
Quantitative Analyses

Three quantitative assessments of a possible FTA between the United States and Taiwan serve as the basis for analysis in this chapter. The US International Trade Commission (USITC 2002a) has assessed US-Taiwan FTA prospects in general and sectors of interest in particular. The USITC model considers the elimination of tariff barriers and quotas, but not other nontariff barriers. A report by Taiwan's Chung-Hua Institution for Economic Research (2002) uses a similar methodology but provides more detail on services. Finally, John Gilbert (2003) estimates the effects of a US-Taiwan FTA alongside 12 other US FTAs currently under negotiation or discussion. All three assessments use the Global Trade Analysis Project (GTAP) 5 computable general equilibrium model to estimate trade regime changes.¹

Total Welfare Gains and GDP

The USITC estimates that total US welfare gains from an FTA with Taiwan would be \$200 million. This is trivial relative to total US GDP of \$7.95 trillion in the 1997 baseline. The Gilbert and Chung-Hua estimates are substantially larger in absolute terms, but even the larger Chung-Hua number is only 0.01 percent of US GDP. For Taiwan, the estimated

1. The GTAP Web site is www.gtap.agecon.purdue.edu.

Table 2.1 Welfare gains predicted by studies of a US-Taiwan free trade agreement (millions of 1997 dollars)

Study	United States	Taiwan
USITC		
Allocative efficiency	0	0
Terms of trade	200	1,200
<i>Total welfare</i>	200	1,000
Gilbert		
Allocative efficiency	108	-23
Terms of trade	653	1,066
<i>Total welfare</i>	760	1,043
Chung-Hua		
Allocative efficiency	1,550	1,629
Terms of trade	-480	1,004
<i>Total welfare</i>	1,070	2,633

Sources: USITC (2002a), Gilbert (2003), and Chung-Hua Institution for Economic Research (2002).

gains are greater in both absolute and relative terms. Estimated total welfare gains range from \$1 billion or 0.3 percent of 1997 GDP in the USITC and Gilbert studies to as much as \$2.6 billion or 0.8 percent of GDP in the Chung-Hua study. Table 2.1 summarizes the welfare effects estimated by each of the studies.

According to the USITC estimate, welfare gains for both the United States and Taiwan result from improvement in the terms of trade rather than from allocative efficiency gains.² The USITC estimates that US allocative efficiency gains would be zero, with terms-of-trade gains making up the entire welfare gain. The pattern is much the same in the Gilbert study. The distribution of welfare gains for Taiwan is similar in both studies, although in the Gilbert study the allocative efficiency effects for Taiwan are slightly negative.

In contrast, the Chung-Hua study predicts much larger gains for both Taiwan and the United States, attributing them largely to improvements

2. "Terms of trade" refers to the prices of a country's exports relative to the prices of its imports. If the tariff changes following enactment of an FTA have the effect of making a given amount of a country's exports worth a greater amount of the country's imports, then the country's terms of trade are said to improve. "Allocative efficiency" refers to how well an economy's available resources (factors, or inputs) are assigned to production. By reducing distortions in a country's trade environment, an FTA might improve its allocative efficiency.

in allocative efficiency. Indeed, in the case of the United States, the Chung-Hua study estimates that the terms-of-trade effect is negative.

Because the estimated absolute effect on the United States of an FTA with Taiwan is so modest, the USITC assumed that it would not induce US total factor productivity gains. Given the more significant impact on Taiwan, the USITC assumed that total factor productivity in Taiwan might increase by 0.38 percent should an FTA be enacted by 2005.³ That would increase Taiwan's welfare gains to \$4.2 billion or 1.5 percent of GDP. Liberalizing services trade by eliminating nontariff barriers could conceivably produce enough additional gains for the United States to improve total factor productivity, although probably not by very much. This possibility is discussed below in light of the Chung-Hua study, which does model the effect of reducing barriers to trade in services.

