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Estimates from Gravity and Computable General Equilibrium Models

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Quantitative assessments of the trade expansion and income gains fostered by a US-Pakistan FTA require detailed consideration of the economic structure and multilateral trade patterns of both countries. To carry out this task, we use both gravity and computable general equilibrium (CGE) models. Our gravity model is an augmented version of Andrew Rose's (2004) framework. Whereas Rose analyzed total merchandise trade between multiple partner countries, we use the CGE model to examine disaggregated merchandise trade. We also incorporate more extensive information about regional trade agreements (RTAs) than Rose originally considered. Our CGE model is based on the comparative static framework of world trade and economic activity designed by the Global Trade Analysis Project (GTAP). The GTAP model disaggregates world merchandise trade by sectors and also (unlike the gravity model) covers world trade in services.

The reason for presenting estimates from two models is to increase our confidence in the general tenor of the results. Whereas the gravity model is grounded in the empirical tradition of trade analysis, the CGE model rests foremost on theoretical foundations. Thus each model serves as a check on the other. The basic features and results of our gravity and CGE models are described in the sections that follow. Appendix B provides technical details on the two models.

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Gravity Model: Construction and Results

With the proliferation of preferential trading arrangements in the 1990s, the gravity model has become a widely used tool for analyzing the consequences of bilateral and regional trade agreements.[1] The basic gravity model evaluates thousands of two-way bilateral trade flows, measured in a common currency (adjusted for inflation), against the gravitational "mass" of explanatory variables describing the characteristics of bilateral trading partners. The "core" variables are distance and joint real GDP.[2] Nearly all gravity models find that two-way trade between countries is significantly greater the larger the combined GDP and the shorter the distance between them. Additional explanatory variables are specified as well, and these are of greatest interest as they show how much two-way trade expands or contracts from the quantity predicted by the basic core variables on account of the partners' institutional or policy features. For instance, trading partners that share a common border, a common language, or a common currency are typically found to enjoy significantly greater mutual trade.

To analyze RTAs, a dichotomous (0, 1) explanatory variable—often called a "dummy" variable—is introduced to represent preferential arrangements, individually or on a combined basis. If the coefficient on the dummy variable is positive and significant, then the RTA is judged to expand trade between the partners. The extent of trade expansion is usually measured in percentage terms, which can be derived from the estimated coefficient on the dummy variable. Given the log-linear specification of the gravity model regression equation,[3] the impact of an FTA on bilateral trade can be computed in percentage terms as $100*[exp(b_{rta})–1.00]$. In this expression, b_{rta} is the estimated coefficient for the dummy variable representing the presence of an RTA, and $exp(b_{rta})$ is

1. Greenaway and Milner (2002) provide an excellent introduction to and review of the recent literature on the gravity model and its econometric applications for assessing the trade and other consequences of preferential trading arrangements among regional trading partners.

2. A third "core" variable is joint GDP per capita. A higher joint GDP per capita figure implies a smaller joint population figure (for a given joint GDP level). Less combined population tends to depress the bilateral level of trade; hence the coefficient on joint GDP per capita is frequently negative. However, some gravity model investigators consider joint GDP per capita to serve as a proxy for accumulated physical and human capital, with the expectation that the coefficient on this variable in the regression equation would be positive.

3. In a log-linear regression equation, the dependent variable (here, two-way bilateral trade) is expressed in logarithmic terms, whereas some independent variables (notably the discrete dummy variables) are expressed simply as linear numbers (e.g., 0 or 1), while others (notably the continuous variables, such as distance or joint GDP) are expressed in logarithmic terms.

the value of the natural number e raised to the exponent b_{rta}. For example, if the coefficient b_{rta} is 0.33, then the value of $exp(b_{rta})$ is 1.39, and the percentage expansion in trade is estimated as 100*[1.39–1.00], which equals 39 percent.

Analytical Framework

We investigate the potential for expansion of US-Pakistan trade under an FTA following the approach of Jeffrey Frankel (1997) and Inbom Choi and Jeffrey Schott (2001), among others, using the general framework of the Rose (2004) gravity model. Our approach represents the existing RTAs on a combined basis, circa 2000, as reported to the World Trade Organization (WTO). It also tries to account for the possibility that the existing level of US-Pakistan trade is significantly greater or smaller than the level predicted by the basic explanatory variables of the gravity model in the absence of an FTA. It does this in two ways described below.

Our econometric results are based on bilateral trade flows worldwide from 1962 to 1999, compiled by Robert Feenstra and colleagues (2005). Those data were disaggregated according to the 4-digit Standard International Trade Classification (SITC), whereas for the present analysis they were aggregated to the 1-digit SITC level and deflated by the US consumer price index. The data were then concorded, by year and country pair, to the extensive set of explanatory variables compiled for the Rose (2004) gravity model.[4] The "core" explanatory variables in the Rose dataset include distance between trading partners, joint real GDP, and joint real GDP per capita. The Rose dataset also includes a number of country-specific variables, such as landlocked or island status, language, colonization, and dates of independence. In all, the dataset constructed for the present analysis, using the augmented Rose gravity model, entails nearly 940,000 observations, covering bilateral trade for about 61,000 combinations of commodities and pairs of trading countries.[5]

To the core explanatory variables are added dummy variables representing bilateral, regional, and other preferential trading arrangements such as the generalized system of preferences (GSP).[6] Whereas Rose

4. The regression variables constructed from the Feenstra et al. and Rose datasets are described in appendix table B.1.

5. Notwithstanding its large size, the combined Feenstra et al. and Rose dataset has some gaps, and excludes Taiwan and some centrally planned economies because of holes in the two datasets.

6. Under the GSP, a number of advanced countries extend preferences to less developed countries on a nonreciprocal basis. The GSP programs of major industrial and other countries are monitored by the UN Conference on Trade and Development (UNCTAD), including through a series of manuals describing the individual programs. See UNCTAD (2004a).

(2004) treated RTAs on a combined basis, covering 10 largely multilateral RTAs around the world,[7] we utilize official information about trade agreements notified to the WTO (Crawford and Fiorentino 2005) to consider 60 bilateral and regional trade agreements spanning the gravity model estimation period 1962–99.[8] The RTAs are represented by three independent RTA variables covering: (1) the European Union itself and 8 RTAs to which it is a party, plus 2 RTAs to which the United States is a party (the US-Israel FTA and the North American Free Trade Agreement [NAFTA]); (2) 10 RTAs organized by other high-income countries (HICs); and (3) 39 RTAs organized solely among middle- and low-income countries (MICs and LICs).[9]

The treatment of recent bilateral and regional trade agreements enables estimation of different gravity model coefficients for the impact on bilateral trade, according to whether the European Union or the United States is a party, whether the pact includes other (smaller) high-income countries, or whether the pact is solely between middle- and/or low-income countries. There are two reasons for these distinctions: first, a pact that includes either of the two giant economies (the European Union or the United States) could plausibly inspire a bigger percentage change in trade than one that includes a smaller high-income economy, such as Australia or Sweden; second, a group that includes only middle- or low-income countries might have more emphasis on diplomatic accommodation than economic liberalization, and thus might exert a smaller percentage impact on trade.

In our calculations, two variables representing US-Pakistan trade integration and openness are specified in addition to Rose's set of explanatory variables. For the first variable, actual trade integration between Pakistan and the United States is captured by a dummy (0, 1) variable for trade between the two countries, as if an FTA were already in place. For the second variable, "openness" is measured by a separate dummy variable for each country that takes the value of 1 each time Pakistan (or the

7. The Rose dataset includes dummy variables with a value of 1 for 10 prominent RTAs: the Association of Southeast Asian Nations (ASEAN), European Union, US-Israel FTA, North American Free Trade Agreement (NAFTA), Caribbean Community (Caricom), Agreement on Trade and Commercial Relations between the Government of Australia and the Government of Papua New Guinea (Patcra), Australia–New Zealand Closer Economic Relations Trade Agreement (Anzcerta), Central American Common Market (CACM), South Pacific Regional Trade and Economic Cooperation Agreement (Sparteca), and the Southern Cone Common Market (Mercosur).

8. According to Schott (2004a), by May 2003 some 155 bilateral and regional trade agreements had been notified to the WTO under Article 24 of the General Agreement on Tariffs and Trade (GATT).

9. The majority of the agreements included in the third RTA variable are bilateral and regional trade agreements among small developing countries and among the newly independent states of Eastern Europe. See Crawford and Fiorentino (2005) and appendix B.

United States) is a trading partner with any other country. The estimated coefficients for the openness variables suggest the degree to which either country's trade with the world is greater or less than the norm established both by the "core" gravity model variables and by other variables on the right-hand side of the gravity equation.

