.1	50.0	46.4	47.9	47.6
72B	Maritime cabotage	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0
73A	Supporting air transport	50.0	50.0	50.0	50.0	50.0	40.7	32.5	48.8	41.3	35.0	32.5	45.9
73B	Air transport proper	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0
74	Auxiliary transport	50.0	50.0	50.0	50.0	50.0	36.9	23.8	50.0	42.5	18.8	32.5	48.1
75A	Postal (incl. courier)	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	25.0	50.0	200.0	131.7
75B	Basic telecommunications	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	190.8
75C	VA telecommunications	88.4	64.3	100.0	100.0	89.3	18.8	25.0	12.5	12.5	12.5	25.0	74.0
81+82	Financial services	44.3	36.3	50.0	50.0	40.8	17.8	16.7	18.8	12.5	17.9	25.0	36.3
81+82	Life insurance	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0
83	Real estate	50.0	50.0	50.0	50.0	50.0	12.6	18.8	6.3	6.3	12.5	18.8	46.6
84	Rental	40.0	40.0	40.0	40.0	40.0	8.5	12.0	5.0	19.0	5.0	17.0	35.3
85	Computers/20/0	16.8	16.0	20.0	20.0	11.0	6.0	6.0	6.0	2.5	2.5	2.5	13.6
86A	R&D (social sciences)	18.5	18.3	20.0	20.0	15.8	17.1	14.2	20.0	20.0	14.2	15.0	17.7
86B	R&D (hard)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
89	Business	38.6	38.9	40.0	40.0	35.4	20.3	12.2	28.3	10.6	17.2	13.3	32.6
92	Sewage	50.0	50.0	50.0	50.0	50.0	33.6	17.2	50.0	6.3	6.3	6.3	42.1
93	Education	50.0	50.0	50.0	50.0	50.0	23.8	23.8	23.8	33.8	50.0	20.0	43.9
94	Health/society	45.8	45.8	50.0	50.0	37.5	36.5	30.2	42.7	43.8	50.0	29.2	45.2
96	Recreation and culture	19.4	18.8	19.2	20.0	19.4	15.0	14.4	15.6	3.3	18.8	13.8	17.9

Sources: Details on Taiwan are compiled from this study; details on the remaining countries are obtained from Hoekman (1995).

Notes: The original GATS-specific breakdown of activities is contained in the United Nation's Central Product Classification (CPC), for industrial comparison, the code is converted to International Standard Industrial Classification (ISIC). The case of the construction sector in Taiwan is used to illustrate the derivation of the tariff equivalent (te) as follows: Since the coverage ratios (cr) for Taiwan's construction services, both before and after, are 0.5, and the benchmark tariff equivalent (te*) of the construction sector is 40%, following the tariff equivalent equation as shown in the text (i.e., $te = (1 - cr) \times te^*$), the tariff equivalent for the construction services in Taiwan is $te = (1 - 0.5) \times 40\% = 20\%$.

Table 4A.2 **Taiwan's Further Commitments, Post-WTO Accession**

I. Horizontal Commitments	
1.	Foreign businesses and individuals in Taiwan may invest directly in portfolios in companies whose shares are listed in the securities market of Taiwan, without previous ceiling limitations.
2.	Duration of business visitors extended from sixty days to ninety days.
3.	Intra-corporate transferees may stay for an initial period of two-years renewable each year, as compared to the previous period of stay of no more than three years.
II. Sector-Specific Commitments	
Professional services:	Legal and Architectural services
Rental leasing:	Financial leasing of private cars
Telecommunications services:	Basic telecommunications services
	Voice telephone services
	Packet-switched data transmission services
	Circuit-switched data transmission services
	Telex, Telegraph and Facsimile services
	Private leased circuit services
Audiovisual services	Motion picture and video tape production and distribution services
	Motion picture projection services
	Sound recording
Insurance and its related services	Nonlife insurance services
	Reinsurance and retrocession
	Services auxiliary to insurance (including broking and agency services)
Banking and other financial services	Acceptance of deposits and other repayable funds from the public
	Lending of all types
	Financial leasing
	All payment and money transmission services
	Guarantees and commitments
	Trading for own account or for account of customers
	Participation in the issues of short-term bills
	Money broking, asset management
	Settlement and clearing services for financial assets
	Advisory and other auxiliary financial services
	Provision and transfer of financial information
	Other
Services auxiliary to all media of transport	Cargo-handling, storage and warehousing and freight transport agency services
	Other

