Contents

Chapter 1
Trade and Welfare Effects of the FTAA

The FTAA will be introduced into a region that has already achieved substantial trade liberalization through a network of preferential trade relationships. Almost all FTAA members are also pursuing multilateral trade liberalization in the Doha Development Agenda. In this chapter, we analyze agriculture in the FTAA in this regional and multilateral context. First, we take into account the regional trade preferences that already provide low or nonexistent duties on many bilateral trade flows in the region. We find that the FTAA's role in consolidating and completing the regional integration that already has occurred in the Western Hemisphere can lead to significant, additional expansion in the region's agricultural trade. We also consider the relationship between the FTAA, which will focus on market access (tariffs and non-tariff trade barriers), and the more comprehensive multilateral Doha negotiations on agriculture, which are expected to address market access, domestic support and export subsidies. The Western Hemisphere's role as a major net agricultural exporter to the rest of the world gives it an important stake in multilateral agricultural reform, and progress in Doha negotiations on reducing domestic support and export subsidies will facilitate tariff reform in the FTAA.

This analysis uses a global, computable general equilibrium (CGE) model to simulate the potential effects of the FTAA.[1] The model is composed of 16 country or regional models, including 9 from the Western Hemisphere, linked through trade. Since we focus on agriculture, the model includes nine primary agriculture sectors and six processed food sectors; the other sectors in the economy are broadly defined as natural resources, manufacturing, and services. The model accounts for preferential agricultural tariff rates in the region, and explicitly models domestic agricultural support in the European Union (EU), Japan, Mexico and Canada in 2001, and the 2002 U.S. Farm Security and Rural Investment (FSRI) Act.

Regional Trade Agreements in the Western Hemisphere

Trade preferences are an important feature of the agricultural trading system in the Western Hemisphere. About 20 preferential trade arrangements already are in effect in the Western Hemisphere, in addition to nearly 40 agreements that provide preferences for specific sectors, and more trade agreements are under negotiation or proposed.[2] Almost every member of the FTAA is now party to at least one agreement, and the multiple agreements to which most FTAA members are party create a network of overlapping memberships within the Western Hemisphere. One role of the FTAA will be to consolidate and advance the trade liberalization that has already occurred under these regional agreements.

Many types of trade preferences exist in the Western Hemisphere. In *reciprocal trade arrangements*, all parties agree to mutual reduction or elimination of trade barriers, but the level of market integration can vary. In the Western Hemisphere, the most

[1] See appendix 1-1 for a more detailed description of the model.
[2] A compendium of trade agreements in the Western Hemisphere is maintained at http://www.sice.org/TRADEE.ASP.

comprehensive reciprocal arrangements are *customs unions*, which now include MERCOSUR, the Central American Common Market (CACM), the Andean Community (former Andean Pact), and the Caribbean Community and Common Market (CARICOM). In a customs union, members reduce or eliminate internal tariffs and agree on common external tariffs. *Free trade areas,* such as the one created by NAFTA, reduce or eliminate internal tariffs but allow members to maintain separate external tariffs. Free trade areas therefore require detailed rules of origin to prevent the transshipment of imports into the union through the country with the lowest external tariffs. The FTAA will be a free trade area. *Partial scope agreements* are agreements in which trade preferences are given to selected sectors. *Economic complementation agreements* are agreements to increase economic cooperation with the stated objective of realizing free trade.

Nonreciprocal preferences, in which only one party provides trade preferences, are applied extensively in the Western Hemisphere. Among the major programs are the U.S. generalized system of preferences (GSP) and Canada's generalized preferential tariffs (GPT), both of which allow duty-free or preferential treatment for many agricultural imports from developing countries. Generally, neither arrangement allows preferences in the over-quota tariffs of tariff-rate-quota (TRQ) regimes or for safeguards. The GSP and GPT preferences apply to all FTAA members, except NAFTA members and GSP for Bermuda. Some countries party to GSP and GPT also are eligible for other trade preferences. The United States and Canada provide nonreciprocal preferences for many agricultural products from the Caribbean, and the U.S. also provides preferences for imports from the Andean countries.[3] Nonreciprocal preferences are concessions, not binding commitments; in some cases they may expire and require reauthorization. Reciprocal trade agreements that are ratified by their participants provide a greater degree of assurance about the stability of the negotiated tariff preferences.

In the Western Hemisphere, regional trade agreements and preferences largely have succeeded in including agriculture in general in trade liberalization, although sensitive imports are often exempted (table 1-1). NAFTA, for example, will eliminate almost all barriers to agricultural trade among its members by the time it is fully implemented in 2008. Canada's imports of supply managed commodities (dairy, poultry and eggs) and U.S. imports of sugar, dairy, and peanuts from Canada are among the exceptions. In MERCOSUR, almost all agricultural tariffs are to be removed, although Argentina's economic crisis has led to the elimination of regional preferences on many items, including some food products. The U.S.-Chile free trade agreement, signed in 2003, includes all agricultural products.[4]

In addition to regional trade agreements among Western Hemisphere partners, many FTAA members have trade agreements with non-hemisphere partners. The United States has free trade agreements with Israel, Jordan, and Singapore, with other negotiations

[3] The U.S. Caribbean Economic Recovery Act (CBERA), enacted in 1983, provides preferential or duty-free tariffs to 24 Central American and Caribbean countries. Canada's CARIBCAN program, enacted in 1986, provides duty-free access on many products to the Commonwealth Caribbean countries. The U.S. enacted the Andean Trade Preferences Act (ATPA) in 1991, which provides preferential duty treatment to Bolivia, Columbia, Ecuador and Peru. See chapter in this report on Market Access for a discussion of the commodity composition of U.S. nonreciprocal preferences.
[4] This U.S.-Chile free trade agreement is not incorporated into the CGE model described in this chapter.

under way or proposed. Mexico has entered into a free trade agreement with the European Union that excludes agricultural commodities receiving EU domestic support, and it has agreements with the European Free Trade Association (EFTA) and Israel. Chile's agreements include one with the EU, and a MERCOSUR-EU negotiation is in progress. Caribbean countries, along with African and Pacific countries are extended preferences by the EU, and Haiti will receive the EU's "Everything-But-Arms" extended to 48 least developed countries.

One benefit from moving forward to the FTAA will be the reduction or elimination of the discrimination that these pacts have introduced within the Western Hemisphere. The United States, for example, is not a member of MERCOSUR and faces a competitive disadvantage relative to its members' duty-free trade with each other. Likewise, FTAA countries outside of NAFTA no longer will have to compete against the preferences that the United States, Mexico and Canada give each other. In addition, the FTAA would "lock in" preferences, whereas nonreciprocal arrangements such as the U.S. GSP and ATPA must be periodically re-authorized and can therefore be allowed to lapse.

Welfare Effects of the FTAA

Based on the assumption that all agriculture and manufacturing tariffs will be eliminated, the FTAA will lead to welfare (or purchasing power) gains of $63 billion for the region, with gains achieved by every member of the trade agreement (fig. 1-1).[5] U.S. welfare is expected to increase by $4.1 billion. Welfare gains derive from two sources: resource reallocation and productivity growth. First, tariff elimination removes tariff-based price distortions that influence production and consumption decisions. Countries then can reallocate resources to products for which they hold a comparative advantage, and consumers can follow their spending preferences. The resulting allocative efficiency gains from tariff elimination will account for almost $4 billion in welfare gains for the region. Every country will achieve these static welfare gains from the FTAA except Chile, whose static gains are nearly zero as a result of its export taxes.

Second, the FTAA is expected to generate dynamic gains in the productive capacity of developing countries in the Western Hemisphere. The link between trade openness and accelerated economic growth has been widely observed in developing countries, and attributed to several sources. Productivity gains accrue when the expansion of exports and imports of capital goods between developing and developed members leads to technological spillovers that stimulate total factor productivity (TFP) growth in the developing countries. These spillovers can stem from technological advances embodied in traded goods, "learning by doing," increased input varieties, or market expansion that leads to increasing returns to scale and/or Smithian economies of "fine specialization" (as opposed to Ricardian differences in factor proportions). All of these can help increase the productive efficiency of land, labor, and capital in all sectors of a developing economy.[6]

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[5] Results reflect outcomes after a long-term adjustment (10-15 years) of the world economy. Results are reported in nominal U.S. 2002 dollars. Percent changes are reported relative to the model base year, a representative year in the global economy (1997).

[6] The link between trade liberalization and factor productivity growth, based on de Melo and Robinson (1991), is one way to approximate the faster economic growth observed in more open economies than in closed economies. Trade-

Such potential productivity gains will add $59 billion to the estimated welfare impact of the FTAA on the region, with benefits accruing to every country, including Chile. Welfare gains will be largest in Argentina and Brazil, whose economies will increase in size by about 5 percent and 7 percent, respectively, due to the FTAA, mainly reflecting the large role of trade in manufacturing in these economies. By increasing returns to capital, productivity gains also will help to attract foreign direct investment, an important goal of the FTAA for the Western Hemisphere's developing countries but a potential impact that is not incorporated in this analysis.

Effects of the FTAA on Western Hemisphere Trade

If all tariffs (agricultural and manufacturing) are eliminated in the FTAA, and productivity gains are realized, annual agricultural trade within the Hemisphere will increase by about $4.0 billion, or about 6 percent (table 1-2). Agriculture will account for about 20 percent of the expansion in hemispheric trade due to the FTAA, proportionally larger than its current 9-percent share in merchandise trade and a reflection that agricultural tariffs are higher than on manufactures in many countries and regions, including the United States.[7] Annual U.S. agricultural exports to the hemisphere will increase by $1.4 billion (about 6 percent) and imports by about $900 million (about 3 percent).

The increase in U.S. trade with the Western Hemisphere will lead to small adjustments in U.S. trade with the rest of the world. Annual U.S. agricultural exports to non-FTAA countries will decline about $300 million, and U.S. imports from these markets will increase slightly, about $100 million. On net, the FTAA will increase annual U.S. global agricultural exports and imports by about $1 billion each.

Figure 1-2 shows changes in FTAA members' global agricultural exports due to the FTAA. All countries will increase their agricultural exports to the region, including Mexico, which will face greater competition in the United States, its main export market, when the preferences it receives under NAFTA are extended to other FTAA members. The Andean region and the Central American/Caribbean region will have among the highest rates of growth in their annual agricultural exports (3 percent and 5 percent, respectively), with most export growth destined for the U.S. market. Despite their nonreciprocal preferences in the U.S. market, these regions face U.S. trade barriers on some agricultural products, particularly processed foods. U.S. tariffs are low or zero on most processed food products, but they remain very high on a small number of products. Comprehensive tariff reform in the FTAA can therefore result in additional agricultural export growth by countries that already benefit from preferences.

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productivity externalities have been incorporated into many recent analyses of trade liberalization (e.g., Hinojosa-Ojeda, Lewis and Robinson, 1995; Diao, Roe and Somwaru, 2001; and Andriamananjara and Hillberry, 2001). However, the conditions that must be in place for productivity growth to be accelerated are likely to include not only tariff reform, but also factors such as institutional reforms that facilitate investment and trade (Rodrick et al., 2002). Productivity gains may also come from an increase in the varieties of intermediate inputs available (Rutherford and Tarr, 2002). In our analysis, we assume a conservative coefficient to describe this relationship, identical for all developing countries in the Hemisphere. Recent empirical evidence on the trade-productivity link suggests this effect could be very large: in a 98-country study, Frankel et al. (1999) estimated that a 1-percentage-point increase in the trade share of GDP increased the contribution of productivity to output by about 2 percentage points.

[7] Tariffs on FTAA members' imports from the Western Hemisphere, by commodity, are found in appendix table 1-1 C.

The Central American/Caribbean and Andean regions will also have relatively large increases in annual agricultural imports under the FTAA (16 percent and 18 percent, respectively), due to the relatively high tariffs they maintain on imports (fig. 1-3). Whereas most other countries in the hemisphere have already liberalized their agricultural trade with major partners, these two regions receive nonreciprocal trade preferences from the U.S., their major trade partner in the hemisphere, and from Canada.

The expansion of both agricultural exports and imports in the Central American/Caribbean and Andean regions indicates that their agriculture is likely to undergo significant structural change in response to the FTAA, although on net their aggregate agricultural production will expand. Managing the process of structural change will be important for smaller economies. Their transition to a free trade environment has been a critical issue in the FTAA negotiations. FTAA members have agreed that the trade pact will take into account differences in the levels of development and size of the economies in the Western Hemisphere, in order to create opportunities for the full participation of the smaller economies and to increase their level of development. The U.S. FTAA proposal on market access is intended to facilitate the adjustment of small economies to free regional trade by offering them deeper and faster access to U.S. markets during the FTAA's expected transition period to free trade.

FTAA Trade Impacts by Commodity

The largest agricultural trade impacts of the FTAA will be in processed foods, for which the Western Hemisphere's annual global exports will increase by about $1.5 billion, or 3 percent (table 1-3). This export category is a large, heterogeneous sector that includes fruit and vegetable juices, syrups and confections, flour, baked goods, roasted coffee and teas, sugar and sugar products, and orange juice. The Western Hemisphere's annual global exports of dairy products also will have relatively large growth, at about $330 million, or 33 percent, reflecting the high tariffs that remain on dairy products in the Western Hemisphere. The FTAA's global exports of "other crops"—a category that includes fibers, seeds, flowers, and tropical products such as coffee and bananas—will increase by about $235 million, or 3 percent. Global annual grain exports, including rice, wheat, and other grains, will increase about $460 million, or 6 percent. The commodity composition of the region's import growth due to the FTAA is similar to that of its exports, reflecting that most of the trade expansion is in intraregional trade.

Canada's largest growth in annual global agricultural exports due to the FTAA will be in wheat ($110 million); its largest import growth will occur in dairy products ($210 million). Mexico's largest increases in annual agricultural exports due to the agreement will occur in processed foods ($45 million) and horticulture ($16 million); its largest annual import growth will occur in processed foods ($21 million) and fats and oils ($30 million). Argentina's largest increases in annual exports due to the FTAA will occur in processed foods ($90 million) and oilseed and fat products ($40 million). Brazil's annual exports of processed foods, which includes sugar and orange juice, will increase by $210 million under the agreement.

U.S. Agricultural Trade Impacts

The growth in annual U.S. agricultural exports will be greatest to Central American and Caribbean countries ($650 million, mostly processed foods) and Andean countries ($360 million, mostly of grains, and oilseeds and products) (figs. 1-4 and 1-5).[8] Annual U.S. agricultural exports to Canada will increase by about $160 million (mostly dairy) in the FTAA. The FTAA will liberalize sensitive sectors that had been exempted by NAFTA, including Canadian dairy. Annual U.S. agricultural exports to Argentina ($100 million) and Brazil ($120 million) will be mostly in processed foods.

The Central American and Caribbean region also will account for most of the increase in U.S. agricultural imports due to the FTAA ($310 million), followed by increased imports from the Andean region of $170 million annually. Most of the growth in U.S. imports from these two supplying regions will be in processed food products. Although most U.S. tariffs on processed agricultural imports from these countries are already zero, U.S. preferences generally maintain very high tariffs on a small number of commodities related to U.S. farm programs including, for example, chocolate crumb, sweetened cocoa powders, cake mixes and animal feeds made with milk derivatives.

U.S. imports from Brazil will increase by about $130 million annually and from Argentina by about $60 million annually, with both trade flows composed of a variety of nongrain crops, including sugar and other processed food products. U.S. agricultural imports from Mexico will increase slightly due to the FTAA, by about $15 million annually.

U.S. Agricultural Production Impacts

Because trade with the Western Hemisphere accounts for a small share of U.S. agricultural production, trade expansion due to the FTAA will have only a small effect on U.S. output. Except for rice, real output changes by less than 1 percent in the aggregate sectors described in this analysis, by sector (table 1-4). Increased U.S. exports will lead to a small expansion of output in oilseeds, oils and fats, milk and dairy products.

Inclusion of U.S., Agriculture Maximize Benefits of the FTAA

The participation of the United States in the FTAA will help the Western Hemisphere attain the full potential benefits of the agreement. The large size of the U.S. economy makes it the single most important regional market for the rest of the hemisphere. In agriculture, U.S. participation will account for about one-third of the region's global agricultural export growth due to the FTAA and about one-quarter of the region's global agricultural import growth (table 1-5). For U.S. trade partners, the potential trade opportunities with the United States will support both their efficiency gains based on increased trade and specialization, as well as potential productivity gains linked to the expansion of trade between developing- and developed-country partners. For the United States, participation in the FTAA ensures expansion of both U.S. agricultural exports and imports. Without U.S. participation, U.S. global agricultural exports would decline

[8] Data on changes in U.S. agricultural trade by country and commodity are reported in appendix tables 1-1A and 1-1 B.

because of the preferential treatment that will be extended to competing suppliers within the Western Hemisphere through the terms of the agreement. Also, U.S. agricultural import growth, which lowers costs and increases variety for consumers, would be diminished.

Agriculture is often a sensitive sector in free trade agreements because most countries provide domestic support or relatively high trade protection to their agricultural producers, and the effectiveness of these policies would be compromised by freer trade. Reflecting the diverse levels of economic development of FTAA members, their agricultural policies evidence a range of objectives, including farm income support, reducing price or income variability, providing income and employment in rural or low-income areas, and stimulating economic development. While the use of agricultural support and protection create challenges for the inclusion of agriculture in the FTAA, benefits will be greater if agriculture is included in, rather than excluded from, the agreement. Trade liberalization of manufacturing alone would increase FTAA members' demand for manufacturing imports, causing some countries to reduce their agricultural production and trade in order to shift resources into industry. This redistribution of agricultural to manufacturing production will lead to a small increase in demand for agricultural imports in these countries. In addition, productivity gains linked to expanded trade in manufacturing sectors will stimulate consumer demand for all products, including food. The effects of the FTAA on agricultural trade in the Western Hemisphere therefore still will be positive but far smaller if agriculture is excluded from trade reform. Including agriculture in the FTAA increases these positive effects through the potential efficiency and welfare benefits linked directly to agricultural trade liberalization.

Doha Development Agenda and the FTAA

FTAA members (except Bermuda) simultaneously are negotiating their regional trade agreement and multilateral policy reforms in the WTO Doha Development Agenda. Globally, the continued proliferation of regional trade agreements indicates that regionalism and multilateralism have become accepted as dual trade strategies for most countries. By May 2003, the WTO had been notified of 184 regional trade agreements (WTO, 2003). Nearly every country in the world is now a member of at least one trade agreement (Crawford and Laird, 2001). Nevertheless, the benefits of a regional versus a multilateral trade strategy is a continuing public policy debate.

Multilateralism will always be a "first best" strategy because it is nondiscriminatory, that is, all countries participate and offer similar tariff treatment to all WTO members. This principle of nondiscrimination forms the foundation of today's global trade rules. Regionalism, on the other hand, violates this principle by offering preferential tariff treatment to selected trade partners. Opponents of regionalism argue that the creation of trade among a small group of preferred trade partners is achieved at the expense of trade with and investment in nonmembers.

Advocates of regionalism generally emphasize its incremental and more attainable benefits compared with global reform, and its potential role in advancing or strengthening the multilateral process. Regional agreements are more likely to achieve deeper and faster reform among like-minded partners than is possible in the more diverse multilateral negotiations. Advocates also argue that a region's successful experience in dealing with nontariff barriers following the removal or reduction of regional tariffs can provide experience that strengthens the multilateral process. The newer regional agreements formed in the past decade, particularly those in the Western Hemisphere, have also helped to accelerate economic growth in small economies, by locking in unilateral reforms, stimulating investment and productivity growth, and fostering their links with large and more developed economies (Ethier, 2001). For small, reforming countries especially, regionalism can play a role as a first step in engaging in the global trading system, and it helps give such countries a greater stake in a rules-based global trading system. Trade rules that ensure predictability and fairness in trade relationships, and that offer a credible enforcement mechanism, provide conditions that are favorable for the conduct of business, investment, and the expansion of trade.

As the Western Hemisphere pursues a regional agreement, two factors make multilateral agricultural reform of continued importance for FTAA members. First, FTAA countries are global agricultural traders. They depend on non-FTAA markets, with about 65 percent of their agricultural exports destined for, and 35 percent of their agricultural imports originating from, outside the Western Hemisphere. Non-FTAA markets are especially important for the United States and Brazil, for whom they account for 75 percent to 80 percent of their total agricultural exports. The FTAA region is also a major trade bloc in global agricultural markets. Their agricultural exports outside the Western Hemisphere account for about 45 percent of world agricultural trade, and their imports from the rest of the world account for about 9 percent of that trade.

The Western Hemisphere's position as a large net agricultural exporter gives it a great stake in WTO negotiations that may further liberalize global agricultural markets. Despite the reforms achieved in the Uruguay Round, these markets are still characterized by significant policy distortions (USDA, 2001). Further multilateral reform will impose disciplines on FTAA members and the rest of the world alike. However, in general, the level of distorting policies used by FTAA members is lower than in most other countries and regions. The average, post-Uruguay Round bound agricultural tariff of FTAA countries of about 40 percent is lower than the global average bound rate of 62 percent (Gibson et al., 2001). The average applied rate of FTAA countries is about 13 percent. Domestic support in the FTAA is also relatively low. The 2002 producer support estimates for the three FTAA members of the Organization for Economic Cooperation and Development (OECD) are 18 percent (United States), 20 percent (Canada), and 22 percent (Mexico)—below the aggregate OECD rate of 31 percent (OECD, 2002). Finally, export subsidies by FTAA members are minimal, with the EU accounting for over 90 percent of global expenditure on these subsidies in 1998 (USDA, 2001).

These patterns in agricultural trade flows and agricultural policy distortions suggest that the region will benefit from additional global trade reforms. Any scenario of globalized reform shows the benefits of a multilateral agreement for the Western Hemisphere. For example, if the Doha Development Agenda replicates the limits set in the Uruguay Round, the region's annual agricultural exports outside the Western Hemisphere would increase by 10 percent and its imports by 2 percent. Western Hemisphere agricultural export growth in this scenario for multilateral reform is estimated to account for about 40 percent of the resulting expansion of global agricultural trade.

The multilateral negotiations also have significance for the FTAA because of their more comprehensive agenda for agricultural reform. The Doha Round is negotiating disciplines on market access, domestic support, and export subsidies. While the mandate for the FTAA includes export subsidies in the region and all other practices that distort trade in agricultural products, its regional scope means that it is difficult for the FTAA to limit members' domestic support for their agricultural sectors. In addition, the FTAA cannot address the use of export subsidies by non-FTAA countries that affect competition within the Western Hemisphere and in third-party markets.

FTAA members recognize the global character of their agricultural markets and the importance of third-country policies. At the Toronto Trade Ministerial Meeting in 1999, FTAA members agreed to work in the multilateral negotiations toward the global elimination of export subsidies on agricultural products. FTAA members addressed the problem of domestic support at the Quito Trade Ministerial Meetings in November 2002. There, members agreed on the need for significant results in the negotiations on agriculture both in the FTAA and the WTO, and noted that progress in the FTAA's market-access negotiations for agriculture will depend on progress being made on a broader agriculture agenda. This interdependence of the regional and multilateral negotiations increases the Western Hemisphere's stake in the Doha Development Agenda.

Conclusion

As trade becomes increasingly important for both U.S. agricultural producers and consumers, the potential benefits from the U.S. pursuit of a more open and market-oriented global trading system become greater. U.S. producers will benefit directly from their greater access to world markets and indirectly from the economic growth and increased demand for food that trade liberalization can foster. Consumers will benefit because global trade rules help to increase product variety, lower food costs, and ensure the safety and security of food supplies. The U.S. pursuit of regionalism complements its pursuit of multilateralism. The dual pursuits reinforce the same principles of trade liberalization, with regionalism offering an opportunity to achieve deeper reforms on key issues with some partners. Multilateralism provides the venue for more comprehensive and inclusive, but likely more gradual, trade liberalization, and it can help minimize the potential negative impacts of regionalism.

This analysis focused on tariff reforms in the FTAA. Market access is only one element of the FTAA negotiations, which also could address other areas that may affect trade in the hemisphere. Furthermore, trade is analyzed in this paper at relatively aggregate levels. For some individual commodities, complex trade policies and domestic programs will likely influence both the liberalization process and the potential trade flows in the FTAA. For these commodities, the results reported here can be only indicative of broad market trends in a free trade area.

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Appendix 1-1
A CGE Model

The computable general equilibrium (CGE) model used in this chapter is composed of 16 countries or regions linked by trade. There are nine primary agriculture sectors and six processed food sectors; the other sectors in the economy are broadly defined as natural resources, manufacturing, and services.[9] The model data are from the Global Trade Analysis Project (GTAP) version 5, August 2002 update. The model base year is 1997, with results adjusted to 2002 dollars using the U.S. gross domestic product (GDP) deflator (U.S. OMB, 2003).

The model follows the standard neoclassical specification of trade-focused CGE models. Each sector produces a composite commodity that can be transformed according to a constant elasticity of transformation (CET) function into a commodity sold on the domestic market or into an export. Output is produced according to a constant elasticity of substitution (CES) production function in primary factors, and fixed input-output coefficients for intermediate inputs. The model simulates a market economy, with prices and quantities assumed to adjust to clear markets. All transactions in the circular flow of income are captured. Each country model traces the flow of income (starting with factor payments) from producers to household, government, and investors, and finally back to demand for goods in product markets.

Consumption, intermediate demand, government, and investment are the four components of domestic demand. Consumer demand is based on Cobb-Douglas utility functions, generating fixed expenditure shares. Households pay income taxes to the government and save a fixed proportion of their income. Intermediate demand is given by fixed input-output coefficients. Real government demand and real investment are fixed exogenously. Import demand is described by almost-ideal demand system (AIDS) import demand functions.

The model includes three primary factors and associated factor markets: labor, capital, and agricultural land. Land is disaggregated into two types-cereals and oilseeds, and all other land. Full employment for all categories is assumed, and aggregate factor supplies are fixed. In the experiments reported here, we assume that all factors are fully mobile. However, land markets are segmented. Land used in cereals and oilseeds cannot be substituted for land used to produce other crops.

There are three key macro balances in each country model: the government deficit, aggregate investment and savings, and the balance of trade. Government savings are the difference between revenue and spending, with real spending fixed exogenously, and revenue depending on a variety of tax instruments. The government deficit is therefore determined endogenously. Real investment is set exogenously and aggregate private savings are determined residually to achieve the nominal savings-investment balance. The balance of trade for each country (and hence foreign savings) is set exogenously and valued in world prices. Each model solves for the relative domestic prices and factor returns that clear the factor and product markets, and for an equilibrium real exchange

[9] We use the standard global CGE model described in Lewis, Robinson, and Thierfelder (2003).

rate which brings aggregate export supply and import demand into balance, given the exogenous aggregate trade balance of each country.