Trade Effects

Bilaterally, the USITC study forecasts an increase in US exports to Taiwan of 16 percent, or roughly \$3.5 billion annually, under an FTA. US imports from Taiwan are expected to increase by 18 percent, or \$7 billion. Thus, the bilateral US trade deficit with Taiwan would increase by \$3.5 billion.

Global US exports would increase 0.2 percent over base-year levels, by \$2.4 billion, while global US imports would rise only \$3.2 billion—less than half of the value of the increased imports from Taiwan alone. Taiwanese imports would displace imports from other countries in the US market for two reasons. First, with the advantage of tariff-free entry into the United States, Taiwanese firms may displace the goods of more efficient producers elsewhere, a phenomenon known as trade diversion. Second, under an FTA, the mix of imported inputs needed by the United States to make finished goods may change, and Taiwan may be the most efficient producer of these goods. This displacement effect is reflected in the USITC forecast that a US-Taiwan FTA would increase the global US trade deficit by only \$800 million, not by the \$3.5 billion added to the bilateral deficit with Taiwan. Similarly, Taiwan's global exports would increase by 2 percent or \$2.8 billion, and imports would increase by 2 percent or \$2.6 billion, leading to an increased net trade surplus of \$200 million.

Would a US-Taiwan FTA create more trade than it diverted? As table 2.2 shows, the preponderance of Taiwanese export growth would be in a

3. Total factor productivity gains for 2009 and 2013 of 0.35 and 0.30 percent, respectively, are predicated on the assumption that an FTA is not implemented until those dates. The USITC is not adding those gains to the earlier total factor productivity gains.

Table 2.2 US and Taiwanese sectors that would benefit most from bilateral export growth, 2005 (millions of 1997 dollars)

United States		Taiwan	
Sector	Growth	Sector	Growth
Other machinery and equipment	868	Textiles, apparel, and leather	3,104
Motor vehicles and parts	629	Other machinery and equipment	836
Other foods	520	Metals and metal products	666
Electrical equipment	307	Electrical equipment	599
Chemicals, rubber, and plastic	300	Other transportation equipment	504
Other transportation equipment	199	Chemicals, rubber, and plastic	414
Vegetables, fruits, and nuts	164	Other foods	182

Source: USITC (2002a).

single commodity group—textiles and apparel. Economies with lower wages than Taiwan are probably lower-cost producers of these goods. Similarly, a large share of US export growth is forecast to be in automobiles, a sector where there is little evidence that US exports to Asia are competitive. This leads to the conclusion that trade diversion may well exceed trade creation under a US-Taiwan FTA.

Gilbert's simulation also indicates trade diversion. His expected reduction in US tariff revenue from trade with third parties under a US-Taiwan FTA is \$281 million—the second largest for the United States (after Indonesia) among the 13 potential US FTAs he examines. In Taiwan, tariff revenue in world trade excluding the United States would fall by \$498 million. While nonmember tariff revenues decline under a US-Taiwan FTA, tariff revenues from members' trade decline more. Gilbert predicts that total US exports to Taiwan would rise by \$6.6 billion, and exports to the rest of the world would fall by \$2.4 billion, while US imports from Taiwan would rise by \$7.2 billion and imports from the rest of the world would fall by \$2.3 billion. The biggest percentage declines in value of exports to the United States and Taiwan would be for China (−0.16 percent) and the Philippines, Central America, Indonesia, and Singapore (all between −0.15 and −0.10 percent).

As Gilbert notes (2003, 5), "Negative terms-of-trade consequences of an FTA for nonmember economies are another measure of trade diversion, since the changes in trading prices reflect the reduction in imports by members from nonmember sources." His study finds negative terms-of-trade effects for other countries and regions resulting from a US-Taiwan FTA, the same result he found in the other FTAs he examined.

As explored further in the next section, trade diversion would account predominantly for Taiwan's export gains, particularly in the textiles and apparel sector. This outcome would be mitigated, but not eliminated, by

fuller inclusion of services trade induced by the removal of nontariff barriers, as suggested by the Chung-Hua study.