Finally, in light of concerns about the adverse impact of corruption on commercial ties, we have added an explanatory variable representing the sentiments of foreign firms about doing business not only in Pakistan but also in up to 50 other countries worldwide, as published since 1995 by Transparency International (TI). Specifically, we have added a "joint corruption perceptions" (shown in tables 8A.1 and 8A.2 as "joint TI index") variable to the Rose gravity model dataset. This variable is formed by the product of logarithmic TI scores for business integrity in each country covered by the TI published data for 1995–99. In this formulation of the model, the greater the perceived integrity of business transactions in the two trading countries, as measured by a higher joint TI index of integrity rankings, the greater the expected level of their mutual trade.[10]

Results from the Gravity Model

Tables 8A.1 and 8A.2 present the regression results for overall trade (SITC 0 through 9) and for trade by major commodity categories—food, beverages, and tobacco (SITC 0 and 1); raw materials (SITC 2 and 4); mineral fuels and lubricants (SITC 3); and manufactures (SITC 5 through 8). Regression coefficients are presented for the overall period 1962–99 and for two subperiods, 1990–99 and 1995–99, which correspond to the decade of the 1990s and the post–Uruguay Round period respectively. Finally, the gravity model estimates are presented both with and without the US-Pakistan trade integration and openness explanatory variables. As it turns out, against the backdrop of bilateral trade flows worldwide, the presence or absence of these additional variables makes little difference to the other coefficients.

The regression results for both total and disaggregated trade mirror the widely reported empirical robustness of the gravity model. In particular, the core explanatory variables, led by distance, joint real GDP, and joint real GDP per capita, bear the anticipated signs and are generally significant at high levels. Thus, for instance, bilateral trade is positively

10. Given the limited number of countries covered by the Transparency International rankings, bringing the joint TI index as an explanatory variable into the Rose gravity model cuts in half the number of observations available for estimating the model's parameters for the subperiod 1995–99. As seen in tables 8.1 through 8.3, adding the joint TI index also requires dropping two explanatory variables (*common country* and *currency union*) from the estimating equation for 1995–99, because these variables are collinear in the reduced sample, and this creates econometric problems.

related to the joint GDP of the partner countries and negatively related to the distance between them. Similarly, countries sharing a common border tend to trade significantly more with one another, whereas landlocked countries tend to trade significantly less than other pairs of countries. The influence on bilateral trade of a higher joint TI index, showing greater integrity in both domestic and international business dealings, is widely found to be positive and significant.[11]

The overall explanatory power of our gravity model, using disaggregated bilateral trade data from the Feenstra et al. dataset (R-squared generally about 0.30–0.40), is appreciably lower than that found by Rose (2004) using aggregate bilateral trade data (R-squared 0.50–0.60). An exception, however, is the impressive explanatory power of the regression results in table 8A.2 for manufactures (R-squared 0.50 and higher).

Gravity model studies by Rose (2004) and previous investigators, using aggregate bilateral trade data, frequently report estimated coefficients near unity for RTA variables representing about 10 "strong" RTAs combined. By contrast, in our analysis the estimated coefficients for our three RTA variables (distinguished by the character of each partner country) are generally less than 0.50, except the coefficients for the RTAs in which the European Union and the United States are partners in the post–Uruguay Round period (1995–99). For the EU and US RTAs in the late 1990s, the estimated RTA coefficients substantially exceed 0.50, both for total trade and for trade in agricultural and manufactured goods (the coefficients are especially high for trade in manufactures). Interestingly, the coefficient estimates for the middle- and low-income country RTAs variable are widely negative and significant throughout the 1990s, suggesting that these agreements are not robust in economic terms. It is also worth noting that the estimated coefficients for EU and US RTAs are sometimes substantially higher than the estimated coefficients for the other HIC RTAs variable, especially for trade in manufactures in the post–Uruguay Round period.

Separate regression results (not reported) that include a variable for the US-Israel FTA and NAFTA find an estimated coefficient for these two RTAs that is substantially higher—by more than two to one—than the estimated coefficient for the EU RTAs variable.

The openness variable of the gravity model reports the extent to which Pakistan's actual trade deviates from the levels predicted by the standard variables in the gravity model for an imaginary country with almost identical conditions (e.g., the same GDP, the same distance from markets, the same common borders, etc.). The only difference is that the "imaginary Pakistan" trades with its partners to the average extent pre-

11. Mineral fuels are an exception, reflecting the strong cross-country correlation between oil wealth and corruption.

dicted by all the right-hand variables in the gravity equation except the openness term.

The openness term (–0.93 for the whole period) indicates that Pakistan's actual trade falls below the average benchmark established by the model both for total trade and for trade in individual sectors. This suggests that protection and other "trade resistance" factors are especially strong in Pakistan. The model indicates that Pakistan's total trade is 61 percent less than the average benchmark. The openness coefficient for individual sectors gives similar results. Put another way, if Pakistan were to achieve the average level of openness of all countries (a coefficient of 0.00), its commerce with the world would more than double. By contrast, the regression coefficients for the US openness variable are uniformly positive and statistically significant.

Estimated coefficients for the US-Pakistan trade integration variable on a sector-by-sector basis (table 8A.2) are significant mainly for manufactured products, indicating that bilateral trade may already exceed the international norm for this important trade category.[12] Further, Pakistan's negative openness term suggests that US exports to Pakistan would grow more rapidly than Pakistani exports to the United States under the market-opening influence of a US-Pakistan FTA. The trade integration coefficients also suggest that nonmanufactures, especially agricultural products and raw materials, would be prime candidates for trade expansion in both directions. Other evidence, reported below, suggests that there is also considerable room for expanded trade in manufactures between Pakistan and the United States.[13]

The implications of the highly significant estimates for the joint TI index deserve additional consideration. The mean value of this explanatory variable is substantially lower for bilateral trade involving Pakistan (2.34) than for trade involving other country pairs (3.19), implying that poor business practices in Pakistan significantly reduce its trade with the United States and other countries. Based on the joint TI index coefficient estimate of 0.41 for overall trade during 1995–99 (table 8A.1), the "integrity burden" on Pakistan's trade (compared with the world norm) can be calculated on the order of 35 percent [100*(0.41)*(3.19–2.34)]. In other words, Pakistan's poor business practices result in 35 percent lower trade for the country than would otherwise be the case. If the US-Pakistan FTA contributes to better business practices in Pakistan, ultimately raising

12. The evidence is mixed on this point, however, in that the US-Pakistan integration variable is positive but insignificant for trade in manufactures during the post–Uruguay Round period.

13. Results of the CGE model support this discussion, as they also project that a US-Pakistan FTA will lead to faster growth rates for bilateral agricultural trade as well as for US exports. However, unlike what is argued in this paragraph, results from the CGE model do not show that trade expansion in agriculture will occur in both directions.

Table 8.1 Bilateral trade expansion predicted by gravity model coefficients for EU and US RTAs (percent)

	1962–99	1990–1999	1995–99	Simple average
Total trade (SITC 0-9)	13	22	95	43
Disaggregated trade				
Agriculture (SITC 0 and 1)	17	13	84	38
Raw material (SITC 2 and 4)	6	23	60	30
Fuels (SITC 3)	0	0	0	0
Manufacturing goods (SITC 5-8)	26	40	156	74

them to the norm of other countries, then Pakistan might instead enjoy an "integrity dividend" of 35 percent in its trade—not only with the United States but also with other trading partners.

Table 8.1 reports the bilateral trade expansion effects implied by the significant coefficient estimates for the EU and US RTAs variable in tables 8A.1 and 8A.2.[14] The simple average column gives equal weight to the coefficients estimated for each of the overlapping periods. Based on the simple average percentage expansion for total trade and for the four sectors taken together, it appears that overall US-Pakistan merchandise trade might expand, under an FTA, by a central estimate of about 43 percent, holding all other factors constant. Two-way trade in agriculture and manufactures might expand by about 38 percent and 74 percent, respectively. Based on data for the post–Uruguay Round period (1995–99), the impact for Pakistan of an FTA with the United States or the European Union as a partner might be significantly larger: a 95 percent increase for total trade, an 84 percent gain for agricultural trade, and a boost of 156 percent for trade in manufactures.

If the estimation results cited previously—those incorporating the US RTAs variable independently as an additional explanatory variable—are to be believed, then the expansion of US-Pakistan trade in agriculture and especially in industrial and other manufactured goods would be well in excess of 100 percent. Such an expansion of US-Pakistan trade in manufactures may seem implausible, but the figure accords with the negative

14. The figures in table 8.1 are based on the regressions that include the dummy variables for US-Pakistan trade integration and openness. However, as mentioned, the dummy variables make very little difference to the RTA coefficients. In table 8.1, the highly implausible negative estimated values for the coefficients of the EU and US RTAs variable that occur in the regressions for trade in fuels are treated as zero.

openness term estimated for Pakistan. Moreover, a great deal of bilateral trade expansion could be induced by improved business practices and by a leap in bilateral foreign direct investment, as suggested in chapter 7.[15]

CGE Model: Construction and Results

CGE models, based on general equilibrium principles, are built with the objective of turning abstract theories into practical tools. A number of features distinguish CGE models from other widely used frameworks for trade policy analysis (especially gravity models). In particular, the actions of economic agents are modeled explicitly through utility and profit maximizing assumptions, while economywide resource and expenditure constraints are rigorously enforced. Because they link markets into a single system, CGE techniques effectively capture feedback and flow-through effects induced by policy changes. Economic distortions often have repercussions beyond the sector in which they occur and CGE models are designed to capture these indirect effects. The models are particularly well suited to the examination of free trade arrangements, where multisector liberalization is undertaken in at least two economies simultaneously and where adverse consequences of discriminatory preferences may well arise (Panagariya 2000).