The model incorporates budgetary expenditure for 2001 domestic farm programs in the European Union, Japan, Canada and Mexico from the OECD Producer Support Estimate database for 2001 (OECD, 2002). Data for U.S. farm programs are the projected annual expenditures in 2002 under the Farm Security and Rural Investment Act. The model incorporates endogenous farm programs, where applicable, following Burfisher, et al. (2002). In the U.S., loan deficiency payments support floor prices for grains and oilseeds, with payments to farmers increasing when market prices decline below the loan rate. In the EU and Canada, export subsidies are used to clear excess domestic supplies resulting from the EU's fixed intervention prices for grain, oilseeds and livestock, and Canada's price management program for dairy.

Other farm payments are exogenous income transfers to households. These include direct payments and countercyclical payments in the United States, Canada (National Income Stabilization Accounts or NISA payments) and Mexico (PROCAMPO, the Farmers Direct Support Program). Households spend these transfers on consumption, savings and taxes according to the aggregate average propensities described in national accounts data.

The model also includes fixed, per unit ad valorem subsidies to inputs and output. Since the production technology in the model uses fixed input-output coefficients for intermediate inputs, a subsidy to intermediate goods operates like an output subsidy. Subsidies on capital inputs in agriculture lower the costs of capital and attract capital out of non-agricultural sectors.

Rather than use the market price component of the Producer Support Estimate data, the model uses data on tariffs and tariff equivalents from various sources. MFN agricultural tariffs for all countries are from the Agriculture Market Access Database (AMAD). AMAD provides tariffs on an ad-valorem basis, including the ad valorem equivalents of specific tariffs. Tariff rate quotas are modeled as ad valorem tariffs using the average of above and below quota tariff rates. AMAD tariffs are aggregated to the GTAP categories using import weights.

This chapter develops a preferential agricultural tariff database for U.S. GSP, ATPA and Caribbean Basin Economic Recovery Act (CBERA) programs, and for Canadian GPT and Caribbean preferences. Preferential tariff data for the U.S. and Canada are from their tariff schedules for 2000, aggregated to GTAP categories using simple averages. In MERCOSUR and Chilean bilateral trade pacts, agricultural tariffs in the model are assumed to be zero, although MERCOSUR, the Andean Community, and other preferential agreements in the Western Hemisphere allow some exceptions to their common external tariffs and zero internal tariffs (Stout and Ugaz-Pereda, 1998). This assumption may therefore lead to an underestimate of the FTAA's effects

Following de Melo and Robinson (1992), the model incorporates links between the expansion of exports and imports of capital goods between developing and developed countries and technological spillovers that stimulate factor productivity growth in the developing country. Trade is assumed to have a role in stimulating productivity growth through channels that include technology differences among countries, knowledge spillovers, the transmission of ideas, and market expansion that leads to increasing returns to scale and/or Smithian economies of "fine specialization" (as opposed to Ricardian differences in factor proportions). A sectoral export externality links export growth in manufactures to an increase in total factor productivity (TFP) within the sector. An import externality links imports of manufactures with sectoral TFP. Finally, an increase in aggregate exports leads to economy-wide increases in the efficiency of capital inputs. Note, however, the conditions that must be in place for productivity growth to be accelerated are likely to include not only tariff reform, but also factors such as institutional reforms that facilitate investment and trade (Rodrick et al., 2002).

Chapter 2

Trade Liberalization in the Western Hemisphere: Impacts on U.S. Agricultural Exports

Experience with the regional trade agreements already in effect in the Western Hemisphere suggests that the trade effects of the FTAA will exceed the impact of its tariff and quota changes. For instance, to the extent that the FTAA requires closer cooperation on sanitary and phytosanitary issues, as is the case with the North American Free Trade Agreement (NAFTA), member countries are likely to adjust their import standards so that they do not restrict trade unnecessarily. Moreover, the FTAA is likely to have a myriad of indirect effects that ultimately expand trade, even though these changes may not be spelled out in the agreement. Many developments of this sort took place following the implementation of NAFTA and the Common Market of the South (MERCOSUR, or Mercado Común del Sur). Examples include increased investor confidence within the two regions, the further exploitation of scale economies, and the upgrading of transportation linkages along new and existing routes of trade.

To better understand the potential breadth of the FTAA's influence, this chapter assesses the impact that NAFTA, MERCOSUR, and related agreements have had on agricultural trade within the Western Hemisphere. Focusing on U.S. agricultural exports from 1980 through 1999, the chapter employs a series of modified gravity models, as suggested by Cheng and Wall (1999), to identify noteworthy changes in trade coinciding with these agreements. A main strength of this approach is that it distinguishes the impact of a trade agreement on U.S. exports to a specific country from the relative closeness of that country's bilateral trade relationship with the United States. However, the variables used to identify trade agreements may also capture the influence of other factors that were contemporaneous to these reforms.

To develop a complete picture of regionalism's impact on U.S. agricultural exports, separate models are estimated at the aggregate level and for 32 individual commodities. This analysis generates several important findings:

> (1) Unilateral trade reforms undertaken by Mexico during the late 1980s and early 1990s have provided a sizable boost to U.S. agricultural exports to Mexico. According to gravity-model estimates, these unilateral reforms accounted for 39 percent of U.S. agricultural exports to Mexico from 1989 through 1999, or an average of roughly $1.7 billion per year. Thus, one of NAFTA's main benefits to U.S. agriculture has been to "lock in" reforms that Mexico had made prior to NAFTA.
>
> (2) NAFTA's influence on U.S. agricultural exports to Mexico is statistically significant for three of the commodities studied: grapes, yarn and thread, and leather. Although the model differentiates NAFTA and Mexico's unilateral reforms, both were components of an integrated strategy for market reform that Mexico has pursued since the mid-1980s. Mexican trade liberalization, both unilateral and through NAFTA, accounted for an average annual increase in U.S. agricultural exports to Mexico of $3.1 billion during 1994-99.

(3) The estimated impact of the Canada-U.S. Free Trade Agreement (CFTA) and NAFTA on U.S. agricultural exports to Canada is not statistically significant. This finding, which is observed both at the aggregate level and for all the individual commodities studied, may reflect the fact that most barriers to U.S.-Canada agricultural trade were relatively low prior to CFTA, while several important sectors dairy, poultry, and eggs were exempted from trade liberalization.

(4) MERCOSUR's application of a common external tariff has lowered some barriers to U.S. agricultural exports, creating new opportunities for trade. Relatively high levels of U.S. agricultural exports during the MERCOSUR period are observed at the commodity level for all four MERCOSUR countries and at the aggregate level for Argentina, Paraguay, and Uruguay. In the cases of Argentina and Brazil, several consumer-oriented food products from the United States appear to have benefited from tariff reductions linked to MERCOSUR's common external tariff, although the value of this trade is still small compared with exports to Canada and Mexico.

(5) MERCOSUR appears to have had a trade-diverting effect on U.S. wheat exports to Brazil. With the creation of MERCOSUR, Argentina has dramatically increased its share of the Brazilian wheat market, while U.S. wheat exports to Brazil have declined. Argentine wheat enters Brazil duty free, while U.S. wheat faces MERCOSUR's common external tariff for the product.

The rest of the chapter contains a methodological overview of the modified gravity models and an extensive discussion of their findings. Technical aspects of the models are discussed in appendix 2-1, while the International Bilateral Agricultural Trade (IBAT) database, the source of the export data used in the chapter, is profiled in appendix 2-2.

Gravity Model Methodology

In its most basic application, the gravity model of international trade posits that the level of exports from one country to another is a function of each country's gross domestic product (GDP) and its population, as well as the distance between the two countries. To estimate the trade effects of regional trade agreements, a number of "gravity modelers" (such as Frankel, 1997; Endoh, 1999; and Soloaga and Winters, 2001) have included additional explanatory variables that indicate a country's membership in a specific trade agreement or trade bloc. These variables, however, do not distinguish the influence of a trade agreement from the long-term, relative closeness of a specific bilateral trading relationship. Nor do they account for the strong likelihood that the impact of a trade agreement varies from one participant to another.

To overcome these shortcomings, this chapter features a different specification of the gravity model (table 2-1). Following Cheng and Wall, the modified models include two sets of fixed effects (variables with the value of one or zero) that respectively identify specific importing countries and specific years. The fixed effects for importing country play a crucial role in the analysis, as they control for the importing country's long-term bilateral trading relationship with the United States. This increases the likelihood that the trade-agreement variables capture the effects of those agreements, rather than the general closeness of a particular bilateral relationship. Moreover, the trade-agreement variables are country-specific in order to address the possibility that the impact of a trade agreement varies among its participants. Table 2-2 provides a definition of each trade-agreement variable.

While the modified gravity models provide an improved framework for assessing regional trade agreements, the trade-agreement variables may still capture the influence of unrelated developments that are contemporaneous to these accords. Unusual weather patterns are an obvious example of an unrelated phenomenon that causes short-term changes in agricultural production and trade, and less experienced observers might incorrectly attribute these changes to one or more trade agreements. By having encompassing measures of the effects of trade-policy reforms, the modified gravity models may offer better estimates of their impact than models that focus narrowly on tariff reductions. However, these measures may be so broad that they capture the influence of factors that have little to do with trade agreements.

Empirical Findings

Total Agricultural Exports. Table 2-3 summarizes the results from the model of total U.S. agricultural exports. Although each variable denoting exports to Canada or Mexico during the CFTA/NAFTA period obtains a positive coefficient, only the coefficient for Unilateral-Mexico is statistically significant. Thus, the model supports the theory that Mexico's unilateral reforms have boosted U.S. agricultural exports to Mexico since 1989. It also suggests that the role of NAFTA in "locking-in" Mexico's earlier reforms was an important one.[10]

Figure 2-1 contrasts the actual and expected values of U.S. agricultural exports to Mexico from 1980 through 1999, based on the coefficients from the model. The figure illustrates that the modified gravity model does a reasonably good job of capturing the broad features of this trade, given the relative simplicity of the model and the coarseness of the trade-agreement variables. The largest difference between the actual and predicted values occurs in 1995, right after the sudden devaluation of the Mexican peso in December 1994. This suggests that the inclusion of an exchange-rate variable might improve the performance of the modified gravity model.

Using the coefficients for Unilateral-Mexico and NAFTA-Mexico, one may calculate the expected value of U.S. agricultural exports to Mexico when these variables are held to zero.[11] This simulation reveals that the model attributes a great deal of influence to Unilateral-Mexico and NAFTA-Mexico. Mexico's unilateral reforms account for 39 percent of U.S. agricultural exports to Mexico during 1989-1993, while the reforms and

[10] A sample with more observations of U.S. agricultural exports to Canada and Mexico during the CFTA-NAFTA period might afford more precise estimates of these coefficients. To explore this possibility, an alternative model was estimated using the data for all 32 commodity groupings, but this model also yielded insignificant coefficients for CFTA-Canada, NAFTA-Canada, and NAFTA-Mexico. However, these coefficients were significant in another alternative model, estimated using ordinary least squares, in which the original sample was limited to countries with agricultural imports from the United States of at least $500 million. The results from both models are available from the authors.

[11] Appendix 2-1 describes this calculation in greater detail.

NAFTA together account for 59 percent of this trade during 1994-99.[12] These percentages correspond to additional trade flows worth an average of $1.3 billion per year during 1989-93 and $3.1 billion per year during 1994-99. The impact of the unilateral reforms alone averages $1.7 billion per year during 1989-1999.

The simulation also provides an estimate (albeit insignificant) of NAFTA's impact on U.S. agricultural exports to Mexico. According to the model, NAFTA accounts for 20 percent of this trade during 1994-99. This estimate is substantially larger than the assessment of ERS's 1997 NAFTA Report (Crawford and Link, 1997), which concludes that U.S. agricultural exports to Mexico in 1996 were about 3 percent higher than they would have been in NAFTA's absence. This analysis relied upon a computable general equilibrium model and only examined the first 3 years of NAFTA's 14-year transition to trade liberalization. Based on careful consideration of NAFTA's commodity-specific provisions, ERS's 2002 NAFTA Report (Zahniser and Link, 2002) identifies several U.S. agricultural exports to Mexico whose trade volume during 1994-2000 increased by more than 15 percent as a direct result of NAFTA: rice, dairy products, cotton, processed potatoes, apples, and pears.

Figure 2-2 presents a similar simulation of U.S. agricultural exports to Canada in the absence of CFTA and NAFTA. Although the coefficients for CFTA-Canada and NAFTA-Canada are not statistically significant, the trade effects associated with these coefficients are large in value. Specifically, the model attributes an annual average of $2.3 billion of U.S. agricultural exports to Canada during 1989-1999 to the two agreements. Since 1985, U.S. agricultural exports to Canada have increased steadily and without interruption, a pattern that may correspond to the insignificance of CFTA-Canada and NAFTA-Canada.

MERCOSUR appears to have had a trade-creating effect on U.S. agricultural exports to Argentina, Uruguay, and Paraguay. This trade has grown dramatically since MERCOSUR's implementation, but each of these countries is still a relatively minor market for U.S. agricultural products, especially when compared with Canada or Mexico. According to the IBAT database, U.S. agricultural exports to these three countries totaled $176 million in 1999, compared with $13.2 billion for Canada and Mexico combined. Argentina is the largest customer of U.S. agricultural products in MERCOSUR, with agricultural imports from the United States totaling $154 million in 1999. A simulation of this trade in MERCOSUR's absence suggests that the common market increased U.S. agricultural exports to Argentina by an average of $117 million per year during 1991-99 (fig. 2-3).

MERCOSUR's positive influence on U.S. exports probably stems from the common market's external tariff. In many instances, this external tariff is substantially lower than the tariffs previously applied individually by MERCOSUR's member countries. For example, Argentina's average applied tariff rate dropped from 20 percent to 10 percent between 1987 and 1995, while Brazil lowered its average from 58 percent in 1986 to 10 percent in 1995 (Stout and Ugaz-Pereda, 1998: p. 134). However, the model suggests

[12] A one-tailed *t*-test supports the joint hypothesis that the coefficients of Unilateral-Mexico and NAFTA-Mexico in Model 1 are greater than zero at the 90-percent confidence level, even though NAFTA-Mexico's coefficient by itself does not pass such a test.

that MERCOSUR has diverted U.S. agricultural exports away from Brazil, especially during 1991-93 (fig. 2-4). The initial decline in this trade corresponds not with the start of the common market in 1991 but instead with the year 1987. Thus, factors other than MERCOSUR may be partially responsible for the reduced level of exports. In addition, the commodity models analyzed below indicate that developments in wheat trade account for a substantial portion of the negative effect associated with MERCOSUR.

One additional result of interest lies among the fixed effects for importing country. Each fixed effect for the MERCOSUR countries is negative and strongly significant, a result that should not be surprising given that the excluded country for purposes of comparison is Canada. But the variable identifying exports to Mexico is statistically indistinguishable from zero. This suggests that the long-term U.S. trading relationship with Mexico is about as close as the long-term relationship with Canada, once the size of the two economies and the differing impacts of CFTA, NAFTA, and Mexico's unilateral reforms are taken into account.

Commodity Models. To explore the impact of regional trade agreements at the commodity level, we estimate 32 additional models, each for a specific commodity or group of commodities. Table 2-4 summarizes the results of these models with respect to the trade-agreement variables. As a group, these models provide additional support for the hypothesis that Mexico's unilateral trade reforms have strengthened U.S. agricultural exports to that country. Unilateral-Mexico obtains a positive and significant coefficient in 14 commodity models: beer, cotton, flowers and foliage, apples, rice, wheat, peanuts, macaroni, beef, pork, prepared breakfast food, soda and bottled water, tobacco, tobacco products, and tomatoes. In contrast, NAFTA-Mexico is positive and significant in only four commodity models: grapes, yarn and thread, leather, and tobacco products.

Given ERS's previous research about NAFTA, it is not surprising that grapes and yarn and thread are among the commodities where NAFTA-Mexico is significant. The 2002 NAFTA report (Zahniser and Link, 2002) describes Mexico's elimination of its import-licensing requirement for U.S. grapes as an important element of NAFTA. It also emphasizes the importance of NAFTA's rules of origin for textiles and apparel, which restrict NAFTA trade benefits to articles produced from fabric, yarn, thread, and fiber manufactured in the NAFTA countries. These rules are likely to have boosted demand of Mexican textile and apparel producers for U.S. yarn and thread.

But there are also many noteworthy absences from the list of commodities where NAFTA-Mexico is significant. The 2002 NAFTA report concludes that NAFTA provided a moderate boost (a 6-percent to 15-percent increase in trade volume during 1994-2000) to U.S. exports to Mexico of corn, oilseeds, beef, and sorghum. They also indicate that NAFTA provided a strong boost (more than 15 percent) to U.S. exports to Mexico of rice, dairy products, cotton, processed potatoes, apples, and pears. These findings suggest that the commodity models in this chapter would benefit from a NAFTA variable that more precisely measures the agreement's commodity-specific provisions.

Similar to the model of total agricultural exports, the commodity models provide no evidence that CFTA and NAFTA have had a significant impact on U.S. agricultural exports to Canada. The coefficient for CFTA-Canada is positive in 8 commodity models, while the coefficient for NAFTA-Canada is positive in 20 commodity models. However, none of these coefficients are statistically significant. Again, these results differ from ERS's commodity-level assessments of CFTA and NAFTA. The 2002 NAFTA report indicates that the two agreements have provided a moderate stimulus to U.S. exports to Canada of cotton and processed tomatoes and a strong stimulus to exports of beef and wheat products (flour, bulgur wheat, starch, gluten, and uncooked pasta). The general lack of significance of CFTA-Canada and NAFTA-Canada in the modified gravity models may be due to the relatively low level of Canadian protection that existed prior to CFTA against U.S. exports. Moreover, dairy products, poultry, and eggs were exempted from the process of U.S.-Canada trade liberalization. In any case, within the context of this chapter's modified gravity models, the size of the Canadian economy and the historically close trading relationship between the two countries are the main explanatory factors of U.S. agricultural exports to Canada.

The finding that MERCOSUR has boosted U.S. agricultural exports to Argentina and Paraguay is mirrored in several commodity models. Of the 15 commodity models in which Argentina is included, 3 models obtain a positive and significant coefficient for Argentina/1991-99: fruit or vegetable juice, edible nuts, and prepared breakfast food. For prepared breakfast food, MERCOSUR's positive influence on U.S. exports is even stronger during 1994-99, as evidenced by the positive and significant coefficient for Argentina/1994-99. Many of these exports benefited from tariff reductions linked to MERCOSUR's external tariff. During the 1980s, Argentine tariffs on dairy products, processed fruits and vegetables, fruit and vegetable juices, and other consumer-oriented agricultural products ranged from 20 to 38 percent. By 1995, the average tariff for consumer-oriented agricultural products had fallen to 14 percent (Stout and Ugaz-Pereda, 1998: p. 134).

In the model of U.S. soybean exports, the coefficient for Argentina/1994-99 is positive and strongly significant, which at first glance suggests that MERCOSUR has had a positive impact on this trade. However, the significance of this coefficient is more likely due to a severe drought that sharply reduced the size of Argentina's 1996/97 soybean crop (U.S. Department of Agriculture, Foreign Agricultural Service, 1997). As a result, U.S. soybean exports to Argentina, usually less than $200,000 per year, climbed to $124 million in 1997 and $10 million in 1998. Only the commodity model for raw tobacco shows that MERCOSUR has depressed U.S. exports to Argentina. U.S.-Argentina trade in this commodity was customarily small during 1980-1999, with exports to Argentina never exceeding $500,000 per year.

Paraguay appears in just seven commodity models, two of which indicate that MERCOSUR is a significant factor influencing U.S. exports to that country. First, the common market is found to have increased U.S. beer exports to Paraguay during 1991-99. This trade averaged $12 million per year during 1997-99, compared with just $204,000 per year during 1988-1990. Second, MERCOSUR is associated with lower U.S. exports of milk and cream to Paraguay. Like U.S. tobacco exports to Argentina, this trade was extremely small throughout the sample period, last exceeding $100,000 in 1983.

Although the model for total agricultural exports indicates that MERCOSUR has reduced U.S. exports to Brazil, the commodity models suggest that the common market has stimulated many aspects of this trade. The coefficient for Brazil/1991-99 is positive and significant for seven commodities: cheese, distilled alcoholic beverages, fruit or vegetable juice, rice, leather, prepared breakfast food, and soda and bottled water. In addition, the coefficient for Brazil/1994-99 is positive and significant for 11 commodities: cheese, distilled alcoholic beverages, fruit or vegetable juice, apples, grapes, beef, plants and bulbs, prepared breakfast food, soda and bottled water, legumes, and wine. In many instances, U.S. exports of these products are likely to have benefited from Brazilian tariff reductions associated with MERCOSUR's common external tariff. Stout and Ugaz-Pereda emphasize that Brazil's applied tariffs on agricultural products prior to MERCOSUR were much higher than Argentina's, with most tariff rates exceeding 40 percent.

The commodity models also provide evidence that MERCOSUR has limited some U.S. exports to Brazil, as the coefficient for Brazil/1991-99 is negative and significant in the models for wheat, milk and cream, and legumes. (The coefficient for Brazil/1994-99 is not negative and significant in any of the commodity models.) Among these products, milk and cream and legumes are not prominent candidates for trade diversion. Milk and cream exports to Brazil averaged less than $1 million per year during 1988-90 and only $3 million per year during 1997-99. Legume exports to Brazil actually have grown under MERCOSUR, from an average of $2 million per year during 1988-90 to $6 million per year during 1997-99.

Wheat, in contrast, is a completely different case. U.S. wheat exports to Brazil dropped from an annual average of $23 million during 1988-90 to just $4 million during 1997-99. Across the same two periods, Argentine wheat exports to Brazil surged from $183 million to $801 million per year. MERCOSUR's tariff preference partially explains this shift, as the common market's external tariff for wheat equaled 11.5 percent in 2002 (Svec, 2002: p. 12). But improved wheat yields in Argentina also help to explain the changing fortunes of U.S. wheat exports to Brazil. In fact, Argentine wheat producers have nearly closed the yield gap that separates them from their U.S. counterparts (Schnepf, Dohlman, and Bolling, 2001: pp. 30-31).

Conclusion

The modified gravity models in this chapter highlight a number of important recent developments in the pattern of U.S. agricultural exports. First and foremost, exports to Mexico during 1989-1999 are significantly higher than previous exports to Mexico, once the changing size of the Mexican economy and the historic closeness of the U.S.-Mexico trading relationship are taken into account. This result is obtained both at the aggregate level and for 14 different commodities. Unilateral reforms by Mexico to open its market in the late 1980s and early 1990s are responsible for most of the heightened level of this trade. The additional trade benefits secured by NAFTA appear to be less important to U.S. agricultural exports to Mexico, providing a significant stimulus only to grapes, yarn and thread, leather, and tobacco products. As a practical matter, the unilateral and regional trade reforms are both parts of the profound economic reorientation that Mexico has undergone since the late 1980s, and the two types of reform *together* are found to have a significant impact on U.S. agricultural exports to Mexico. With the exception of one alternative model, none of the models associate the CFTA/NAFTA period with a significant change in U.S. agricultural exports to Canada. Previous ERS assessments of NAFTA's commodity-specific provisions (included those originally negotiated in CFTA) suggest that CFTA and NAFTA have had a much broader impact on U.S. agricultural exports to both Canada and Mexico.

The models suggest that MERCOSUR has had a mixed effect on U.S. agricultural exports. For all four countries, there are commodities where MERCOSUR is linked to increased U.S. exports, and at the aggregate level, MERCOSUR is found to have created trade in the cases of Argentina, Paraguay, and Uruguay. With respect to Brazil, however, a finding of trade diversion is obtained at the aggregate level and for milk and cream, legumes, and wheat. Among these commodities, wheat is the most likely case of trade diversion, as Argentina has dramatically increased its share of the Brazilian wheat market.

Care must be taken in the evaluation of these findings, as the variables that denote the participation of a country in a particular trade agreement also capture the influence of other contemporaneous factors. Incorporating additional variables that more fully describe international markets for specific commodities should improve the performance of the models in this chapter. Examples include volume measures of trade, actual transportation costs, levels of production by country, changes in yields, the amount of consumption, and quantitative measures of trade impediments. Of course, additional data collection usually comes at a cost, and one of the main attractions of gravity models as they stand is that their data requirements are relatively small. The next generation of gravity models is likely to depart from this tradition.

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Appendix 2-1
Description of Methodology

Econometric Approach. In the not too distant past, most gravity models of international trade were estimated using ordinary least squares, and this approach continues to be applied by many researchers. However, the data sets that describe bilateral trade flows usually lack observations for those instances where trade equaled zero or was not reported. This is particularly true at the commodity level, where the proportion of such observations can be rather high. Since this characterization applies to the database used in this chapter, the modified gravity models here are estimated as tobit models, as presented by Green (pp. 727-729):

(1) $y^*_{it} = \beta' x_{it} + \varepsilon_{it}$,

$y_{it} = 0$ if $y^* \leq 0$,

$y_{it} = y^*_{it}$ if $y^* > 0$,

where y^*_{it} is latent measure of trade. The observed, dependent variable (y_{it}) equals the log of U.S. exports to country *i* in year *t*, as measured in U.S. dollars.

The number of missing observations in the export data increase as one moves backwards in time through the data set, so the sample is restricted to the 1980-1999 period to ensure that missing observations do not drive the results. In addition, a country's observations are included only if there are at least 10 nonzero observations (out of 14) during 1980-1993 and at least 5 non-zero observations (out of 6) during 1994-99. This evaluation is conducted on a model-by-model basis. Thus, the set of countries included in the model of total agricultural exports is substantially larger than the sets used in the commodity models.

Explanatory Variables. In addition to the intercept, the models in this chapter contain a number of explanatory variables. The log of the importing country's GDP accounts for variations in U.S. exports due to the size of the importing economy. This variable, measured in U.S. dollars, is drawn primarily from the International Monetary Fund's World Economic Outlook Database. GDP data for countries not in this database are from the *Statistical Yearbook of the United Nations*.

Although population estimates are readily available in the World Bank's *World Development Indicators CD-ROM* and the United Nations' *Demographic Yearbook*, the models employed here do not include the log of the importing country's population, a variable that appears in many previous gravity models. This decision is motivated by the fact that the log of population is closely correlated to the log of GDP. According to 1995 data, the correlation coefficient between the two variables is 0.70 for the 127 countries in the sample.

Trade-Agreement Variables. Of primary interest are the explanatory variables that indicate a country's participation in a particular trade agreement (table 2-2). Unlike most previous works, these variables are country-specific in order to address the possibility that the impact of a trade agreement varies among its participants. This possibility is especially strong in the case of NAFTA, which took effect on January 1, 1994, and will complete its implementation phase on January 1, 2008. NAFTA includes three distinct schedules for tariff elimination: a U.S. schedule for Mexican exports, a Canadian schedule for Mexican exports, and a Mexican schedule for U.S. and Canadian exports. Moreover, NAFTA subsumes CFTA and its tariff-elimination schedules for U.S.-Canada trade.

CFTA took effect on January 1, 1989, and its provisions were fully implemented on January 1, 1999. Thus, the first 5 years of NAFTA (1994-98) coincide with the last 5 years of CFTA's tariff-elimination schedule. To distinguish the impact of this latter phase of CFTA's implementation from the agreement's broad influence since 1989, the models include two variables that identify exports to Canada during the CFTA/NAFTA period: CFTA-Canada (1989-99) and NAFTA-Canada (1994-99).