Source: Draft Schedule for The Separate Customs Territory of Taiwan, Penghu, Kinmen, and Matsu.

Note: The listed sector-specific commitments are further liberalized either completely or partially in terms of four modes of supply.

Table 4A.3 Liberalization of Taiwan's Agricultural and Manufacturing Sectors (%)

Sector	2000	2005
Agriculture	-3.11	-50.11
Livestock	-0.60	-58.40
Forestry	-0.10	-33.53
Fishery	-3.16	-37.71
Mining	-3.69	-7.17
Processed foods	-2.72	-14.88
Beverages and tobacco products	-57.43	-75.97
Textiles	-13.24	0.74
Garments and apparel	0.00	-12.45
Leather and leather products	0.00	-28.33
Wood and wood products	-0.87	-46.91
Paper and paper products	-14.42	-99.66
Petroleum and petroleum products	0.00	-42.51
Plastics and chemicals products	-1.79	-29.24
Other mineral products	-5.97	-30.62
Steel	-1.98	-97.37
Non-iron metals	-0.73	-30.56
Metal products	-4.10	-41.04
Motor vehicles	-0.66	-40.13
Other transportation equipment	-3.65	-26.54
Electronics, electrical and other machinery	-16.80	-29.31
Other manufactured products	-3.20	-52.50

Table 4A.4 Reductions in Tariff Equivalents in Service Sectors (%)

	Tariff Equivalents			Reduction		
	Pre-2000 (1)	Post-2000 (2)	50% (3)	Pre-2000 (4)	Post-2000 (5)	Total (6)
Construction	10.00	10.00	0.00	-50.00	0.00	-50.00
Trade, transportation and communications	85.70	53.90	-37.11	-31.45	-18.55	-50.00
Business and financial services	24.30	21.40	-11.93	-44.03	-5.97	-50.00
Other services	26.20	25.60	-2.29	-48.85	-1.15	-50.00

Notes: Tariff equivalents for services sectors are calculated from the second section of this study. The 50% reduction in tariff equivalents is an arbitrary figure adopted in Robinson, Wang, and Martin (1999). (3) = [(2)/(1) - 1] * 100.

Table 4A.5 **Tariff Reductions in Mainland China (%)**

Sector	2000	2005
Agriculture	-29.84	-40.08
Livestock	-49.93	-66.69
Forestry	-64.38	-81.97
Fishery	-39.60	-53.94
Mining	-61.77	-58.50
Processed foods	-36.93	-44.50
Beverages and tobacco products	-45.26	-56.96
Textile	-56.89	-71.94
Garments and apparel	-56.19	-71.13
Leather and products	-62.02	-78.20
Wood and products	-62.56	-78.20
Paper and products	-46.81	-59.12
Petroleum and products	-26.30	-26.65
Plastic and chemical products	-53.63	-68.06
Other mineral products	-55.24	-69.99
Steel	-34.03	-39.89
Non-iron metals	-48.43	-61.32
Metal products	-59.97	-75.43
Motor vehicle	-63.07	-78.73
Other transportation equipment	-52.39	-66.49
Electronics, electrical machinery and other machinery	-48.54	-61.41
Other manufactures	-62.29	-77.91
Utility	-54.49	-68.30
Construction	-54.49	-68.30
Trade, transportation and communication	-54.49	-68.30
Business and financial services	-54.49	-68.30
Other services	-54.49	-68.30

Table 4A.6 Effects on Taiwan's Output, by Sector (%)