Sectoral Effects

Though the global and bilateral welfare and trade effects of a US-Taiwan FTA are very modest—indeed, almost insignificant in the case of the United States—some sector-specific effects would be more pronounced. US exports of motor vehicles and parts to Taiwan would increase by almost 400 percent (\$629 million), and US exports of fish, processed rice, and other foods by more than 100 percent. The largest winner in dollar terms at \$868 million or 17 percent would be a broad commodity category in the GTAP model entitled “other machinery and equipment,” which includes computer and office equipment, engines and turbines, communications equipment, appliances, and a variety of other manufactured goods. Though US exports to the world in this sector would rise \$709 million, that figure represents only a 1 percent increase on a global basis. The increase in exports to Taiwan would be equivalent to as much as a 1 percent increase globally in just a handful of sectors, and only in vegetables, fruits, and nuts would the increase be as much as a 2 percent worldwide export gain. Table 2.2 ranks winners on both sides based on growth in bilateral exports.

In a few Taiwanese sectors, the increase in bilateral exports due to an FTA would exceed 100 percent, but their baselines are insignificant. The exception is textiles and apparel, where the 126 percent increase in exports to the United States generating \$3.1 billion would be a 21 percent increase over global 2001 exports of \$14.7 billion. More is said about this sector later in this chapter because it would be the main source of Taiwanese gains under an FTA with the United States and because impending changes in global textile trade complicate the analysis of benefits for Taiwan.

The other big bilateral export winners for Taiwan would be other machinery and equipment (\$836 million), metals and metal products (\$666 million), electronic equipment (\$599 million), other transportation equipment (\$504 million), and chemical, rubber, and plastic products (\$414 million). In none of these sectors is the increase in total US imports from the world greater than 1 percent.

Table 2.3 ranks the US sectors, by output in 2005, that would be most affected by an FTA. Sectoral output gains greater than 0.1 percent occur only in a single group (vegetables, fruits, and nuts), and output losses greater than 0.1 percent also occur only in a single group (textiles, apparel, and leather). These are small effects.

Table 2.4 ranks US winners and losers by the effects of an FTA on sectoral bilateral trade balances, not just on exports, thus resulting in a

Table 2.3 US sectors most affected by US-Taiwan free trade agreement, by output in 2005 (percent)

Increased output		Decreased output	
Sector	Growth	Sector	Growth
Vegetables, fruits, and nuts	0.3	Textiles, apparel, and leather	-0.4
Fishing	0.1	Other crops	-0.1
Other foods	0.1	Processed rice	-0.1
Motor vehicles and parts	0.1	Other manufactures	-0.1
Electrical equipment	0.1		
Other machinery and equipment	0.1		

Source: USITC (2002a).

different ranking. When viewed through this lens, support for an FTA might be expected to come from US motor vehicle and parts producers, service industries, and agriculture. The sectors facing the most import pressure would be textiles, apparel, and leather; metal and metal products; nonvehicle transportation equipment; electronic equipment; the general category of “other manufacturers”; and the chemicals, rubber, and plastic products. Textiles and apparel would suffer the most, as no other US industry comes close to losing \$3.2 billion in trade. This is consistent with the finding shown in table 2.3 that this industry would suffer the largest reduction in output as well.

Table 2.5 shows global trade balance changes, which differ in several ways. Globally net exports of other machinery and equipment would expand by \$249 million compared with gains of only \$2 million in bilateral terms. Global net exports of electronic equipment would expand by \$42 million compared with a \$300 million deficit in bilateral trade. Most dramatically, the services industry would move from the third-biggest gainer to the second-biggest loser in global terms—a shift of more than half a billion dollars. Finally, the \$3 billion textile and apparel loss suffered by the United States bilaterally would be reduced to \$1 billion on a worldwide basis.