For Mexico, NAFTA is the extension of a process of unilateral trade reforms that followed the country's accession to the General Agreement on Tariffs and Trade (GATT) in 1986. In the late 1980s and early 1990s, Mexico dramatically reduced its tariffs and opened its economy to foreign direct investment. Import licensing was eliminated for many agricultural products, and tariffs were established well below the 50-percent ceiling established by Mexico's GATT Adhesion Protocol. U.S. exports that benefited from these reforms include beef, pork, sorghum, soybeans, and other oleaginous crops (Rosenzweig Pichardo, 2000). Because Mexico is one of the most important customers for U.S. agricultural products, these reforms may be viewed as a predecessor to NAFTA, somewhat akin to CFTA. For this reason, the models employ two variables to measure trade liberalization's impact on exports to Mexico: Unilateral-Mexico (1989-1999) and NAFTA-Mexico (1994-99). The year 1989 is selected as the beginning of the period covered by Unilateral-Mexico to account for the piecemeal implementation of the reforms over along period, as well as the fact that key agricultural trade reforms were implemented after 1989.

All four variables listed above are hypothesized to have a positive impact on U.S. agricultural exports, as these measures have provided the United States with substantially freer access to the Canadian and Mexican markets. In contrast, the process of regional integration in South America may have positive or negative effects on U.S. exports. Argentina, Brazil, Paraguay, and Uruguay created MERCOSUR through the Treaty of Asunción, which took effect on November 29, 1991. By progressively eliminating most tariff barriers within the common market, MERCOSUR provides its members with preferential access to each other's markets. Since the United States is not part of MERCOSUR, this process may divert potential U.S. exports from the common market.

However, MERCOSUR also provides for a common external tariff ranging from zero to 20 percent towards non-member countries. In many instances, this tariff is substantially lower than the tariff previously applied by the individual MERCOSUR countries. Thus, its implementation may spur additional U.S. exports to the common market. In addition, Chile and Bolivia became associate members of MERCOSUR in 1996 and 1997, respectively. This means that they share in MERCOSUR's project of internal trade liberalization but do not apply the common external tariff.

To gauge MERCOSUR's impact on U.S. exports, four variables identify exports to particular MERCOSUR countries following the common market's creation: Argentina/1991-99, Brazil/1991-99, Paraguay/1991-99 and Uruguay/1991-99. Four more variables--Argentina/1994-99, Brazil/1994-99, Paraguay/1994-99, and Uruguay/1994-99--indicate exports to these countries during 1994-99. This latter group of variables is intended to capture the additional effect associated with the progressive reduction of tariffs within MERCOSUR, as well as NAFTA's possible influence on U.S. exports to MERCOSUR. Finally, two variables Bolivia/1997-99 and Chile/1996-99 identify exports to Bolivia and Chile following their becoming associate members of MERCOSUR.

The coefficient for each trade-agreement variable measures the shift in the intercept associated with the observations denoted by that variable. As an example, consider the results for CFTA-Canada in the model of total agricultural exports (table 2-3). The coefficient for this variable (0.3758) equals the difference between the expected value of the latent trade variable y_{it}^{*} when CFTA-Canada equals zero and the expected value of y_{it}^{*} when CFTA-Canada equals one.

It is important to emphasize that the trade-agreement variables may also capture the influence of unrelated developments that are contemporaneous to these accords. Unusual weather patterns are an obvious example of an unrelated phenomenon that causes short-term changes in agricultural production and trade, and less experienced observers might incorrectly attribute these changes to one or more trade agreements. By having encompassing measures of the effects of trade-policy reforms, the modified gravity models may offer better estimates of their impact than models that focus narrowly on tariff reductions. However, these measures may be so broad that they capture the influence of factors that have little to do with trade agreements.

Expected Value of the Dependent Variable. Following Green (p. 728), the expected value of the dependent variable (the log of exports to country *i* in year *t*) equals

(2) $$E[y_{it} \mid x_{it}] = \Phi\left(\frac{\beta' x_{it}}{\sigma}\right)(\beta' x_{it} + \sigma\lambda_{it}),$$

where

$$\lambda_{it} = \frac{\phi(\beta' x_{it} / \sigma)}{\Phi(\beta' x_{it} / \sigma)}$$

and σ is the model's scale parameter.

By subtracting the model's coefficient for Unilateral-Mexico (0.4987) from $\beta' x_{it}$ and then substituting this difference for $\beta' x_{it}$ in equation (2), one may calculate the expected value of U.S. agricultural exports to Mexico during 1989-1993 when Unilateral-Mexico is held equal to zero. Similarly, for corresponding exports during 1994-99, one may calculate the expected value when Unilateral-Mexico and NAFTA-Mexico are held to zero by also subtracting the coefficient for NAFTA-Mexico (0.3892) from $\beta' x_{it}$ when re-calculating the equation. This technique provides the basis for conducting a simple simulation of what the value of U.S. agricultural exports to Mexico would have been in the absence of NAFTA and Mexico's unilateral reforms.

Appendix 2-2
The International Bilateral Agricultural Trade Database

The export data for the models are drawn from the International Bilateral Agricultural Trade (IBAT) database. This unique statistical resource, developed by Mark J. Gehlhar of ERS, reflects an innovative effort to choose among the competing trade statistics reported to the United Nations. Given the trade statistics reported by two countries, the IBAT database includes the figures from the country with the larger share of reported trade that matches the reported trade of its trading partners. This evaluation is conducted on an annual basis at the 4- and 5-digit level of the Standard Industrial Trade Classification (SITC). Countries in the sample are listed in appendix table 2-1.

A relatively simple example from Argentina-Brazil trade helps to illustrate this process. As reported to the United Nations, the official statistics of Argentina and Brazil contain incompatible measures of Argentine wheat exports to Brazil in 1995. This trade equaled $662 million according to Argentina, but just $4 million according to Brazil. Fortunately, the entire body of statistics reported by Argentina, Brazil, and their trade partners provides insight into the general reliability of the two countries' trade reports. With this information, one may calculate a "Reliability Index" for Argentina's wheat export data and for Brazil's wheat import data for 1995. This index is defined as the proportion of a country's reported trade that matches the statistics of its partners. Then, the statistic with the higher Reliability Index is included in the IBAT database. With the assistance of a computer, this decision rule can be elegantly applied to all the bilateral trade data reported to the United Nations commodity by commodity, year by year, and country by country.

Consider first the wheat export data of Argentina (appendix table 2-2). A match is defined as having occurred when Argentina's reported exports to country *i* equal the imports from Argentina reported by country *i*, plus or minus 20 percent. Eight of Argentina's reported bilateral export flows qualify as matches, for a total of $128 million. This value forms the numerator of the Reliability Index. The denominator equals the sum of Argentina's reported export flows where both Argentina and the importing country report some non-zero level of trade ($128 million + $797 million = $925 million), minus the value associated with the largest proportionate discrepancy ($662 million). In this instance, Brazil is the country with the largest discrepancy. Thus, the denominator equals $263 million ($925 million - $662 million), and the Reliability Index for Argentina' wheat export statistics for 1995 equals 0.49.

Next, consider the wheat import data of Brazil. For 1995, Brazil reported wheat imports from only two sources: Argentina ($4 million) and Paraguay ($1 million). A match occurs when Brazil's reported imports from country *i* equal the exports to Brazil reported by country *i*, plus or minus 20 percent. Neither figure qualifies as a match, so the Reliability Index for Brazil's wheat import statistics for 1995 is zero. Since 0.49 is greater than zero, the IBAT database records Argentine wheat exports to Brazil in 1995 as $662 million, not $4 million.

With respect to U.S. trade, the IBAT database primarily uses information provided by the United States, which has the higher Reliability Index in most face-to-face comparisons.

However, the U.S. data are not used on every occasion. Appendix table 2-3 lists the proportion of observations in the IBAT database that were reported by the United States for the 32 commodity categories featured in the commodity models. Among these commodities, grapes have the highest proportion of U.S. observations (0.767) and sunflower seed oil has the lowest (0.519). The median proportion is 0.6485, which is the average of the proportions for corn (0.648) and cotton (0.649). The possibility that as many half of U.S. trade reports for certain commodities could be inferior to the reports submitted by U.S. trade partners provides strong justification of the IBAT database's selective approach.

Chapter 3
Measuring Agricultural Tariff Protection

The focus of the FTAA negotiations differs from that of the multilateral WTO negotiations because the FTAA discussions cover only market access, one of the three WTO "pillars." While FTAA members recognize the need to discipline the use of export subsidies within the region, a second WTO pillar, progress on this issue depends largely on whether importing countries are willing to also forgo buying subsidized products from countries outside the region. As for the third pillar, domestic support, the United States always has insisted that it remain a multilateral issue, and thus not subject to negotiation in regional talks. As a result, market access issues are at center stage within the FTAA, particularly for agricultural trade. In this chapter, we focus on one aspect of market access, tariff liberalization, and the extent to which tariffs in the region pose an impediment to trade in agricultural goods between the United States and its neighbors in the Western Hemisphere.

FTAA members have already achieved substantial tariff reform through a combination of multilateral, subregional, and bilateral pacts trade pacts. Through multilateral negotiations, the WTO Agreement on Agriculture (AoA) resulted in the conversion of nontariff barriers to tariffs. Countries also committed to reducing their agricultural tariffs over the AoA's implementation period. However, even after all the cuts have been realized, the simple global average most-favored-nation (MFN) bound tariff on agricultural imports will exceed 60 percent.[13] While the average MFN bound tariff for countries in the Western Hemisphere is considerably lower at about 30 percent, substantial room remains for further liberalization.[14]

Additional steps have already been taken to reduce tariffs on interregional trade. Between 1990 and 1999, there were nearly 40 bilateral and subregional trade and investment pacts negotiated within the hemisphere, including several renewals of old initiatives such as the Central American Common Market (CACM) and the Caribbean Community and Common Market (CARICOM). The two largest trading blocs within the hemisphere were also created during this time, the North American Free Trade Agreement (NAFTA) and the Common Market of the South (MERCOSUR).[15] Many of these subregional agreements provide greater access for agricultural goods by eliminating tariffs and other barriers on substantially all trade. As a result, the agricultural markets of most of the countries in the region have been opened up well beyond their WTO obligations.

Another outcome of these pacts is that trade within the region is conducted under an array of different tariff rates. Within the United States, agricultural goods imported from some countries may face MFN tariffs, while the same goods imported from NAFTA countries may face lower tariff rates. In addition, exports of certain agricultural goods from other

[13] Bound tariffs are the maximum duties that a country is permitted to levy on imports. Under WTO rules, a country cannot apply duties higher than the bound level without notifying and compensating other members. In practice, countries often apply duties significantly below the bound levels.
[14] See Gibson et al., for a description of how this average was calculated.
[15] Countries in the Western Hemisphere also are making agreements with those outside of the hemisphere. Mexico negotiated a free trade agreement with the European Union (EU), and Chile and MERCOSUR are negotiating their own bilateral free trade agreements with the EU.

FTAA countries may be eligible for duty-free treatment under the Generalized System of Preferences (GSP), the Caribbean Basin Economic Recovery Act (CBERA), or the Andean Trade Preference Act (ATPA). In 2001, more than 60 percent of U.S. agricultural imports from Western Hemisphere countries were eligible to enter at preferential tariff rates, i.e., rates below the MFN bound rates. At the same time, the duties faced by most U.S. exports in its NAFTA partners' markets are well below MFN levels. In addition, many of the other countries within the hemisphere actually apply duties at rates substantially lower than their permitted MFN bound levels. When trying to gauge the effect that cutting MFN tariffs may have on future trade, the large amount that currently takes place at preferential and applied tariffs below bound MFN rates has to be taken into account.

This chapter addresses a number of tariff-related questions relevant to the negotiations: What are the levels and patterns of tariff protection currently faced by U.S. agricultural exports within the FTAA? To what extent has the United States already opened its agricultural markets to the region? Which are the most important products being exported by our Western Hemisphere trading partners that continue to face high duties in the United States? Do some products within the region face higher protection across the board than do others and to what extent are these products exported by United States?

Trade and Tariffs Within the FTAA Region

The tariff liberalization that took place within the Western Hemisphere in the 1990s was accompanied by impressive growth in intraregional trade. During this period, the annual rate of growth in intraregional trade increased by 11.1 percent, exceeding the 8-percent annual growth rate in hemispheric trade with the rest of the world, as well as the annual growth rate in overall global trade of 6.6 percent per year (U.S. General Accounting Office, 2001). FTAA agricultural trade became an increasingly important component of overall U.S. agricultural trade as well. About 55 percent ($23.1 billion) of all U.S. agricultural imports and about 37 percent ($19.9 billion) of U.S. agricultural exports came from or went to FTAA countries in 2001. NAFTA partners Canada and Mexico accounted for 38 percent of U.S. agricultural imports and 29 percent of U.S. agricultural exports in 2001. Much of this trade already takes place at zero duties. Compared with NAFTA, overall trade with the rest of the FTAA countries is considerably less, accounting for 17 percent of U.S. agricultural imports and 8 percent of exports. It is this share of U.S. agricultural trade that will be most affected by the FTAA. In 2001, the leading U.S. agricultural exports to FTAA countries consisted of coarse grains, red meats, and snack foods. The leading imports were fresh vegetables, coffee, and red meats.

Within the region, the United States is generally the most important destination for exports. During the 1998-2000 period, the FTAA countries relied on the U.S. market for an average of 32 percent of their agricultural exports, although some marked differences existed between individual countries. The level of dependency on the U.S. market as an export destination was greatest for the Dominican Republic, which shipped about 80 percent of its total agricultural exports there. The NAFTA partners are also highly dependent on the United States, with about 73 percent of Mexico’s and 55 percent of Canada’s agricultural exports destined for the United States. The MERCOSUR countries, on the other hand, tend to trade most heavily with each other, shipping less than 10 percent of their exports to the United States.[16]

Table 3-1 provides some basic statistics on 2001 U.S. agricultural imports from FTAA countries as well as the number of tariff-line products in which trade took place.[17] Almost 70 percent of U.S. agricultural imports from the region came from NAFTA partners Canada and Mexico, both of which tend to have a much broader base in terms of the number of tariff lines and diversity of products exported to the United States. Of the remaining U.S. imports, spread out among the other 31 countries, Chile and Brazil led the way at over $1 billion each, accounting for almost 30 percent of the non-NAFTA total.

Table 3-1 also categorizes imports from Western Hemisphere countries by the amount of trade that came in at MFN versus preferential tariffs. This provides an important gauge of the capacity of the United States to further reduce tariffs under an FTAA as well as an indicator of how much actual trade will be impacted by tariff cuts.

The U.S. market is already relatively open to the hemisphere. In 2001, 49 percent ($11.3 billion) of total U.S. agricultural imports from FTAA countries entered duty-free under either NAFTA or one of the three nonreciprocal trade preference programs, the GSP, CBERA, and ATPA, each of which offers duty-free entry on a range of products. Another 32 percent ($7.5 billion) of total agricultural imports entered at MFN duty-free rates. This means that only about 19 percent of U.S. agricultural imports were assessed duties in 2001. About 12 percent of the total consisted of imports from Mexico at NAFTA rates that, while not yet duty-free, were considerably below MFN rates.[18] In 2001, only 7 percent ($1.5 billion) of the U.S. imports from FTAA countries came in at MFN duties. About 4 percent of U.S. imports were assessed MFN duties under 5 percent, while less than 1 percent came in at duties above 15 percent.

The larger FTAA countries tend to export a fairly wide range of agricultural products to the United States. For many of the smaller countries, however, exports to the United States consisted of only a few products, and often one product dominated. For example, almost 90 percent of Dominica's exports to the United States during 1998-2000 consisted of cigars, while 87 percent of Grenada's were made up of nutmeg. In 10 of the 33 countries, a single commodity accounted for at least one-half of its total exports to the United States.

The value of U.S. duty-free preferences under nonreciprocal trade programs varies across countries, depending on the overall makeup of their agricultural exports. At 99 percent, Belize had the highest share of its products enter under preferential rates. A number of Caribbean nations, including the Bahamas, Barbados, the Dominican Republic, Guyana, Jamaica, and St. Lucia exported over 80 percent of their U.S.-bound agricultural products under either GSP or CBERA. Through NAFTA, 68 percent of U.S. agricultural imports from Canada and 82 percent from Mexico benefited from preferential duties. Some

[16] MERCOSUR consists of Argentina, Brazil, Paraguay, and Uruguay.

[17] Product coverage is the same as that specified in Annex 1 of the WTO Agreement on Agriculture. In 2001, the U.S. agricultural tariff schedule distinguished between 1,754 tariff-line items.

[18] These duties are being progressively reduced to zero under the NAFTA timetable.

countries, however, including Argentina and Chile, had extremely low shares (under 10 percent) of their U.S.-bound exports enter at preferential rates.

As a result of preferential rates, the simple unweighted average U.S. tariffs facing FTAA countries in 2001 were lower than the already low MFN average bound U.S. tariff of 10.4 percent. Due to NAFTA preferences, Canada at 4.7 percent and Mexico at less than 1 percent face the lowest simple average tariffs among FTAA countries.[20] Countries qualifying for tariff preferences under the CBERA or ATPA programs face simple average tariffs of slightly over 6 percent on agricultural products while other FTAA countries, which benefit only from the GSP, face slightly higher averages of about 9.1 percent.

While the simple averages may appear to be low, the United States continues to maintain relatively high tariffs, with little or no preferential access, on certain agricultural products, many of which are of special export interest to FTAA countries. These include import-sensitive products such as sugar and sugar-containing products, peanuts and peanut butter, certain types of tobacco, orange juice, dairy products, and beef. Tariff rate quotas (TRQs) limit imports of many of these products. A TRQ allows a certain amount of a product to be imported at a generally low "in quota" rate, with any additional imports facing the higher "over quota" rate. For example, the tariffs for tobacco imports within the quota are around 10 percent while the tariffs on over-quota imports are 350 percent.

Table 3-2 shows the extent to which individual FTAA countries' agricultural exports to the United States faced TRQs in 2001. The region as a whole accounted for slightly less than 50 percent ($2.0 billion) of the value of products imported under U.S. TRQs, with Canada alone accounting for 31 percent ($1.3 billion). The remaining amount was spread over 22 countries, from Brazil ($200,235) to Venezuela ($208). The bulk of this trade took place within the quota and most of it was at preferential rates. The small amount of over-quota trade was almost exclusively from NAFTA partners.[19] Neither the GSP, CBERA, nor ATPA program extends preferential access for products subject to over-quota tariffs. That there was very little over-quota trade at MFN rates suggests the trade-chilling effects of these high over-quota tariffs. It also indicates that for those FTAA countries whose exports face high over-quota rates, there would appear to be substantial potential benefit from an elimination of these barriers. A general conclusion from these tariff and trade data is that even though the trade benefits for FTAA countries from negotiating a free trade agreement with the United States might appear small, given the high proportion of trade already taking place at low or zero duties, when one takes into account those sensitive products on which prohibitively high rates are levied, the potential benefits could expand considerably.

Comparing Tariff Protection Across FTAA Countries

20 These tariff averages are calculated as simple means across the 1,754 tariff-line items found in the U.S. agricultural tariff schedule. Note that tariffs averages calculated from the full tariff schedule differ from those based on 6-digit aggregates of the Harmonized System, as reported in table 3.5

19 Over-quota imports from Mexico were assessed preferential rates under NAFTA, while Canadian imports would have been assessed the MFN rate. All over-quota imports from other countries would also have been at MFN rates.

Comparing tariffs across countries is neither a straightforward nor a simple exercise. Over 50 years ago, Viner observed that “there is no way in which the ‘height’ of a country’s tariffs as an index of its restrictive effect can be even approximately measured, or for that matter, even defined with any degree of significant precision” (Viner, 1950). While there are numerous approaches to calculate the overall level of tariff protection provided by a country’s tariff schedule, none is without some aggregation bias. The easiest and most common approach is to calculate a simple unweighted tariff mean. The main drawback with a simple average is that it gives equal weight to all goods regardless of importance in trade.

To remedy this deficiency, weighted averages are often calculated in an attempt to emphasize certain tariffs over others. Weighting a country’s tariffs based on its import values is a commonly used weighting scheme. However, it provides distorted results because items with the most restrictive tariffs will receive virtually no weight, since little or no trade takes place under such tariffs. Weighting based on shares of domestic value of production would ensure that highly protected commodities produced in large amounts get appropriately large weights, but production data at the tariff-line level are rarely available. Using shares of the domestic value of consumption is another alternative weighting scheme, but also biased to the extent that high tariffs reduce consumption. Similar to production, consumption data are generally not available at the tariff-line level. Weighting by the value of global trade is perhaps the least biased alternative since it gives relatively greater weight to those products most important in international exchange and escapes, in large part, the distortions associated with using own-import weights.

Using the value of global trade as a weighting scheme may still not provide countries with the information that is needed to evaluate the level of protection their exports face in each importing country. Even though two countries’ exports may face exactly the same tariffs in a third country, the average tariff each faces can differ based on the composition of each of the country’s exports. The restrictive effect that an importing country’s tariff schedule has on each of its trading partners' exports depends on how high its duties are on the basket of products being exported by each of these trading partners. Table 3-3 ranks selected FTAA countries based on the percent of total agricultural export value accounted for by the top four export categories. The degree of dependency on a few products is extremely high throughout almost the entire region, with the top four exports (at the HS 6-digit level) accounting for over 90 percent of total exports in the cases of St. Lucia, the Bahamas, St. Kitts and Nevis, and Guyana.[20] All but 10 countries earn over one-half of their agricultural export earnings from only four products. This concentration level demonstrates the importance that a relatively small subset of tariffs can have on trade between two partners. Even the United States, which has the most diversified export sector in the region, does not export every product nor is it equally concerned with every one of its trading partners’ tariffs. The challenge is to devise a meaningful method of measuring and comparing relative levels of tariff protection between trading partners that distinguishes between “important” and “unimportant” tariffs.

[20] The Harmonized System (HS) provides an internationally recognized nomenclature for classifying globally traded goods. The World Customs Organization establishes the definitions of HS commodity groupings.

The information found in tables 3-4 and 3-5 is one way to achieve this goal (see appendix 3-1). Each table contains three sets of tariff means—a simple, unweighted mean of applied tariffs and two weighted means, one of applied tariffs and one of bound tariffs.[21] Table 3-4 contains tariff means faced by U.S. agricultural exports in each of the selected countries, while table 3-5 contains the tariff means faced in the United States by each of these countries' agricultural exports. In the case of the weighted means in table 3-4, the weights used to calculate each mean are based on total U.S. agricultural exports, not exports to the individual country. In turn, the weighted means in table 3-5 are generated using the total agricultural exports of each U.S. trading partner as weights. Using the shares of commodities in the exporting country's *total exports* as weights ensures that the greatest emphasis is placed on those tariffs in the importing country that are of most importance to the exporting partner. It also provides a valuable starting point for considering the effect that a country's tariff regime has on its trading partner's exports.[22]

From the U.S. perspective, the most protected country in the sample is the Dominican Republic, whether one uses the simple or weighted mean as an indicator. Based on the weighted mean, if all U.S. agricultural exports had gone to the Dominican Republic during the base period, the average duty faced would be about 18.5 percent. This average is due to tariffs of 30 percent or higher on such important U.S. exports as tobacco products, pet foods, almonds, apples, and baked goods. These tariffs are assigned relatively heavy weights in the calculations. Peru had the second highest tariff protection on U.S. agricultural exports due to fairly high (25-30 percent) rates on meats and grains, other important U.S. exports. On the other end of the spectrum, five countries—Canada, Nicaragua, Mexico, Chile, and Guatemala—all have weighted tariff means of less than 10 percent.

U.S. exports face applied tariffs in Western Hemisphere markets that are considerably lower than the bound rates. The lowest applied rates tend to be concentrated in products of use to farmers (seeds, cuttings and live plants, semen, breeding stock, etc.) or plant and animal materials with commercial uses (gums, resins, essential oils, extracts, and hides and skins). Regional trade in many of these products is fairly modest. However, some products that are very important to U.S. agriculture, including wheat, soybeans, and cotton, also face low applied tariffs in many, although not all, countries within the hemisphere. It is also the case, however, that many products face uniformly higher-than-average tariffs within the region. From the standpoint of U.S. exports, the most important of these are tobacco products, meats, rice, beer, wine, and distilled spirits. Certain fruits and vegetables including apples, grapes, oranges, grapefruit, potatoes, and onions also face higher-than-average applied tariffs in many markets especially during specific times of the year when domestic production is available. Finally, dairy products, sugar, and processed products containing dairy products and sugar tend to face higher-than-average applied tariffs in most countries.

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[21] All tariff rates were first aggregated in the form of simple averages from the national tariff-line level (usually the HS 8-digit level) to the HS 6-digit level.

[22] See the appendix to this chapter for a detailed discussion of the export-weighting methodology. Like other weighting schemes, export weights have some limitations. Differences in the composition of a country's bilateral trade flows may result from differences in its trader partners' consumer preferences or from policies such as historical quota rights, rather than the partners' tariffs.

Comparing the weighted and simple unweighted applied means of each country gives a good indication of the level of bias each country's tariff schedule contains against U.S. exports. To the extent that a country levies higher tariffs on those products that are important from a U.S. export perspective than on those products not important to the U.S., the weighted average will exceed the unweighted one. In this respect, Mexico's tariff schedule demonstrates the highest relative bias against U.S. exports. When weighted by U.S. exports, Mexico's mean applied tariff is almost three times the simple unweighted mean. This is understandable, however, since under NAFTA tariffs on some products were immediately cut to zero while others were reduced to zero by the end of 2003. In the case of the most import-sensitive commodities, however, tariffs will not reach zero until 2008. In 2001, Mexico was still levying tariffs on several important U.S. export commodities, including corn, poultry, and tobacco/tobacco products. In general, however, there is not much difference between the weighted and unweighted tariff means in table 3-4 partly because countries within the hemisphere tend to have relatively low levels of dispersion across both their bound and applied tariffs.

The overall, export-weight, average applied rate for the countries found in table 3-4 is 12.5 percent, less than one-third of the bound average of 43.3 percent. The difference between the applied rates that U.S. exports face and the bound rates are especially large for Jamaica, Nicaragua, and Colombia. Mexico also shows a large difference, with U.S. agricultural exports facing an export-weighted, average NAFTA tariff in Mexico of 8.6 percent versus an average bound tariff of over 50 percent. This is an indication of the maximum level of protection that U.S. exports could have faced if NAFTA did not exist and if Mexico applied tariffs at the bound levels. But, Mexico also tends to apply tariffs at levels below the MFN bound rates. Thus, a more accurate indication of the impact of NAFTA would be to compare the NAFTA average with an export-weighted average of Mexico's applied tariffs. If NAFTA were not in place, U.S. exports would have faced an export-weighted, average MFN applied tariff in Mexico of 35.4 percent versus the NAFTA average of 8.6 percent. In the case of Canada, the only other market in the hemisphere where the United States received preferential treatment in 2001, the MFN applied and bound rates are the same. Thus, in the absence of NAFTA, U.S. exports would have faced a weighted MFN bound rate of 12.8 percent in Canada instead of the lower NAFTA average of about 7 percent.