Simulation	Sector				
	A	B	C	D	E
Agriculture and mining					
Agriculture	-8.716	-8.849	-14.593	-14.686	-10.977
Livestock	4.609	4.315	-6.822	-6.944	-6.312
Forestry	-1.248	-1.589	-1.698	-1.730	-1.607
Fishery	0.235	0.173	-0.502	-0.581	-0.425
Mining	-1.562	-1.862	-2.785	-2.715	-2.127
Non-heavy manufacturing industries					
Processed foods	8.161	7.766	-1.961	-2.085	-0.828
Beverages and tobacco products	-14.398	-14.515	-14.526	-14.598	-12.540
Textile	21.186	22.243	24.488	26.200	19.602
Garments and apparel	-1.031	1.826	3.838	3.018	4.754
Leather and products	7.395	9.674	14.156	17.529	12.279
Wood and products	-2.638	-2.783	-2.359	-2.792	-2.583
Paper and products	-0.158	-0.074	-0.055	0.158	0.617
Plastic and chemical products	5.155	5.368	5.746	6.335	4.503
Other mineral products	0.413	0.065	-0.105	0.131	-0.068
Other manufactures	-6.593	-7.147	-6.206	-6.510	-4.073
Heavy manufacturing industries					
Petroleum and products	0.866	0.914	0.621	0.827	0.913
Steel	-2.187	-2.961	-3.182	-3.409	-3.678
Non-iron metals	-0.156	-0.109	0.761	0.513	-0.631
Metal products	-16.037	-16.426	-15.391	-15.998	-6.582
Motor vehicle	12.436	12.812	18.422	18.070	9.813
Other transportation equipment	-4.595	-4.407	-1.869	-2.358	-3.113
Electronics, electrical and other machinery	5.257	6.011	6.977	7.152	4.447
Utility	1.143	1.160	1.065	1.197	0.900
Construction	2.526	2.022	2.033	2.273	0.750
Trade, transportation and communication	-0.204	0.335	0.389	0.309	0.502
Business and financial services	-0.199	-0.835	-0.817	-0.836	-0.753
Other services	-0.594	-0.720	-0.269	-0.251	0.061

Table 4A.7 **Effects on Taiwan's Exports, by Sector (%)**

Simulation	Sector				
	A	B	C	D	E
Agriculture and mining					
Agriculture	-2.548	-2.180	-9.153	-8.199	-23.183
Livestock	15.349	15.592	-34.662	-34.840	-46.269
Forestry	-4.720	-5.814	-2.006	2.191	2.589
Fishery	-4.347	-3.502	3.459	2.876	2.162
Mining	3.124	4.328	0.875	8.136	7.867
Non-heavy manufacturing industries					
Processed foods	37.926	36.518	-4.970	-5.669	6.275
Beverages and tobacco products	30.535	37.121	37.776	35.865	29.659
Textile	26.927	27.847	30.485	32.858	24.272
Garments and apparel	-5.857	-1.175	1.884	0.245	4.900
Leather and products	12.583	15.372	20.783	25.757	17.865
Wood and products	-2.556	-2.868	-2.468	-2.918	-3.364
Paper and products	11.496	13.098	15.221	16.486	11.836
Plastic and chemical products	10.895	11.159	11.660	13.035	8.692
Other mineral products	6.336	7.135	8.320	10.285	7.792
Other manufactures	0.169	-1.639	-0.287	1.103	-4.012
Heavy manufacturing industries					
Petroleum and products	-4.595	-3.599	-4.971	-5.434	-4.327
Steel	6.342	5.155	3.016	3.700	0.673
Non-iron metals	5.048	5.256	6.524	6.357	2.433
Metal products	4.577	4.190	5.511	3.234	-14.294
Motor vehicle	29.132	30.054	39.217	38.963	21.904
Other transportation equipment	-4.137	-3.782	-0.852	-1.343	-2.495
Electronics, electrical and other machinery	8.542	9.482	10.542	10.912	6.325
Utility	0.532	0.369	0.726	0.853	0.709
Construction	-9.183	4.488	8.242	7.059	8.122
Trade, transportation and communication	-4.388	46.023	46.463	44.852	48.851
Business and financial services	-11.477	8.730	9.643	8.039	12.234
Other services	-10.611	25.285	27.656	26.017	30.010