Against these significant advantages, CGE models are highly data intensive and subject to several uncertainties: How should equations be specified, what parameters should be used, and how should the FTA experiment be designed? Because CGE simulation results are sensitive to these decisions, they should be viewed cautiously. Our CGE model is based on the GTAP framework, a publicly available model that is widely accepted and used. The GTAP model is a multiregion, multisector model that assumes perfect competition and constant returns to scale. Other CGE frameworks, sometimes characterized as "dynamic" models, assume that countries enjoy increasing returns to scale as they specialize, and that monopolistic markups are eroded by trade liberalization. They may also assume that freer trade spurs investment and productivity. These additional assumptions typically result in larger calculated trade and economic gains as a consequence of removing barriers. By contrast, the results reported here, using a comparative statics framework, are probably conservative.

15. Ignoring the other coefficients, and focusing on post–Uruguay Round estimation results, the model suggests that overall US-Pakistan trade might grow by 184 percent, led by expansion of trade in manufactures (232 percent) and agriculture (306 percent). Even these results are plausible in light of Pakistan's negative openness term.

Experimental Design

The proposed FTA between Pakistan and the United States is first simulated independently of the existence of other actual and potential FTAs. The results thus reflect the estimated effect of the proposal in isolation from any liberalization that occurred after the reference year for the GTAP6 database (2001) or that might be on the drawing boards.

We then consider an all-partners experiment, in which the proposed US-Pakistan FTA is implemented simultaneously with a selection of other "new" US FTAs (those ratified after the GTAP6 database was assembled) and prospective US FTAs that might be negotiated in 2006 and 2007. The "new" US FTAs considered in the model are Australia, the Central American Free Trade Agreement–Dominican Republic (CAFTA-DR), Chile, Morocco, and Singapore; the prospective FTAs (in addition to the US-Pakistan FTA) are Korea, Malaysia, the Southern African Customs Union (SACU), Switzerland, and Thailand.[16]

In all cases, the arrangements are assumed to be implemented "clean," meaning that all import tariffs are eventually reduced to zero by the participating economies, on a bilateral preferential basis. Services trade barriers are also eliminated.[17] However, all other tariffs and barriers (i.e., those applied to nonparticipating economies) are left in place. In other words, possible liberalization negotiated in the WTO Doha Development Round is not taken into consideration. Moreover, in the experiment with all free trade areas, it is assumed that the FTAs are implemented only with the United States; preferential liberalization among the proposed partner regions is not considered.

To provide a benchmark for the implications of bilateral free trade areas, we also consider unilateral trade reform scenarios for Pakistan and the United States. In these scenarios, each economy is assumed to unilaterally remove all tariffs on a nondiscriminatory basis.

All of the simulations are run as exercises in comparative statics. This entails "before" and "after" pictures, allowing all the agreed bilateral liberalization to take place and all industries to adjust, but with no attempt to profile the time frame of adjustment. The factor market "closure" conditions allow full mobility of capital and labor across domestic industries. In other words, all capital and labor (both skilled and unskilled) are assumed fully employed once the adjustment process is complete. The im-

16. The United States has also ratified an FTA with Jordan and has signed an FTA with Bahrain, which is pending ratification. The GTAP6 database does not separately identify these two countries. In September 2005 Ambassador Robert Portman mentioned Egypt, Korea, Malaysia, and Switzerland as possible FTA partners in the near term. Since the GTAP6 database does not separately identify Egypt, that country is not shown in our tables.

17. Estimates of the extent of barriers to services were obtained from Dee, Hanslow, and Phamduc (2003).

plicit time frame is the long run, typically regarded as an adjustment period of about 10 years, although the adjustment path is not directly modeled. Land is treated as imperfectly mobile across agricultural activities, while other natural resources are assumed committed to individual industries as specific factors.

Results from the CGE Model

Estimates of the overall effect of the proposed agreement are presented in table 8A.3. The model predicts dramatic increases in the volume of bilateral trade between the United States and Pakistan, with US exports of goods and services to Pakistan increasing by 89 percent, and Pakistani exports of goods and services to the United States increasing by approximately 36 percent. Although this seems to indicate a significant imbalance, it is worth remembering that US exports amount to only 8 percent of Pakistan's total import bill. Conversely, the United States buys almost 25 percent of Pakistan's exports. Therefore, if these estimates are correct, the US-Pakistan FTA will not impose much pressure on Pakistan's balance of payments. In fact, Pakistan will still enjoy a trade surplus with the United States.

From this perspective a doubling of Pakistan's imports from the United States does not look all that dramatic—although it could present challenges for specific sectors. It might be thought that the reason for the dramatic increase in predicted US exports is that Pakistan's imports from other countries would decline once US firms enjoy a preferential tariff structure, an effect known as "trade diversion." But trade diversion is not predicted to occur with Pakistan, because the relatively large welfare effect for the country results in greater income, which is spent on imports from all countries, including countries that are not parties to an FTA with Pakistan. This income effect is large enough to outweigh the price effects of tariff preferences.

The overall welfare effects of the agreement are estimated to be small and negative for the United States but positive and substantial for Pakistan.[18] The unilateral benchmark results give some indication of why the outcomes differ for Pakistan and the United States. The United States is already a very open economy, and hence has little to gain in terms of efficiency from further liberalization. However, in the static CGE framework, the United States loses in welfare terms (although by only a small fraction of GDP) from unilateral reform due to an adverse shift in the terms of trade. Because Pakistan's market is relatively small, there are limited

18. The welfare effects presented in table 8.3 are measured as the equivalent variation in income. This is essentially the change in household income that is equivalent to the estimated change in GDP, at constant consumer prices.

opportunities to counter an adverse terms-of-trade shift with increased market access. In a CGE model with "dynamic" features, positive income effects would likely overshadow the adverse terms-of-trade effects. Some of the dynamic features not included in our static CGE model are enhanced competition and reduced markup margins following the elimination of trade barriers, and induced productivity in the competing domestic industries.

The welfare effects of the US-Pakistan FTA are presented in more detail in table 8A.4, for all regions in the model. Many economies suffer very small welfare losses as a consequence of the agreement, including the Central American countries, South Korea, the Philippines, and, notably, the other economies of the South Asian region (India, Bangladesh, and Sri Lanka). In addition, "preference dilution"—the phenomenon by which other FTA partners lose the benefits of preferential access to the US market when Pakistan enters into free trade with the United States—does not seem to be a significant factor for US partners, although there is a slight effect for Mexico and CAFTA-DR members. As a proportion of regional GDP, all welfare effects on nonmembers are very minor (less than 0.1 percent of GDP). Under unilateral reform, by contrast, nonmembers generally benefit.

Table 8A.5 presents details on changes in patterns of overall trade by region. The effects of the US-Pakistan FTA on nonmember exports to the United States are very small and generally negative. For Pakistan, however, the effects are more significant and positive, especially for the economies of East and Southeast Asia. This seemingly paradoxical effect reflects income expansion, as discussed above.

The CGE model allows us to predict which sectors are most likely to be affected by the proposed agreement. Table 8A.6 presents the estimated changes in the total dollar value of bilateral and total exports by economic sector. The simulations predict very large gains in US exports of some major items—processed food, chemicals, machinery and equipment (including electronic equipment), and some transport equipment. Rapid trade growth, but from a small base, is also predicted for clothing, fabricated metal products, and motor vehicles. Several of these are accorded high levels of protection in Pakistan: The GTAP6 database records a 25 percent tariff on clothing, 21 percent on fabricated metal products, and 44 percent on motor vehicles.[19] From the perspective of overall US industry exports, none of the changes are large enough at the bilateral level to have a significant impact on total exports.

For Pakistan, the bilateral export gains are smaller and concentrated in textiles and clothing. Reflecting the comparatively large role that the

19. While Pakistan's applied tariffs have generally declined since 2001, tariffs in these sectors remain high. Earlier chapters in this report discuss recent changes in Pakistan's tariff schedule.

United States plays in Pakistan's bilateral trade profile, these translate into significant overall trade expansion in clothing. Pakistani exports of vegetables and fruits are also expected to grow but from a low base. Other sectors decline, indicating that the reform leads to significant reallocation of production resources, and not merely changes in the regional composition of trade.

The predicted changes in bilateral trade in services are positive but relatively small: export gains of 15 percent for the United States and 7 percent for Pakistan. Moreover, total US exports of services are predicted to decline, indicating that the increase in US service exports to Pakistan represents trade diversion. The model suggests two possibilities for the small changes. The first is that the trade flow barriers estimated by Dee, Hanslow, and Phamduc (2003) are relatively small (about 5 percent). The second is that other types of barriers (capital taxes and output taxes) are not region specific in GTAP, so it is possible that data and conceptual limits lead to an understatement of the potential for expansion of bilateral services trade.

The estimated changes in output volume by sector are presented in table 8A.7. These figures are useful for understanding the possible extent of structural adjustment that might be required under the agreement. In the United States, all sectors are only marginally affected by the proposed FTA. This suggests that US adjustment issues in response to the US-Pakistan FTA would be quite modest. In Pakistan the adjustments are likely to be more substantial, with significant output declines predicted in coal, oil, and gas, leather products, chemicals, and other manufactures. However, output gains are estimated in clothing, motor vehicles, and services. Overall, the FTA output adjustments seem manageable, especially when compared with the unilateral benchmark calculations, which suggest some very large adjustments.