The aggregate results of the Chung-Hua study (2002) are broadly similar to those of the USITC, but there are some important differences at the sectoral level.⁴ The Chung-Hua model estimates total welfare gains from

4. The Chung-Hua study estimates four scenarios. Scenario 1 is based on free trade in goods; scenario 2 adds to that a 25 percent mutual reduction in the tariff equivalent of the bilateral barriers to trade in services; scenarios 3 and 4 add to scenario 2 the assumption that there are productivity gains of 0.5 and 1 percent, respectively, in each productive sector in the Taiwanese economy. Except where otherwise specified, the results cited here are for scenario 1, which is the scenario most directly comparable with the USITC study in its methodology and assumptions.

Table 2.4 US sectors most affected by US-Taiwan free trade agreement, by bilateral trade balance in 2005
(millions of 1997 dollars)

Contributors to surplus		Contributors to deficit	
Sector	Trade balance (X-M)	Sector	Trade balance (X-M)
Motor vehicles and parts	441	Textiles, apparel, and leather	-3,187
Other foods	322	Metals and metal products	-629
Services	175	Other transportation equipment	-332
Vegetables, fruits, and nuts	163	Electronic equipment	-303
Meat products	56	Other manufactures	-174
Livestock	28	Chemicals, rubber, and plastic	-141

X = exports

M = imports

Source: USITC (2002a).

a US-Taiwan FTA of \$2.6 billion for Taiwan and \$1.07 billion for the United States. These numbers are substantially larger than the estimate of the USITC, presumably because the Chung-Hua study models eliminate not only tariffs and quotas but also other nontariff barriers. For Taiwan, a substantial portion of the welfare gain is due to improvements in terms of trade, whereas for the United States the Chung-Hua model estimates that the terms-of-trade effect is adverse.

According to the Chung-Hua study, trade would expand under a bilateral FTA, with Taiwan and the United States increasing their exports to one another by \$6.4 billion and \$3.4 billion, respectively. These estimates are almost identical to those of the USITC. US global imports and exports are estimated to increase very slightly, by about one-third and two-fifths of a percentage point, respectively. Despite the slightly larger boost to US exports than imports in percentage terms, this would lead to an additional increase in the deficit of about \$230 million because of the initial large US global trade deficit. The global trade effects for Taiwan would be several times larger, and its positive trade balance in this model would increase by \$340 million.

The Chung-Hua estimate of the FTA's effect on the composition of exports and imports, and thus on the production structure in each country, is also similar to that of the USITC. It predicts that Taiwan's exports of garments would increase by 152 percent or \$3.3 billion, all going to the United States. To achieve this increase, domestic production of garments must rise by 63 percent, which in turn requires an upsurge in textile production of \$1.7 billion or 8.6 percent. On the other hand, the effects on US exports and domestic production structure are quite modest.

Table 2.5 US sectors most affected by US-Taiwan free trade agreement, by global trade balance in 2005
(millions of 1997 dollars)

Contributors to surplus		Contributors to deficit	
Sector	Trade balance (X-M)	Sector	Trade balance (X-M)
Motor vehicles and parts	369	Textiles, apparel, and leather	996
Other foods	335	Services	353
Other machinery and equipment	249	Metals and metal products	296
Vegetables, fruits, and nuts	123	Wood and paper products	84
Electronic equipment	42	Other transportation equipment	79
Coal, gas, etc.	27	Other manufactures	59

X = exports

M = imports

Source: USITC (2002a).

The biggest gain would be in the export and production of autos, estimated to increase by \$1.6 billion and \$1.4 billion, respectively. The Chung-Hua estimates for autos are much higher than those of the USITC study. The largest US losses would be in production of garments and textiles, which would drop by \$1 billion and \$500 million, respectively.

Quantitative Effects Relative to Other FTAs

The economic gains described in the preceding section are modest, even when compared with the expected effects of other FTAs now contemplated by the United States. Table 2.6 presents a range of forecasts for a US-Taiwan FTA alongside forecasts for FTAs with South Korea, Singapore, and New Zealand. Because each of these results was obtained from the GTAP 5 model, they are to some degree comparable, although the scope, initial assumptions, industry disaggregation, and time dimensions may differ.