Table 4A.8 Effects on Taiwan's Imports, by Sector (%)

Simulation	Sector				
	A	B	C	D	E
Agriculture and mining					
Agriculture	25.449	25.082	19.499	19.884	13.641
Livestock	0.942	1.083	17.927	18.894	22.953
Forestry	0.214	0.129	0.244	-0.245	-0.758
Fishery	20.686	20.720	14.061	15.012	11.621
Mining	1.586	1.561	0.941	1.577	1.368
Non-heavy manufacturing industries					
Processed foods	1.545	2.101	6.298	7.109	7.256
Beverages and tobacco products	100.613	100.763	102.631	104.138	82.315
Textile	14.126	16.029	15.930	17.425	14.199
Garments and apparel	17.354	12.394	10.898	14.210	7.308
Leather and products	18.604	19.632	20.928	25.623	17.374
Wood and products	3.925	3.455	2.910	3.373	0.739
Paper and products	9.395	9.549	9.207	9.810	4.336
Plastic and chemical products	7.860	8.345	8.016	8.846	5.568
Other mineral products	8.204	8.773	8.309	9.355	4.183
Other manufactures	11.990	12.723	11.848	12.557	1.819
Heavy manufacturing industries					
Petroleum and products	11.570	12.264	11.819	12.481	6.347
Steel	0.707	1.141	1.662	1.692	0.020
Non-iron metals	12.211	12.437	12.437	13.262	4.760
Metal products	27.431	27.539	28.133	28.941	8.554
Motor vehicle	12.750	12.700	12.890	13.536	8.314
Other transportation equipment	3.031	2.906	3.082	3.319	1.523
Electronics, electrical and other machinery	10.141	10.018	10.182	11.054	4.697
Utility	0.532	0.369	0.726	0.853	0.709
Construction	4.006	13.115	12.030	12.620	12.512
Trade, transportation and communication	3.991	72.395	72.927	74.060	71.419
Business and financial services	6.434	29.707	29.713	30.661	28.001
Other services	2.473	15.981	15.934	16.382	15.660

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Comment Ponciano S. Intal, Jr.

As Warren and Findlay, Hoekman and Braga, and Philippa Dee have all noted, the literature on the modeling efforts on services trade liberalization is still miniscule. Thus, the Chou et al. paper is a welcome addition, especially because it tackles economywide effects of services trade liberalization in a multiregional model. Drawing from the Philippine experience, the discussion, analysis, and policy decisions on services trade deregulation and liberalization have been primarily at the industry level (e.g., banking and telecommunications), with barely any quantitative analysis on the effects on the rest of the economy. This is in sharp contrast to the policy debate on agriculture and manufacturing protection and liberalization, which benefited from the availability of estimates of the structure of tariffs and industry protection and economywide analyses. In the service sectors, it has been very difficult to estimate the “tariff equivalents” of service-sector regulation and protection. As a result, it was not possible to undertake economywide quantitative analysis of the effects of service-sector deregulation and liberalization.

My comments on the paper focus on the following points: the need to refine or modify the Hoekman-type estimates; the technology spillover effect; the structural effects of trade liberalization on Taiwan’s economy; and Taiwan’s and China’s nonaccession to the World Trade Organization (WTO).

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Need to Refine or Modify the Hoekman-Type Estimates

The authors used the Hoekman method to estimate the tariff equivalent of service-sector regulation and protection for Taiwan and used the Hoekman estimates for the other countries in their multicountry, multi-industry computable general equilibrium (CGE) analysis. Aware of the weaknesses of the Hoekman method, the authors nevertheless chose to use it because Hoekman's estimates are the only consistent set of estimates for the whole world that is apparently available.