Table 3-5 reports the tariffs that each of the 20 FTAA countries faces in the U.S. market. The first two columns contain the unweighted and weighted means of U.S. applied tariffs, which can differ by exporter based on eligibility for tariff preferences under either NAFTA or one of the nonreciprocal tariff preference programs GSP, CBERA, or ATPA. Again, we provide a weighted average of bound tariffs for comparison purposes.

Given the mix of agricultural products it exports globally, Brazil, at 12.8 percent, faces the highest export-weighted duties in the United States. The United States levies relatively high tariffs on a number of Brazil's important exports, including sugar, orange juice, tobacco, and soybean oil. Jamaica was the only other country facing an export-weighted average tariff of over 10 percent, largely a function of the importance of its sugar exports, which make up over one-quarter of total exports. On the other end, the exports of four countries—Haiti, Peru, Ecuador, and Mexico—all faced average tariff rates below 1 percent in the U.S. market. The top exports from each of these countries tend to face very low or zero duties in the United States. In fact, for the region as a whole (excluding NAFTA partners) the top four exports are coffee, bananas, soymeal, and soybeans, all of which face low or zero duties.

Even though the averages are low, the export-weighted applied rates exceed the unweighted ones in all but six of the countries, and in some cases they are over three times as large. Is this an indication that the U.S. tariff schedule is biased against the exports of most FTAA countries? The answer is more complicated than it appears, because of the size and importance of the U.S. market and the structure of the U.S. tariff schedule. In the previous section, we demonstrated that the U.S. market is already relatively open to agricultural trade within the hemisphere, for two reasons. First, the United States has bound 22 percent of its agricultural tariffs at zero in the WTO, and most of the remaining rates have been bound at low levels. As a result, the United States has the lowest simple mean bound tariff in the region. Additionally, under the CBERA and the ATPA programs, eligible countries are granted duty-free access on their exports to the United States. The two programs extended duty-free access to about 65 percent of all agricultural tariff lines in the U.S. tariff schedule. With a total of 87 percent of all agricultural tariff-lines being duty-free, it is not surprising that CBERA and ATPA countries face simple applied tariff averages of only 1.8 percent.[23] However, these low averages conceal a number of relatively high tariff peaks, many of which are found on products of export interest to some FTAA countries, including sugar, tobacco, frozen orange juice, soybean oil, and peanuts. When these tariffs are weighted by each country's exports, the weighted averages tend to exceed the unweighted ones.

For some countries in the hemisphere, the differences in the weighted and unweighted averages demonstrate that there are considerable potential trade benefits from reducing U.S. tariffs. This conclusion would not have been evident based solely on the low simple average tariffs these countries face. For some of these, however, market access is being provided through tariff-rate quotas. This can skew the weighted tariff averages found in table 3.5. Sugar, the fifth most important export from FTAA countries is a good example, since it faces high average duties in the United States, as a result of steep over-quota tariffs. For almost one-half of the countries in table 3-5, U.S. sugar tariffs are the largest component of the weighted average (see table 3-3). The high weight accorded to sugar in our calculations is potentially misleading in the case of those countries whose sugar exports are largely a result of the quota allocation they receive under the U.S. sugar TRQ. This is particularly true of some Caribbean countries, where the quota allotment they receive is equal to more than one-half of their total exports to the world. Some of these countries are actually net importers of sugar, and it is likely that the value of their sugar exports would be significantly less were they not guaranteed a high price on their within-quota exports to the United States. When countries are allocated part of a lucrative quota, the result might be to create a trade flow that might otherwise not have taken place under free trade.

[23] The simple averages reported in the previous section are higher than those reported above because they are an average over all 1,754 HS 8-digit tariff-lines in the U.S. schedule. In this section, we first calculated simple averages at the HS 6-digit level. This collapsed the tariff database to 682 HS 6-digit tariffs. This allowed us to use each country's exports, which are only available at the HS 6-digit level, as weights.

Comparing the preferential and MFN bound tariff averages is also revealing. In percentage point terms, the differences are perhaps not as great as one might expect, especially in view of the extension of duty-free access on 65 percent of all tariff-lines under the CBERA and ATPA programs. However, most of the eligible products under these programs already face low duties. In fact, the simple average tariff across those lines on which preferences are extended is about 7 percent, while the simple average of the remaining 13 percent of dutiable tariffs on which no preferences are extended is about 47 percent. The conclusion here is that the GSP, CBERA, and ATPA have not significantly diluted the potential value of an FTAA to the region. There are still many products of export interest to our regional trading partners that do not receive preferences under U.S. programs. In addition, just as U.S. trading partners in the region can legally raise their applied rates to their bound levels, the United States can always withdraw or modify the preferential access it gives under these programs. This should provide these countries an incentive to lock in duty-free access to the U.S. market through a reciprocal agreement like the FTAA.

To give expression to the relative importance of two trading partners' tariffs, Sandrey utilizes the sort of information found in tables 3-4 and 3-5 to create a tariff- and trade-based measure called the Relative Tariff Ratio Index (RTR).[24] The RTR is a useful way to combine the trade and tariffs of two trading partners into a single and concise figure. Figure 3-1 contains RTRs calculated as the ratio of the trade-weighted average tariff that U.S. exports face in the selected countries from table 3-4 (the numerator) and the equivalent average faced by their exports in the United States from table 3-5 (the denominator). A ratio of one would reflect similar protection in the respective tariff schedules of the two trading partners. A ratio greater than one means that U.S. agricultural exports face higher average tariffs in the trading partner's market than its exports face in the U.S. market. RTRs range from well over 100 for Haiti and to below 1 for Nicaragua (fig. 3-1). These ratios do not reflect the levels of tariffs, but rather the relative tariff protection faced at the respective borders of bilateral trading partners. In the case of Haiti, for every tariff percentage point, on average, that Haitian agricultural exports face in the United States, the United States faces 126.6 percentage points in Haiti. In 6 of the 20 countries surveyed, U.S. agricultural exports face average tariffs more than 10 times as high as their exports face in the United States. Nicaragua is the only country in which the tariffs faced by U.S. exports are less than those faced in the United States by its trading partner's exports.

Conclusion

Through a combination of multilateral, intraregional, and bilateral pacts, Western Hemisphere countries have made significant progress in reducing agricultural tariff protection over the last decade. In an effort to build on the trade and investment ties created by these pacts, 34 countries in the hemisphere resolved to form a FTAA. One of the main goals of the FTAA is to progressively eliminate tariffs on substantially all trade within the hemisphere.

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[24] Sandrey attributes the original concept for the RTR to John Luxton, former Associate Minister for Foreign Affairs and Trade in New Zealand. See appendix for more information on the RTR.

It is in the interest of all Western Hemisphere countries to reduce tariff protection in order to obtain cheaper sources of supply and to achieve the increased level of economic activity made possible by a more efficient utilization of resources. Free trade permits these efficiency gains by allowing greater specialization according to each country's "comparative advantage." Trade liberalization will make possible important economic benefits such as greater exploitation of economies of scale and increased domestic and foreign investment in response to new export opportunities. An FTAA would stimulate the U.S. agricultural economy by reducing the high tariff barriers on U.S. agricultural exports to the region. U.S. agricultural exports face weighted average tariffs within the largest non-NAFTA markets in the region that range from just under 10 percent to almost 20 percent. The bound rates that these countries committed to in the WTO are even higher, with the weighted averages ranging from 16 percent to over 100 percent. The extent of the gains from increased trade to the United States depends not just on the level of applied tariffs to its exports but also on what these barriers might be in the future if no FTAA were established. There is always the possibility that these countries could raise their applied rates to the much higher bound levels.

Over the past decade, Western Hemisphere countries have actively pursued liberalizing and integrating their economies through a wide variety of interregional free trade and customs union agreements. The United States currently has signed free trade agreements with eight countries in the region: Canada and Mexico through NAFTA, the five Central American countries (Guatemala, El Salvador, Honduras, Nicaragua, and Costa Rica) through CAFTA, and Chile through the U.S.-Chile FTA. In the remaining countries in the hemisphere U.S. exporters often compete with other countries in the region whose exports are subject to considerably lower duties. From the U.S. perspective, a strong argument in favor of an FTAA is that it would eliminate the disadvantage U.S. exporters confront when competing with exports from countries facing preferential rates, thus enabling them to expand market share.

Opening hemispheric markets has presented negotiators with a number of challenging issues, including reaching agreement on which tariff rates to use as a starting point, how quickly to phase in the elimination of tariffs, and how to treat sensitive products (those most vulnerable to import competition). Negotiators have agreed to use tariffs that were actually being applied in October 2002 as the base rates from which cuts will be made (Spitzer, 2003).[25] Starting the cuts from applied tariffs is important for U.S. exports since our analysis shows that the weighted-average bound tariffs facing U.S. exports are on average 3.5 times higher than applied tariffs. Therefore, progressively eliminating tariffs from their bound levels would mean that significant trade liberalization for some U.S. products might not begin until the end of the implementation period. By agreeing to use the applied rates as the starting point, U.S. exporters will gain increased market access within the first year of the agreement.

Negotiators also have established four elimination categories: category A tariffs are to be eliminated immediately; category B in the short term (up to 5 years); category C in the medium-term (up to 10 years); and category D in the long term (longer than 10 years) for

[25] An exception has been granted for the CARICOM countries, which will be allowed to start their reductions from WTO bound rates for some agricultural products.

a limited number of the most sensitive commodities. To date, there has been no definitive agreement on the extent to which countries will be able to place sensitive agricultural products into category D, but according to the WTO rules governing the formation of FTAs, tariffs must be eliminated on substantially all products within 10 years after the agreement's initial implementation date.

This analysis has focused on one aspect of market access—tariff liberalization—and the extent to which tariffs in the region pose an impediment to trade in agricultural goods between the United States and its trading partners in the hemisphere. Using an index that combines trade flows and tariffs into one simple measure has allowed us to compare the levels of tariff protection that U.S. exports face in other countries with the levels faced by those countries in the U.S. market. Using a country's trading partner's total exports as weights allows us to escape, in large part, the distorting effects that high tariffs have on the country's imports. This approach could provide a useful aggregate measure to compare how an individual country's allocation of products across categories with different tariff elimination timetables might affect the export barriers that it faces over the course of the implementation period.

While we cannot formally project the potential FTAA-induced expansion in U.S. agricultural exports in this analysis, our detailed comparison of the levels of trade and tariff protection within the region shows that there would be considerable potential benefits to the United States from further trade liberalization within the hemisphere. The average level of tariff protection in these countries is considerably higher than in the United States. As a result, an FTAA would require larger cuts in FTAA country tariffs than in U.S. ones. However, it does not necessarily follow that after all adjustments have had time to take place, we would see a significant imbalance in trade gains. Even in the short term, countries that export a large share of products such as sugar, peanuts, tobacco, and orange juice, on which protection is generally higher in the United States, are likely to benefit. In the longer term, because of its size and wealth, the U.S. market should provide ample incentive for countries currently protected by high tariffs to restructure their industries in order to compete with U.S. producers. Indeed, one of the main incentives for Latin American countries to form an FTAA is to attract the investment that would allow them to eventually diversify and expand their exports.

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Appendix 3-1

It is no easy task to even approximately measure the protective effect of a country's tariff schedule by collapsing it into a single measure such as a mean. Undeterred by this difficulty, economists have devised numerous ways to estimate tariff means. At the same time, most caution against interpreting these measures as an expression of the restrictive effect of duties on trade flows. The most common procedures generally used involve either calculating a simple average of all tariffs or assigning weights to tariffs before averaging.

The main problem with simple averages is that they fail to distinguish between "important" and "unimportant" tariffs, even though the relative importance of individual tariff lines in a country's tariff schedule differs considerably. In the U.S. agricultural tariff schedule, for example, imports in 2001 ranged from a high of $2.3 billion under the national tariff line for beer from malt to just $330 under one of the over-quota national tariff lines for long-staple cotton. Across the 1,754 agricultural tariff lines within the U.S. schedule, 238 registered no imports at all in 2001. Many of these items faced tariffs in excess of 100 percent. Despite its limitations, the simple average is often used because it is relatively easy to compute and understand.

The common alternative to a simple average involves assigning weights to each line in an effort to emphasize certain tariffs over others. The most commonly used weighting scheme assigns weights based on the value of a country's imports at each tariff line. This would be equivalent to dividing the value of total imports by the total duty collected, if all imports were assessed the rate in question. This approach has repeatedly been shown to provide biased results, since low tariffs tend to be associated with high imports and thus large weights, while high tariffs tend to restrict or prohibit imports and thus have small or zero weights. In addition, countries often apply different tariffs based on the country of origin due to free trade agreements or the extension of tariff preferences under nonreciprocal programs such as the Generalized System of Preferences (GSP). Thus, the information conveyed by a tariff mean calculated using an importer's MFN rates may have no value to a trading partner that faced preferential rates.

To remedy these deficiencies, Sandrey uses the Relative Tariff Ratio Index (RTR) to measure and compare relative levels of tariff protection between trading partners. The RTR first matches an exporter's trade to an importer's tariffs, using the exporting country's total exports as the weighting scheme. This provides a practical way of distinguishing between "important" and "unimportant" tariffs in the schedules of each of the exporter's trading partners.

In order to calculate an RTR, one would, of course, need comparable data between one partner's exports and the other partner's tariffs. Unfortunately, these data do not necessarily exist at the tariff-line level, when a country has bound its tariff at a level more precise than the HS 6-digit level. Tariff schedules across countries use identical HS nomenclatures for categorizing duties up to the 6-digit level. Beyond the 6-digit level, however, commodity definitions vary from country to country, making specific comparisons across countries impossible. In our calculations, we used trade data for the 3-year period, 1998-2000, from the United Nations Trade Database, a collection of trade statistics reported by member countries to the United Nations. Agricultural trade is aggregated into 682 HS-6 categories. Because the HS-6 categories are less detailed than many country's tariff schedules, it was necessary to first average tariffs to the HS-6 level. This was done via a simple average. We then calculated weights based on the value of each exporting country's total exports at the HS-6 level during the 1998-2000 period.

These weights were then used to calculate a unique average tariff for each set of trading partners. This was done by weighting each of the importing country's average tariffs at the HS-6 level by the proportion of the exporting country's total exports accounted for by products found in that HS-6 category. For example, assume country A's only export was wheat, while country B's only exports were wheat and soybeans, and each accounted for 50 percent of the total export value. If both countries had a tariff of 20 percent on wheat and zero on soybeans, then country A would face an average tariff of 20 percent in country B, while country B would face an average tariff of 10 percent in country A. Even though both countries have over 600 HS 6-digit average tariffs, the only tariffs that factor into the calculation of the importing country's average are those on products the trading partner is exporting.

While we find this method of weighting tariffs appealing because it avoids the problem of restrictive tariffs getting little or no weight, like all methods, it is not without its potential drawbacks. The weighted tariff averages calculated using this methodology are biased in favor of products that the exporting country is actually exporting, rather than those it might potentially export. One may argue, however, that given the mercantilist view that most governments bring to trade negotiations, actual exports tend to be more influential than potential ones when individual tariff barriers are considered. The reality is that actual trade is known beforehand, while potential trade can only be estimated after factoring in changes in tariffs. The measure also does not account for demand differences across individual importers. Products that a country does not export in large amounts, but for which potential import demand in an individual importing country may be relatively large, will receive low weights. One also runs the opposite risk of giving large weight to products that in certain countries may not have any import potential due to a lack of consumer demand for reasons related to individual tastes and preferences, religious restrictions, or public health concerns.

Tariffs used in the calculations included the final bound MFN tariffs scheduled by WTO members and the actual tariffs applied to trade. To the extent possible, all non ad valorem duties have been expressed in ad valorem equivalents, which are needed for the calculations. The final tariff bindings reflect the rate that will be effective after phased implementation of Uruguay Round tariff cuts. As a general rule, developed countries phased in their tariff schedules during the period 1995-2000. Developing countries began phasing in their tariff reductions in 1995 as well, but have until 2004 to complete implementation. In cases where developing countries applied tariffs that were unbound, they had the flexibility to offer ceiling bindings on these products. These ceiling bindings were exempt from the reduction commitments, so the final bound tariff would take effect in 1995.

For the United States, the applied tariffs differ from the MFN bound tariffs depending on whether the country is a NAFTA partner or whether it qualifies for one of several nonreciprocal trade preference programs, such as the GSP, the CBERA, and the ATPA. Likewise, the tariffs the United States faces in other countries can differ from the bound rates if a country applies a lower MFN rate in practice. The only preferential rates the United States faces in the hemisphere in 2001 were those negotiated through NAFTA.

Chapter 4
Consequences for U.S. Sugar

The consequences of a Free Trade Area of the Americas (FTAA) for the supply, distribution, and pricing of U.S. sugar are not yet known. Several scenarios of increased market access to the U.S. sugar market under the FTAA are possible, each with different effects on domestic sugar producers, consumers, and U.S. sugar policy.

Using the U.S. Department of Agriculture (USDA) sugar projections baseline model to analyze the effects of several market access options, this chapter looks first at the cost structures of Western Hemisphere sugar-producing sectors. The ability of Western Hemisphere sugar-producing countries to supply the U.S. market is discussed, with the assumption that FTAA outcomes will be consistent with current U.S. international commitments affecting sugar. The overall analysis is being done in the context of domestic sugar policy, with consideration of how some policy instruments may be used to adjust to increased sugar access from the hemisphere.

Costs of Sugar Production

One way of analyzing the competitiveness of sugar-producing countries in the Western Hemisphere is to compare and rank average costs of their production. LMC International periodically publishes estimates of world sugar and sweetener costs of production.[26] The data go back to 1979/1980 and *The 2000 Report* extends the data through 1998/99. Field, factory, and administrative costs are examined for 41 countries that produce sugar from sugar beets and for 63 countries that produce sugar from sugarcane. All sugar-producing countries in the Western Hemisphere are included. Although there are many limitations in the use of production cost estimates, these data can form the basis for comparing competitiveness in production across regions and countries.[27]

Table 4-1 shows four groupings of Western Hemisphere sugar-producing countries ranked according to average costs of producing raw cane sugar during 1994/95-1998/99. (Figure 4-1 shows the same information as a cumulative cost curve for the individual countries.) The lowest cost producers are in Center/South Brazil, Colombia, El Salvador, and Guatemala. Together, these countries' sugar production averaged about 14.8 million metric tons (mt) or about 48 percent of total hemispheric production. The average cost was estimated at a very low 7.7 cents a pound. The second grouping includes Bolivia, North/East Brazil, Costa Rica, Ecuador, Mexico, Nicaragua, and Florida in the United States. Production costs averaged 12.34 cents a pound, and average production averaged slightly less than 10.0 million mt. Together, the first and second cost groupings constitute more than 80 percent of cane sugar production in the Western Hemisphere, giving the

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[26]The study is copyrighted. Results for specific countries or regions may not be quoted or published without the prior approval of LMC International. For more detailed information regarding LMC services, contact: Andrea Kavaler, LMC International, 1841 Broadway, New York, NY, 10023, or by telephone at (212) 586-2427, or via e-mail at: analysis@lmc-ny.com.

[27]See "U.S. and World Sugar and HFCS Production Costs, 1994/95-1998/99," in *Sugar and Sweetener Situation and Outlook*, USDA-ERS, SSS-232, September 2001, http://www.ers.usda.gov/publications/so/view.asp?f=specialty/sss-bb/.

cumulative cost curve a long portion below or close to the weighted-average hemispheric cost (100 in fig. 4-1).

The third grouping includes Argentina, Belize, Guyana, Honduras, Panama, Paraguay, Peru, and Louisiana and Texas in the United States. Production costs averaged 16.54 cents a pound. The fourth group takes into account the highest cost areas, which includes Hawaii in the United States. The third and fourth groupings' production averaged 4.1 and 1.9 million mt, respectively. These third and fourth groupings represent the more nearly vertical shaping of the cost curve for cumulative production above 25 million mt (fig. 4-1).

These data show U.S. cane sugar-producing areas in Louisiana, Texas, and Hawaii in the higher cost categories. This means that at least 80 percent of cane sugar production in the hemisphere occurs at lower cost than in these areas.

The United States is the only significant producer of beet sugar in the Western Hemisphere. Although LMC International ranks the United States as one of the world's lowest cost producers of beet sugar, its costs in aggregate are still high relative to other Western Hemisphere cane sugar producers. Table 4-2 shows a low to high range of U.S. production costs, white sugar basis, for cane and beet sugar. The ranges are essentially overlapping in the United States, but the Western beet sugar producing areas generally have higher average costs than do those in the East.

Figure 4-2 shows U.S. cane and beet sugar-producing regions' disaggregated field and factory costs as percentages of hemispheric averages. Only Florida has a cost element (factory costs) lower than the average. Field and factory costs in U.S. cane areas other than Florida are anywhere from 37 percent to 90 percent higher than the corresponding hemispheric average. The Eastern U.S. beet sugar costs are about 16 percent higher than in Florida. The Western U.S. beet sugar costs are intermediate between Texas and Hawaii.

Net Surplus Production

Many factors influence the direction and magnitude of trade flows. Although cost considerations are important for assessing competitiveness, they are not sufficient for predicting trade flows. Factor endowments, marketing infrastructure, investment capital, industrial organization, consumer preferences, government policies, and other elements are important. These elements, however, are not analyzed here in depth because this report's focus emphasizes the implications of increased access of Western Hemisphere sugar on U.S. sugar supply, use, and prices.

Consideration of hemispheric costs shows the United States to be a relatively high-cost sugar producer, although there are U.S. producing regions where costs are competitive with cost-efficient hemispheric producers. Equally important for analysis is consideration of existing trade patterns and the likelihood that sugar produced in the Western Hemisphere could be shipped into the U.S. market. A simple way to approach this issue is to examine the net surplus production status of individual countries. Although there are alternative ways to define net producer status, the one chosen in this chapter is the difference of average production less average consumption for 1995/96-1999/2000. The averaging approach reduces the effects of extraordinary events and stock-level changes.

Table 4-3 shows net surplus production data for all countries, with totals reported for the geographical groupings of North America, the Caribbean, Central America, and South America. The hemisphere as a whole is a large net surplus producer of sugar more than 8.4 million mt. Net surplus production is positive in all areas except North America where the U.S. and Canadian deficits outweigh Mexico's positive balance by more than 2.0 million mt. The ratio of net surplus production to production is sizeable in the three surplus areas: 57.1 percent in Central America, 36.2 percent in South America, and 32.9 percent in the Caribbean. Most countries in those areas are very experienced in the international market.

The South American and Central American countries tend to have lower costs of production coupled with relatively large net production surpluses. A combination of low production costs and large net surpluses would indicate a high capability of directing more exports to the U.S. market, although marketing costs would have to be considered as well. The Caribbean area, on the other hand, is fairly high cost. Most of their exports go to the European Union and the United States under preferential arrangements that guarantee them prices much higher than world levels, thereby covering, to a greater extent than otherwise, their high costs of production. It is only in this area where additional trade directed to the U.S. market might seem questionable.

U.S. Sugar Policy

In 1998 at the San Jose Ministerial meeting, the United States and other Western Hemisphere countries agreed that any FTAA agreement will be consistent with the rules and disciplines of the World Trade Organization (WTO) and that the FTAA will have to coexist with subregional agreements, such as the North American Free Trade Agreement (NAFTA). In addition, it seems reasonable that the U.S. Government is likely to continue its price support for U.S.-produced sugar.

U.S. sugar policy contains three elements: (1) WTO obligations, especially minimum access on imports of raw and refined sugar; (2) NAFTA obligations governing imports of sugar from Mexico; and (3) the U.S. sugar program. Descriptions of these elements follow.

U.S. Sugar Imports and the World Trade Organization

As part of the Uruguay Round Agreement on Agriculture (URAA), the United States agreed to import a minimum quantity of 1.256 million short tons, raw value (STRV) of raw and refined sugar each marketing year (October/September). Included in this amount is a commitment to import at least 24,251 STRV of refined sugar. The URAA made these commitments binding under the WTO.

The raw cane sugar tariff-rate quota (TRQ) is allocated to 40 quota-holding countries based on a representative period (1975-1981) when trade was relatively unrestricted. A duty of 0.625 cent a pound, raw value, is applied to in-quota imports.[28] Most countries have the low duty waived under the General System of Preferences or the Caribbean Basin Initiative. Between 95 and 98 percent of the raw cane sugar TRQ fills each year, and the refined sugar TRQ is filled almost as soon as it opens.

The high-tier sugar tariff applies to sugar imports above the level of the sugar TRQ. The Uruguay Round specified base rates for raw cane sugar of 18.08 cents a pound and for refined sugar of 19.08 cents a pound. Starting in 1995, the rates were to be cut by 0.45 cent a pound each year for raw sugar and 0.48 cent a pound for refined sugar. The yearly reductions were to take place until 2000, when the raw sugar high-tier tariff was to be 15.36 cents a pound and the refined sugar high-tier tariff rate was to be 16.21 cents a pound.

North American Free Trade Agreement

The North American Free Trade Agreement (NAFTA) contained provisions on trade in sugar. Those provisions were modified by a side letter in November 1993, before NAFTA went into effect on January 1, 1994.

According to the NAFTA side letter, Mexican sugar low-tier tariff exports to the United States are restricted by Mexico's net surplus production of sugar. The “net surplus” is defined as Mexico's production of sugar less its consumption of sugar and high-fructose corn syrup. From FY 2001 through FY 2007, Mexico is to have duty-free access to the U.S. market for the amount of its surplus as measured by the formula, up to a maximum of 250,000 metric tons, raw value (MTRV). Beginning in FY 2008, Mexico is to have duty-free access with no quantitative limit.

NAFTA specifies a declining high-tier tariff schedule for raw and refined sugar over the transition period to duty-free sugar trade in 2008. For 2003, the raw sugar tariff was 7.56 cents a pound, and the refined sugar tariff was 8.01 cents a pound. The raw sugar tariff is scheduled to drop about 1.5 cents each year, and the refined sugar tariff about 1.6 cents a year. Both rates will then reach zero in FY 2008.

Sugar Loan Program, Allotments, and Payment-in-Kind Acreage Diversion

The primary policy tools available to the U.S. Department of Agriculture to assist sugarcane and sugar beet producers are contained in the Farm Security and Rural Investment Act of 2002 (the 2002 Farm Act). The U.S. sugar program provides for USDA to make loans available to processors of domestically grown sugarcane at a rate of 18 cents per pound and to processors of domestically grown sugarbeets at the rate of 22.9 cents per pound for refined sugar. Loans are taken for a maximum term of 9 months and must be liquidated along with interest charges by the end of the fiscal year in which the loan was made. The loans are nonrecourse. This means that when the loan matures, USDA must accept sugar pledged as collateral as payment in full in lieu of cash repayment of the loan, at the discretion of the processor.