A final issue of concern is how the benefits of the proposed FTA are likely to be spread across society. The GTAP framework deals with this issue in the Ricardian tradition, by estimating changes in the rewards to the primary factors (capital, labor, land) used in the production process. The estimated percentage changes in real factor rewards are presented in table 8A.8. In the United States, all effects are relatively minor. In Pakistan, however, important income changes are predicted. In particular, the model predicts a decrease in the returns to natural resources, suggesting that Pakistani farming households are likely to come under pressure from increased US agricultural exports. The returns to labor, both skilled and unskilled, also appear to fall. However, the returns to capital rise by a larger magnitude than the estimated fall in returns to labor.

Because the United States has recently signed several new FTAs, and is considering others, it is important to consider how those FTAs would affect our simulation outcomes. We consider a scenario in which the proposed US-Pakistan agreement is implemented simultaneously with other

current and prospective FTAs that might enter into force by 2007, with the United States as the FTA hub. As mentioned above, the current US FTAs are with Australia, CAFTA-DR, Chile, Morocco, and Singapore; prospective partners for a US FTA are Korea, Malaysia, SACU, Switzerland, and Thailand.[20] The results are presented in tables 8A.9 through 8A.13.

The main result from table 8A.9 is that the presence of the other FTA partners slightly restrains expansion but otherwise does not substantially alter the predicted changes in bilateral trade between the United States and Pakistan. However, there are substantial increases in total US trade, reflecting the broader array of trading opportunities that arise under the hub formation. Similarly, while the overall welfare effect is only slightly reduced for Pakistan, the benefits are much greater for the United States from multiple FTAs owing to terms-of-trade improvement. Even so, the gains remain a very small fraction of US GDP, reflecting both low initial US barriers to trade and the relatively small economic size of its current and prospective FTA partners.

Table 8A.10 shows the estimated regional welfare effects. Under the multiple FTA scenario, the effects on certain countries are magnified, especially for the NAFTA partners, Western Europe, Japan, and China. The negative effects on nonmembers remain small in proportion to their GDP levels.

The regional trading pattern estimates in table 8A.11 indicate that, when the US-Pakistan FTA is considered in conjunction with other FTAs, several countries experience a loss of exports to the United States. This is particularly true for countries that are not US FTA partners. Moreover, CAFTA-DR and Morocco lose exports to Pakistan, because the hub-spoke structure does not eliminate barriers between Pakistan and other US partners, such as CAFTA-DR and Morocco. In our earlier discussion of the effects of a US-Pakistan FTA on third countries that do not have preferential access to the US market, we identified Bangladesh, India, and Sri Lanka as countries that might be adversely affected by a US-Pakistan bilateral FTA. It is worth highlighting that, when all US bilateral FTAs are considered, the impact on these countries is significantly larger than when a US-Pakistan FTA is considered in isolation.

While estimated changes in the sectoral patterns of trade and production (tables 8A.12 and 8A.13) are not significantly different from those already discussed (tables 8A.6 and 8A.7), there are some differences in the volume of total US trade, especially in processed rice, textiles and clothing, and other manufactures. However, tables 8A.12 and 8A.13 indicate that a large fraction of the projected trade changes are redirection, and that production changes remain relatively small, with the exception of grains and processed rice.

20. Egypt is also a prospective FTA partner but is not currently available in the GTAP database.

Summing Up

The quantitative results from the gravity and CGE models presented in this chapter offer two useful views of the economic prospects of a US-Pakistan FTA. The views concur in some respects that deserve emphasis. Importantly, the estimates from the two models concur in suggesting that an FTA between Pakistan and United States would significantly expand trade between the two countries. The overall gain in mutual trade is conservatively estimated at about 43 percent by the gravity model and at between 89 percent (US exports to Pakistan) and 36 percent (Pakistan exports to the United States) by the CGE model (averaging an increase of about 60 percent in bilateral two-way trade). In addition, both models agree that the expansion in bilateral trade would be focused in agriculture and manufactures. Improved business practices in Pakistan, in concert with the proposed US-Pakistan FTA, might further expand Pakistan's overall trade by as much as 35 percent, not only with the United States but also with other major trading partners.

The general equilibrium estimates of the GTAP model provide additional insights. The CGE model finds no improvement in overall economic welfare for the large US economy, but an appreciable improvement for Pakistan, estimated at 1.5 percent of GDP per annum. It also points to particular sectors in both countries that would benefit from the expansion of bilateral exports. These include grains, processed foods, chemicals, machinery and equipment (including electronic equipment), and other transport equipment in the United States, and textiles and clothing in Pakistan.

Adverse spillover effects arising from trade diversion under the hypothesized US-Pakistan FTA are small. Effects of appreciable magnitude are confined mainly to the Central American economies, Korea, the Philippines, and certain economies in South Asia (principally Bangladesh, India, and Sri Lanka). In all cases, however, the adverse impacts are minor (less than 0.1 percent of GDP).

Finally, the results of the GTAP model suggest that liberalization of services trade between Pakistan and the United States would not lead to substantial economic gains for either country. This result seems at odds with the thrust of "deeper integration" under other US FTAs and, more generally, the wave of RTAs worldwide. An explanation for this result may lie in the still elementary and underdeveloped framework of the domestic and international services economy in the GTAP model. It may also lie in the model's absence of more sophisticated dynamic linkages between foreign direct investment and international trade in both goods and services.

Appendix 8A

Table 8A.1 Gravity model estimates for total trade without and with US-Pakistan trade integration and openness, 1962–99

	1962–99		1990–99		1995–99	
Variable	**Without**	**With**	**Without**	**With**	**Without**	**With**
Constant	–18.89***	–18.03***	–7.18***	–6.15***	–11.53***	–10.12***
Distance	–0.79***	–0.81***	–0.77***	–0.80***	–0.77***	–0.79***
Joint GDP	0.73***	0.73***	0.54***	0.53***	0.64***	0.63***
Joint GDP per capita	–0.07***	–0.08***	–0.26***	–0.27***	–0.41***	–0.41***
Common language	0.17***	0.12***	0.21***	0.14***	0.22***	0.15***
Common border	0.50***	0.49***	1.04***	1.01***	1.11***	1.09***
Landlocked	–0.18***	–0.19***	–0.51***	–0.52***	–0.40***	–0.42***
Island	0.10***	0.08***	0.34***	0.34***	0.40***	0.43***
Land area	–0.12***	–0.13***	–0.07***	–0.08***	–0.05***	–0.07***
Common colonizer	–0.07**	–0.01	–0.12***	–0.03	0.00	0.09
Colony	0.73***	0.73***	0.30*	0.30*	0.18	0.18
Ever a colony	1.71***	1.77***	0.98***	1.06***	0.76***	0.85***
Common country	0.24	0.21	–0.65	–0.75	(dropped)	(dropped)
Currency union	0.81***	0.79***	1.54***	0.66***	(dropped)	(dropped)

GSP	–0.10***	–0.10***	0.30***	0.27***	0.05	0.06**
EU and US RTAs (11)	0.12***	0.12***	0.20***	0.20***	0.65***	0.67***
Other HIC RTAs (10)	0.24***	0.24***	0.33***	0.34***	0.35***	0.37***
MIC and LIC RTAs (39)	0.54***	0.55***	–0.20***	–0.12***	–0.28***	–0.18***
Joint TI index					0.45***	0.41***
US-Pakistan trade		1.23**		0.55		–0.27
US openness		1.48***		1.47***		1.42***
Pakistan openness		–0.93***		–0.92***		–1.00***
R-squared	0.40	0.41	0.34	0.35	0.40	0.41
Observations (thousands)	940	940	263	263	64	64
Groups (thousands)	61	61	44	44	22	22

***, **, * indicate that the coefficients are statistically significant at the 99, 95, and 90 percent levels, respectively.
GSP = generalized system of preferences
HIC, MIC, LIC = high-, middle-, low-income countries, respectively
RTA = regional trade agreement
TI index = Transparency International's corruption index

Notes: Table shows estimates for total trade in all commodities and manufactures (Standard International Trade Classification, SITC 0 through 9). Regressand is log real trade. Distance, joint GDP, joint GDP per capita, land area, and joint TI index are measured in log terms. Estimated year effects are not reported. Numbers in parentheses indicate how many RTAs are covered by the separate RTA variables. Groups are numbers of country pair–commodity combinations for which trade exists in the data sample.

Source: Authors' calculations based on generalized least squares estimation of the Rose (2004) gravity model with random effects, using a combined version of the Rose (2004) and Feenstra et al. (2005) datasets.