Be that as it may, it still merits consideration to modify at least some of the more indefensible and unrealistic Hoekman-type estimates. The credibility of the CGE analysis hangs on the reasonableness of the estimates of the tariff equivalents of service-sector regulation and protection. Thus, the more robust the estimates of tariff equivalents, the better.

Some examples of the puzzling Hoekman estimates can be cited here. It is very hard to believe that the tariff equivalent for the trade, transport, and telecommunications sector in the Philippines is lower than in Singapore. This is especially so if there is a presumption that the lower the tariff equivalent, the more contestable and efficient the industry (which is apparently the implicit assumption in the paper). A statement that the Philippine trade, transport, and telecommunications sector, given its lower tariff equivalent, is more efficient than Singapore's would be totally laughable. The sector is one of the sources of Singapore's international competitiveness; in contrast, the transport and telecommunication industries have been one of the major bottlenecks to Philippine development. It is also worth noting that there are many foreign retailers in Singapore, whereas the Philippine retail industry was closed to foreigners from the late 1950s until 2000.

Similarly, I find it very surprising that Japan's trade, transport, and telecommunications sector has a significantly lower average tariff equivalent than that of the United States, especially given the usual American complaint about the Japanese distribution sector and the apparently more open and dynamic American sector compared to Japan's.

The Hoekman-type results show particularly high tariff equivalent in the transportation, storage, and communication sector in virtually every country in the world, including the United States, Canada, and the European Union. Most of the estimates are beyond 100 percent. Developed countries have very low tariff rates on goods: for example, virtually zero for Singapore and an average of 6.5–6.6 percent for Japan and the United States. Given the importance of transport, storage, and communication in much of the goods sectors in these countries, the high tariff equivalent implies that the effective rates of protection in the goods sectors could be close to zero or even negative. This seems unrealistic. Again, this rather awkward result suggests the need to refine the Hoekman-type estimates, especially for the transport, storage, and communication sector.

In this regard, the recent work of T. Warren and C. Findlay (1999) and their colleagues in Australia and the rest of East Asia on measuring the tariff equivalents of the barriers to trade in services is worth exploring as a possible alternative to the Hoekman-type estimates. At least, it would be useful to calibrate the model by drawing from the results from Warren, Findlay, and their colleagues in order to determine whether or not the model's results are robust.

On the Technology Spillover Effect

I find the incorporation of the technology spillover effect interesting and potentially very insightful. However, I find the simulation results puzzling. By assumption, the technology spillover effect is only from the developed countries to the developing countries. However, a comparison between the results of scenario B and scenario C in table 4.9 (on the effects on gross domestic product [GDP] by region) indicates that, with the exception of China, the GDP growth rate rose more proportionately in the developed countries (i.e., Japan, the European Union, Canada, Australia-New Zealand, and the United States) than in the developing countries (i.e., the Association of Southeast Asian Nations [ASEAN]). This is inconsistent with what could be expected from a technology spillover effect that is presumably meant to benefit more the developing countries by assumption. It is important for the authors to explain the counterintuitive results of the impact of the technology spillover effect on GDP growth.

Structural Effects of Trade Liberalization on Taiwan's Economy

The results of the simulations on the economic structure of Taiwan are interesting but also puzzling. For example, in simulation A, the results indicate that goods liberalization under the Uruguay Round will largely benefit nonheavy manufacturing, utilities, and construction and will hurt heavy manufacturing and all the service subsectors (see table 4.11). As the authors pointed out, this result in simulation A in table 4.11 seems to indicate that Taiwan's comparative advantage still lies in nonheavy manufacturing. This seems somewhat at odds with the popular impression that the country has become a world leader in semiconductors and other electronics industries (included in heavy manufacturing in the authors' classification) and is losing competitiveness in the more labor-intensive industries like garments (included in nonheavy manufacturing in the authors' classification). Given the rising real wages in Taiwan and the secular appreciation of the New Taiwan dollar, Taiwan has been in the process of economic restructuring away from relatively unskilled labor-intensive industries like garments and plastics (under nonheavy manufacturing) toward skilled labor- and capital-intensive industries like electronics and electrical machinery. It is likely that there is an aggregation problem here where both losing and gaining industries are included in the same classification under heavy manufacturing or

nonheavy manufacturing. It may be better to give information on the output effects of the twenty-seven industry subsectors rather than the more aggregated sectors in table 4.11 in order to help the readers gain better insight on the impact of trade liberalization on the Taiwanese economy.