[28] In the Harmonized Trade System, chapter 17 specifies the low-tier tariff at 1.46066 cents per kilogram less 0.0206686 cent per kilogram for each degree of polarization under 100 degrees.

The 2002 Farm Act requires USDA, to the maximum extent possible, to operate the U.S. sugar loan program at no cost to the Federal Government. USDA must operate the program in a manner that will avoid the forfeiture of sugar to Commodity Credit Corporation (CCC). To discourage forfeiture of nonrecourse loans, the sugar price at the time of loan repayment must be high enough to cover the loan principal plus interest expenses and other costs.

The 2002 Farm Act gives USDA the authority to accept bids from sugarcane and sugar beet processors to obtain raw cane sugar or refined beet sugar in CCC inventory in exchange for the reduction of the production of raw cane sugar or refined beet sugar. This is one way to control expected excess (or price depressing) supplies of sugar.

To facilitate operation of the sugar program at no cost to the Federal Government, the 2002 Farm Act requires USDA to establish flexible marketing allotments for sugar. The overall quantity of sugar to be allotted for a crop year is determined by subtracting the sum of 1.532 million STRV and carry-in stocks of sugar (including CCC inventory) from the USDA's estimate of sugar consumption and reasonable carryover stocks at the end of the crop year. USDA is required to adjust allotment quantities to avoid the forfeiture of sugar to CCC.

USDA's authority to operate sugar marketing allotments is suspended if USDA estimates that sugar imported for human consumption, not including the re-export programs, will exceed 1.532 million STRV such that the overall allotment quantity would have to be reduced. The marketing allotments would remain suspended until such time that imports have been restricted, eliminated, or otherwise reduced to or below the 1.532 million STRV level.

Sugar Imports: Current Situation and Future Possibilities

The United States allocates the raw sugar TRQ to 40 countries based on historical trade shares from 1975-1981. Table 4-4 shows allocations made for FY 2001. Twenty-three of the 40 countries are situated in the Western Hemisphere. Excluding Mexico’s NAFTA share, imports from Western Hemisphere countries total 715,541 mt, or about 64 percent of the raw sugar TRQ excluding NAFTA. Including the NAFTA share for FY 2001, the total becomes 821,329 mt, or about 9 percent of sugar for U.S. domestic food and beverage use.

Table 4-4 shows that the Caribbean area (excluding Cuba) is very much dependent on the U.S. market. It was allocated an amount that was about 46 percent of total exports estimated for the 2001 marketing year. Central American countries are less dependent on the U.S. market. They were allocated an amount equaling about 8.5 percent of their total exports. Although South American countries in aggregate received an allocation more than 38 percent higher than either of the other areas, their allocation amounted to only about 3.4 percent of total exports and 1.4 percent of their total production for 2001.

Various Future Outcomes: Analytical Framework

There is no sure way to predict an outcome of FTAA negotiations for increased imports of sugar into the United States. There may be no increased access. On the other hand, any increase would have to be consistent with U.S. WTO and NAFTA commitments. In the context of U.S. sugar price support policies, increased imports could induce large sugar forfeitures to the CCC.

Two types of increased sugar access are possible. In the first, the United States modifies its TRQ import regime by increasing sugar quota allocations made to hemispheric sugar exporters. The allocation amounts may be either moderate or large. Maintenance of the TRQ structure would still provide support to U.S. prices higher than world levels, and preferential imports would provide hemispheric exporters higher (or certainly no lower) returns than the world market. In the second type of access, the United States permits hemispheric duty-free sugar imports with no upward quantitative limit. The second case resembles Mexico's sugar access to the United States under NAFTA in 2008.

The U.S. sugar baseline projections model is used for analyzing the effect of increased sugar imports from hemispheric exporters (see appendix). The model's advantage is that it incorporates substantial policy, production, processing, and consumption detail of the U.S. and Mexican sugar and high-fructose corn syrup sectors.[29] The model has been updated to be consistent with estimates and projections published in the April 2002 *World Agricultural Demand and Supply Estimates* report.

Four modeling scenarios are analyzed. In the first two scenarios, the United States retains its TRQ import regime but differs in the amounts of increased access. In the first, hemispheric quota access is doubled (excepting Mexico's raw sugar TRQ allocation of 7,258 MTRV) to 708,283 MTRV (780,740 STRV). This double-access scenario is intended as the case of a moderate increase. The second scenario, on the other hand, is a case of a large increase. It specifies an increase of 2.0 million MTRV (2.205 million STRV). Allocations to countries outside the Western Hemisphere would be equal to levels in FY 2001. Although NAFTA provisions would continue to hold, increased imports of sugar from FTAA countries into the United States are likely to affect the level of imports from Mexico.

The first two scenarios occur in the context of the U.S. sugar loan program. Because sugar imports for human consumption exceed 1.532 million STRV, marketing allotments are assumed to be suspended. Because the loan program provides for nonrecourse loans, processors are assumed to forfeit sugar placed under loan if U.S. sugar prices in the model are not projected to be above the minimum level to avoid forfeiture. For a loan rate of 18 cents a pound, the minimum price to avoid forfeiture is calculated to be 20.17 cents a pound. (The additional amount above 18 cents accounts for interest charges and expenses borne by the processor if the loan were to be paid off in cash. If the market price were below the minimum, then the processor would be ahead financially by forfeiting the sugar to the CCC instead of paying off the loan with cash.)

[29] See "Conceptual Overview of the U.S. Sugar Baseline" in *Sugar and Sweetener Situation and Outlook*. SSS-227, January 2000, www.ers.usda.gov/briefing/sugar/sugarpdf/baseline.pdf; and *USDA Agricultural Baseline Projections to 2011*, Staff Report WAOB-2002-1, www.ers.usda.gov/publications/waob021/waob20021.pdf.

The 2002 Farm Act gives the USDA authority to exchange publicly owned sugar for reduced production of sugar crops. This enables the USDA to reduce sugar loan program costs by eliminating storage costs and reducing unneeded excess sugar production that could increase the likelihood of loan forfeitures. In the first two scenarios, it is assumed that the USDA exchanges sugar it owns for reduced production of sugarcane and sugar beets. Because these scenarios involve increases in U.S. sugar supply through granting greater market access to hemispheric producers, the likelihood of loan forfeitures at increased levels is greatly enhanced at a loan rate of 18 cents a pound. This implies that U.S. producer adjustments consist of increasingly larger transfers of publicly owned sugar for reduced plantings, with market prices stabilized at or above the minimum price to avoid forfeiture. While this represents one type of adjustment process, there could be pressure to reduce the loan rate to allow the market to adjust to the larger supply potential resulting from increased market access. The idea is that U.S. producers might be expected to bear a larger share of the burden of the FTAA through price-induced production reductions rather than the USDA through its sugar-exchange activities.

In terms of the modeling activity, the first two scenarios are run with the loan rate first at 18 cents a pound and then at levels low enough to eliminate forfeitures to the CCC for both scenarios. In the case of the double-access scenario, the loan rate has to be reduced to 15 cents a pound in order to eliminate forfeitures. For the 2-million-MTRV scenario, the loan rate has to be reduced to 13 cents a pound to eliminate forfeitures.[30]

The third and fourth scenarios represent extremes where there is duty-free access to hemispheric producers with no quantitative limits. The U.S. sugar loan rate program is assumed abandoned, and the U.S. raw sugar price drops close to world levels, separated from it by an assumed marketing margin of 2 cents a pound. The third scenario assumes no change in world prices after the U.S. liberalization. The fourth scenario assumes that world prices increase by 2 cents a pound (a 22-percent increase) due to increased U.S. import demand. Although the FTAA negotiations are scheduled for completion by the beginning of 2005, it is assumed for modeling that increased sugar access is not in full force until 2009. This delay is imposed to eliminate confounding effects from U.S. adjustments to NAFTA sugar provisions. Although the high-tier NAFTA tariff on imports of Mexican sugar are decreasing prior to 2008, it is not until 2008 that the high-tier NAFTA tariff reaches zero and domestic Mexican sugar prices are formally bound to U.S. prices.[31]

TRQ Outcomes With An 18-cent Loan Rate

[30]Although not modeled, there are other ways to provide support to sugar producers other than through price support. Even longstanding price support programs can be switched over to income support systems as was recently done to the peanut support program.

[31] Although it may be the case that prior to 2008 U.S. and Mexican prices are linked but separated by the NAFTA high-tier tariff, it is not certain when Mexican policymakers will permit this linkage to happen. Currently, the Mexican government owns about 50 percent of current sugar production capacity. For an undetermined time period, the Mexican government is expected to restrict how much sugar can be sold domestically and how much must enter into export channels. The baseline assumes that the Mexican government's goal is to create a marketing environment that will facilitate a re-privatization of the mills that the government owns and to help insure future returns to the entire sector until 2008 when the transition to NAFTA is complete. In other words, baseline modeling specifies that Mexican sugar prices are exogenous to modeling scenarios until 2008. It is because the NAFTA adjustments cannot be unambiguously handled until 2008 that the analysis of the FTAA starts in 2009, 1 year after the completion of NAFTA transition process.

The sugar base assumes that the loan rate remains at 18 cents a pound throughout the course of the projections period. Modeling results for the model's base (table 4-5) indicate that the 18-cent loan rate level implies that the CCC sugar stockholding is likely to be a major factor through 2010, when a price equilibrium above the minimum price to avoid forfeiture is finally achieved. The effect of increasing hemispheric market access is to keep prices at the minimum level (20.17 cents a pound) through loan forfeitures that channel excess production to the CCC. Even in the moderate double-access scenario, CCC stocks in 2012 are projected at 79 percent of the additional market access (615,000 STRV). In the 2-million-MTRV scenario, CCC stocks in 2012 are projected at 1.95 million STRV, or 88 percent of the increased import access amount.

In these scenarios, U.S. sugar production decreases relative to the base primarily because of reduced planting due to USDA's Payment-in-Kind Diversion Program. Imports from Mexico are not much affected because U.S. sugar prices are about the same as in the base scenario.

TRQ Outcomes With Lowered Loan Rates

The TRQ scenarios are run again with lowered loan rate levels. The objective is to determine a loan rate level that is consistent with no sugar forfeitures to the CCC by the end of the projections period. Table 4-5 shows modeling results, including sourcing of U.S. sugar and CCC inventory levels for the various scenario versions for 2012.

For the double-access scenario, lowering the loan rate to 15 cents a pound yields zero forfeitures to the CCC for all years 2010 through 2012. For the 2-million-MTRV scenario, lowering the loan rate to 13 cents a pound allows CCC holdings to reach zero by 2010, with holdings as high as 1.369 million STRV in the first year of the FTAA. (This result comes about because the modeling specification implies that domestic production reacts to sugar prices lagged at least 1 year; that is, production responds to the 2009 price decrease in the 2010 crop year.)

These market-adjusting scenarios (double access with a 15-cent loan rate, and a 2-million-MTRV increase with the 13-cent loan rate) show a similar dynamic pattern: increased imports lower sugar prices; U.S. production decreases the succeeding year; sugar prices then rise, but U.S. production does not increase because abandoned mills and processing facilities are assumed permanently closed. Price dynamics serve to move U.S. sugar supply from domestic to imported sourcing, but because the imports are capped under a TRQ system, prices recover eventually and sustain U.S. producers and processors who survived the intervening price downturn.

In the first scenario (double access), FTAA imports cause the U.S. raw sugar price to decrease 10 percent in the first year (17.17 cents a pound) relative to the 15-cent loan rate base. The raw price recovers in the second year by 0.83 cent and is 20 to 21 cents a pound by 2012. U.S. sugar production is reduced 8.5 percent (768,000 STRV) relative to the 18-cent loan rate base in 2012. Sugar imports from Mexico are lowered by 203,000 STRV, or 24.9 percent relative to the base in 2012. (Lower prices in Mexico increase

Mexican beverage end user demand for sugar relative to HFCS.) Imports as a source of U.S. sugar consumption increase from 18.3 percent to 23.9 percent in the base.

In the second scenario (2-million-MTRV access), U.S. production in 2012 is reduced by 30.3 percent (2.73 million STRV) relative to the base. FTAA imports cause the U.S. raw sugar price to decrease 24.8 percent in the first year (to 15.17 cents a pound) relative to the base. The large price reduction serves to eliminate sugar-processing capacity and lay the groundwork for price recovery. This price recovery begins in 2010 (19.72 cents a pound), and prices are in the 23-cent range by 2011. Imports from Mexico in 2012 are actually up by 642,000 STRV relative to the base because of the high U.S. price. Imports as a share of U.S. sugar consumption are projected at 43.6 percent.

Unrestricted FTAA Access

The third scenario (unrestricted) opens the U.S. sugar market to all Western Hemisphere producers at zero tariff. Because the net surplus producer status of the hemisphere is extremely large, and because the largest, lowest-cost producers have low transport costs relative to non-hemispheric competitors, it is assumed that this scenario is equivalent to unrestricted free trade in sugar for the United States. The implication is that the level of U.S. sugar prices will be closer to world price levels, and that changes in U.S. prices will be highly correlated with changes in corresponding world prices. The price dynamic associated with the first two scenarios (TRQ allows a sugar price recovery after the exit of some U.S. production) is no longer present. U.S. producers and processors will have to have low costs to survive.

The baseline model assumes that future world raw sugar prices will be in the 9-cent-a-pound range after 2008. The U.S. loan rate equals 18 cents a pound through 2008, and the loan rate program is assumed abandoned in 2009. Taking into account various price margins, a U.S. raw sugar price is about 11 cents a pound starting in 2009. Table 4-5 shows various results.

Implications for U.S. sugar production are severe: cane sugar production is projected at only 229,000 STRV by 2012, and beet sugar production is projected at 535,000 STRV. These declines are of such great magnitude (95-percent reduction for cane sugar and 89-percent for beet sugar) that one cannot be assured that any U.S. sugar production would remain, save the production of niche sugars.

The fourth scenario is similar to the third, but world prices are assumed to rise to 11 cents a pound because of increased world excess sugar demand caused by the U.S. action. The U.S. price is about 13 cents a pound. The higher 2-cent price compared with the third scenario has significant effects for U.S. production. Production is decreased by 61.3 percent rather than being mostly eliminated. Beet sugar decreases 49.6 percent to 2.414 million STRV, and cane sugar production decreases by 74.5 percent to 1.084 million STRV. Most of the remaining production is located in the low-cost Eastern beet-producing areas and in Florida cane growing areas. Most sugar consumed in the United States would be coming from imports—7.63 million STRV, or 68.6 percent.

Although these latter results do not imply the complete abandonment of sugar production in the United States, the challenge is very real. With open access, the U.S. sugar sector is subject to world price movements. An assumed long-term equilibrium world sugar price at 9 cents a pound may be too high. Also, the world sugar market is at times volatile, and low prices below most producing countries' costs of production are commonplace. Whether the U.S. sugar sector could survive this environment without assistance would likely be a serious concern.

Modeling results do not indicate large shifts away from high-fructose corn syrup (HFCS) to sugar as sugar prices decline. Costs of producing HFCS in the United States are only slightly higher than costs of producing sugar in Center/South Brazil, the lowest cost sugar producer in the hemisphere. HFCS may be substituted for refined sugar, whose price generally incorporates the additional costs of refining raw sugar, about 3 cents a pound. Even though results imply that U.S. HFCS producers can lower prices to meet the competition from lower priced sugar, the results are still dependent on low-to-moderate prices of U.S. produced corn and world raw sugar prices equal to or higher than 9 cents a pound. Either lower raw sugar prices or greater U.S. corn prices could cause some significant shifting away from HFCS.

Conclusion

Analysis shows the United States to be a relatively high-cost sugar producer, although U.S. producing regions (Florida and Eastern sugar beet-producing areas) have costs that are competitive with cost-efficient hemispheric producers. The hemisphere as a whole is a large net surplus producer of sugar and could meet all U.S. sugar needs. The effect of an FTAA would depend on whether increased access were capped under a TRQ system or unlimited. Under a TRQ system, increased imports could cause sugar forfeitures to the CCC. Keeping the current loan program and controlling U.S. Government budget exposure might require a lowering of the loan rate, especially for higher levels of FTAA sugar access.

Analysis of the FTAA shows that under a TRQ system, U.S. sugar prices recover to pre-access levels but imports permanently replace some U.S. production. In effect, harm to surviving U.S. sugar producers is temporary and is felt only during the transition to increased sugar imports resulting from the FTAA. In the case of unlimited FTAA access, surviving U.S. producers must absorb world price movements and face constant competition with the hemisphere's most cost-efficient exporters. Sugar imports would likely constitute over 70 percent or more of all sugar consumed in the United States. Although results do not indicate consumption shifts away from HFCS, these results are dependent on raw sugar prices at or higher than 9 cents a pound.

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Appendix 4-1
The U.S. Sugar Baseline Modeling Framework

USDA releases its U.S. sugar baseline projections at the annual Agricultural Outlook Forum held each February. Baseline projections are a conditional scenario based on specific assumptions about macroeconomics, agricultural policy, weather, and international developments. All commodity baselines incorporate provisions of the Farm Security and Rural Investment Act of 2002 (2002 Farm Act) and assume that its provisions remain in effect throughout the projections period. Additionally, the U.S. sugar baseline incorporates the provisions of the URAA and the NAFTA.

The USDA sugar baseline model currently projects supply, use, and prices out through 2011. The production sector includes sugarcane-producing areas of Florida, Louisiana, Texas, Hawaii, and Puerto Rico. The sugar beet-producing areas include the Great Lakes region (Michigan and Ohio), the Red River Valley (Minnesota and eastern North Dakota), the Upper Great Plains (Montana, northwestern Wyoming, and western North Dakota), the Central Great Plains (Colorado, Nebraska, southeastern Wyoming), the Northwest (Idaho, Washington State, eastern Oregon), and the Far West (California, central Oregon). Acreage allocation decisions are modeled as functions of grower prices relative to alternative crop prices.[32] Crop yield projections are based on observed trends. Regional sugar yield per-acre projections are based on econometric analysis of the relationship between sugar yields and crop yield developments and yearly trend improvements that capture technical improvements in each region.

Sugar production differs from other field crops in that it requires extensive processing to be put in a form that is marketable. Unless processing facilities are close to cropping acreage, it is uneconomical to grow sugar crops. In the baseline model, adjustments to

[32] See "Calculation of Real Price Indices for U.S. Sugar Crops," in *Sugar and Sweetener Situation and Outlook*. SSS-229, Sept. 2000.

processing capacity are a function of the margin between predicted sugar prices and the average sugar price necessary for processors to cover variable costs. Within a producing region, it is assumed that there is a normal distribution of costs about point estimates reported by USDA.[33] If the margin drops to zero, the modeling specification indicates the exit of half of processing capacity from that region. It is further assumed that capacity reductions are irreversible; that is, there is a very high cost of reopening closed facilities.

Sweetener demand is composed of end use demands by the beverage and food-processing industries, nonfood demanders, and households or nonindustrial users. Commodity coverage includes not only sugar but also high-fructose corn syrup. In recognition of the importance of NAFTA, the USDA sugar baseline model includes a Mexican sweetener component. Particular attention is placed on modeling how much exportable sugar surplus Mexico possesses throughout the projections period. Substitution tradeoffs in Mexico between sugar and HFCS are of particular modeling concern because of the potential of HFCS to displace sugar, especially in beverage end uses.

[33] See www.ers.usda.gov/farmincome for costs of processing for cane and beet sugar.

Chapter 5
An Analysis of the U.S. Orange Juice Industry

As the United States engages in negotiations to create the FTAA, Florida orange growers have expressed concern over the impact that reduced import tariffs would have on their share of the domestic juice market. The Florida orange industry enjoys considerable tariff protection against imports, especially against imported frozen concentrate. Orange growers worry that reducing or eliminating the tariffs would decrease the price competitiveness of juice produced from domestically grown oranges. Orange growers then would face decreased demand for their oranges from U.S.-based juice processors. Since juice processors purchase about 95 percent of Florida fresh orange production, a decline in processor demand would have an adverse effect on orange prices and grower revenue.

With these concerns in mind, our objective in this chapter is to assess the potential impact of the FTAA on the U.S. orange juice market. We begin with an overview of the U.S. market, including a discussion of the changing tastes of American consumers, who now often favor fresh (more precisely, not-from-concentrate) orange juice. Our discussion distinguishes between the two prevalent types of orange juice consumed, namely frozen concentrate (FCOJ) and not-from-concentrate (NFC) and why this distinction is important in how the FTAA would affect U.S. orange growers and processors. In the subsequent sections, we describe our global orange juice model and present estimates of the impact on U.S. trade, production, and consumption of implementing a comprehensive FTAA. The last section provides some concluding comments.

The U.S. Orange Juice Market

U.S. customers consumed more than 1.6 billion single-strength equivalent (SSE) gallons of orange juice in 1999, making the United States the world's leading consumer of orange juice. Since the mid-1980s, overall per capita orange juice consumption has been increasing. The average 1997 and 1999 per capita consumption (6 gallons) represents a 15-percent increase over the 1985-87 average (table 5-1). Estimates show that orange juice makes up nearly 20 percent of Americans' total fruit servings (Putnam, Kantor, and Allshouse, 2000). Economic growth, as well as the general shift toward convenience products and healthier lifestyles, has played a major role in stimulating consumer demand for orange juice.

The most important trend in consumer demand over the past decade has been the shift away from traditional, reconstituted and frozen concentrated orange juice (FCOJ), toward not-from-concentrate (NFC) orange juice. NFC is processed orange juice that has never been in a concentrated form. Consumers perceive it as having a taste that more closely resembles the taste of fresh-squeezed orange juice. During the 1990s, NFC consumption grew, on average, 2 percent per year, and by 1999, consumption had reached about 40 percent of total juice consumption (table 5-2). Consumers have been willing to pay the higher per-unit price for NFC orange juice. The average annual retail price for NFC is $5.35 per gallon, while the comparable price for frozen juice is $3.22 per gallon.[34] The

[35] ERS calculations from AC Neilson Scantrak data for marketing year October 1999 through September 2000.

premium paid for NFC reflects higher production, storage, and transportation costs compared with the more established frozen market.

U.S. orange juice production ranks second in the world behind Brazil, with total U.S. production surpassing 1.4 billion SSE gallons in 1999/2000. The U.S. industry is centered in Florida and is estimated to generate $9.13 billion in output, nearly 90,000 jobs, and $4.18 billion in value added (Hodges et al., 2001). During the 1990s, Florida oranges used in juice production increased on average 5 percent per year (table 5-2). While utilization increased for both major juice types, the average annual increase for NFC, at 10 percent, was more than twice that of FCOJ.

EU, Brazil, and U.S. Dominate World Orange Juice Trade

The United States is the world's second-largest importer and exporter of orange juice, behind the European Union (EU) and Brazil, respectively. At 355 million SSE gallons, imports made up roughly 14 percent of U.S. orange juice supplies in 1999/2000 season. The majority of U.S. orange juice imports is FCOJ, because it is easy to ship internationally. Relatively little NFC is imported. At 65 degree Brix (the level of concentration at which most FCOJ is traded), seven parts water must be added to reconstitute the juice for direct consumption. An equivalent amount of NFC would mean shipping seven times the volume. The high shipping costs for NFC have insulated the United States from Brazilian import competition and have enabled the U.S. industry to dominate the domestic and Canadian NFC orange juice market. Over the past decade, orange juice imports as a share of domestic supplies have declined markedly in the United States (table 5-3). The main cause for these changes in trade flows was the large increase in production from the Florida growers. High production levels—combined with relatively low prices—have resulted in significant increases in U.S. orange juice stocks. Increased stockpiles may induce Florida processors to sell at relatively low prices, thereby putting downward pressure on prices of imported juice.

A few countries (Brazil, Mexico, Costa Rica, and Belize) supply more than 95 percent of U.S. orange juice imports (table 5-4). Brazil is the principal supplier to the United States, supplying 271 million SSE gallons, or 75 percent of total imports, in 1999. During the 1990s, Brazil's orange exports to the United States declined markedly—from 330 million SSE gallons (average 1989-1991) to 204 million SSE gallons (average 1997-99). Moreover, Brazil's share of total U.S. orange juice imports declined from 91 percent to 68 percent during the same period. With increased competition in the U.S. market, Brazil has shifted its attention to other markets, such as Europe and Japan, where demand for orange juice has been growing or is expected to grow at a relatively brisk pace.

Some Brazilian exporters have been dissuaded from exporting to the United States by the U.S. imposition of anti-dumping duties. In 1987, the U.S. Department of Commerce first issued an anti-dumping duty on imports of FCOJ from Brazil. By 1999, the Commerce Department had revoked duties for three of the four largest processors in Brazil (*Federal Register*, 1999b). Currently, most Brazilian processors are subject to a low antidumping duty of 1.96 ad valorem (*Federal Register*, 1999a). Five firms are subject to the high duties ranging from 27 to 64 percent *ad valorem*, likely making the U.S. market prohibitive in these cases (*Federal Register*, 1999b; Federal Register, 2000). Under the FTAA, the United States has opposed changing World Trade Organization (WTO) anti-dumping rules.

Mexico, Costa Rica, and Belize are competitive in the U.S. market largely because of preferential trade agreements, such as the North American Free Trade Agreement (NAFTA) and the Caribbean Basin Initiative. Under NAFTA, the United States agreed to phase out tariffs on orange juice imports from Mexico over 15 years, beginning in 1994. The agreement establishes a tariff-rate quota (TRQ) that gives Mexico annual access for 40 million SSE gallons of frozen concentrate and 4 million SSE gallons of NFC. The FCOJ in-quota rate is currently at 18 cents per SSE gallon. Once the quota fills, Mexico is charged 30 cents per SSE gallon. The in- and over-quota rates for NFC are currently the same, at 8 cents per SSE gallon; thus, the TRQ acts as a simple tariff. In addition, a safeguard protects the U.S. industry against anticipated surges of imports from Mexico. Under the terms of the safeguard, tariffs on imports of Mexican FCOJ return to pre-NAFTA or most-favored-nation (MFN) levels (whichever was lower) whenever two triggers are reached. These are a volume trigger (annual import from Mexico in excess of 70 million SSE gallons during 1994-2002 and 90 million SSE gallons during 2003-07) and a price trigger (when for 5 consecutive days the FCOJ price falls below the most recent 5-year average price for the corresponding month). While Mexico has often exported beyond the TRQ, it has not met the requirements for the safeguard provision.

Enacted in 1983, the Caribbean Basin Initiative (CBI) allows the importation of orange juice duty-free to those countries identified under the act. CBI countries that currently export orange juice to the United States include Costa Rica, Belize, Honduras, and the Dominican Republic. With the exception of the Dominican Republic, the orange juice industries of these countries depend almost completely on export markets, as their domestic markets are quite small. In recent years, CBI exports to the United States have risen sharply (table 5-4). This trend is the result of increased investments in orange production, mostly in Belize and Costa Rica, and increased competition in the EU market, prompting the Central American and Caribbean industries to turn to the United States (Del Oro, 2002). CBI exports accounted for 20 percent of U.S. orange juice imports in 2000.

