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## **Partial-Equilibrium and Industrial-Shift Analysis of the U.S.–Colombia FTA**

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FINAL REPORT

# Partial-Equilibrium and Industrial-Shift Analysis of the U.S.–Colombia FTA



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# Executive Summary

Colombia and the United States began discussing bilateral negotiations for a free trade area during the summer of 2003. Actual negotiations are expected to begin in mid-2004 and an agreement is expected to be implemented by 2006. The agreement is likely to be comprehensive, though the primary benefit for both countries will be increased market access. This study aims to assess Colombia's interests in the FTA with the United States. We measure the effects of the agreement on trade balances and industrial production and employment using a partial equilibrium approach.

In examining the effects of the FTA under different tariff staging reductions, as well as the staging scheme adopted in the U.S.-Chile FTA, we recognize that Colombia already enjoys preferential access to the U.S. market and therefore lower tariffs on most exports under ATPADEA. Thus, our simulations examine the impact of an agreement should ATPADEA benefits expire. We evaluate the impact of the FTA on Colombia's imports and exports to the United States for staging of tariff reductions between one and 10 years. As expected, the effect on imports is significant because of the relatively high price elasticity of Colombia's imports and the initially high tariffs. The cumulative impact of imports is about 18 percent growth in their value over 10 years.

The effect on U.S. imports of Colombian products is likely to be small because of the comparatively low tariffs on U.S. imports and relatively low average price elasticity of U.S. import demand. Although changes in the *volume* of Colombia's exports are proportional to changes in U.S. imports of those products resulting from tariff-induced price changes, the same does not hold for the *value* of the exports. While tariff cuts lower prices for U.S. consumers, those cuts do not affect the price received by Colombian exports to the U.S. market. As a result, tariff-induced price changes cause Colombia's exports to expand, without affecting the corresponding prices of those exports in Colombia.

We also evaluate the impact of the FTA on Colombia's exports and imports based on the broad guidelines of the U.S.-Chile FTA whereby tariffs on agricultural products are eliminated over 12 years and tariffs on other products are eliminated over 10 years. As expected, Colombia's imports are likely to increase more than its exports, with the result that

the trade balance with the United States deteriorates somewhat. But while exports to the United States generally have a dampened response to tariff-induced price changes, some export products have considerably higher than average responses to those changes. For example, petroleum gases, anthracite coal, propane, and some cotton knits have particularly high price elasticities of import demand, and imports in the U.S. market therefore tend to respond strongly to price variations. Colombia's trade balance with the United States will remain in surplus.

Industry-level analysis—which examines the cascading effects of Colombia's present tariff structure by considering trade taxes applied to imports of raw materials and intermediate goods that affect the price of the final good—offers useful measures of how trade liberalization alters effective rates of protection. The effective rate of protection measures how tariffs on a product and its tradable inputs jointly affect the value added of a particular activity. Calculating only the nominal rate of protection suggests that the tariff on imports will encourage domestic producers to increase their output. But whether they do so depends also on the tariffs applied to inputs used in manufacturing. The effective rate of protection therefore measures the net protection on the production process rather than simply the gross protection on the industry's output.

The incidence of tariff reductions for inputs and final products differs between import-substitution industries and export-oriented ones. In measuring the incidence of the effective rate of protection in Colombia and its elimination under the FTA we separate calculations for export-oriented and import-competing industries. For import-substituting industries, the tariff on the final good acts as a subsidy, while the tariff on inputs acts as a tax. Protection granted to final goods therefore increases returns to value-adding factors in those industries. Higher protection on outputs raises the domestic prices for import-competing goods and increases the returns for their production. Taxes on intermediate inputs, however, reduce the returns to value-adding factors.

Export-oriented industries derive no benefits from domestic protection on their output. Instead, they confront world prices for their sales while being taxed on their inputs through tariffs paid on imported inputs. Because Colombia's tariff regime raises prices for intermediate goods its effect on the country's export-oriented industries is always negative.