Another likely explanation for the positive (negative) impact of the goods liberalization under the Uruguay Round on Taiwan's nonheavy (heavy) manufacturing output can be gleaned from the schedule of Taiwan's liberalization in tandem with the Uruguay Round. Specifically, Taiwan's schedule suggests that the nonheavy manufacturing industries (e.g., leather goods, garments and textiles, processed food) have the lowest tariff reductions. Thus, the positive output effect of Taiwan's proposed goods liberalization on the nonheavy manufacturing sector stems from the shift in *relative* industrial protection toward the nonheavy manufacturing sector.

However, it is puzzling that the outputs of the trade, transportation, and communication sector and the other service sectors declined *despite the comparatively high rates of protection*. Two possible explanations can be pointed to here. The first one is that the goods-sector liberalization resulted in significant real wage increase, thereby making the service sectors (being presumably labor intensive) less competitive, resulting in lower exports, greater imports, and less domestic output. The second possible explanation is that the heavy manufacturing sector, which registered a reduction in output, is particularly intensive in the use of services, thereby dragging down the output performance of the service sectors. I find the second possible explanation less convincing.

Clearly, it is best for the authors to provide an economic underpinning, including what is happening to the relative factor prices in conjunction with the factor intensities of the various sectors, to the somewhat surprising results in scenario A.

A comparison of the total output effects under scenarios A and B in table 4.11 shows a marginal increase in the growth rate from 0.35 percent to 0.39 percent. That is, the table indicates that services trade liberalization has miniscule impact on the overall output of the economy. This is partly because services trade liberalization results in the restructuring of the service sector itself, with lower outputs in services except in trade, transport, and communication and a corresponding increase in both exports and imports of services. The only noticeable impacts of the services trade liberalization on the structure of the economy are the reversal in the output growth of trade, transport, and communication sector; the marked deceleration in the growth rate of the construction industry; and a marginal acceleration in the growth rate of nonheavy manufacturing. These results are interesting and deserve elaboration. What is behind these structural effects? What is happening with factor prices? What is happening on the exchange rate? Is there a real currency appreciation that has dampened the output effect of the services trade liberalization? How do these results on Taiwan of services trade

liberalization—that is, miniscule overall output effect but significant industry restructuring effect within the service sector—compare with similar policy experiments in other countries?

Taiwan's and China's Nonaccession to the World Trade Organization

The authors present an interesting simulation on the effect of Taiwan's and China's not being admitted into the WTO. The authors found that the accession of Taiwan and China into the WTO would not have a significant effect on the world economy and the economies in the region, but the concomitant trade liberalization in the two countries will nonetheless have substantial benefits to Taiwan and China. For Taiwan, the accession will provide significant boost to trade in manufactures and a decline in exports of services. The sectoral and trade effects in Taiwan are not very surprising because much of tariff reductions in goods are backloaded after the year 2000, whereas much of the service-sector liberalization occurred before 2000. The minimal impact of China's accession into the WTO on the countries in the region is somewhat surprising, given the growing importance of the China market, the large tariff reductions planned, and the competition that China presents to other developing countries (e.g., ASEAN and South Asia). It seems reasonable to expect that with the accession of China into the WTO and the further opening up of the Chinese economy, a further round of industrial restructuring could occur in East Asia and the Pacific in the next decade similar to the so-called "flying geese" that occurred in the late 1980s and early 1990s in the region. The authors might like to elaborate further on their results with respect to the nonaccession of China and Taiwan into the WTO.