In recent years, increased domestic production and growing international demand have prompted the U.S. orange juice industry to place greater attention on export markets, such as Canada and the EU. U.S. orange juice exports grew 60 percent during the 1990s, to reach $278 million in 2000.[35] Among U.S. processed horticultural products, orange juice exports are surpassed only by frozen potatoes and wine in terms of total export value. Table 5-5 shows that NFC was the driving force behind the increase. While frozen concentrate revenues hardly fluctuated in the 1990s, NFC exports increased by over 300 percent in value (from $35 million to $157 million). Canada has become the largest NFC consumer outside the United States, accounting for 68 percent of the value of exports in 2000. Canada is a likely destination for NFC because of its proximity to U.S. producing

[36] Excludes fortified orange juices equaling $9 million in 2000.

areas. As methods of transportation have improved, the EU has increased its NFC purchases and is likely to continue to do so (Goodrich and Brown, 1999).

Brazilian and U.S. Orange Juice Industries In Fierce Competition

Orange juice is a high-value product with markets mainly limited to high-income countries. Competition is strong between Brazil and the United States. By comparing production and transportation costs, this section puts some perspective on the advantages and disadvantages facing both industries.

Table 5-6 compares orange production, orange utilization, and orange juice production for the United States and Brazil from 1997/98 through 1999/2000 seasons.[36] The orange crop in Brazil is much larger than in the United States. However, the U.S. juice industry utilizes a larger proportion of total orange production than the Brazilian industry—processed utilization in Brazil averages 77 percent of the crop, while in Florida it averages 95 percent. Higher processed utilization combined with higher juice yields allows U.S. orange juice production to rival Brazil's.

Brazil and the United States harvest oranges for processing during opposite seasons. Brazil starts to harvest fruit in late June or July, depending on fruit maturity, and extends to the end of December and often into January. Florida usually begins to harvest its crop in mid-November and goes through June. Juice made from Florida's early to mid-season oranges is pale and sometimes very sweet. To consistently meet consumers' quality expectations, Florida processors blend domestic juice with imported juice that is less sweet and of deeper color. In this way, the U.S. and Brazilian industries can complement each other. However, because frozen concentrate can be stored for several years, competition between the countries is often intense despite counterseasonal production cycles.

Brazil is more likely to be affected by drought than Florida. Drought tends to reduce juice yields and make orange trees more susceptible to disease. Brazilian growers generally do not irrigate, relying instead on rainfall. By contrast, most Florida growers irrigate their groves. Irrigation not only provides moisture during drought conditions, but reduces the effects of frosts or freezes by warming the surrounding area and icing over the oranges, keeping them warmer internally.

Orange processors in Brazil enjoy a sizable advantage in the cost of production compared to Florida. One study estimates that production costs are 42 cents per gallon SSE versus 75 cents per gallon SSE in Florida (Muraro et al., 2001). Import tariffs and other expenses considerably raise the price of Brazilian orange juice delivered to the United States. The current U.S. tariff on frozen concentrate imports from Brazil is about 30 cents per gallon SSE. Muraro et al. estimate that transportation costs and the Florida equalization tax add an additional 10 cents to the cost of delivered product to the United States. Thus, the total estimated costs of Brazilian frozen concentrate delivered with all taxes and tariffs paid is around 80 cents which is slightly higher than comparable costs in Florida. The higher production costs faced by Florida producers generally reflect higher

[37] Data for Brazil and the United States are from the States of Sao Paulo and Florida. Almost all orange production in other States in these two countries is sold as fresh fruit.

prices for labor, land, and machinery. Clearly, the U.S. orange juice tariff supports the price of orange juice in the United States, and liberalization of the tariff would allow the Brazilian orange juice industry to capitalize on the lower production costs it enjoys compared to the U.S. industry.

Measuring FTAA's Potential Impact

To measure the potential impacts of the FTAA on the U.S. orange juice industry, we developed a multimarket simulation model of the global orange juice market. The model is an extension of work by Alston and James (2001) recognizing that countries consume and bilaterally trade similar products with different qualities. Our model explicitly distinguishes two types of orange juice: frozen concentrate and NFC. It specifies the major players in the orange juice market, the United States, Brazil, the EU, Canada, and Mexico, and a rest-of-world region.

In our model design, we focus on two economic agents: producers and consumers of orange juice. Consumers and producers are assumed to make their decisions in purchasing and selling orange juice depending on prices of frozen concentrate and NFC. The demand for and supply of frozen concentrate and NFC thus depends on "own and cross" prices. The two products are considered to be imperfect substitutes. NFC is a high-quality juice product and as such is able to command a higher price than frozen concentrate. In the model, we establish parameters that indicate low consumer substitutability of frozen concentrate and NFC.

Consumers also choose within each of the two juice categories whether to purchase domestically or from foreign sources and from which importer they prefer in making their purchases. (This is a simplification from the "real world" where the processor makes this decision in response to packers' demands; packers dilute, add flavors and vitamins, and provide different packaging and sell to retailers, who in turn sell to the consumer.) By distinguishing products according to country of origin, we take into account consumer preferences reflecting certain country-specific quality attributes typically associated with that product—for example, sweetness and color. Nevertheless, we assume that juices from different countries and the domestic product are highly substitutable. This is a reasonable assumption since juice is storable, and countries can compete on an all-year-round basis.[37] The appendix provides the specifics of the simulation model.

Creating Tariff Scenarios

We consider two counterfactual scenarios. In each scenario we first eliminate the U.S. tariff on its NAFTA partner Mexico. The tariff is scheduled to decrease to zero by 2008. Thus, we estimate an adjusted base period (base period plus NAFTA) inclusive of a fully implemented NAFTA agreement. By following this approach, the solutions of our two counterfactual simulations can be compared to the adjusted base period and interpreted solely as the effects of the FTAA. The simulation results should be interpreted as the longrun effects of FTAA. The long run is defined as a time period sufficient to allow

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[38] Bulk frozen concentrate can be stored for several years provided the temperature is kept at acceptable levels. NFC can be stored two ways, frozen or chilled. Each of these storage methods allows NFC to be stored for at least a year.

orange growers to adjust the planting of orange trees and the bearing of oranges commensurate with market conditions.

Nevertheless, we assume that other factors such as utilization rates, juice yields, and other technological innovations remain constant.

In Scenario 1, we eliminate U.S. tariffs imposed on Brazilian orange juice.[38] In Scenario 2, we again remove the U.S. tariffs on Brazilian orange juice *and* we relax the assumption that consumer preferences remain constant. Instead, we allow for U.S consumers to increase their demand for NFC compared with frozen concentrate, to mirror recent trends in U.S. consumption patterns.

Table 5-7 reports the results of the first counterfactual scenario for the United States. Removal of the U.S. tariff reduces the Brazilian import price, thereby enhancing the competitiveness of Brazilian imports. U.S. consumers demand more Brazilian orange juice and less domestically produced juice and the U.S. price for frozen concentrate falls by 10.4 percent. On the supply side, U.S. frozen juice production decreases 4.9 percent.

Lower priced frozen orange juice leads to a 3.2-percent increase in consumption. Brazilian imports more than account for the increase. U.S. imports of Brazilian frozen concentrate increase 55 percent and Brazil's (volume) share of the U.S. import market rises from 65 percent to 80 percent, a level not seen since the early 1990s. In contrast, the switching of import sources to Brazil results in a loss of trade for Mexico. Mexico's exports to the U.S. decline 11.2 percent while its share of the U.S. frozen concentrate market falls from 21 percent to 15 percent.

Although not explicitly included in the model, a complete elimination of the U.S. orange juice tariff vis-à-vis Brazil would have adverse effects on the CBI countries that currently enjoy duty-free access to the U.S. market. Given that all of the countries in this region currently export most of their orange juice production to the United States, reduced tariffs for Brazilian exporters would result in lower prices paid for exports from CBI, along with a loss of market share. Our rest-of-world region, which closely mirrors CBI exports, experiences a market share decline from 14 percent to 6 percent. Reduced market share will likely result in a contraction of their industries.

To meet stronger U.S. demand for frozen concentrate, Brazil increases production 1.4 percent and diverts trade, mainly from the EU, to the United States. The EU is the largest importer of Brazil's frozen concentrate production. The tariff imposed by the EU on frozen concentrate imports is 15 percent ad valorem. With the elimination of the U.S. tariff, the United States becomes relatively more attractive than the EU to Brazilian exporters. Brazil exports to the EU decline 4.7 percent, from 1,154 to 1,100 million gallons SSE, while expanding to the United States by 55 percent, from 240 to 371 million gallons SSE.

[39] Tariff rates used on imports from Brazil do not reflect the anti-dumping duties.

In Scenario 1, we also reduce the U.S. tariff on Brazilian NFC. The qualitative effects on the United States in this market are analogous to frozen concentrate but the quantitative effects are considerably smaller (table 5-7). This is because U.S. import tariffs are smaller on NFC relative to frozen concentrate and there is far less reliance on the import market. While the value share in production of the U.S. juice market is roughly evenly divided between NFC and frozen concentrate, NFC imports are a fraction of frozen concentrate imports. Brazilian fresh exports to the United States increase 15.1 percent with the more liberalized trading environment, but Brazil's share of the U.S. market is still substantially under 1 percent.

It is important to note that our estimates of the impact on the U.S. NFC market may be understated. These estimates are small partly because the parameter estimates used to calculate the changes are based on trade patterns observed during the late 1990s—a period when the United States imported relatively small amounts of NFC. NFC imports continue to make up a fraction of total U.S. NFC supplies. In the future, however, the comparative advantage that the U.S. industry enjoys in supplying the domestic NFC market may be eroded by reductions in the costs of producing and shipping Brazilian NFC. Evidence suggests that Brazil already has begun to increase its NFC exports. From 1999 to 2001, Brazilian NFC exports rose from $4 million to $33 million.

In Scenario 1, demand for oranges from U.S. growers falls. We estimate that the 2.7-percent decrease in overall production of both frozen concentrate and NFC would lead to a corresponding decline in the demand for oranges (table 5-8). Assuming fixed costs for harvesting and hauling oranges from the field to the processing plant, a constant utilization rate and juice yield, and fixed processing margins, we estimate that orange prices would fall 15.1 percent. Clearly, lower orange prices combined with lower production hurt orange grower revenue and likely profitability of the sector. We estimate a $185-million decline in revenue or 17 percent from our adjusted base period.

In Scenario 2, we consider the possibility that the expansion in favor of U.S. consumer preferences for NFC over frozen concentrate continues into the future. This preference change is important because it affects how much juice is imported relative to how much is produced in the United States. Domestic producers supply most of the NFC consumed in the United States; this is not the case for frozen concentrate supplies, which are far more dependent on imports. Thus, increased demand for NFC relative to concentrate would imply more domestic production and less importation.

NFC's share of U.S. orange juice consumption increased 20 percent during the 1990s. If the trend continues, by 2010 the fresh share of total juice consumption would increase by another 20 percent. However, it is more likely that the market for NFC will reach maturity in the near future, thus likely mitigating the growth in its share of the market. For this reason, in Scenario 2 we consider modestly increasing the relative shares in favor of NFC by 2.5 percent while maintaining the increase in total juice consumption from Scenario 1. Other factors remain constant as in Scenario 1. For example, we do not consider increased demand because of population growth and therefore may understate the long-term demand for orange juice. We also do not consider improvements in transportation that would make Brazilian NFC exports to foreign markets more feasible.

Tables 5-9 and 5-10 report the results from Scenario 2 (FTAA and a preference change in favor of NFC) for the U.S. orange juice and orange market. We find that if this trend in consumer preferences continues even at a fairly small rate, overall U.S. orange juice production falls by only 1.9 percent (frozen concentrate production falls 8.2 percent but NFC production increases 5.6 percent). The decline in the derived demand for oranges grown in the United States would correspondingly be eased. While it is far from certain that consumer preferences will continue to favor NFC into the future, this change combined with FTAA would result in orange production and prices falling by 1.9 and 3.8 percent, respectively (table 5-10). Grower revenue would drop by 6 percent, a decline that is considerably less than the 17 percent estimated in Scenario 1.

Conclusion

There are two main points that can be drawn from our analysis of the potential effects of FTAA for the juice industry. First, removal of the U.S. import tariffs on orange juice increases Brazil's competitiveness and leads to substantially larger frozen concentrate imports into the United States. Adjustments in the U.S. market occur on both the production and consumption sides of the market. Orange juice production declines by approximately 3 percent. Consequently, the demand for U.S.-grown oranges decreases and on-tree prices substantially fall, thus damaging orange grower revenues.

Secondly, the U.S. industry's focus on NFC production helps to mitigate the adverse impacts of FTAA on the U.S. industry. U.S. orange growers are in a better position than they would have been if tariffs on Brazilian juice had been eliminated several years ago. U.S. and Brazilian producers supply nearly all the frozen concentrate to the U.S. market, while, in contrast, the U.S. industry alone supplies nearly all the NFC. The U.S. tariff protection on frozen concentrate is also roughly three times the tariff on NFC. Removal of U.S. tariffs would make Brazil relatively more dominant in the frozen concentrate market. The U.S. industry's advantage in NFC would not be seriously compromised from the FTAA. Furthermore, should U.S. consumers' demand for NFC increase over the next decade, even at a reasonably slow rate, the impacts of the FTAA on U.S. orange juice and orange production would be less severe. Then again, reductions in transportation costs of NFC may help Brazil become more competitive in the future. Consumer preferences and innovation in transportation technology therefore become key variables in affecting the outcome of the FTAA on the U.S. orange juice sector.

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Appendix 5-1

Equations (1) and (2) depict the decision process. For each orange juice f = frozen concentrate and n = not-from-concentrate in each importing country (i, j, or k), consumers demand the domestically produced juice (either f or n) and similar but not identical foreign produced juices.[39] The linear consumer demand functions can be

[39] Brazil and Mexico's demand functions are specified with domestic price as the only right-hand-side variable since imports are limited.

expressed as:

$$(1) D_f^{ij} = a_f^{ij} + \sum_k b_f^{ijk} P_f^{ijk} + c_f^j \, avgP_n^j$$

$$(2) D_n^{ij} = a_n^{ij} + \sum_k b_n^{ijk} P_n^{ijk} + c_n^j \, avgP_f^j$$

where D_f^{ij} and D_n^{ij} represent country i's demand for concentrate produced in country j for all i's and j's. P_f^{ijk} and P_n^{ijk} are market prices inclusive of import tariffs where relevant. (When $j = k$ the price represents the own price of demand and when $k \neq j$ the price represents cross prices.) In addition, demand depends on the average consumer price, avg P_n^j or avg P_f^j (weighted by value of the domestic and import shares in the base equilibrium), of the substitute product, which is either n or f. Other demand shifters such as income and population growth are assumed fixed.

The supply of product n and f is a function of its own and cross prices:

$$(3) S_f^j = a_f^j + b_f^j P_f^j + d_f^j P_n^j$$

$$(4) S_n^j = a_n^j + b_n^j P_n^j + d_n^j P_f^j$$

Where P_f^j and P_n^j are prices in the producer's domestic market. We assume producers of frozen concentrate and NFC base their production decisions on own and cross prices. Other supply shifters such as juice yields are assumed fixed.

Also, prices of imported products deviate from domestic prices depending on transportation costs (*TC)* and whether there are any tariffs (τ). In particular, we specify tariffs as ad valorem equivalents:

$$(5) P_f^{ij} = P_f^j (1 + \tau_f^{ij}) + TC_f^{ij}$$

$$(6) P_n^{ij} = P_n^j (1 + \tau_n^{ij}) + TC_n^{ij}$$

for all i where $i \neq j$ in equations 5 and 6.

World markets clear when net trade of juice across all countries equals 0:

$$(7) \sum_i T_f^{ij} = S_f^j - \sum_i D_f^{ij}$$

$$(8) \sum_i T_f^{ij} = S_n^j - \sum_i D_n^{ij}$$

The equilibrium solution reproduces all prices and quantities observed circa 1999. We call this our base solution that is assumed to be a longrun equilibrium. When tariffs are reduced or removed, the model generates a new equilibrium by recalculating domestic supply and demand levels, re-balancing world trade, production, consumption, and prices in the process. The pattern of prices and quantities observed in the base solution can then be compared to the pattern that emerges from the simulation exercise.

The model requires own- and cross-price elasticity estimates for the supply and demand equations. We specified the overall demand elasticities equal to –0.4 (table 5-11). This is in line with demand elasticity estimates found in the recent literature (Zabaneh, 1999;

Goodrich and Brown, 1999). Our search of the literature did not find estimates of cross-price elasticities between U.S. and Brazilian products, supply elasticities, or elasticities of substitution or transformation. Thus, these estimates are based on our understanding of the industry and markets. The elasticity of substitution between NFC and FCOJ was set equal to –1 (in countries that consume both juices). The small size of the elasticity of substitution between NFC and FCOJ is based on the observation that industrialized consumers perceive NFC to be a relatively higher quality product and that consumers would be reticent to substitute for FCOJ. We assume a high elasticity of substitution (-5) between juice from different countries and the domestic product. Given the limited empirical evidence and lack of data for estimation, we specified the values of the fundamental parameters of the model to be equal across countries.

We assumed supply to be inelastic (0.3 for the United States and the European Union and 0.5 for Brazil, Mexico, and rest-of-world). With orange juice being a derived product from oranges, and orange trees generally having a commercial life span of approximately 25 to 30 years, there is likely to be little production responsiveness to yearly price movements resulting from trade liberalization. Over a longer time period (several years) orange growers can adjust the planting of orange trees commensurate with market conditions. Depending on the age distribution of trees and alternative uses of the land, the adjustment period may take longer or shorter. We define the long run as a time period sufficient to allow orange growers to adjust plantings and enter or exit the industry.

The remaining model parameters are calculated based on the assumptions of weak separability and homotheticity for the demand side and from a similar representation of the individual firm's profit maximization problem for the supply side and stylized facts about the juice market for the 1998-2000 marketing years (Florida Department of Citrus, 1997; U.S. Dept of Agriculture, 2000a). This approach follows the methodology described in Alston and James (2002).

Chapter 6
U.S. Foreign Direct Investment in the Western Hemisphere

Foreign direct investment (FDI) plays an ever-increasing role in defining the U.S. presence in the Western Hemisphere processed food industry. An especially large burst of U.S. FDI in the hemisphere occurred during the 1990s, following Mexico's investment code reforms in 1989, the implementation of MERCOSUR (Common Market of the South) in 1991, and NAFTA (North America Free Trade Agreement) in 1994. Given this experience, will the FTAA likely affect the rate of U.S. FDI growth in the hemisphere?

There is no clear-cut answer to this issue, since many factors affect companies' decisions to establish affiliates in other countries. This paper provides some perspectives on the FTAA and U.S. FDI. It describes trends in U.S. FDI in the processed food industries in the hemisphere since the early 1990's. It discusses motivations for FDI, including recent changes in FDI protections in the Western Hemisphere, due in part to regional trade agreements. Finally, it offers conclusions on the potential effects of the FTAA on the motivations for U.S. firms to increase FDI in the hemisphere.

U.S. FDI In the Western Hemisphere

The stock of U.S. foreign direct investment in the Western Hemisphere food processing industry reached $13 billion by 2001, more than doubling since 1990 (fig. 6-1). These investments generated sales that were also double the level of 1990 (fig. 6-2). The importance to the U.S. of FDI in the FTAA is underscored by the fact that the $45 billion of sales from foreign affiliates of U.S. firms in the hemisphere has eclipsed U.S. processed food export earnings to the hemisphere ($12.5 billion in 2000).

Mexico, Canada, Brazil, and Argentina are the largest host countries for U.S. FDI in the Western Hemisphere processed food industry. Mexico and Canada are the second and third most important worldwide destinations for U.S. FDI in the food processing industry after the United Kingdom. U.S. investments cover a wide array of processed food products, but investments in beverages—both soft drinks and malt beverages—oilseed processing, and highly processed foods are the largest.

Some U.S. companies, such as Kellogg, General Mills, and Corn Products International have been in these markets for decades.[40] Others such as Tyson Foods, Perdue, and Smithfield, ventured into the hemisphere market during the past decade. Cargill, ADM and Bunge increased their presence in the Latin American oilseed complex in the 1990s. Corn Products International is one of the largest food processing companies in the United States and is now perhaps the largest presence of the U.S. processing firms operating in the hemisphere. Latin America accounted for a fifth of the company's earnings, and in the early 1990s, the company's consumer food sales and earnings compounded at 11 percent and 17 percent, respectively.

Within NAFTA, market integration has been deepening, as evidenced by rapidly expanding two-way trade and the greater north-south orientation of U.S.-Canada and

[40] See appendices for a list of U.S. and other firms engaged in FDI in Argentina and Brazil.

U.S.-Mexico industries. Some of the increased NAFTA trade in intermediate and processed products is linked to growth in FDI. Large firms are now better able to divide production lines between member countries, so that a product mix can be produced on either side of the border with considerable duty-free import/export activity in intermediate goods.

In contrast to Canada and Mexico, FDI has provided the primary means for U.S. companies to participate in the Argentina and Brazil markets, with limited trade in intermediate or processed food products. From the U.S. perspective, Argentina and Brazil have been limited and even declining markets for U.S. processed food exports since the 1990s. Sales from U.S. FDI affiliates in the Argentine and Brazilian processed food industry are $3 billion and $6 billion respectively, far greater than the level of U.S. exports of processed foods to those countries (figs. 6-3 and 6-4). U.S. FDI sales are also larger than exports in Venezuela, Colombia, Peru, Chile, Honduras, Costa Rica, and the Dominican Republic, indicating that it is less costly to set up affiliates to serve those markets than to attempt to export from the United States.

Because Brazil and Argentina produce many of the same commodities as the United States and have lower input costs, it is more economical for U.S. firms in those countries to produce processed products by FDI from local inputs. Also, most of the products from U.S.-owned firms in Argentina and Brazil are destined for their domestic markets. Even in export-oriented Argentina, nearly three-fourths (and in Brazil, nearly two-thirds) of the sales from U.S. FDI are for domestic use. Nevertheless, some U.S. FDI is export-oriented. U.S.-owned firms in Argentina and Brazil supply products to the U.S. market such as apple juice and frozen concentrated orange juice, processed meats, processed nuts, chocolate, coffee, and sugar products.

Some processed food trade between the U.S., and Brazil and Argentina is due to trade among affiliates. U.S. imports of processed foods from Argentine affiliates of U.S.-based multinationals were valued at $60 million in 1998 (table 6-1). The value of U.S. imports from affiliates in Brazil is undisclosed, but is thought to be much larger. U.S. exports to food processing affiliate plants in Argentina and Brazil amounted to only $72 million and $21 million respectively in 1998. U.S. exports to Argentine affiliates, at 60 percent of the total, comprised a significant share of the total processed food exports.

The United States is not the only foreign investor in the hemisphere, but it accounts for a significant share of the region's FDI. It is estimated that the United States has approximately 40 percent of the total FDI in Brazil's processed food industry. In Argentina's processed food industry, it is estimated that U.S. firms account for 25 percent of the total foreign direct investment. Likewise, about 60 percent of the total FDI in Mexico's processed food industry and more than half of the total FDI in Canada's processed food industry are from the United States. Major non-U.S. investors include industry giants Nestlé (Switzerland) and Unilever (U.K.-Netherlands), the two largest food processing companies worldwide in terms of sales. Danone (France) and Parmalat (Italy) are relative newcomers in the Western Hemisphere market.

Domestic or multinational firms tend to dominate individual sectors. For example, in Brazil, Kellogg's manufactures most breakfast cereals, while Coca-Cola and Pepsi dominate the soft drink market. Nestle and Parmalat dominate the dairy industry, along with Brazilian dairy cooperatives. Unilever's affiliate Gessy Lever is Brazil's leader of canned vegetables and tomato-based products. Brazilian firms dominate meat processing, most processed fruits, orange juice and beer.

Motivations for FDI

Motivations for FDI come from internal factors, such as prospective economic growth rates, and external factors, such as trade and FDI policies. At the heart of increased FDI in the hemisphere has been investor sensitivity to macroeconomic conditions relating to economic stability and growth in key countries such as Mexico, Canada, Argentina, and Brazil, the largest host countries for U.S. FDI in the hemisphere. Sizeable population increases, and the fundamental changes that are occurring in eating habits, such as increased use of prepared foods and away-from-home consumption, are other factors driving FDI in food industries. Also, firms are recognizing the new market opportunities that are emerging for creating global supply chain systems that have the potential to operate efficiently across borders.

Unilateral trade reforms and free trade agreements have played roles in increasing opportunities for FDI. Market integration provides the opportunity for companies to operate with even larger economies of scale in regional rather than national markets. Falling trade barriers permit companies to reconfigure trade patterns that are more efficient and find new opportunities such as accessing seasonal supplies that reduce inventory and storage costs.

Liberalization of FDI rules have also helped to stimulate FDI in the hemisphere. Mexico adopted a major unilateral reform of its longstanding restrictive foreign investment regime in May 1989. The Regulations of the Law to Promote Mexican Investment and to Regulate Foreign Investment were issued, which provided greater certainty by establishing rules for classified activities. These laws were extended in a new Foreign Investment Law in 1993 that allowed investment in more sectors of the economy. Important rules enacted under NAFTA regime include the rights of foreign investors to have the same process of recourse to dispute settlement as national investors do, with some exceptions. Expropriations can only proceed by public utility cause and through compensation at the commercial valuation. In addition, Canadian, Mexican, and U.S. investors have the right to third party arbitration in investment-related disputes for nationals, governments, or state enterprises of the three countries.

Argentina and Brazil have FDI rules in place through bilateral agreements and through MERCOSUR. Through the 1990s, the Argentine government signed bilateral agreements with 14 Western Hemisphere countries and Canada that included provisions for investment. The Argentine Government signed the Reciprocal Encouragement and Protection of Investment Agreement with the United States in 1991. Brazil signed bilateral agreements with Chile and Venezuela that included investment provisions.

The Colonia Protocol for the Promotion and Protection of Investments in MERCOSUR adopted in January 1994 is the principal regulation for governing foreign direct investment between MERCOSUR member countries, with provisions on investment treatment, transfers, expropriation, and settlement of disputes. The Buenos Aires Protocol for the Promotion and Protection of Investments, which applies to nonmember countries, was approved in August 1994. There are exceptions to investment protection, which include fishing (Argentina), and leasing of rural property (Brazil). Settlement of disputes between contracting parties is under the dispute settlement proceedings established under the Protocol of Brasilia (1991) or the mechanism established in the framework of the Treaty of Asuncion (Article 8 of Protocol of Colonia). For nonmember countries, settlement is through arbitration according to Article 2 of the Buenos Aires Protocol.

Conclusion

If rules that are conducive to foreign direct investment are adopted, the FTAA could affect the rate of growth of FDI in the hemisphere. Increased FDI will contribute to the achievement of an increasingly integrated food supply system that serves the hemisphere efficiently.