Table 8A.2 Gravity model estimates by major commodity categories without and with US-Pakistan trade integration and openness, 1962–99

	Food, beverages, and tobacco (SITC 0 and 1)					
	1962–99		1990–99		1995–99	
Variable	**Without**	**With**	**Without**	**With**	**Without**	**With**
Constant	–13.62***	–12.61***	–3.75***	–2.69***	–7.09***	–5.66***
Distance	–0.66***	–0.68***	–0.62***	–0.65***	–0.61***	–0.63***
Joint GDP	0.59***	0.58***	0.41***	0.41***	0.46***	0.45***
Joint GDP per capita	–0.11***	–0.12***	–0.23***	–0.24***	–0.30***	–0.30***
Common language	0.22***	0.16***	0.22***	0.15***	0.27***	0.21**
Common border	0.58***	0.57***	1.07***	1.05***	1.14***	1.11***
Landlocked	–0.23***	–0.25***	–0.48***	–0.50***	–0.44***	–0.47***
Island	0.08**	0.06	0.31***	0.30***	0.32***	0.36***
Land area	–0.06***	–0.08***	–0.03***	–0.05***	0.01	–0.01
Common colonizer	–0.15**	–0.08	–0.18*	–0.10	0.04	0.15
Colony	0.49***	0.50***	0.55	0.54	0.44	0.44
Ever a colony	2.08***	2.15***	1.28***	1.36***	1.02***	1.11***
Common country	0.98	0.95	–0.70	–0.80	(dropped)	(dropped)
Currency union	0.82***	0.80***	1.92***	1.03*	(dropped)	(dropped)
GSP	–0.03***	–0.03***	0.39***	0.36***	0.21***	0.22***
EU and US RTAs (11)	0.15***	0.16***	0.11***	0.12***	0.59***	0.61***
Other HIC RTAs (10)	0.32***	0.32***	0.36***	0.37***	0.41**	0.42**
MIC and LIC RTAs (39)	0.31***	0.32***	–0.27***	–0.20***	–0.35***	–0.26***
Joint TI index					0.41***	0.38***
US-Pakistan trade		0.64		–0.52		–1.40
US openness		1.76***		1.51***		1.48***
Pakistan openness		–1.06***		–0.94***		–1.12***
R-squared	0.32	0.33	0.28	0.29	0.36	0.37
Observations (thousands)	194	194	53	53	13	13
Groups (thousands)	12	12	9	9	4	4

Raw materials (SITC 2 and 4)						
1962–99		1990–99		1995–99	
Without	With	Without	With	Without	With
–16.62***	–16.04***	–6.19***	–5.53***	–9.46***	–8.70***
–0.58***	–0.59***	–0.48***	–0.50***	–0.54***	–0.55***
0.67***	0.67***	0.41***	0.40***	0.48***	0.47***
–0.22***	–0.23***	–0.21***	–0.22***	–0.31***	–0.32***
–0.04	–0.08	0.03	–0.01	–0.01	–0.04
0.32***	0.31***	1.01***	0.99***	1.08***	1.06***
–0.18***	–0.19***	–0.43***	–0.44***	–0.44***	–0.45***
0.08**	0.07*	0.21***	0.21***	0.29***	0.31***
–0.07***	–0.08***	0.01	0.00	0.05***	0.03**
–0.15**	–0.09	0.16*	0.22**	0.33*	0.37**
0.42***	0.42***	0.09	0.08	0.16	0.16
1.19***	1.23***	0.50***	0.55***	0.57***	0.61***
–0.19	–0.21	–1.61	–1.68	(dropped)	(dropped)
0.76***	0.75***	0.59	0.03	(dropped)	(dropped)
–0.18***	–0.18***	0.05	0.04	–0.02	–0.01
0.05	0.06*	0.21***	0.21***	0.46***	0.47***
0.21***	0.21***	0.20*	0.21**	0.18	0.19
0.52***	0.53***	–0.04	0.01	–0.03	0.02
				0.39***	0.37***
	2.34**		1.04		0.16
	0.93***		0.85***		0.71***
	–0.96***		–0.70***		–0.67***
0.31	0.31	0.27	0.27	0.32	0.33
162	162	43	43	11	11
11	11	7	7	4	4

(table continues next page)

Table 8A.2 Gravity model estimates by major commodity categories without and with US-Pakistan trade integration and openness, 1962–99 *(continued)*

	Mineral fuels and lubricants (SITC 3)					
	1962–99		1990–99		1995–99	
Variable	**Without**	**With**	**Without**	**With**	**Without**	**With**
Constant	–11.13***	–10.40***	–3.26***	–2.36***	–6.56***	–5.13***
Distance	–1.02***	–1.04***	–0.85***	–0.87***	–1.07***	–1.09***
Joint GDP	0.29***	0.29***	0.27***	0.26***	0.44***	0.44***
Joint GDP per capita	0.44***	0.43***	0.04	0.03	–0.21***	–0.23***
Common language	–0.29***	–0.33***	–0.01	–0.08	0.30**	0.25*
Common border	0.51***	0.50***	1.10***	1.09***	1.42***	1.41***
Landlocked	–1.33***	–1.35***	–1.29***	–1.31***	–1.11***	–1.14***
Island	0.47***	0.46***	0.58***	0.57***	0.87***	0.90***
Land area	0.19***	0.18***	0.16***	0.15***	0.16***	0.13***
Common colonizer	0.74***	0.79***	0.76***	0.85***	0.69**	0.76**
Colony	0.73***	0.73***	–0.07	–0.08	0.27	0.26
Ever a colony	1.00***	1.05***	0.22	0.30	0.37	0.47
Common country	–0.79	–0.81	–1.13	–1.21	(dropped)	(dropped)
Currency union	0.71***	0.70***	0.66	0.02	(dropped)	(dropped)
GSP	–0.36***	–0.35***	–0.27***	–0.29***	–0.39***	–0.35***
EU and US RTAs (11)	–0.39***	–0.39***	–0.14*	–0.14*	0.12	0.16
Other HIC RTAs (10)	0.30**	0.30**	–0.13	–0.11	0.50	0.56
MIC and LIC RTAs (39)	0.35***	0.36***	0.17	0.23**	0.07	0.19
Joint TI index					0.13**	0.07
US-Pakistan trade		0.73		–0.75		–1.72
US openness		0.95***		1.10***		1.40***
Pakistan openness		–0.69***		–0.87***		–1.86***
R-squared	0.33	0.34	0.26	0.27	0.37	0.40
Observations (thousands)	61	61	17	17	5	5
Groups (thousands)	5	5	3	3	2	2

***, **, * indicate that the coefficients are statistically significant at the 99, 95, and 90 percent levels, respectively.

Notes: Regressand is log real trade. Distance, joint GDP, joint GDP per capita, land area, and joint TI index are measured in log terms. Estimated year effects are not reported. Numbers in parentheses indicate how many RTAs are covered by the separate RTA variables. Groups are numbers of country-pair-commodity combinations for which trade exists in the data sample.

Source: Author's calculations based on generalized least squares estimation of the Rose (2004) gravity model with random effects, using a combined version of the Rose (2004) and the Feenstra et al. (2005) datasets.

Manufactures (SITC 5 through 8)						
1962–99		1990–99		1995–99	
Without	With	Without	With	Without	With
–24.61***	–23.78***	–11.37***	–10.35***	–17.42***	–16.14***
–0.98***	–1.00***	–1.01***	–1.04***	–1.03***	–1.05***
0.95***	0.95***	0.74***	0.73***	0.89***	0.88***
–0.09***	–0.10***	–0.34***	–0.35***	–0.56***	–0.56***
0.32***	0.27***	0.27***	0.21***	0.24***	0.18***
0.59***	0.58***	1.19***	1.16***	1.13***	1.11***
–0.06***	–0.07***	–0.52***	–0.53***	–0.36***	–0.38***
0.01	–0.01	0.36***	0.36***	0.41***	0.44***
–0.23***	–0.24***	–0.15***	–0.16***	–0.14***	–0.15***
–0.14***	–0.08**	–0.28***	–0.18***	–0.15*	–0.06
0.79***	0.80***	0.38	0.38	0.18	0.17
2.11***	2.16***	1.44***	1.52***	1.02***	1.10***
0.49	0.47	–0.80	–0.89	(dropped)	(dropped)
0.67***	0.65***	1.70***	0.76**	(dropped)	(dropped)
–0.07***	–0.07***	0.49***	0.47***	0.15***	0.17***
0.22***	0.23***	0.33***	0.34***	0.92***	0.94***
0.35***	0.35***	0.46***	0.47***	0.40***	0.42
0.71***	0.71***	–0.31***	–0.23***	–0.36***	–0.26***
				0.65***	0.61***
	1.31*		1.49**		0.90
	1.53***		1.59***		1.42***
	–0.84***		–1.00***		–1.03***
0.57	0.57	0.51	0.51	0.66	0.66
461	461	133	133	31	31
28	28	21	21	11	11

Table 8A.3 Estimated changes in key economywide variables for the United States and Pakistan: CGE model

	United States			Pakistan		
Variable	**Initial value** (millions of dollars)	**Bilateral FTA** (percent change or millions of dollars)	**Unilateral benchmark** (percent change or millions of dollars)	**Initial value** (millions of dollars)	**Bilateral FTA** (percent change or millions of dollars)	**Unilateral benchmark** (percent change or millions of dollars)
Total import value	1,288,130	–0.1	2.8	14,993	16.1	32.7
From partner	3,748	36.3	16.3	1,272	90.8	9.0
From rest of world	1,284,382	–1.1	1.5	13,722	9.1	34.9
Total export value	880,543	0.5	6.7	14,179	–6.3	13.1
To partner	1,242	89.3	11.5	3,595	36.3	11.7
To rest of world	879,301	0.4	6.6	10,584	–20.7	13.6
Tariff revenue	19,919	392	–19,919	2,159	–152	–2,159
From partner	282	–282	–282	84	–84	–84
From rest of world	19,636	674	–19,636	2,075	–68	–2,075
Welfare as percent of GDP	9,983.5	0	–0.1	81.6	1.5	0.7
Total equivalent variation		–1,003	–11,243		1,237	602
Allocative efficiency		–371	1,639		627	895
Terms of trade		–632	–12,882		610	–294

Source: Initial data from the GTAP6 database (Dimaranan and McDougall 2005). Authors' estimates from simulation results.