For most import-substituting industries, the FTA will likely lead to contractions, but cost reductions will substantially mitigate the effects of those contractions (e.g., when the nominal rate of protection declines by 13 percent, cost-associated price declines averaging -9 percent nearly will offset price declines averaging 11 percent). Export-oriented industries are expected to expand production by nearly 10 percent on average as a result of lower input costs likely under an FTA. Especially large production increases are expected in export activities for fruits, nuts, and beverages; cattle farming; forestry products; coal mining; petroleum, canning of fruits and vegetables; and manufactures of vegetable and animal oils. Output of import-substituting industries is expected to contract by nearly 4 percent as producers face more

competition from foreign suppliers. Overall, gains from expanded output in export-oriented industries significantly outweigh contractions likely to be experienced by import-substituting industries, and Colombia's output could expand by about 5 percent overall.

The employment effects associated with FTA-induced adjustments in Colombia's industries assumes fixed labor-output coefficients in production. For this reason, export-oriented industries likely to expand their employment are those that will increase their output significantly, while those experiencing the largest contractions in employment are those with larger output adjustments. Overall, total employment in Colombia is likely to increase by more than 5 percent, with the largest gains in mining industries, followed by export-oriented industrial activities. Naturally the biggest gains will occur in export-oriented industries, which are likely to increase employment by 7.5 percent. Import-competing industries are likely to experience contractions in their labor force, which in our estimates average less than 4 percent.

In sum, labor adjustment costs are likely to be relatively small. Twenty percent of the formal labor force works in import-substituting manufacturing, which is the most vulnerable sector. Even if 4 percent of those workers have to change jobs, the adjustment would represent considerably less than 1 percent of the labor force. Moreover, the labor turnover rate in manufacturing is normally 7–8 percent a year, so this reduction could be accommodated by normal turnover in 2 years. Many displaced workers will likely be absorbed into other sectors, especially the service and export-oriented industries, the latter of which is expected to increase its employment by 7.5 percent, which would add another 1.5 percent to Colombia's total employment figures under the FTA. In addition, evidence of significant Colombian labor force mobility suggests that workers could adjust from import-substituting industries to those directed to export markets because tariff reductions are likely to take place over several years.



# 1. Introduction

In this study we assess Colombia's interests in a free-trade area with the United States, either through the Free Trade Area of the Americas (FTAA) regional trade agreement or a bilateral trade agreement. Our purpose is to provide the Government of Colombia with a quantitative framework for analyzing the country's interests in liberalizing trade with the United States in a manner that is economically and technically viable, supportive of the Government's overall reform program, and responsive to private sector needs. We provide detailed product and industry-specific information on the effects of implementing tariff changes to support a practical, action-oriented plan.

We measure the effects of trade liberalization between Colombia and the United States using a partial equilibrium approach. We use sector, industry, or product estimates to examine the effects of changes in trade policy on sectors or products of particular interest. Because these types of models examine narrow product categories, they are able to capture the likely direct effects of policy changes on individual products. They do not, however, capture interactions between sectors and so do not account for secondary or indirect effects that could result as capital and labor move from the less productive to the more productive sectors. Thus, while partial equilibrium models are suitable for examining the direct effects of liberalization on narrow product categories, general equilibrium analysis is more suitable for analyzing the effects of trade liberalization on upstream, downstream, and substitute products. Partial equilibrium analysis can also be dynamic, and in contrast to general equilibrium analysis, can be used to assess the impact of trade policy reforms over time.

## FTAA Process

The FTAA initiative was formally launched at the 1994 Summit of the Americas in Miami. The intent is to complete negotiations by January 2005 to develop obligations in 10 areas: market access, agriculture, services, investment, government procurement, intellectual property, competition policy, subsidies, antidumping and countervailing duties, and dispute settlement. Progress has been slow. To ensure that negotiations conclude by January 2005, the Eighth Ministerial Meeting held in November 2003 broke with the "single undertaking"

principle that all issues are to be negotiated as a block. Instead, a mixed plan was approved whereby countries will accept shared obligations on a series of issues but have the option of engaging in bilateral or multilateral negotiations on other issues.

The final FTAA will be divided into a basic agreement and additional agreements. The basic agreement will cover common obligations for all countries, but at a lower level than originally envisioned. The additional agreements will allow countries to participate at different levels of commitment. While the basic agreement will likely cover market access commitments, the additional agreements will cover areas such as investment, intellectual property, customs clearance, rules of origin and government procurement.