Reference

Warren, Tony, and Christopher Findlay. 1999. How significant are the barriers? Measuring impediments to trade in services. Paper presented at the *Services 2000: New Directions in Services Trade Liberalization Conference*. 1–2 June, the University Club, Washington, D.C.

Comment June-Dong Kim

This paper simulates the effects of services trade liberalization using a multi-regional computable general equilibrium model and also investigates the effects of the accession of Taiwan and Mainland China to the World Trade Organization (WTO).

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This study improves upon previous works by incorporating technical change in international transport services due to the accession of Taiwan and mainland China into the WTO. It also endogenizes the balance of trade by setting up a global bank in order to capture the efficiency gains from the trade liberalization, particularly in services trade.

Even though the authors mention limitations to their study, let me iterate some comments on their measures of tariff equivalents in service sectors. The authors adopt Hoekman's method for calculating tariff equivalents in service sectors, which is based on the sectoral coverage ratios of specific commitments by each of the member countries. More specifically, Hoekman's calculation of a country-specific tariff equivalent in each service sector is defined as one minus the coverage ratio multiplied by the benchmark tariff equivalent, which takes a value of 200 percent for the most restrictive sectors such as transportation and basic telecommunications, and a value of 20 to 50 percent for the rest.

The resulting measure of tariff equivalent may be useful for making comparisons of relative restrictiveness in services trade across countries. However, one needs to be cautious when using this measure in simulating the effects of services trade liberalization.

First, the simulation results using this measure may be sensitive to the absolute magnitude of the benchmark tariff equivalent set for each sector. The benchmark tariff equivalent can be interpreted as "prohibitive" rates, where services trade is completely restricted. Setting a benchmark value of 200 percent for certain sectors and a value of 20 to 50 for the rest can be indicative of the relative restrictiveness of each service sector across countries. However, applying this measure in simulating percentage changes of some macro variables may lead to overestimation or underestimation, depending on the absolute magnitude of the benchmark tariff equivalent that is arbitrarily set for each sector.

Furthermore, multiplying the benchmark tariff equivalent by country- or sector-specific coverage ratios is problematic in that it double-counts the country- or sector-specific trade barriers. The relative restrictiveness of services trade is already incorporated in the country- or sector-specific coverage ratios. Hoekman's method of setting the benchmark tariff equivalent depending on the relative degree of restrictiveness reiterated the measurement of the trade restrictiveness of each sector and country, magnifying the difference in tariff equivalents across sectors.

Therefore, simulations using this measure tend to overestimate the effects in those sectors where trade is relatively more restrictive, and, thus, a relatively high benchmark tariff equivalent is assigned. The simulation results, that the effects of trade liberalization in transport and communications are a lot greater than those of the other sectors, may be attributed to these problems.

To avoid this kind of problem, one may assign an equal benchmark tariff

equivalent across sectors (for example, 100 percent) and multiply them by the country-specific coverage ratios. The resulting measure of country- and sector-specific tariff equivalents may yield more reasonable simulation results.

In addition, as the authors mention, the simulation model does not take into account commercial presence and movement of natural persons. Because Hoekman's tariff equivalents cover all of the four modes of supply, there is an inconsistency between the coverage of tariff equivalents and the simulation model. In order to be consistent, it is necessary to construct tariff equivalents incorporating only cross-border supply and consumption abroad.

Concerning the computable general equilibrium (CGE) simulation using the GTAP model, simulation results of the CGE model tend to be sensitive to the elasticity parameters used in the simulation. If the elasticity parameters of the service sectors are set relatively higher than those of agricultural or manufacturing sectors, it might lead to the simulation results that trade liberalization in the service sectors has much greater impact on world trade than trade liberalization in agriculture or manufacturing. Reporting the elasticity parameters used in the simulation will be informative in this regard.

It might also be helpful if the authors provide some intuitive explanation on what brings about the rise in inflation rates after trade liberalization, even in simulations C and D. In addition, it may be interesting to further investigate why the utilities and construction sectors in Taiwan show a great increase in output due to trade liberalization.