Table 8A.4 Estimated changes in net welfare by country or region: CGE model (millions of dollars)

Country/region	Initial GDP (billions of dollars)	Bilateral FTA			Unilateral benchmark					
					United States			Pakistan		
		Total	Allocative efficiency	Terms of trade	Total	Allocative efficiency	Terms of trade	Total	Allocative efficiency	Terms of trade
Australia	350.3	22	2	20	196	7	190	4	0	4
New Zealand	49.8	2	1	1	73	0	73	3	0	3
China	1,060.2	–9	13	–22	2,307	314	1,993	43	10	33
Hong Kong	165.2	8	4	4	55	–71	125	–15	0	–15
Japan	4,017.9	9	35	–26	1,855	294	1,561	–34	17	–51
South Korea	408.5	–11	6	–17	898	93	805	39	9	30
Bangladesh	45.5	–12	–6	–6	202	97	104	0	0	–1
India	458.6	–18	–10	–8	233	83	150	35	8	27
Sri Lanka	15.6	–7	0	–7	158	20	138	12	1	11
Pakistan	81.6	1,237	627	610	184	30	154	602	895	–294
Chile	65.0	2	1	1	52	0	52	3	0	2
Rest of South America	1,176.4	50	12	38	877	198	679	2	–7	9
CAFTA-DR	102.2	–14	–11	–3	858	356	502	–6	–4	–2
Western Europe	8,228.2	41	144	–102	5,340	408	4,932	–51	–33	–18
Eastern Europe	817.9	18	12	6	465	9	455	7	–4	11
Morocco	32.9	3	2	2	22	7	15	–4	–1	–3
SACU	10.0	–1	0	–1	32	3	29	–1	0	–1
Rest of world	1,624.4	56	19	36	1,729	56	1,673	205	18	187

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Table 8A.4 Estimated changes in net welfare by country or region: CGE model (millions of dollars) *(continued)*

Country/region	Initial GDP (billions of dollars)	Bilateral FTA			Unilateral benchmark					
					United States			Pakistan		
		Total	Allocative efficiency	Terms of trade	Total	Allocative efficiency	Terms of trade	Total	Allocative efficiency	Terms of trade
Indonesia	140.6	1	3	–1	293	–67	360	32	–5	37
Malaysia	86.9	5	15	–10	165	–46	212	117	–4	121
Philippines	67.3	–9	–4	–5	224	46	178	–2	0	–2
Singapore	84.8	21	2	19	16	–23	40	7	–2	8
Thailand	111.6	1	1	1	280	–42	323	16	1	15
Vietnam	31.1	2	1	1	152	72	80	1	0	1
ASEAN	522.5	22		1,130	171					
Canada	703.7	80	13	67	–869	43	–912	9	3	6
United States	9,983.5	–1,003	–371	–632	–11,243	1,639	–12,882	–156	–36	–120
Mexico	599.0	–5	–25	20	–1,199	–124	–1,075	2	2	0
NAFTA	11,286.2	–927			–13,311			–145		
World total	30,518.9	471			3,355			869		

ASEAN = Association of Southeast Asian Nations
CAFTA-DR = Central American Free Trade Agreement–Dominican Republic
NAFTA = North American Free Trade Agreement
SACU = Southern African Customs Union

Source: Initial data from the GTAP6 database (Dimaranan and McDougall 2005). Estimates from simulation results.

Table 8A.5 Estimated changes in the regional pattern of exports: CGE model (percent change)

	Initial value (billions of dollars)			Bilateral FTA			Unilateral benchmark			
							United States		Pakistan	
Country/region	Total	To United States	To Pakistan	Total	To United States	To Pakistan	Total	To United States	Total	To Pakistan
Australia	72.3	8.6	0.3	0	–0.1	6.8	0.3	3.8	0	–11.8
New Zealand	18.1	2.8	0	0	–0.1	7.8	0.4	5.9	0	12.0
China	379.4	108.3	0.9	0	–0.3	12.8	1.0	8.2	0	45.4
Hong Kong	98.0	20.4	0.1	0	–0.2	3.4	0.6	8.2	0	6.4
Japan	448.0	123.7	0.8	0	–0.3	12.7	0.4	4.0	0.1	64.8
South Korea	175.4	37.2	0.5	0	–0.3	11.9	0.6	6.4	0.1	57.4
Bangladesh	7.8	2.9	0	–0.1	–1.0	5.3	2.8	19.3	0.1	18.6
India	60.3	12.2	0.6	0	–0.5	9.9	0.4	2.3	0.1	35.7
Sri Lanka	6.4	2.4	0.1	0	–0.9	10.8	1.9	20.2	0.1	53.7
Pakistan	14.2	3.6		–6.3	36.3		1.5	16.1	7.5	
Chile	21.7	4.0	0	0	–0.1	3.5	0.2	1.6	0	–0.7
Rest of South America	187.6	49.4	0.2	0	–0.1	7.7	0.4	3.2	0.1	20.2
CAFTA-DR	34.1	13.4	0	0	–0.4	5.2	2.0	13.7	0	0.2
Western Europe	2,655.5	309.1	3.2	0	–0.2	9.9	0.3	3.1	0	24.3
Eastern Europe	341.3	24.2	0.3	0	–0.1	7.9	0.2	0.8	0	14.1
Morocco	11.2	1.1	0	0.1	–0.1	5.8	0.3	1.9	0	–29.7
SACU	6.2	0.5	0	0	–0.6	5.9	1.0	28.9	0	5.7
Rest of world	555.4	114.7	4.0	0	–0.2	7.5	0.5	2.8	0.1	24.7

(table continues next page)

Table 8A.5 Estimated changes in the regional pattern of exports: CGE model (percent change)*(continued)*

	Initial value (billions of dollars)			Bilateral FTA			Unilateral benchmark			
							United States		Pakistan	
Country/region	Total	To United States	To Pakistan	Total	To United States	To Pakistan	Total	To United States	Total	To Pakistan
Indonesia	68.0	11.4	0.2	0	–0.4	8.9	0.7	10.4	0.1	75.8
Malaysia	124.4	24.0	0.5	0	–0.2	9.7	0.3	3.0	0.1	146.8
Philippines	37.8	11.5	0	0	–0.3	9.6	0.1	5.5	0	30.3
Singapore	110.3	17.8	0.6	0	–0.2	11.8	0.2	1.1	0	26.0
Thailand	79.4	17.2	0.2	0	–0.3	10.6	0.3	5.9	0.1	53.2
Vietnam	15.3	1.4	0	0	–0.1	4.7	0.2	5.1	0	33.9
ASEAN	435.1	83.3	1.6	0	–0.2	10.5	0.3	4.6	0	74.8
Canada	265.1	198.0	0.1	0	–0.1	7.2	–1.0	–2.2	0	11.3
United States	880.5		1.2	0.5		89.3	4.3		0.1	8.8
Mexico	164.2	129.4	0	0	0	5.0	–0.5	–1.8	0	13.2
NAFTA	1,309.8	327.3	1.4	0.3	–0.1	78.5	2.6	–2.1	0	9.2
World total	6,838.0	1,249.1	14.3	0.1	–0.1	16.1	0.8	2.7	0.1	32.2

Source: Initial data from the GTAP6 database (Dimaranan and McDougall 2005). Estimates from simulation results.

Table 8A.6 Estimated changes in the sectoral pattern of exports: CGE model (percent change)

	United States					Pakistan				
	Initial value (millions of dollars)		Bilateral FTA			Initial value (millions of dollars)		Bilateral FTA		
Country/region	Total	To Pakistan	Total	To Pakistan	Unilateral benchmark	Total	To United States	Total	To United States	Unilateral benchmark
Grains	9,633	31	0.6	159.8	1.5	180	7	−15.6	−0.8	6.3
Vegetables and fruits	5,017	2	0.2	30.0	1.0	190	5	−6.9	29.0	8.8
Other agriculture	14,703	97	0.6	54.3	2.7	274	22	−14.6	−12.2	11.2
Forestry and fisheries	1,497	0	0.1	104.3	0.9	34	4	−8.0	−10.9	9.3
Coal, oil, and gas	4,251	1	0.2	243.1	2.7	203	16	−36.6	−38.6	42.1
Processed rice	463	0	1.0	107.5	2.5	464	5	−12.6	−7.3	−0.4
Other food products	28,204	38	0.8	336.2	1.5	467	23	−20.6	−16.3	−5.8
Textiles	12,449	9	1.1	227.7	5.4	5,440	1,555	−3.9	43.8	6.4
Wearing apparel	4,995	2	1.1	471.5	9.4	2,122	1,007	15.7	65.2	2.5
Leather products	1,893	0	1.1	306.9	18.8	358	15	−38.0	−5.1	−11.8
Wood products	8,206	2	0.6	250.3	1.5	74	32	−24.1	−23.9	−2.5
Paper products	20,026	17	0.5	103.0	0.7	22	3	−23.8	−24.6	0.4
Chemicals	104,314	129	0.5	97.4	1.3	434	13	−21.3	−18.4	12.0
Minerals and metals	32,032	17	0.6	282.2	1.6	130	10	−29.1	−27.5	−1.7
Fabricated metal products	14,848	3	0.6	427.2	1.2	90	29	−33.2	−30.5	−3.2
Motor vehicles	56,726	6	0.3	824.9	−0.1	7	1	−22.2	−23.1	7.4
Other transportation equipment	51,796	69	0.9	115.0	2.5	115	1	−31.8	−32.4	1.1
Electronic equipment	110,411	37	0.7	244.7	2.6	18	1	−32.0	−32.8	12.4
Machinery and equipment	164,865	130	0.9	226.9	2.3	191	37	−36.1	−36.6	−0.2
Other manufactures	14,446	13	0.9	167.0	3.5	403	102	−31.7	−28.9	−4.4
Nontraded services	4,082	8	0.7	34.7	1.6	112	12	−27.0	−27.4	−11.8
Traded services	215,685	630	−0.1	15.1	11.1	2,850	695	−3.7	7.1	20.0

Source: Initial data from the GTAP6 database (Dimaranan and McDougall 2005). Estimates from simulation results.