The objectives of the market access negotiations were set out at the Fourth Meeting of Ministers of Trade in San Jose, Costa Rica, in March 1998.<sup>1</sup> These objectives were as follows:

- Progressive elimination of tariffs, nontariff barriers, and other measures restricting trade between participating countries;
- Negotiation of all tariffs;
- Negotiation of different trade liberalization timetables; and
- Inclusion of smaller economies in FTAA negotiations.

Initial market access offers were to be made on all tariff lines by August 2003.<sup>2</sup> Those offers represented reductions to FTAA member countries making similar concessions from the base most-favored-nation (MFN) tariff schedules. Thereafter, revised offers were to be submitted that provided for linear tariff eliminations, meaning that all tariffs, regardless of their levels, would be reduced by an agreed percentage. There is, however, the possibility of nonlinear exceptions that provide for different rates of tariff cuts across products. Countries can select from four types of schedules for tariff elimination: immediate, no more than five years, no more than 10 years, and longer than 10 years.

For nontariff measures, countries were to submit an initial report on notification of such measures by November 2002. A common methodology was then to be developed for their reduction and elimination. These measures included those distorting trade in agricultural products, including those that have an effect equivalent to agricultural export subsidies.

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<sup>1</sup> See [http://www.ftaa-alca.org/ngroups/popup/PopMAObjectives\\_e.htm](http://www.ftaa-alca.org/ngroups/popup/PopMAObjectives_e.htm).

<sup>2</sup> The product offers were to consist of (1) the percentage of trade (by value) with hemispheric partners in each of the product baskets (A, B, C, and D), as well as for products not included in any basket; (2) the percentage of tariff lines represented by products offered in each product basket (A, B, C, and D), as well as for products not included in any basket; (3) the percentage of trade (by value) with hemispheric partners in each product basket (A, B, C, and D) that is subject to tariff-rate quotas; and (4) the percentage of tariff lines in each product basket (A, B, C, and D) that are subject to tariff-rate quotas. Agricultural products are to be considered as a separate product basket. See [http://www.ftaa-alca.org/TNC/tnc23\\_e.asp](http://www.ftaa-alca.org/TNC/tnc23_e.asp).

## Colombia's Bilateral Negotiations with the United States

The collapse of the World Trade Organization (WTO) talks in Cancun, Mexico, in 2003 focused interest on regional and bilateral negotiations in the Americas and elsewhere. Colombia is no longer a part of a group of developing countries that opposed WTO negotiations without a resolution of the U.S. and EU agricultural subsidies. Instead, it and other Latin American countries are entering into discussions regarding bilateral trade agreements with the United States.

Colombia and the United States initiated discussions on bilateral negotiations during the summer of 2003, with actual negotiations expected to begin in spring 2004 and the planned implementation of the agreement to begin by 2006. The FTA is likely to be comprehensive and, notwithstanding the variety and complexity of issues to be negotiated, increased market access is likely to be the primary benefit for both countries when all goods traded between the two countries receive duty-free access.

The start-up of operations would coincide roughly with the expiration of the current Andean Trade Preference Act-Drug Eradication Act (ATPADEA), which was signed in 1991 and renewed in 2002 to provide Bolivia, Colombia, Ecuador, and Peru with duty-free or reduced-duty access for certain goods exported to the U.S. market. Although many supporters of ATPA sought to renew it before its expiration in 2001, the U.S. House of Representatives and Senate did not reach an agreement on a final bill that would allow ATPA to continue. It was only on August 6, 2002, that President Bush renewed a new version of ATPA through December 31, 2006. The current version provides duty-free access to additional products such as petroleum and petroleum products, regional apparel, footwear, certain leather items, and tuna. One of the benefits of a FTA for Colombia would be that its exports would not have to rely on periodic congressional reauthorization of preferential treatment, such as granted under the ATPA.