The most notable and perhaps relevant comparison is with South Korea. Even taking into account the difference in their respective GDPs—\$300 billion for Taiwan versus \$446 billion for South Korea in 1997, the baseline numbers in the GTAP model⁵—the effects of a US-South

5. Both the \$300 billion for Taiwan's 1997 GDP noted here and the \$280 billion for 2002 cited earlier in the text are nominal figures. Despite a modest decline in real GDP in 2001, Taiwan's real GDP in 2002 was substantially higher than in 1997.

Table 2.6 Predicted effects on welfare and trade of US free trade agreements with Taiwan, South Korea, Singapore, and New Zealand

Effect	USITC/ Taiwan		Gilbert/ Taiwan		Chung-Hua/ Taiwan		USITC/ South Korea		Gilbert/ South Korea		Gilbert/ Singapore		Gilbert/ New Zealand	
	Percent	Billions of dollars	Percent	Billions of dollars	Percent	Billions of dollars	Percent	Billions of dollars	Percent	Billions of dollars	Percent	Billions of dollars	Percent	Billions of dollars
Welfare effects														
Total US welfare	0.0	0.20	0.01	0.76	1.07	19.62	0.23	0.03	2.69	0.00	-0.08	0.00	0.02	0.02
Allocative efficiency		0.00		0.11	1.55				-0.17				-0.02	0.01
Terms of trade		0.20		0.65	-0.48				2.86				-0.06	0.01
Total partner welfare	0.3	1.00	0.35	1.04	2.63	3.85	0.69	0.37	1.64	0.43	0.34	0.25	0.16	0.16
Allocative efficiency		0.00		-0.02	1.63				1.74				0.04	0.01
Terms of trade		1.20		1.07	1.00				-0.10				0.30	0.15
Global trade effects														
US exports	0.2	2.40	0.49	4.20	3.20	7.40	0.80	0.78	6.7	0.05	0.43	0.05	0.43	0.43
US imports	0.2	3.20	0.48	5.00	1.0	0.69	12.50	7.10	0.05	0.51	0.04	0.41	0.04	0.41
US trade balance ^a		-0.80			-0.23				-5.10					
Partner exports	2.0	2.80	2.88	3.90	1.75	8.00	3.50	3.57	5.33	0.45	0.57	1.44	0.25	0.25
Partner imports	2.0	2.60	3.71	4.12	2.86	10.60	6.20	5.79	9.18	0.47	0.64	2.13	0.35	0.35
Partner trade balance ^a		0.20			0.34				-2.60					

(table continues next page)

Table 2.6 Predicted effects on welfare and trade of US free trade agreements with Taiwan, South Korea, Singapore, and New Zealand (continued)

Effect	USITC/ Taiwan		Gilbert/ Taiwan		Chung-Hua/ Taiwan		USITC/ South Korea		Gilbert/ South Korea		Gilbert/ Singapore		Gilbert/ New Zealand	
	Percent	Billions of dollars	Percent	Billions of dollars	Percent	Billions of dollars	Percent	Billions of dollars	Percent	Billions of dollars	Percent	Billions of dollars	Percent	Billions of dollars
Bilateral trade effects on US														
Exports to partner	16.0	3.50	29.28	6.60		3.40	54.0	19.20	48.16	14.57	0.97	0.20	17.50	0.47
Imports from partner	18.0	6.60	19.89	7.20		6.40	21.4	10.30	23.39	6.08	6.24	1.42	33.64	0.74
Balance with partner ^a		-3.50						8.90						

a. Negative numbers indicate increased deficit.

Sources: USITC (2002a), Gilbert (2003), and Chung-Hua Institution for Economic Research (2002). John Gilbert generously supplied data for South Korea, Singapore, and New Zealand omitted from his final draft.