Strategic corporate considerations will be at the heart of decisions on increased foreign direct investment. Countries chosen for additional FDI will most likely have some comparative advantage in agricultural products and other major inputs. While Brazil, Argentina, Canada, and Mexico are most likely to remain as the core countries, U.S. FDI will probably increase in other countries as well if the FTAA succeeds in extending protection of U.S. FDI to all countries in the region.

Given that many firm-specific factors affect individual firms' FDI decisions, it is difficult to bracket the potential growth in FDI in the hemisphere. Nevertheless, growth in FDI is expected to be positively influenced by free trade agreements for any given set of foreign direct investment motivations. Favorable business climate and favorable investment laws, a stable economy and government, and the potential for economic growth are positive precursors for both FDI and trade agreements. One difficulty in measuring the effect of free trade agreements is that trade agreements are typically trailing indicators of an improved business environment in a host country.

Recommended Reading

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Chapter 7
Environmental Issues

In the United States, legislation requiring formal environmental assessments of certain physical projects dates back 30 years. Within the last decade, nongovernmental organizations (NGOs) and other stakeholders have been calling for an extension of these environmental assessments to trade agreements (WWF, 2001). The goal of this chapter is to discuss the economics of trade and environment links, discuss environmental issues in the Free Trade Area of the Americas, provide a review of existing literature on the environmental effects of agricultural trade liberalization, and quantify the possible environmental effects of an FTAA on U.S. agricultural areas. This chapter does not represent an official environmental review under U.S. Executive Order 13141, which mandates that the environmental impacts of trade agreements be evaluated.

The first relatively in-depth environmental assessment of a free trade agreement, was the U.S.-Chile Free Trade Agreement (FTA) (USTR, undated). However, that assessment of U.S. environmental effects of agricultural trade liberalization was conducted in a qualitative manner. The assessment's judgment that these environmental impacts in the U.S. will be small is primarily based on the fact that U.S. agricultural exports to Chile are, and will continue to be, a small fraction of total U.S. exports. While a qualitative analysis was sufficient in the U.S.-Chile FTA case, many interest groups may desire a more rigorous analysis for trade agreements that may alter trade flows significantly.

Although the discussion in this chapter focuses on effects in the United States, the environmental impact of trade liberalization, and the assessments thereof, are of global interest. For instance, paragraphs 6 and 31-33 of the ministerial declaration of the Fourth World Trade Organization Ministerial Conference held in Doha, Qatar in November 2001 address trade and environment issues. These include "the efforts by members to conduct national environmental assessments of trade policies on a voluntary basis."[41]

The Environmental Impact of Trade Liberalization

What are the short- and long-run environmental outcomes of liberalization? Such outcomes may be positive (decreased environmental damage) or negative (increased environmental damage). Both Anderson (1992) and Lopez (1994) find that if countries do not have effective environmental policies in place, the environmental effects of freer trade can be negative. On the other hand, if such policies are in place, freer trade will generally increase total benefits to society (Anderson, 1992). As an aid to understanding the possible outcomes and their causes, it can be useful to sort the environmental impact of trade liberalization into three general categories of effects—scale, technique, and composition effects (Cole, Rayner, and Bates, 1998):

- *Scale Effect*. Empirical evidence has long linked open economies to economic growth (Edwards, 1992; Harrison, 1996). Increased output and scale of production due to trade liberalization, however, may generate additional

[41] See http://www.wto.org/english/thewto_e/minist_e/min01_e/mindecl_e.htm for text of the declaration.

pollution emissions and accelerate the depletion of natural resources (outcome: likely to be negative).

- *Technique Effect*. All else being equal, increasing per capita income due to liberalization tends to result in calls for increased regulation mandating cleaner technologies. Trade liberalization thus may have a technique effect as producers alter production methods to adopt cleaner production technologies (outcome: positive). In addition to this wealth-driven effect, market-driven technological change reduces the ratio of inputs to outputs, and re-engineers production processes so as to minimize waste (outcome: likely to be positive).

- *Composition Effect*. Trade liberalization may also affect the composition of output produced in an economy, as resources formerly devoted to inefficient protected industries, which are frequently pollution-intensive, will be utilized elsewhere according to the notion of comparative advantage (outcome: uncertain).

These three effects may interact to create an inverted-U relationship between income and pollution, although it is not at all clear how robust this relationship is (Dasgupta et al., 2002). Named in honor of Simon Kuznets, who proposed a similarly shaped relationship between income and income inequality, this hypothetical relationship is known as the environmental Kuznets curve (EKC) (Dasgupta et al., 2002; World Bank, 1999). The argument is that when a country develops from an initially low level of income, the scale effect dominates, as there is increased demand for all inputs, including the use of the environment as a sink (disposal site) for waste. Rising incomes, however, increase the willingness to pay for environmental amenities. Regulations are enacted, forcing a shift to cleaner production processes, as the technique effect reduces harmful emissions and environmental damage. As resources are shifted out of protected polluting industries and rising incomes shift preferences to cleaner goods, the composition and technique effects eventually dominate the scale effect. See Nimon, Cooper, and Smith (2002) for a more detailed discussion of these concepts.

Agricultural production can both enhance and degrade the environment. Agriculture provides rural landscape amenities and wildlife habitat, but also has resulted in soil erosion, nutrient and pesticide runoff, and the loss of wetlands. Agriculture is likely the leading source of water quality impairment of rivers and lakes in the United States (U.S. EPA, 1998). If agricultural trade liberalization increases total production in the United States then in parallel, environmental degradation could increase. However, at the same time, the loss in rural amenities in some regions (through conversion of agricultural land to other uses) could slow down. Mitigating the increasing degradation associated with scale effects could be the increasing adoption of environmentally benign farm management practices in less developed regions as their incomes increase. Certainly there will be regional shifts in levels, as well as types, of environmental externalities as comparative advantage produces geographic redistribution of agricultural production.

The relative importance of types of agricultural production methods may differ according to a country's level of per capita income. For example, the prevalence of *extensive* methods of agricultural production, in which output is increased by expanding the area planted, possibly to marginal lands, may be greater in poorer countries. In contrast, higher-income countries tend to be more likely to employ *intensive* methods, in which output is increased by expanding the use of inputs other than land.

Extensive and intensive methods are associated with different types of externalities. For example, soil erosion and deforestation may be relatively more prevalent externalities for extensive agriculture while nutrient and pesticide runoff may be relatively more prevalent under intensive agricultural practices (Wood et al., 2000). Agricultural trade liberalization may affect the overall level of environmental degradation, but it may also cause shifts between types of effects.

Only a few empirical studies specifically examine the environmental effects of agricultural trade liberalization, and even fewer studies focus on the FTAA countries. Some research has been conducted on Organization for Economic Cooperation and Development (OECD) countries and a few studies have been done on NAFTA countries (United States, Mexico, and Canada). As these three countries will account for a large portion of the amount traded with in the FTAA, this research does provide some insights. However, taken as a whole, the results of these studies are inconclusive. See Nimon, Cooper, and Smith (2002) for a discussion of these studies.

Environmental Impact on U.S. Agricultural Areas

Regarding the change in U.S. agricultural output as a result of trade liberalization under an FTAA, the production changes are quite small, so it would be reasonable to expect that the environmental effects will be small as well. However, there are still several justifications for conducting an empirical analysis of the environmental effects. One is to confirm that these effects will indeed be small. Secondly, even though the overall effects may be small, they may hide some notable regional effects. Finally, it can serve as a model for analysis of the environmental impacts of future trade agreements.

In this section, we empirically analyze the environmental effects on the United States of estimated agricultural production changes associated with the trade liberalization scenario.[42] The empirical framework used is the U.S. Regional Agricultural Model (USMP, see appendix 7-1 for further discussion). USMP simulates how changes in various farm policies (e.g., those related to commodity production, resource use, the environment, and trade), commodity market conditions, and agricultural sector technologies will affect regional commodity supplies, commodity prices, commodity demands, farm input use, farm income, government expenditures, participation in farm programs, and various indicators of environmental quality.[43] The USMP model, in addition to scale effects, allows for some composition effects such as changing crop mix and technology effects such as changing fertilizer application rates and tillage practices,

[42] U.S. agricultural production impacts of the FTAA are reported in chapter on trade and welfare effects of the FTAA, in this report.
[43] USMP and the MTED model use somewhat different aggregations for the output categories. Appendix 7-2 maps the MTED output categories to the closest related USMP output categories. MTED's fruit and vegetable and sugar categories have no counterpart in USMP, and hence are not considered here.

in response to trade shocks, although these are expected to be small given small predicted changes in production associated with the FTAA.[44]

Among the primary environmental impacts that traditionally tend to be of interest in agriculture are measures of soil erosion and nitrogen and phosphorus contamination (see appendix 7-1). As the current version of USMP has 24 environmental indicators relating primarily to these impacts, only a small subset can be presented here; the focus in this presentation is on the indicators in USMP that may be the most direct measure of environmental implications beyond the edge of the field. These indicators are nitrogen loss to water and to the atmosphere, phosphorous loss to water, and sheet-, rill-, and wind-related soil erosion.

As is evident from table 7-1, the total national level impacts (last column) are minimal, as would be expected given the small changes in production. Nationwide in the United States, the FTAA is predicted to lead to small environmental benefits in terms of soil erosion and water pollution from nitrogen and phosphorus, with reductions of less than 0.2 percent of baseline values, and small environmental costs in terms of air pollution from nitrogen, with increases of less than 0.1 percent of baseline values. However, the totals do mask some larger, but still relatively small changes at the regional level. For instance, while soil erosion decreases nationwide, it does increase slightly in some regions, and while air pollution from nitrogen increases nationwide, it does decrease in some regions. It is important to consider the change in the actual levels in conjunction with the percentage changes as some of the larger percentage changes (e.g., the 3.9 percent and 2.9 percent increase nitrogen loss to water and to atmosphere, respectively, in the Pacific region) represent changes from relatively small baselines. The higher percentage changes in the Pacific region relative to the other regions may be due to USMP predicting that most of the increase in U.S. rice production will occur there. Given the spatial reallocations in production of a given crop as well as the shifts from one crop to another as predicted by USMP, both decreases and increases in environmental indicators are evident in the tables. The production changes are too small for changes in environmental indicators to be ascribed to changes in input application rates. At any rate, an in-depth analysis of the specific model results is not a productive exercise as the changes in the indicators are likely smaller than the range of inaccuracy in the results.

Placing monetary values on these environmental impacts (see appendix 7-1) is useful for assessing the costs and benefits of agri-environmental policies. However, not only are researchers still in the early stages of assessing the environmental impacts of agricultural

[44] The state-of-the-art approaches for quantitative national level analysis across multiple commodities of the environmental impacts of a trade agreement would be through multiple commodity partial equilibrium (PE) models (a simplified model of the economy that presumes no income effects due to price changes), such as USMP, or through multi-sector computable general equilibrium models (a model which simultaneously represent all the industries in a national economy, or even in all of the world's economies), such as ERS' Future Agricultural Resources Model (FARM) model (USTR, 2000). To the best of the authors' knowledge, the analysis presented in this chapter is the only quantitative national level analysis across a reasonably comprehensive set of agricultural commodities of several environmental impacts of an agricultural trade agreement. Other comprehensive analyses appear to have been performed for several countries utilizing ad hoc approaches (e.g., UNEP, 2001). In the American hemisphere, Agriculture Canada's Canadian Regional Agricultural Model, a PE model similar in scope to USMP, could in principle be used for an environmental assessment of a trade agreement. OECD (2000) provides an overview of methodologies for assessing the environmental effects of trade liberalization agreements.

activities beyond the edge of the field, relatively few attempts have yet been made to assign monetary values to these impacts. As is evident from table 7-2, the total national level effects (last column) are minimal, as would be expected given the small changes in production. Offsite damages due to nitrogen loss to water (table 7-2) increase by $500,000 (with most of that increase being attributable to changes in the Pacific region), while offsite damages due to sheet and rill erosion decrease by $2.5 million. However, the totals do mask some larger, but still relatively small changes at the regional level. The net increase in the cost of loss of soil productivity due to erosion (i.e., soil depreciation) is minimal.

Additional Trade and Environmental Concerns

This section provides brief overviews of trade and environment issues that cannot be addressed by our empirical analysis, but that may be of some concern within the FTAA region. These issues include the creation of "pollution havens," the introduction of harmful nonindigenous species, the environmental impacts of sugar and horticultural production, and transboundary environmental issues.

One concern regarding trade liberalization frequently expressed by governments is that this process creates an incentive for countries to lure capital by lowering environmental standards, which in turn may cause other countries to respond in kind. This process is commonly referred to as the "race to the bottom" hypothesis. Little evidence has been found for this effect in practice (e.g., Fredriksson and Millimet, 2000; Xu, 1999), and the concept appears to apply more to manufacturing than to agriculture. A related concept is that of the "pollution haven" hypothesis, which says that some countries with low demand for environmental quality will adopt lax environmental standards that attract investment and export pollution-intensive goods. Countries with a high demand for environmental quality will adopt high standards and import pollution-intensive goods.

Another concern is that increased agricultural trade among FTAA countries may increase the risk of introducing invasive agricultural pest species and diseases to new countries and new geographic areas. The costs of invasive pests can be significant, in terms of increased production costs, lost output, reduced access to foreign markets, and ecosystem damage. However, the difficulty in measuring these costs makes it extremely challenging to determine what standards should be set for import screening. A standard of "zero entry" would be prohibitively expensive, while standards that are too lax could expose agricultural producers, consumers, and the natural environment to unacceptable risks. To safeguard against invasive pests, USDA's Animal and Plant Health Inspection Service (APHIS) operates a variety of point-of-entry, quarantine, and foreign pest control programs and activities. The important policy question then is whether current standards and resources devoted to these programs and activities are appropriate given the increasing level of trade expected among the FTAA countries, and hence, expected risks from trade.

Thirdly, among the products whose environmental impacts cannot be modeled by USMP is sugar, either from sugarcane or sugar beets, given that these commodities are not included in the model. One significant agri-environmental issue in the United States involves the Florida Everglades Agricultural Area (EAA), where sugarcane production has contributed to loss of water retention capacity of the land base, a loss which has negative environmental consequences for the broader Florida Everglades watershed. The lowering of natural water tables on drained cropland has accelerated oxidation and decomposition of organic peat soils in the EAA, resulting in wide scale land-elevation declines due to soil subsidence. Soil subsidence and related loss in water retention capacity in soil are a serious concerns in the EAA (Aillery, Shoemaker, and Caswell, 2001). Such losses increase excessive floodwater discharges to the Everglades marsh, decrease dry-season water flows to the marsh and to Florida Bay, and increase reliance on lake management for water storage purposes. Hence, a decrease in crop production in the EAA could potentially increase water retention capacity. Aillery, Shoemaker, and Caswell (2001) found that a 10 percent (20 percent) reduction in the domestic price of raw sugar could increase EAA water retention capacity by 10,000 (80,000) acre-feet annually over baselines levels of 46,000 acre-feet annually, attributable primarily to an acceleration of cropland retirement. The magnitude of this change cannot be directly compared to the environmental effects estimated for other commodities by USMP as implications of water retention capacities for the environmental indicators in USMP (the level of decrease in erosion, for instance) are unclear. Of course, the long-term environmental consequences of the movement of land out of sugar production depend on the alternative land uses. For instance, if the land is developed into urban uses, the negative environmental consequences could be greater than under sugarcane production.

In addition to sugar, the USMP model does not contain horticultural products, and hence, it cannot assess the environmental impacts of changes in their production. Horticultural production tends to be associated with high levels of pesticide and herbicide applications. However, with a predicted production increase of 0.1 percent due to the FTAA, the environmental consequences are likely to be small.

Fourthly, in terms of the transboundary environmental implications of agriculture under FTAA, the risk of introducing harmful nonindidenous species (HNIS) is likely to be the main area of direct concern to the United States, since additional transboundary implications for air and water pollution associated with the FTAA over those associated with NAFTA are probably small. One would expect that increased trade with countries not on the U.S. border will have minimal transboundary effects on air and water quality in the United States. Of course, this assumption presumes that trade between NAFTA countries will not greatly increase with an increase in the free trade area. On the other hand, due to the FTAA, trade between NAFTA countries in some commodities could decrease, potentially leading to decreasing transboundary effects on air and water quality between those countries. Finally, the expansion of trade within North America will likely be associated with increased traffic, congestion, and air pollution along certain transportation corridors.

Conclusion

Agricultural trade liberalization under the FTAA is likely to affect the environment in a variety of ways, some positive and others negative. However, our modeling results show the effects on selected U.S. agri-environmental indicators to be small, which should be expected given the small predicted changes in U.S. production associated with the FTAA. Longer run effects are ambiguous, especially given the scale, technique, and composition effects that can occur outside the static time reference of the model used here. The FTAA likely will produce composition effects associated with the process of liberalization, as price incentives concentrate industries in areas possessing a comparative advantage. Crop substitution, technological modernization, importation of invasive agricultural pest species, increased use of transportation, and the development of environmentally friendly products are other examples in which the expanded agricultural trade associated with the FTAA could have positive or negative effects on the environment.

In principle, assuming that increased trade contributes to rising future incomes in the hemisphere, then the increasing willingness to pay for environmental amenities could translate in the long run into increasingly stringent domestic environmental regulations and enforcement. This, at least, is the case made by the environmental Kuznets curve (EKC) discussed in the introduction to this section, which suggests that beyond a certain income level at least, increasing income is associated with decreasing negative environmental consequences, given that increasing income results in the increasing demands for environmental services. Growth in GDP in the Caribbean region and several South American countries attributable to the trade liberalization under the FTAA could be significant. Income increases in these regions or countries may result in their increasing willingness to pay in those regions for environmental amenities. Nonetheless, it is unknown whether or not such an increase in incomes will be sufficient to induce increasingly stringent domestic environmental regulations and enforcement related to their agriculture sectors.

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Appendix 7-1

The U.S. Agriculture Sector Mathematical Programming Model (USMP)

To consider the effects of trade liberalization on U.S. agriculture's environmental performance the latter, we employ USMP, a regional model of the U.S. agricultural sector. USMP is a comparative-static, spatial and market equilibrium model of the type described in McCarl and Spreen (1980). The model incorporates agricultural commodity, supply, use, environmental emissions and policy measures. The model has been applied to study various issues, such as design of agri-environmental policy (Claassen et. al., 2001), regional effects of trade agreements (Burfisher et al., 1992), climate change mitigation (Peters, et al., 2001), water quality (Ribaudo et al., 2001; Peters et al., 1997), irrigation policy (Horner, et al., 1990), ethanol production (House et al., 1993), wetlands policy (Heimlich et al., 1997; Claassen et al., 1998), and sustainable agriculture policy (Faeth, 1995).

USMP estimates equilibrium levels of commodity price and production at the regional level, and the flow of commodities into final demand and stock markets. Geographic units consist of 45 model regions within the United States based on the intersection of the 10 USDA Farm Production Regions and the 25 USDA Land Resource Regions (USDA, SCS, 1981). Within each region, highly erodible land (HEL) is distinguished from non-HEL. Twenty-three inputs (e.g., nitrogen fertilizer, energy, labor) are included, as are 44 agricultural commodities (e.g., corn, hogs for slaughter) and processed products (e.g., soybean meal, retail cuts of pork). Crop production systems are differentiated according to rotation, tillage, and fertilizer rate. Production, land use, land use management (HEL, non-HEL, crop mix, rotations, tillage practices), and fertilizer applications rates are endogenously determined. Substitution among the production activities is represented with a nested constant elasticity of transformation function. Parameters of the nested-CET function are specified so that model supply response at the national level is consistent with supply response in the USDA's Food and Agriculture Policy Simulator (Salathe et al., 1982), an econometrically estimated national level simulation model of the U.S. agriculture sector.

Major government agricultural programs, chiefly the Production Flexibility Contract Program (PFCP), the Conservation Reserve Program (CRP), and conservation compliance also are represented. The most important of these for this analysis is conservation compliance, which limits expansion of production onto HEL by requiring producers to forego FCP and CRP payments when bringing new HEL into production without implementing an approved conservation system.

On the demand side, domestic use, trade, ending stocks and price levels for crop and livestock commodities and processed or retail products are determined endogenously. Trade is represented with excess demand and supply curves, with the assumption that there is no policy response by the rest-of-world to U.S. environmental policies. Hence, trade volumes respond to changes in prices.

For this analysis the USMP model is calibrated to projected crop and livestock supply, demand, production, acreage, government program, input cost and other conditions for 2005. U.S. agriculture sector conditions in 2005 come from the USDA Baseline. Costs of production for crop production activities and livestock enterprises are based on ERS 1996 cost-of-production budgets (USDA, ERS, 1996). The costs are then indexed to the USDA Baseline projections of variable costs for 2005.

With data from U.S. Department of Agriculture (USDA) production practice surveys (Padgitt et al., 2000), the USDA Long-Term Agricultural Baseline (USDA, WAOB, 1998), the National Resources Inventory (USDA, SCS, 1994), and the Environmental Policy Integrated Climate model, or EPIC (formerly known as the Erosion Productivity Impact Calculator) (Williams et al., 1990), USMP is used to estimate how changes in environmental or other policies affect U.S. input use, production, demand, trade, world prices, and environmental indicators.

Environmental indicators include soil erosion, losses of nitrogen and phosphorous to ground and surface water, volatilization and denitrification of nitrogen, nitrogen runoff damage to coastal waters and erosion damage.[45] [46] Environmental emissions for each crop production activity were obtained from simulations of the production activities using EPIC. EPIC utilizes information on soils, weather, and management practices, including specific fertilizer rates, and produces information on crop yields, erosion, and chemical losses to the environment. For the simulations management practices and initial fertilizer application rates were set consistent with agronomic practices for the 45 regions as reported in the USDA's Cropping Practices Survey (a predecessor of the Agricultural Resource Management Survey). Yield and environmental indicators—such as, nitrogen losses and erosion—were then estimated by running each of the cropping systems represented in USMP through EPIC. Take, for example, the process of constructing USMP's erosion indicator. In the first step, yields were obtained by running EPIC for 7 years for each crop in the rotation with erosion rates set at zero and the distribution of rainfall and temperature set to match reported rainfall and temperatures for the seven-year period from 1989-1995 for each region. Erosion rates were set at zero to ensure that the yields were a function of weather and not of losses in soil productivity. Average yields by crop for each region were calculated from county data from USDA's National Agricultural Statistical Service (NASS) for this same time period and used to evaluate EPIC's performance in simulating crop growth. EPIC-based average yields by crop and region came within 10 percent of average reported yields for these crops and regions over the 7-year period. The environmental indicators were then obtained by running the systems through EPIC with erosion rates set at zero for a period of 60 years. This permitted the systems to be run through two complete cycles of the weather distribution, removing the effect of particular weather patterns on the results. For the estimation of nitrogen losses, a similar two-step process was repeated for nitrogen application rates representing 10-, 20-, 30-, 40-percent reductions from their initial values.

[45] Denitrification is the process by which nitrogen is released to the atmosphere due to bacterial action in wet and compact soils and volatilization occurs when fertilizer applied releases directly to the environment. The sum of these is the USMP indicator "nitrogen loss to the atmosphere."
[46] For information on the environmental impacts of agriculture, see the ERS Briefing Room on Conservation and Environmental Policy (ERS, 2001) as well as the Briefing Room on Global Climate Change (ERS, 2000).

In USMP, economic values have been linked to several of the environmental indicators. With regards to onsite values, agricultural soil erosion results in agricultural productivity losses, polluted air from wind erosion, and off-site costs attributed to water pollution. The loss of productivity stems primarily from the loss of topsoil and nutrients. The USMP's soil-depreciation indicator is the discounted value of long-term yield changes due to this loss, and is based on current output prices.

Estimates of the monetary value of offsite damages are derived from sediment and nitrogen damage indexes developed by the USDA (Claassen et al., 2001; Ribaudo, 1986; Feather et al., 1999). Amenities included in the indexes are municipal water use, industrial uses, irrigation ditch maintenance, road ditch maintenance, water storage, flooding, and soil productivity, fresh water-based recreation, navigation, and estuary-based boating, swimming, and recreation. This set of amenities is by no means an exhaustive list of all amenities affected by sediment and nitrogen runoff, let alone that the impacts of the other environmental indicators have not been monetized yet. Hence, the monetized estimates of offsite damage calculated by USMP here—the value of nitrogen loss to water and the value of sheet and rill erosion damages—should be viewed as a lower bound on total offsite damages.

Of course, while USMP does contain some of the important agri-environmental indicators, the set is by no means complete. One example of an omitted indicator is emissions of pollutants associated with fuel usage. Agricultural trade will be a significant component of overall FTAA trade (see chapter 1 of this report), and increased international commerce likely involves increased transportation and fuel usage. Thus, expanded agricultural trade may contribute to increased emissions of pollutants. Increased ground transportation is often concentrated in a few border corridors, resulting in hotspots of localized environmental stress, such as the high traffic areas in and around Laredo, Texas, and Detroit, Michigan (Sierra Club and Holbrook-White, 2000). A recent study of the border corridors of Vancouver-Seattle, Winnipeg-Fargo, Toronto-Detroit, San Antonio-Monterrey, and Tucson-Hermosillo concludes that NAFTA trade "contributes significantly to air pollution" in all five corridors (ICF Consulting, 2001). Another example of an omitted source of pollution is manure production, and its contribution to nitrogen and phosphorus production. However, the next version of USMP will contain these manure-related indicators. Finally, USMP cannot estimate environmental impacts associated with commodities not in the model, such as sugar and fruit and vegetables.

Chapter 8
Regionalizing the Rules for Sanitary and Phytosanitary Measures

Technical regulations can be significant barriers to regional as well as global trade. In some instances, countries entering into preferential trading agreements have elected to harmonize their measures to eliminate such trade impediments, a strategy that has been pursued in sectors such as motor vehicles and measurement instruments in the European Union (Sykes, 1995). Harmonization can increase economic welfare if the resulting gains from trade outweigh the net benefits of existing regulations. This outcome is more likely if the origins of regulatory heterogeneity are the result of chance events, information differences, or interest group capture. However, harmonization is likely to be inefficient if incomes, tastes, and risks are the primary sources of variation in national regulations. In these instances, other forms of regulatory rapprochement are likely to be more appropriate. The customary choice allows regulators in different jurisdictions to adopt different substantive measures subject to mutually agreed-upon constraints, sometimes referred to as "policed decentralization" (Sykes, 1999).

This latter option was chosen by the negotiators of the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) in the Uruguay Round. The agreement was negotiated to provide a set of multilateral rules that would recognize the legitimate need for countries to adopt different measures to protect human, animal, and plant health, while establishing a framework to reduce their trade-distorting aspects (see box). The agreement reiterates earlier commitments under the General Agreement on Tariffs and Trade (GATT) to apply technical restrictions only to the extent necessary and to avoid unjustifiable discrimination among members, but also requires regulators to (1) provide notification through the WTO of proposed regulations that affect trade (transparency); (2) use scientific risk assessment to inform regulatory decisions (science-based risk management) while allowing national determination of the level of SPS protection (national sovereignty); (3) recognize that different measures can achieve equivalent safety outcomes (equivalence); and (4) allow imports from regions that are free or nearly free of pests or diseases (regionalization). Adoption of international standards (multilateral harmonization) is encouraged, but not required. In addition to these principles, the agreement establishes a permanent SPS committee to oversee implementation of its provisions. Dispute settlement is available when WTO countries are unable to resolve differences through bilateral negotiations.