## Report Structure

In Chapter 2 we characterize trade and market access conditions between Colombia and the United States, including the structure and geographic composition of Colombia's trade, and the country's commodity trade with the United States; the compatibility of Colombia's trade with the United States; and the existing tariff structures of both countries. In Chapter 3 we describe methods used to quantify trade liberalization schemes and the partial equilibrium model that we have chosen for this study. In Chapter 4 we set forth empirical estimates of the trade relationship in the model at the detailed product and industry levels, and summarize results. Chapter 5 presents the results of our model simulations under alternative trade liberalization strategies. We compare the direct effects of trade liberalization across those alternative strategies, discussing the overall and product-specific impacts under each



scenario. Chapter 6 examines production shifts likely to take place in export-oriented and import-substituting industries, and measures their likely changes in output and employment levels. Technical and statistical data, including modeling data, are provided in appendixes.

## 2. Trade and Market Access Conditions

### Trade Structure

Colombia's overall trade with the United States represented an average of 40 percent of total trade between 1997 and 2003.<sup>3</sup> While the importance of the U.S. market grew from less than 40 percent to 45 percent in the last 7 years, the share of imports from the United States changed little. As a result, Colombia has experienced a growing trade surplus with the United States, while maintaining a generally un-trending trade balance with the rest of the world (Table 2-1). These patterns suggest, first, that Colombia's trade surplus with the United States has helped its current account balance; and secondly, that a FTA with the United States could afford an opportunity for Colombia to further improve its trade surplus over the long run by offering increased opportunities for exporters to exploit market growth opportunities in the United States.

On the export side, Colombia is no longer a dual-export economy dependent on petroleum and coffee for foreign exchange revenue. Exports, however, remain fairly concentrated in natural resource-based products such as fuels, coffee, live plants, edible fruits, sugar, iron and steel, paper and paperboard, chemical products, fish and crustaceans, ornamental fish, and precious and semiprecious stones (Table 2-2). Other types of products are mainly unskilled, labor-intensive products such as plastics, apparel and accessories, tanning dyes and extracts, and electric motors and transformers. Of these exports, the major ones currently directed to the United States are petroleum, cut flowers, coffee, paint pigments, apparel items, bananas, and precious and semiprecious stones.

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<sup>3</sup> Total trade is defined as exports plus imports.

**Table 2-1***Colombia's Trade with the World and the United States, 1997–2001 (US\$ billion and %)*

Year	Exports			Imports			Balance	
	World	United States	U.S. Share	World	United States	U.S. Share	World	United States
1997	11.55	4.36	38%	14.37	5.16	36%	(2.82)	(0.80)
1998	10.87	4.20	39%	13.77	4.54	33%	(2.90)	(0.34)
1999	11.62	5.78	50%	9.99	3.88	39%	1.63	1.89
2000	13.16	6.62	50%	11.00	3.19	29%	2.16	3.43
2001	12.30	5.33	43%	12.00	4.24	35%	0.30	1.08
2002	11.90	5.16	43%	11.89	4.02	31%	0.01	1.14
2003	12.80	5.76	45%	13.62	4.08	38%	(0.82)	1.68

SOURCE: Departamento Administrativo Nacional de Estadísticas (DANE).

Colombia's imports from the world and the United States are more diversified than its exports. The largest import category (chapter 84) refers to parts and accessories for machines, digital processing units, and machines for sorting earth stone and ores. The largest electronic import (chapter 85) is transmission apparatus, including telephone lines. Organic chemicals (chapter 29) are mainly in the form of vinyl chloride, propane, and styrene. Helicopters dominate imports of chapter 87, while plastic imports (chapter 39) are mainly in the form of polyethylene used for all sorts of plastic products.

## U.S.-Colombia Trade Compatibility

Empirical evidence from the previous section suggests that Colombia has a comparative advantage in the production and export of natural resource and unskilled labor-intensive products, while the United States has a comparative advantage in the production and export of skilled and capital-intensive products. Comparative advantage analysis, however, is limited to static concepts because in reality countries such as Colombia alter their situations by adopting new technologies either internally through research and development, or externally through foreign direct investment and the development of cross-border production facilities. These new technologies allow countries to change their comparative advantage, exploit new markets and, in the case of developing countries like Colombia, converge to levels of income and economic structures similar to those of developed economies.