Table 8A.7 Estimated changes in the sectoral pattern of production: CGE model (percent change in volume)

Sector	United States			Pakistan		
	Initial value (millions of US dollars)	**Bilateral FTA**	**Unilateral benchmark**	**Initial value** (millions of US dollars)	**Bilateral FTA**	**Unilateral benchmark**
Grains	27,782	0.3	0.4	5,634	–1.5	–0.7
Vegetables and fruits	25,749	0.1	0.1	6,314	–0.3	–0.9
Other agriculture	144,090	0.1	–0.2	13,671	–1.1	–2.6
Forestry and fisheries	21,513	0.1	–0.1	2,701	1.3	0.2
Coal, oil, and gas	112,595	0.1	0.1	2,258	–10.5	–13.6
Processed rice	2,138	0.3	–0.6	4,189	–1.5	–0.4
Other food products	734,887	0.1	–0.3	6,010	–4.7	–16.3
Textiles	143,198	0.1	–6.9	10,929	–4.4	0.2
Wearing apparel	108,886	0.2	–8.2	2,306	9.5	0.8
Leather products	15,715	0.5	–14.7	678	–27.5	–15.8
Wood products	224,967	0.1	0.0	614	–0.9	0.9
Paper products	388,245	0.1	0.0	1,366	–4.0	–8.2
Chemicals	854,532	0.2	–0.6	7,826	–7.4	–10.6
Minerals and metals	376,428	0.3	–0.7	4,030	–4.5	–12.1
Fabricated metal products	286,697	0.2	–0.5	2,008	1.1	–2.3
Motor vehicles	462,140	0	–0.7	1,070	5.7	–33.5
Other transportation equipment	191,991	0.4	0.9	1,187	–4.3	–7.2
Electronic equipment	347,350	0.4	1.2	648	–3.6	–8.0
Machinery and equipment	778,853	0.3	0	2,835	–4.0	–7.1
Other manufactures	63,713	0.4	0.1	1,444	–10.4	–6.1
Nontraded services	2,475,607	0	–0.1	16,819	9.0	11.4
Traded services	9,978,422	–0.1	0.2	44,039	0.9	2.3

Source: Initial data from the GTAP6 database (Dimaranan and McDougall 2005). Estimates from simulation results.

Table 8A.8 Estimated changes in real returns to factors of production: CGE model (percent change at constant prices)

	United States		Pakistan	
Factor	**Bilateral FTA**	**Unilateral benchmark**	**Bilateral FTA**	**Unilateral benchmark**
Land	0.6	0.2	–4.0	–6.9
Unskilled labor	–0.3	–0.1	–2.7	0.1
Skilled labor	–0.3	0	–6.0	–2.7
Capital	–0.3	–0.1	15.8	18.6
Natural resources	0.6	0.6	–22.9	–31.7

Table 8A.9 Estimated changes in key economywide variables under current and proposed US FTAs: CGE model

Variable	United States	Pakistan	Chile	Australia	Singapore	Morocco	CAFTA-DR	SACU	Korea	Malaysia	Switzerland	Thailand
Total import value (percent change)	1.5	14.0	2.5	0.9	1.4	8.5	9.9	6.8	6.5	4.0	0.9	3.0
From partner(s)	16.7	72.2	32.2	12.7	–2.0	132.3	46.3	37.0	42.7	28.4	17.7	52.0
From rest of world	–0.5	8.6	–4.0	–1.9	2.0	–0.1	–1.5	4.2	–1.8	0.5	–1.2	–2.7
Total export value (percent change)	2.3	–7.6	1.1	0.2	2.2	–4.4	6.6	–2.2	10.5	2.5	0.5	1.0
To partner(s)	27.7	22.9	7.5	7.2	5.4	–3.7	35.9	51.3	25.2	9.2	3.5	19.6
To rest of world	–1.2	–18.0	–0.3	–0.7	1.6	–4.5	–12.3	–7.3	6.6	0.9	0	–4.2
Tariff revenue (millions of US US dollars)	–4,283.4	135.9	–239.7	–438.4	–0.6	–161.5	–910.5	–18.1	–7,996.5	–684.0	–565.8	–724.2
From partner(s)	–3,402.2	–83.6	–188.6	–331.6	–0.4	–85.0	–839.2	–25.2	–3,803.9	–378.5	–323.5	–443.2
From rest of world	–881.2	219.5	–51.0	–106.8	–0.2	–76.5	–71.3	7.1	–4,192.6	–305.5	–242.3	–281.0
Welfare as a percent of GDP	0	1.4	0.2	0	–0.2	0.8	1.6	1.4	0.2	0.8	0	0.5
Total equivalent variation (millions of US dollars)	3,204.1	1,115.8	116.4	–31.1	–171.8	258.2	1,629.9	142.4	793.2	709.3	–26.6	553.7
Allocative efficiency	–223.3	608.8	55.9	–2.3	–128.8	138.3	773.3	67.9	2,162.8	491.5	–32.5	–33.1
Terms of trade	3,427.4	507.1	60.5	–28.8	–43.0	120.0	856.6	74.5	–1,369.5	217.8	5.8	586.8

CAFTA-DR = Central American Free Trade Agreement–Dominican Republic
SACU = Southern African Customs Union

Table 8A.10 Estimated changes in net welfare by region, multiple US FTAs: CGE model

Country	Initial GDP (billions of dollars)	Multiple US FTAs[a] (millions of dollars)		
		Total	Allocative efficiency	Terms of trade
Australia	348.7	–31.1	–2.3	–28.8
New Zealand	49.5	–58.5	3.1	–61.5
China	1,054.2	–1,063.0	–426.0	–637.0
Hong Kong	158.3	207.6	–89.7	297.3
Japan	4,006.1	–1,039.9	–498.1	–541.8
South Korea	406.5	793.2	2,162.8	–1,369.5
Bangladesh	45.3	–70.3	–33.8	–36.5
India	456.2	–247.1	–79.2	–167.8
Sri Lanka	15.5	–52.0	–9.5	–42.6
Pakistan	81.1	1,115.8	608.8	507.1
Chile	64.7	116.4	55.9	60.5
Rest of South America	1,172.1	–524.0	–204.7	–319.3
CAFTA-DR	101.4	1,629.9	773.3	856.6
Western Europe	7,941.2	–2,114.4	–661.8	–1,452.6
Switzerland	238.0	–26.6	–32.5	5.8
Eastern Europe	812.8	–257.9	–74.4	–183.5
Morocco	32.6	258.2	138.3	120.0
SACU	9.9	142.4	67.9	74.5
Rest of world	1,615.9	–319.9	–105.2	–214.8
Indonesia	140.1	–93.9	24.7	–118.6
Malaysia	86.1	709.3	491.5	217.8
Philippines	66.9	–123.3	–42.9	–80.4
Singapore	83.4	–171.8	–128.8	–43.0
Thailand	111.1	553.7	–33.1	586.8
Vietnam	30.8	11.6	5.2	6.4
ASEAN	518.3	885.6		
Canada	702.0	–434.4	–94.6	–339.8
United States	9,965.5	3,204.1	–223.3	3,427.4
Mexico	597.8	–622.5	–80.2	–542.3
NAFTA	11,265.3	2,147.3		
World total	30,393.6	1,492.0		

a. The FTA scenario for the United States assumes implementation of the FTAs identified in table 8A.9.

Note: Bold type designates current or prospective US FTA partners.

Source: Initial data from GTAP6 database (Dimaranan and McDougall 2005). Estimates from simulation results.