The physical and economic diversity of the Western Hemisphere countries is a significant obstacle to harmonization of SPS measures within the FTAA region.[47] Because optimal measures for mitigating the risks of exotic pests and diseases are usually contingent on the climate of the importing country, identical animal and plant health measures for tropical and temperate countries would generally lower economic welfare. Large differences in per capita incomes throughout the region likewise could make harmonization of many food safety measures inappropriate: consumers' willingness to pay for reductions in risks is a function of income, so harmonizing developed and

[47] There are different definitions of harmonization. In this discussion, harmonization is defined as the adoption of identical measures.

developing countries' food safety regulations either "up" or "down" could decrease aggregate consumer welfare in the region.

Some form of policed decentralization would therefore appear to be a better model for an agreement in a region comprised of heterogeneous countries. This determination, however, still leaves several alternatives open to negotiators. Does the WTO SPS Agreement provide a prototype of policed decentralization that is suitable for the Western Hemisphere, or would a "WTO-plus" agreement which spells out additional rights and/or obligations better serve the interests of FTAA trading partners?

An evaluation of the options before FTAA negotiators logically begins with a review of the implementation of the WTO SPS Agreement, which came into force in 1995. General assessments of this record by FTAA countries are reviewed in the subsequent section of the paper. The final section examines whether modification of the WTO SPS principles themselves or other options could more effectively advance the overarching goal of welfare enhancement through trade in the FTAA region.

Implementation of the WTO SPS Agreement

The SPS Agreement has met with broad approval since it went into effect in 1995. WTO members concurred that there was no need to amend the SPS Agreement following the first formal review of the agreement in 1999 (WTOa, 1999). The absence of any proposals to renegotiate the SPS Agreement in the next round of multilateral trade negotiations also signaled general acceptance of its provisions.[48]

Beyond these broad assessments, a review of the implementation of the individual provisions of the agreement affords more specific evidence about its achievements and shortcomings, providing a more reliable basis for judging the suitability of these rules for FTAA countries. The record indicates that the multilateral disciplines for transparency and science-based risk management have yielded benefits for the world trading system without compromising legitimate regulatory goals. Fewer gains can be reported under regionalization, equivalence, and multilateral harmonization.

Transparency. There is perhaps more systematic evidence available to gauge fulfillment of the transparency obligations than for any other commitment under the SPS Agreement. These obligations include notification of proposed changes to SPS measures that affect trade, as well as identification of official contact points responsible for providing information about regulatory regimes. The notification requirements constitute the cornerstone of the agreement's transparency provisions that are intended to facilitate decentralized policing by trading partners to ensure compliance with the SPS Agreement's substantive provisions.

[48] Nonetheless, in the WTO "implementation negotiations" leading up to the Doha Ministerial Conference, WTO members agreed to several initiatives to improve implementation of the SPS agreement (as well as other WTO agreements) to help developing countries. The WTO initiated these negotiations to address the needs of developing countries in May 2000 after the Seattle Ministerial Conference failed to launch a new round of trade negotiations. Details of the entire "implementation package" agreed to by WTO members at Doha can be found in WTO(b), 2001.

While transparency does not guarantee that countries will not misuse SPS measures, it contributes to the smooth functioning of the world trading system by facilitating both compliance and complaints by trading partners. Compliance is aided when advance notice of new or modified measures provides an opportunity for firms to change production methods to meet new import requirements, thereby minimizing disruptions that such changes can cause to trade flows. More than 2,500 notifications were submitted between 1995 and 2001, far more than the number submitted under prior GATT obligations.[49]

Although one-third of Western Hemisphere countries (primarily Caribbean islands) have not submitted any notifications to the WTO, all of the major agricultural exporting and importing countries in the region, including the United States, Canada, Mexico, Argentina, Brazil and Chile, routinely notify proposed measures. The United States alone accounted for more than 500 notifications over the 1995-2001 period, while a few developing countries such as Paraguay only submitted one.

Notifications also provide an opportunity for trading partners to raise objections or questions about the legitimacy or design of a proposed measure, possibly averting a trade dispute. WTO members have registered 187 interventions in the SPS Committee between 1995 and 2001 that reference complaints or questions about notified measures.[50] The tabulation of these interventions by region indicates that FTAA countries fully exercised their rights under the transparency provisions: these countries were twice as likely to be the source (85) rather than the target (48) of complaints (table 8-1). The majority of their complaints were against the measures of European countries. Similarly, the regulations of FTAA countries drew more complaints from European countries than from any other region. Intraregional disputes (20) ranked second as both the source and target of Western Hemisphere complaints.

Globally, 30 percent of the interventions cited food safety measures, more than for any other type of regulation (table 8-2). Another 27 percent of the complaints targeted measures related to transmissible spongiform encephalopathies (TSEs).[51] Plant and animal health measures respectively accounted for 22 percent and 18 percent of the complaints, while the remaining 3 percent of the committee complaints identified other concerns.

The interventions involving intraregional FTAA complaints differed significantly from the global pattern. Within the FTAA, plant and animal health measures were challenged more often than food safety measures. Only three complaints (all by the United States) identified regional food safety measures as unjustified obstacles to trade. Another distinguishing feature of the FTAA's intraregional disputes is that they were more likely to be resolved in bilateral consultations before advancing to formal dispute settlement proceedings. FTAA countries reported resolution of 35 percent of their intraregional

[49] Countries notified only 168 measures to prevent risks to public health and safety between 1980 and 1990 under the TBT Agreement, and fewer than half of those notifications concerned SPS regulations (GATT).
[50] Complaints are variously recorded under "information from members," "specific trade concerns," and other business" in the committee minutes.
[51] TSEs include bovine spongiform encephalopathy (BSE), a zoonoses (i.e., disease affecting both animals and humans) which has been linked to new variant Creutzfeldt Jakob disease (nvCJD) in humans.

complaints, compared to 23 percent for complaints involving at least one country outside the region (WTOd, 2001). Finally, there was a stark difference between the global and regional number of developed-country complaints against developed-country regulations: globally, it was the largest category, while regionally it was the smallest, suggesting that the United States and Canada have similar approaches to regulating SPS risks.

While progress on regulatory transparency has been one of the more notable successes of the SPS Agreement, many members have identified procedural shortcomings in the current system. Developing countries in particular have requested assistance with translating documents, extension of deadlines to comment on pending measures, and more timely responses to their requests for further information. The WTO SPS Committee revised its recommended notification procedures in 1999 and again in 2002 (WTOe, 1999 and 2002). More recently, controversy arose over *if* as well as *how* certain measures must be notified. Exporters have identified instances in which importers did not notify regulatory actions—even if they severely disrupted trade—because these actions were regarded as implementation of existing regulations rather than new measures. Canada's unexpected embargo of Brazil's processed beef exports in February, 2001, provides one example of a regulatory action that has prompted interest in strengthening or at least clarifying current notification requirements (WTOf, 2001; WTOg, 2001).

Science-based risk management and national sovereignty. The obligation to reference scientific evidence in defense of a trade-restricting measure clearly reduces the degrees of freedom for disingenuous use of SPS regulatory interventions. In each of the four SPS disputes to reach the WTO Appellate Body over the 1995-2002 period, the measures at issue were judged to be in violation of the provisions which requires that measures be based on a scientific risk assessment.

However, the impact of the disciplines of the SPS Agreement extends far beyond formal dispute settlement results. While hard to quantify, it is apparent that the agreement has generated broad-based regulatory review by some WTO members, as major agricultural exporters and importers determine whether they and their trading partners are complying with the obligation to base their risk management decisions on scientific assessments. Evidence suggests that regulatory authorities are either unilaterally modifying regulations, or voluntarily modifying regulations after technical exchanges (Roberts, 1998).

To give just two examples of accelerated schedules for making longstanding measures consistent with the science obligations in the SPS Agreement, Japan agreed to rescind its 46-year-old ban on several varieties of tomatoes grown in the United States based on scientific research indicating that they were not afflicted with tobacco blue mold disease (USDA), and the United States ended a 20-year-old dispute with four European countries by agreeing to allow imports of rhododendron in growing media under a new phytosanitary protocol. More systematic reports, while far from comprehensive, reinforce the anecdotal evidence. WTO members collectively have reported 35 negotiated or partial settlements, which have increased access for: exports of Uruguayan beef to Israel; exports of Hungarian apples, pears and quinces to the Slovak Republic; Brazilian exports of gelatin to Norway; and shipments of European Union potatoes to the Czech Republic (WTOd, 2001). Still greater is the number of issues that has been resolved before reaching the Committee. The United States and Australia respectively report resolution of 338 and 240 SPS cases in bilateral negotiations over 5 years (APHIS, 1997-2000; *World Food Chemical News*, 2001). This evidence indicates that enacting regulatory changes that allow greater market access has likely become easier now that the SPS Agreement assures policymakers that their trading partners must conform to the same principles.

It is important to note that while countries must be able to reference scientific evidence to support their risk mitigation measures, the national sovereignty provisions entitle them to adopt the levels of SPS protection of their choice, as long as any variation in the levels of protection does not constitute discrimination or a disguised restriction on trade. The SPS Agreement thus leaves scope for importing countries to maintain or adopt exigent standards, as long as they are consistently rigorous for comparable risks. Conservative measures may be maintained under the agreement even when these measures fail to increase domestic welfare. To cite but one example, New Zealand decided to maintain a ban on imports of bone-in poultry cuts from the United States based on an assessment that shipments posed a risk of three disease introductions in backyard (i.e., noncommercial) flocks per 100 importation years (Ministry of Agriculture and Forestry, 2000). Such policies may be scientifically justifiable, but nonetheless fail cost-benefit tests if they ignore the benefits of imports to domestic consumers.

Provisions in the agreement, which (1) recommend that countries take into account the objective of minimizing negative trade effects, and (2) require that measures be no more trade restrictive than necessary, alludes to a larger role for economics in SPS policy choice. These two provisions clearly do not require SPS measures to be justified by the economic welfare effects on producers, consumers, taxpayers, and industries which use the regulated product as an input, but at least envision consideration of economic factors that extend beyond the potential risk-related costs of imports. Greater gains from trade could be realized if FTAA countries adopted a normative framework which would account for the benefits as well as the potential costs of imports, but requiring (rather than just allowing) countries to do so may be seen as an unacceptable infringement on national sovereignty.

Regionalization. The agreement's regionalization provision is an integral part of a science-based approach to regulating trade, as SPS risks often do not correspond to political boundaries. Regionalization provides countries with an opportunity to export products from areas where animal or plant health risks are considered negligible, thereby benefiting consumers without jeopardizing the agricultural resource base in the importing country. By ensuring that partial eradication or control leads to trade gains, regionalization also provides incentives for additional investments in control measures, so that over time this provision is likely to be of growing importance in international agricultural markets.

The trade effects of regionalization are already evident in the Western Hemisphere. Chile’s decision to allow imports of fresh melons and watermelons from all production areas in the United States except Hawaii provides one example of a regional approach to mitigating pest risks (WTOh, 2001). Developing-country exporters have also benefited from regionalization: one prominent example is provided by the United States’ 1997 decision to replace its 83-year-old ban on imports of Mexican avocados with measures that allow imports from specified regions of Mexico to the U.S. Northeast (Roberts, 1997). This measure was subsequently amended to extend the length of the shipping season and to increase the number of States that can import Mexican avocados, and U.S. authorities now are considering opening access to all 50 States.

In general, however, farmers and ranchers in developing countries will face more challenges in capitalizing on the regionalization provisions than developed country producers, because exports will be contingent on adequate public sector investments in laboratory, inspection, monitoring, and certification infrastructure. Argentina's recent experience with outbreaks of foot and mouth disease (FMD) illustrates the importance of such investments. The United States and Canada, as well as several other countries, lifted longstanding bans on Argentina's exports of fresh, chilled, or frozen beef in 1997 as the country neared completion of its FMD eradication program. Exports of Argentine beef to the United States reached 45,000 metric tons in 1999, but the following year U.S. market access for the beef was suspended when FMD was detected in animals that had been smuggled across the border. The United States re-opened its market to Argentine beef in December 2000, subject to certification that the beef came from FMD-free regions (along with other requirements). However, recurring outbreaks led the United States and Canada to reinstate their bans in early 2001.

This episode underscores the fact that investments in public sector regulatory infrastructure must be forthcoming if there is to be a return on private sector eradication efforts. It is also evident that national regimes will not work in some cases: trans-border pest or disease controls may be required where there are insufficient natural barriers or when animals (including wildlife) move freely across borders. It is therefore likely that creating or reinforcing regional sanitary and phytosanitary regimes *across* as well as *within* countries will often be necessary to fully realize the gains from trade in the region. Coordination of this sort may be beyond the institutional capabilities of some FTAA countries.

Equivalence. The SPS Agreement requires members to accept other countries' measures as equivalent to their own if an exporter shows that its measures achieve the importer's desired level of SPS protection. This provision recognizes that regulatory flexibility allows countries to allocate scarce resources efficiently rather than identically. The agreement also encourages members to create bilateral and multilateral agreements to foster equivalence.

Equivalence determinations usually involve process standards, since countries can easily compare product standards, which stipulate observable and/or testable attributes of end products. An enormous number—and arguably a growing proportion—of SPS measures are process standards. One of the principal lessons to emerge from 2 decades of environmental regulation is that process standards are generally an inefficient means of achieving regulatory goals. However, food technologists argue that the unique nature of food hazards—which include pathogens (such as *Salmonella*) that can regenerate and cross-contaminate at several points in the production chain—requires regulating production processes to avoid repeated, expensive tests of conformity with product standards (MacDonald and Crutchfield, 1996). Some analysts have challenged this conclusion (Antle, 1996), but process standards continue to emerge as components of risk management programs, notably in Hazard Analysis and Critical Control Point (HACCP) programs, which an expanding number of countries mandate for a growing number of food products. The equivalence obligation therefore theoretically has the potential to yield significant benefits in international markets for products such as cheeses, meats, fresh produce, and seafood for which process standards are key policy instruments for managing microbial risks.

While the SPS Committee has urged members to submit information on their bilateral equivalence agreements and determinations, few have done so (WTOi, 2001). Consequently, there is no systematic accounting of achievements to date. However, experts indicate that such arrangements are still rare (Gascoine, 1999).[52] Numerous regulatory differences remain in contention even between countries generally recognized as having rigorous regulatory standards that are rigorously enforced. One example is the 1997 EU ban on U.S. poultry exports: European authorities do not consider the chlorine decontamination used in U.S. poultry processing plants equivalent to lactic acid decontamination.

Developing countries therefore have questioned whether the equivalence obligation will actually provide many export opportunities for them, given the difficulties that developed countries have had in exercising their rights under this provision (WTOj, 1998). A number of equivalence arrangements between developing and developed countries do exist, especially for seafood products. However, developing countries—echoing the claims of developed countries—have argued that developed countries often require "compliance" rather than equivalence of measures. Even developing countries that have had substantial success as agricultural exporters, such as Brazil, Mexico, and Thailand have gone on record to note the difficulties in gaining recognition of equivalence (WTOk, 1999, and WTOl, 2001). Globally, the limited access to developed country markets for poultry meat illustrates the both the potential and challenge of equivalence. Of the 144 countries that are WTO members, only 15 are currently eligible to export fresh, chilled, or frozen poultry meat to the EU, 4 may export to the U.S.,[53] 1 may ship to Canada, and none are allowed to export to Australia.

The United States, with the most lucrative market for developing-country exporters in the Western Hemisphere, has stated that its experience indicates the potential for equivalence may be limited because the actual trade benefits of an equivalence determination or agreement may not justify the administrative burden (WTOm, 2000). The United States has also cautioned that *equivalence* does not imply *mutual recognition*: under the equivalence provisions of the SPS Agreement, market access is contingent on a scientific determination that an exporter's alternative measure achieves the level of SPS protection required by the importer, not on reciprocity.

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[52] Possibly the most prominent equivalence accord has been a veterinary agreement signed by the U.S. and the EU in July 1999, after 6 years of occasionally high-profile negotiations over matters seemingly as minor as the colors of wall paint in food-processing facilities. The veterinary agreement reduces—but does not eliminate—inspection of some $1 billion in EU exports of dairy products, fish, and meat to the United States, and $1 billion in U.S. exports of fish, hides, and pet food to EU countries.

[53] In addition to the four countries that are permitted to export fresh, frozen and chilled poultry to the United States (Canada, Great Britain, France, and Israel), some plants in northern Mexico may also re-export U.S.-origin poultry meat to the United States after minimal processing.

Multilateral harmonization. The SPS Agreement urges the widest possible harmonization of countries' SPS measures based on internationally recognized standards, and identifies three organizations to promote this objective: the Codex Alimentarius Commission (Codex) for food safety measures, the International Plant Protection Convention (IPPC) for plant health measures, and the International Office of Epizootics (OIE) for animal health measures.

The agreement's endorsement of harmonization stems from repeated complaints by exporters that complying with divergent SPS measures substantially increases the transactions costs of trade. The net benefits of harmonization for exporters will be positive if the resulting revenues exceed the costs of complying with the international standard. These benefits are usually considered large compared to those of regionalization or equivalence, as the former usually permits greater economies of scale in both production and certification. Consumers may also benefit from harmonization if eliminating regulatory heterogeneity among countries lowers prices and expands product choice.

The limits to multilateral harmonization as sound policy prescription is limited by the factors noted earlier for regional harmonization. However, the impact of multilateral harmonization on trade appears to have been constrained as much by the lack of international standards as by normative considerations. The majority of 1995-99 notifications from WTO members stated that no international standard existed for the notified measure (fig. 8-1). The character of international standards as a public good leads to an expectation of under-investment in their creation. This underinvestment leads not only to too few international standards, but also to too many outmoded standards, which may account, in part, for the low adoption rate for those standards that do exist. Partial or full acceptance of international standards as a percentage of total measures notified by income category was highest for the lower-middle income countries (38 percent) followed by high-income (22 percent), lower income (20 percent) and upper-middle income countries (17 percent) (Roberts, Orden, and Josling, 1999).

The nature of international standards is also important in assessing their impact on trade. Over the past decade, the three standards organizations have allocated most of their resources to the development of metastandards, which identify common approaches to risk identification, assessment, and management rather than international standards per se. In fact, the IPPC has not produced any commodity-specific standards, although some are under development. Exporters' anticipated gains from international metastandards may be smaller than from international standards: for example, even if an importing country has used the IPPC standard to determine the pest status of an exporting country, its measures may nonetheless vary from those of other importers. These metastandards have contributed to the trading system by setting out scientific approaches to regulation, not by promulgating product standards that will be identical across adopting countries.

The WTO SPS Agreement and the FTAA Countries

Developed-country exporters, including the United States and Canada, are the strongest proponents of the current balance of rights and obligations in the WTO SPS Agreement. It is clear why. These countries have been able to successfully challenge measures that have no scientific basis while maintaining their own stringent health and environmental standards that reduce verifiable risks to negligible levels. All four cases to advance to the WTO Appellate Body between 1995 and 2002 have been won by the developed-country complainants: the United States and Canada in *EC Hormones*, Canada in *Australia Salmon*, and the United States in *Japan Varietals* and the United States in *Japan Apples* (table 8-3). Developed-country exporters have also been successful in using dispute settlement procedures to achieve their objectives before their complaints reach a WTO panel. For example, Korea agreed to modify its shelf-life measures in response to separate complaints from the United States (primarily for processed meats) and Canada (bottled water) as the result of formal consultations. At the same time, new initiatives in developed countries to improve food safety, such as the U.S. Food Quality and Protection Act (FQPA), have not been challenged in the WTO even though these new policies have resulted in lower imports from some countries.

Although many developing exporters in the region, including Chile, Argentina, and Brazil, have also been able to capitalize on the institutional innovations established by the SPS Agreement, their intermittent success has sometimes been overshadowed by exogenous regulatory trends that not only frustrate attempts to expand exports, but also have reduced trade in some instances. The increasing demand for food safety in developed countries is the most prominent trend; another is increased reliance on process standards that place more responsibility on the regulatory infrastructure of the exporting country than on border inspection in the importing country. A regulation that reflects both of these trends, the U.S. HACCP requirements for meat and poultry, resulted in a loss of market access for five developing countries (FSIS, 1999).[54] Adoption of new HACCP measures by other developed countries has similarly led to the suspension of developing country exports, particularly seafood (Unnevehr and Hirschhorn, 2000). These countries therefore fear that without more progress on implementing the provisions of the agreement that offer constructive solutions to these challenges, such as regionalization, equivalence and harmonization, their participation in international trade will be further marginalized (WTOj, 1998).

The primary focus of developing importers, on the other hand, is on fulfilling their obligations rather than exercising their rights under the SPS Agreement. They claim that the new obligations (related to requirements for risk assessments, for example) have diverted scarce resources from investments needed to capitalize on the trade opportunities created by other Uruguay Round agreements. This group of importers, including some Central American countries and Caribbean islands in the FTAA region, advocate various forms of increased technical assistance to address their concerns (WTOn 2001; WTOo, 1999).

The varying objectives of these three groups will determine the nexus of interests for a FTAA SPS agreement. The challenge before the SPS negotiators will be to find common

[54] Four countries (the Dominican Republic, Guatemala, Honduras, and Slovenia) were "delisted," which means that they voluntarily delisted all establishments certified for the U.S. market while developing a HACCP program. The U.S. will not accept product from these countries until full documentation is received and evaluated to determine whether the foreign HACCP program meets domestic requirements. Paraguay's eligibility to export to the United States was suspended as it did not implement HACCP requirements or equivalent measures.

ground among those who favor the status quo (developed-country exporters), strengthened commitments to aid market access (developing-country exporters), or increased assistance to live up to current obligations (developing-country importers). The absence of any developed-country net importers (such as Switzerland or Japan) in the Western Hemisphere should simplify the task of reaching consensus on a regional SPS pact. Many developed importers in the WTO have proposed incorporation of the precautionary principle in the current rules to allow more latitude for addressing consumer concerns in SPS regulation, a suggestion that has been strongly opposed by both developed and developing exporters in the Western Hemisphere (WTOp, 2001).

Options for an FTAA SPS Agreement

A regional accord to discipline the use of SPS measures will differ in important respects from the preferential trading arrangements made for tariff and other nontariff barriers within the region. Rules cannot be tailored for specific products of interest to regional trading partners, nor establish preferential schedules for regional exporters to comply with SPS measures. As in a multilateral agreement, a regional agreement consists of a set of rules, applicable to all FTAA countries, that are aimed at reducing the trade distorting aspects of all SPS measures.

If new rules or principles are to be negotiated, it should be recognized that the starting point for the FTAA negotiators will be the WTO SPS Agreement. All FTAA countries, as WTO members, are bound by the provisions in this agreement. The decentralized policing rules of the WTO SPS Agreement therefore establishes a “floor” for any regional rules. Hypothetically, even if FTAA exporters were to agree to relax the equivalence obligation for Western Hemisphere importers, the importers still would be required to recognize the equivalent measures of non-FTAA exporters. Membership in the WTO therefore limits the options of FTAA countries to either existing WTO rules or to “WTO plus” rules that augment trade.

No FTAA country has yet proposed a new addition to the current WTO principles of transparency, science-based risk regulation, national sovereignty, regionalization, equivalence, and multilateral harmonization. Rather, FTAA proposals have ranged from leaving the existing WTO rules intact to making existing rules far more prescriptive (FTAA, 2001). This suggests that differing views on the success or shortcomings of the WTO SPS Agreement does not involve differences over fundamental principles, but rather *implementation* of the current obligations. Although modifying basic treaty rules is favored by those countries who would like to improve implementation of the current obligations, this option has a number of shortcomings. First, making treaty rules more prescriptive is at best a blunt tool for engineering more energetic fulfillment of obligations to achieve region-specific goals or outcomes. Secondly, this option also risks codifying detailed procedures that may be increasingly inappropriate over time. Finally, altering the basic principles of the WTO rules in a regional accord may eventually jeopardize coherence in risk management policy as the multilateral rules evolve over time.

One remedy that can be targeted regionally, and may be especially suitable for a coalition of developed and developing countries (unlike more homogenous regions) is technical assistance. Seven years of experience with the provisions of the WTO SPS Agreement suggest the following options for technical assistance to expand regional trade:

• helping the region's developing countries to eradicate or mitigate pests and diseases in specific regions could yield substantial payoffs, because the complaints raised in the SPS Committee identified animal and plant health measures as the more significant impediments to trade in the hemisphere. Such assistance could be, in effect, extra-territorial investments in biosecurity for importing countries, resulting in increased foreign shipments that benefit domestic consumers without increasing SPS risks that could harm domestic production;[55]

• targeting technical assistance to the strengthening of public sector testing and certification services in the developing countries to speed equivalence determinations or compliance audits by developed country food safety regulators. Technical assistance could also be used by developing countries to establish a separate "enclave" food system that meets higher regional standards, while maintaining standards that are more suitable for the domestic market given national preferences, technologies, and endowments;

• using technical assistance to promote the participation of regional developing countries in activities of the international standards organizations. It is important for new participants to recognize that more widespread adoption of international standards may not always increase trade—trading partners that adopt international HACCP standards, for example, may still have different requirements for gaining access to domestic markets, as seen in the poultry meat sector. Nonetheless, the standards organizations are important institutions for development of science-based regulation, and greater participation by developing countries may contribute to the more effective functioning of international markets by increasing the predictability of regulation in these countries; and,

• technical assistance to help the least developed countries in the region come into compliance with their obligations as importers. However, nearly every FTAA country has fulfilled the SPS transparency requirements, the most basic obligation under the WTO SPS Agreement, and the costs and benefits of investment in national risk assessment capabilities for least developed countries needs to be weighed against the costs and benefits of alternative strategies, including adoption of international standards.

Technical assistance is already widely recognized as an effective mechanism for addressing SPS barriers to trade. The WTO SPS Agreement includes an article on technical assistance that states "Members agree to facilitate the provision of technical assistance to other members, especially developing-country members ...". If FTAA countries choose increased technical assistance as a means of expanding regional trade, they will still have to determine how to best strengthen the current WTO commitment in a regional trade pact. Institutional arrangements will also be an important issue for negotiators. Options include establishment of new regional committees, or use of WTO mechanisms (including existing subcommittees of the Codex Commission, the Office of International Epizootics, and the International Plant Protection Convention) to

[55] Some intergovernmental efforts to eradicate animal and plant pests, including Mediterranean fruit flies, screwworm, and FMD are already under way in the region.

accomplish FTAA goals. Regardless of the outcome, FTAA policymakers will need guidance on establishing priorities for SPS initiatives in the region. Economic research that could aid in the identification of priority projects currently lags far behind analysis of other trade barriers. Additional investments in multidisciplinary research on SPS measures therefore will be necessary if the objective of increasing regional welfare through trade is to be realized.

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