**Table 2-2**

*Colombia's Exports to the World and United States, 2001-2002, by HS Chapter (Thousands of US dollars)*

	<b>Description</b>	<b>World</b>	<b>U.S.</b>	<b>Main Products Directed to U.S. Market</b>
27	Mineral fuels, oils, distillation products, etc	4,465,293	3,189,107	Crude oil, petroleum, bituminous coal, petroleum coke, petroleum gases, liquefied propane
09	Coffee, tea, mate and spices	773,930	250,096	Coffee, caffeinated and decaffeinated, roasted and not roasted
06	Live trees, plants, bulbs, roots, cut flowers etc	613,731	487,565	Cut flowers and flower buds, fresh
87	Vehicles other than railway, tramway	443,356	2,240	Track-laying tractors, road tractors, brakes and servo-brakes & pts for motor vehicles
08	Edible fruit, nuts, peel of citrus fruit, melons	424,966	167,740	Bananas and plantains, fresh or dried
39	Plastics and articles thereof	395,148	27,010	Plates, sheets etc, cell poly vinyl chloride
62	Articles of apparel, accessories, not knit or crochet	351,273	214,854	Suit-type jackets and blazers of wool, trouser overalls breeches shorts of wool, brassieres
17	Sugars and sugar confectionery	342,972	34,368	Cane sugar, raw, solid form, w/o added flav/color, sugar confection
32	Tanning, dyeing extracts, tannins, derivs, pigments	298,774	228,291	Pigments for paint mfr, dyes etc, retail
72	Iron and steel	291,883	14,684	Ferronickel
30	Pharmaceutical products	249,457	5,723	Perfumes and toilet waters, lip and eye make-up preparations
48	Paper & paperboard, articles of pulp	248,917	26,071	Paper, nov 10% fib, paper, uncoated, toilet paper, Kraft paper, copying/transfer paper
38	Miscellaneous chemical products	214,523	3,645	Fungicides, pickling prep for metal surfaces, products and residuals of chemical industry
61	Articles of apparel, accessories, knit or crochet	214,072	52,529	Overcoats, car coats, suit-type jacket & blazer synthetic fiber, trousers overalls shorts
84	Nuclear reactors, boilers, machinery, etc	191,348	40,161	Parts for steam and other vapor turbines, spark-ignition int combustion piston eng parts
85	Electrical, electronic equipment	190,984	33,653	Electric motors, transformers, magnets, internal combustion engine starter motors
03	Fish, crustaceans, mollusks, aquatic invertebrates	150,698	43,791	Fish, ornamental, live, trout (salmo trutta, etc) fresh, chilled, yellow fin tuna
49	Printed books, newspapers, pictures etc	147,807	12,702	Printed books/brochures/leaflets, dictionaries & encyclopedias, newspapers, journals, periodicals
71	Pearls, precious stones, metals, coins, etc	130,953	71,653	Industrial diamonds, rubies, sapphires and emeralds, semiprecious stones, gold, platinum
73	Articles of iron or steel	123,539	31,702	Pipe for oil or gas pipelines iron or steel, tanks, cotters and cotter pins, threaded screws and bolts
21	Miscellaneous edible preparations	121,031	24,411	Coffee extracts, yeasts, inactive, baking powders, sauces, ice cream
41	Raw hides and skins (other than fur skins)	96,663	6,445	Reptile skins, hides and skin, whole hide/skin,
25	Salt, earth, stone, plaster, lime and cement	94,529	62,838	Sulfur of all kinds, marble and travertine cut in blocks or slabs, cement clinkers
76	Aluminum and articles thereof	89,163	30,653	Aluminum waste and scrap, stranded wire, table, kitchen,& other household articles, aluminum
29	Organic chemicals	84,377	5,802	Acyclic hydrocarbons, ethylene, propane (propylene), butane and isomers
40	Rubber and articles thereof	78,154	1,729	Pneumatic tires of rubber, for buses or trucks, article of apparel, floor covering & mat,
04	Dairy products, eggs, honey, edible animal product	77,754	30	Milk and cream, sweetened, butter, cheese,

	<b>Description</b>	<b>World</b>	<b>U.S.</b>	<b>Main Products Directed to U.S. Market</b>
33	Essential oils, perfumes, cosmetics, toiletries	77,519	689	Essential oils, perfumes and toilet waters, lip and eye make-up preparations
94	Furniture, lighting, signs, prefabricated buildings	72,484	21,305	Parts of seats, metal furniture, wooden office furniture, 'furniture of plastics
15	Animal, vegetable fats and oils, cleavage products	70,572	369	Fish-liver oils, palm oil, refined, sunflower-seed or safflower oil, sesame oil, edible fats & oil mixtures