Table 8A.11 Estimated changes in the regional pattern of exports, multiple US FTAs: CGE model

	Initial value (billions of US dollars)			Multiple US FTAs[a] (percent change in value)		
Country/region	**Total**	**To United States**	**To Pakistan**	**Total**	**To United States**	**To Pakistan**
Australia	72.1	8.6	0.3	0.2	7.2	6.0
New Zealand	18.1	2.8	0	–0.4	1.1	7.9
China	377.7	108.1	0.9	–0.3	–1.1	11.3
Hong Kong	98.0	20.4	0.1	–0.2	–2.1	5.8
Japan	446.8	123.6	0.8	–0.2	0.1	12.3
South Korea	174.9	37.1	0.5	10.5	25.2	21.8
Bangladesh	7.8	2.9	0	1.1	–8.3	6.0
India	60.1	12.1	0.6	–0.4	–2.8	7.8
Sri Lanka	6.4	2.4	0.1	–0.7	–7.4	8.8
Pakistan	14.1	3.6		–7.6	22.9	
Chile	21.6	4.0	0	1.1	7.5	1.2
Rest of South America	187.2	49.4	0.2	–0.2	–0.7	6.9
CAFTA-DR	34.1	13.3	0	6.6	35.9	–6.3
Western Europe	2,540.4	294.1	2.9	–0.2	–0.1	9.0
Switzerland	106.8	14.6	0.3	0.5	3.5	10.4
Eastern Europe	340.3	24.2	0.3	–0.1	–0.2	6.8

Morocco	11.2	1.1	0	–4.4	–3.7	–3.7
SACU	6.2	0.5	0	–2.2	51.3	1.9
Rest of world	554.0	114.5	4.0	–0.2	–1.0	6.2
Indonesia	67.8	11.3	0.2	–0.3	–2.7	6.5
Malaysia	124.1	24.0	0.5	2.5	9.2	12.4
Philippines	37.7	11.5	0.0	–0.2	–2.0	10.1
Singapore	110.1	17.8	0.6	2.2	5.4	13.1
Thailand	79.1	17.1	0.2	1.0	19.6	5.1
Vietnam	15.2	1.4	0	–0.1	0.2	6.3
ASEAN	434.0	83.1	1.6	1.4	7.2	10.5
Canada	264.7	197.7	0.1	–0.2	–0.3	7.5
United States	879.7		1.2	2.3		70.6
Mexico	163.9	129.2	0.0	–0.2	–0.4	7.2
NAFTA	1,308.3	326.9	1.4	1.5	–0.4	62.4
World total	6,820.0	1,247.6	14.3	0.5	1.4	14.0

a. The FTA scenario for the United States assumes implementation of the FTAs identified in table 8A.9.

Note: Bold designates current or prospective US FTA partners.

Source: Initial data from GTAP6 database (Dimaranan and McDougall 2005). Estimates from simulation results.

Table 8A.12 Estimated changes in the sectoral pattern of exports, multiple US FTAs: CGE model (percent change in value)

	United States					Pakistan				
	Initial value (millions of dollars)		Multiple US FTAs[a]		Unilateral benchmark	Initial value (millions of dollars)		Multiple US FTAs[a]		Unilateral benchmark
Sector	Total	To Pakistan	Total	To Pakistan		Total	To United States	Total	To United States	
Grains	9,633	31	26.9	125.8	1.5	180	7	−9.5	20.1	6.3
Vegetables and fruits	5,017	2	0.7	21.0	1.0	190	5	−5.7	36.6	8.8
Other agriculture	14,703	97	20.3	35.3	2.7	274	22	−15.3	−4.5	11.2
Forestry and fisheries	1,497	0	0.6	98.5	0.9	34	4	−7.6	−9.3	9.3
Coal, oil, and gas	4,251	1	1.7	237.0	2.7	203	16	−33.3	−34.9	42.1
Processed rice	463	0	41.4	92.8	2.5	464	5	−11.9	−14.9	−0.4
Other food products	28,204	38	8.9	296.0	1.5	467	23	−20.8	−14.2	−5.8
Textiles	12,449	9	17.4	196.0	5.4	5,440	1,555	−5.5	31.8	6.4
Wearing apparel	4,995	2	26.9	453.3	9.4	2,122	1,007	10.3	49.8	2.5
Leather products	1,893	0	7.2	288.4	18.8	358	15	−35.6	−6.3	−11.8
Wood products	8,206	2	2.1	238.4	1.5	74	32	−20.1	−19.6	−2.5
Paper products	20,026	17	1.5	96.5	0.7	22	3	−21.1	−21.0	0.4
Chemicals	104,314	129	2.4	92.6	1.3	434	13	−19.6	−16.2	12.0
Minerals and metals	32,032	17	3.6	268.9	1.6	130	10	−26.4	−24.4	−1.7
Fabricated metal products	14,848	3	2.3	401.3	1.2	90	29	−30.0	−26.9	−3.2
Motor vehicles	56,726	6	2.4	793.9	−0.1	7	1	−19.5	−20.1	7.4
Other transport equipment	51,796	69	−0.7	104.8	2.5	115	1	−26.7	−26.6	1.1
Electronic equipment	110,411	37	−0.5	230.0	2.6	18	1	−28.5	−29.6	12.4
Machinery and equipment	164,865	130	2.2	214.0	2.3	191	37	−32.6	−32.9	−0.2
Other manufactures	14,446	13	13.5	152.7	3.5	403	102	−28.7	−25.5	−4.4
Nontraded services	4,082	8	−0.3	30.1	1.6	112	12	−24.0	−24.0	−11.8
Traded services	215,685	630	−1.0	−6.9	11.1	2,850	695	−6.1	−14.6	20.0

a. The FTA scenario for the United States assumes implementation of the FTAs identified in table 8A.9.

Source: Initial data from GTAP6 database (Dimaranan and McDougall 2005). Estimates from simulation results.

Table 8A.13 Estimated changes in the sectoral pattern of production, multiple US FTAs: CGE model[a]
(percent change in volume)

Sector	United States	Pakistan	Chile	Australia	Singapore	Morocco	CAFTA-DR	SACU	Korea	Malaysia	Switzerland	Thailand
Grains	7.5	–1.1	1.7	–0.6	1.5	–3.1	–5.4	–7.8	–26.7	6.5	–0.3	0.2
Vegetables and fruits	–1.1	–0.3	1.6	0.3	1.3	–0.5	–1.8	–5.8	5.9	3.8	0	–0.2
Other agriculture	1.3	–1.1	0.7	–1.1	–0.2	0	–1.7	–3.5	–0.8	–3.5	–0.2	–0.4
Forestry and fisheries	0	1.1	0.3	0.1	–0.7	6.6	–0.8	–2.3	4.7	3.8	0.1	–1.1
Coal, oil, and gas	0.1	–9.1	0.8	0.1	7.3	–13.8	–8.0	–6.8	1.2	–0.6	0.5	–0.3
Processed rice	7.2	–1.4	0.1	0.3	0.6	–0.8	–5.3	–5.5	2.0	16.4	–3.9	0.8
Other food products	0.2	–5.0	0.4	0.5	0.9	–1.0	–2.9	–5.0	19.5	8.5	–0.5	–1.8
Textiles	–1.2	–5.1	1.2	0.9	22.5	–3.4	41.3	33.7	36.2	41.5	0.9	14.0
Wearing apparel	–1.7	5.6	1.4	1.0	44.7	0.4	37.9	53.1	41.2	81.2	6.3	21.7
Leather products	–1.1	–25.7	1.4	0.6	9.1	1.4	–9.8	–7.9	47.7	9.7	3.2	26.3
Wood products	0	–0.2	1.4	–0.2	4.9	–0.7	–11.2	–4.3	1.6	4.9	0.2	–6.5
Paper products	0.1	–3.5	–0.5	–0.2	3.3	–4.4	–6.5	–6.2	2.2	–0.1	0	–2.3
Chemicals	0.3	–6.6	1.0	–0.2	4.6	–3.7	–5.7	–4.6	5.2	2.8	0.6	–1.9
Minerals and metals	0.3	–3.5	1.8	–0.2	3.7	0.1	–11.8	–0.1	4.8	3.6	0.7	–3.1

(table continues next page)

Table 8A.13 Estimated changes in the sectoral pattern of production, multiple US FTAs: CGE model[a]
(percent change in volume) *(continued)*

Sector	United States	Pakistan	Chile	Australia	Singapore	Morocco	CAFTA-DR	SACU	Korea	Malaysia	Switzerland	Thailand
Fabricated metal products	0	1.4	0.9	–0.1	3.2	0.1	–10.1	1.1	6.3	3.7	1.7	–4.2
Motor vehicles	0.1	6.2	0.5	–0.3	2.7	2.9	–3.2	–1.7	5.1	2.9	0.6	–0.4
Other transportation equipment	–0.3	–2.9	2.0	0.6	6.5	–3.4	–10.1	–1.9	9.1	7.3	0.5	2.5
Electronic equipment	–0.7	–2.4	–4.5	0.3	2.4	–4.7	–20.9	1.7	3.2	3.5	–0.1	–4.2
Machinery and equipment	0.2	–2.8	0.7	0	5.5	–0.3	–18.5	3.0	4.7	6.0	1.0	–2.3
Other manufactures	2.8	–9.2	0.9	0.1	3.3	–2.8	–11.1	–9.9	10.8	4.3	–1.3	–3.3
Nontraded services	0.1	8.8	1.5	0.3	–0.6	10.6	4.0	13.1	–1.2	–0.3	0.3	2.3
Traded services	–0.1	0.9	–1.2	–0.1	–1.8	–0.9	–1.5	1.2	–3.5	–7.3	–0.3	–1.7

CAFTA-DR = Central American Free Trade Agreement–Dominican Republic
SACU = Southern African Customs Union

a. The FTA scenario for the United States assumes implementation of the FTAs identified in table 8A.9.

Source: Initial data from GTAP6 database (Dimaranan and McDougall 2005). Estimates from simulation results.