Korea FTA far surpass those of such an agreement between the United States and Taiwan. Most significant, a US–South Korea FTA would lead to about \$20 billion in increased exports to South Korea and US welfare gains of that magnitude. The first reason for the difference is that initial South Korean trade barriers are greater—in many cases considerably higher—than Taiwanese barriers in 12 of 18 categories. Second, the size of the South Korean economy is almost half again as large as Taiwan’s. Both these factors are associated with greater potential for gains in allocative efficiency and in welfare from trade creation. Of course, it should be kept in mind that more gains from a particular FTA does not mean that that partner economy is “better.” On the contrary, it may well indicate that the partner was more protected before to the agreement and thus a poorer trading partner that, in turn, is more likely to be positively impacted by liberalization.

Implications of Regional Quantitative Modeling for Taiwan

Do the three studies just summarized adequately capture East Asia’s shifting trade patterns? The region is dynamic, and assumptions vary as to the baseline trends from which the future of Asia will unfold. Models focusing on different questions can help illuminate the context of changing trade in the Asia-Pacific region within which a US-Taiwan FTA would take place.

A GTAP modeling exercise by the Asian Development Bank Institute (ADBI) looks at the impact of Chinese economic development on East Asian trade patterns up to 2020 (Roland-Holst 2002). The ADBI estimates that China’s implementation of its WTO commitments will increase its global exports and imports by \$374 billion and \$257 billion, respectively, by 2020. The increased exports will go primarily to the developed world (25 percent to the United States), while some 28 percent of increased imports will come from Taiwan and South Korea. China’s trade growth in recent years has actually run ahead of the ADBI forecast. For example, it was predicted that China would become the largest importer in the region in 2005, a milestone that China reached in 2003 when its imports for the first time exceeded those of Japan. Similarly, Chinese exports seem almost certain to surpass those of Japan in 2004, a milestone that the ADBI predicted would not occur until 2010.

However, China’s trade growth is transforming global and particularly East Asian trade patterns in ways anticipated by the ADBI. The study accurately predicted that China would simultaneously run structural trade surpluses with the United States and the European Union

and trade deficits with East Asia, particularly Taiwan and South Korea (Roland-Holst 2002, 30).⁶

While the estimated effects of a US-Taiwan FTA analyzed here are based on the GTAP model, the 1997 GTAP baseline protection data in each of the three studies was updated to reflect the WTO commitments of China and Taiwan to lower tariffs and phase out quota restrictions on imports. Nonetheless, increases in trade following China's accession are running far in excess of ADBI projections. Thus it is not clear that the three studies of a possible US-Taiwan FTA adequately reflect the growing role of China in shaping regional trade patterns.

In addition, the USITC study does not analyze two trade arrangements that have the potential to further transform regional trade patterns: ASEAN + China and ASEAN+3 (China, Japan, and South Korea).

How Dependable Is the Quantitative Evidence?

To update the 1997 baseline for measuring trade protection in the GTAP 5 model, the USITC inserted into the model parameters for the lower trade barriers in Taiwan and China required by their WTO accession. Trade barrier data for all other countries and regions remain as in 1997. But other tariff changes that have occurred since 1997 might affect the expected new flows between Taiwan and the United States. The Caribbean Basin Initiative, Andean Trade Preferences Act, and African Growth and Opportunity Act all date from this period, and all pay significant attention to textiles and apparel.

A second shortcoming is that most GTAP models do not estimate the effects of liberalization of trade in services, largely because of the difficulty in estimating the tariff equivalent of the various nontariff barriers that restrict services trade. The USITC study, for example, offers the qualitative judgment that freeing up trade in services would be significant but offers no quantitative estimate. One of the major contributions of the Chung-Hua study is that it models the results of liberalization of trade in services, results that are discussed further in the following chapter.

6. Unlike the European Union and the United States, Japan is in near balance in its trade with China. It is forecast that by 2020 South Korea and Taiwan will see exports to China rise \$73 billion over the baseline, while imports will rise just \$38 billion. ASEAN exports to China also will increase relative to its imports from China.