SOURCES: UN COMTRADE database and U.S. International Trade Commission

**Table 2-3**

*Colombia's Imports from the World and United States, 2001-2002, by HS Chapter (Thousands of US dollars)*

	<b>Description</b>	<b>World</b>	<b>U.S.A.</b>
84	Nuclear reactors, boilers, machinery, etc	1,872,528	871,335
85	Electrical, electronic equipment	1,235,589	450,545
29	Organic chemicals	868,955	383,066
88	Aircraft, spacecraft, and parts thereof	865,599	678,848
87	Vehicles other than railway, tramway	736,295	107,865
39	Plastics and articles thereof	551,889	192,341
10	Cereals	466,149	258,983
30	Pharmaceutical products	420,326	91,526
72	Iron and steel	345,429	10,258
90	Optical, photo, technical, medical, etc apparatus	342,339	163,451
48	Paper & paperboard, articles of pulp, paper and board	309,814	97,365
38	Miscellaneous chemical products	276,025	111,015
40	Rubber and articles thereof	270,931	53,699
52	Cotton	230,991	55,476
27	Mineral fuels, oils, distillation products, etc	196,900	35,323
31	Fertilizers	188,580	53,127
73	Articles of iron or steel	171,500	59,296
54	Manmade filaments	169,159	33,382
23	Residues, wastes of food industry, animal fodder	168,860	35,341
33	Essential oils, perfumes, cosmetics, toiletries	166,377	42,073
28	Inorganic chemicals, precious metal compeso,	154,287	51,665
32	Tanning, dyeing extracts, tannins, derivs,pigments etc	144,514	34,458
76	Aluminium and articles thereof	133,006	17,517
15	Animal,vegetable fats and oils, cleavage products, etc	123,810	23,382
12	Oil seed, oleagic fruits, grain, seed, fruit, etc, nes	110,448	35,381
64	Footwear, gaiters and the like, parts thereof	88,540	1,408
55	Manmade staple fibres	85,018	14,224
82	Tools, implements, cutlery, etc of base metal	80,572	33,792
21	Miscellaneous edible preparations	80,174	13,431
74	Copper and articles thereof	76,064	4,430
47	Pulp of wood, fibrous cellulosic material, waste etc	75,022	32,545
95	Toys, games, sports requisites	71,956	8,575
07	Edible vegetables and certain roots and tubers	70,964	3,369

SOURCES: UN COMTRADE database and U.S. International Trade Commission

An alternative approach adopted from business economics by the World Bank and the United Nations Economic Commission for Latin America (TradeCan, 2000) is to assume that there are few natural resource and technological differences between countries. Under these conditions, the degree of concentration or agglomeration of industries helps to account for developmental differences. The concentration of industrial activity in particular locations has allowed some countries to advance more quickly than those countries without industrial agglomeration. By changing the manufacturing production base of countries, regional preferential trade arrangements and bilateral FTAs can help alter and accelerate development. Hanson (1994), for example, has shown that the recent agglomeration of industries in Mexico is associated with increasing returns to scale. In a subsequent study, Hanson (2000) illustrated that the preferential trade agreement with the United States has strongly influenced the degree of industrial agglomeration in Mexico, as industries have increasingly shifted to locations with easy access to the U.S. market and thereby increased employment and incomes in those areas.

In the context of the FTAA and a U.S.-Colombia FTA, the central indicator of Colombia's ability to shift its comparative advantage is the degree of trade compatibility between its export structure and that of the United States. Having established compatibility of traded products, we can then invoke performance indicators to reveal the extent to which firms compete effectively in world and regional markets. Success in export markets—measured by rapidly expanding exports and rising market shares—indicates the extent to which an economy is willing and able to achieve global integration and alter its comparative advantage in the global marketplace.

The trade compatibility index measures the degree of compatibility between Colombia's exported products and U.S. imported products. The index of compatibility ( $C_{x/m}$ ) is computed using the following formula:

$$C_{x/m} = 1 - (\sum |x_{jd} - m_{us}|) / 2$$

where  $x_{jd}$  is Colombia's share of good  $i$  exports relative to its total exports, and  $m_{us}$  is the share of U.S. good  $i$  imports relative to its total imports. The index approaches zero when Colombia exports none of what the United States imports, and it approaches unity when the exports share of product  $i$  of Colombia is identical to the import share of that product by the United States. According to Michaely (2000), the index of compatibility is usually between 0.50 and 0.60 for trade between industrialized countries, and it averages about 0.20 for trade between Latin America countries.<sup>4</sup>

The analysis of Colombia's trade compatibility has been divided into the following three types of product exports:

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<sup>4</sup> The index was originally developed by Michaely (1994) and has recently been applied by Rajapatirana (1997) and Michaely (2000) for Latin American trade, and Lord (2001) for Jordanian trade.

- *Large exports*, defined as products that in 2001 were at least US\$50 million. There were 29 products in this range.
- *Medium-size exports*, whose product export value was US\$21 million–US\$50 million. There were 33 products in this range.
- *Small exports* of US\$15 million–US\$21 million. There were 26 products in this range

Using these value ranges, the total number of products in the sample consisted of 88 products, which together represented nearly one-half of Colombia's export revenue.

The results of the calculations of Colombia's trade compatibility with the United States are reported in Table 2-4. Overall, the unweighted average of the four product categories for Colombia's exports and U.S. imports equals 0.42, which lies between the index of trade between Latin American countries as a whole and that of trade between developed countries. Of these three categories, Colombia's small export products have the highest trade compatibility with the United States, followed by medium-size product exports. Colombia's large exports are less compatible with U.S. foreign needs, but at the product level some products are compatible with U.S. import requirements: petroleum, bituminous coal, cut flowers, coffee, bananas, pigments, ferronickel, sugar. Many small and medium-size exports are also highly compatible with U.S. import requirements: garments, tuna, pneumatic tires, petroleum spirit, tableware, plastic film and sheets, food preparations, and handbags.

**Table 2-4**

*Indices of Trade Compatibility*

<b>Colombia Exports</b>	<b>Index</b>
Large-size	0.32
Medium-size	0.44
Small-size	0.48

## Market Access

Table 2-5 summarizes the current U.S. tariffs on all of Colombia's merchandise exports and products identified as large and medium-size exports in recent years.<sup>5</sup> Some of these products enter the United States duty-free under the ATPA. That initiative was renewed in 2002 and its expiration in 2006 coincides with the expected start-up of the bilateral FTA that will be negotiated between Colombia and the United States.

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<sup>5</sup> Large-size exports are products whose foreign exchange earnings have exceeded US\$50 million in 2001, while medium-size exports are products whose earnings were between US\$21 and US\$50 million.



**Table 2-5***Comparison of Colombia and U.S. Tariff Schedules*

	<b>Colombia</b>		<b>United States</b>	
	<b>Total</b>	<b>Top 100 Imports</b>	<b>Total</b>	<b>Top 100 Imports</b>
Tariff Lines	6,877	99	10,571	97
Minimum Rate (%)	0	0	0	0
Maximum Rate (%)	35	35	35	25
Mean	11.7	11.3	4.2	4.4
Median	10.0	10.0	2.5	0.75
Mode	5.0	5.0	0	0
Standard Deviation	6.3	7.5	10.8	5.9

Nearly 100 medium-size and large product exports from Colombia have annual foreign exchange earnings exceeding US\$21 million. Of these, none has tariffs in the United States that exceed 25 percent. Five have U.S. tariffs in the 15-25 percent range; 11 have tariffs in the 10-15 percent range; 19 have tariffs in the 5-10 percent rate; 18 have non-zero tariffs under 5 percent; and the remaining 45 have zero-rate tariffs. (Import values and MFN tariff rates for these products are presented in Table B-1 in Appendix B.)

The U.S. tariff schedule affecting the top Colombian exports to the United States is a good representation of the overall schedule for over 10,500 tariff lines affecting all of Colombia's exports to that market. Both show that the mean (unweighted) average U.S. tariff is somewhat more than 4 percent, with a range of 0–25 percent on the top imports. The much higher upper range for all imports is due to the high rate on tobacco imports and, to a lesser extent, on that on peanuts.

Colombia's imports tend to have higher tariffs than U.S. imports. The average (unweighted) mean tariff is nearly 12 percent, compared with about 4 percent for the United States. In a similar manner, the median is 10 percent in Colombia, compared with less than 3 percent in the United States; and the mode is 5 percent, compared with 0 percent in the U.S. tariff schedule. These patterns apply as well to Colombia's 100 largest imports, since the basic statistics of the schedule for these products mirror those for all imported products. (See Table B-1 for a listing of Colombia's largest imports.)

# 3. Modeling Methodology

## Alternative Quantitative Approaches

Most attempts to quantify the effects of trade liberalization rely on one of the following approaches, each of which provides a level of information that is not generally available in the other approaches:

- ***Partial equilibrium analysis*** uses single-sector or single-product estimates of supply and demand to examine the effects of trade liberalization on particular sectors or products. Because these models examine narrow product categories, they can capture the likely direct effects of policy changes on individual products. Moreover, partial equilibrium analysis is dynamic and can be used to assess the impact of trade liberalization on such factors as the growth rate of economic activity. The main limitation of this approach, however, is that it does not capture interactions between economic sectors, and therefore does not account for secondary or indirect effects that could result as capital and labor move from the less productive to the more productive sectors of the economy.
- ***Macroeconomic analysis*** provides valuable information about the transmission of trade liberalization effects on the economy, and the feedback effects that occur in the external sector from income and price changes. The dynamic nature of these models allows us to track the effect that relative prices changes will have on investment, consumption, and other major components of the economy, as well as the fiscal revenue implications of those adjustments. Like partial equilibrium analysis, macroeconomic analysis of trade liberalization focuses on the demand side of the economy, and the results therefore allow us to examine the difference between estimates of the direct effects of tariff reforms and those arising from both direct and indirect changes in the macroeconomy. And, like the partial equilibrium approach, this type of analysis does not look at supply-side adjustments from relative prices changes in the economy.
- ***Industry-level analysis*** offers useful measures of how trade liberalization alters effective rates of protection and how these rates changes could shift the existing tariff-induced bias away from import substitution to export expansion and investment in the production of

nontradables. Because the magnitude of protection tends to vary considerably across industries, this type of detailed industry analysis can be used to show how changes in tariffs on U.S. traded goods could influence production and the distribution of benefits and costs among Colombian industries and consumers. While this type of analysis addresses industry-specific demand and supply conditions by examining factor input prices, it does not provide an economy-wide perspective on the effects of trade liberalization.

- *General equilibrium analysis* provides the type of economy-wide perspective that is not available in the other three approaches. It therefore offers a useful means of analyzing the effects of trade liberalization on upstream, downstream, and substitute products. The advantages and limitations of this approach are well-illustrated by the computable general equilibrium model (Light 2003) recently constructed for Colombia to evaluate the potential effects of bilateral trade liberalization with the United States. The advantage of this approach is the ability to capture feedback effects of relative price changes and resource flows on overall gross domestic product (GDP) and social welfare. The major limitations are (1) the comparative static nature of the analysis, which precludes examination of year-to-year changes arising from trade liberalization and (2) the sensitivity of the results to model parameters and the fact that the parameters are not generated from within the model and are therefore not internally consistent.

## Measuring Direct Trade Effects

Tariff reductions under a U.S.-Colombia FTA would affect Colombia's trade balance through three channels. First, reductions on import tariffs in Colombia would be expected to increase the quantity of imports demanded in that country. Second, reductions in U.S. tariffs on imports from Colombia would be expected to increase the quantity of imports demanded in the United States and thereby increase the quantity of exports demanded from Colombia, that is, a change in the quantity of imports demanded in the United States will have a proportional effect on the quantity of exports demanded from Colombia. Third, the change in prices of exports of Colombia relative to those of the rest of the world could give rise to a change in the demand for Colombia's exports by the United States that is not proportional to the change in U.S. import demand if the price elasticity of export demand is less than infinite.<sup>6</sup>

In the partial equilibrium analysis, we can calculate the following *direct effects* of the FTA through econometric estimates of the demand for imports and exports:

- *Total effect* refers to the change in the level of domestic demand for imported inputs resulting from tariff-associated price changes.

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<sup>6</sup> This effect is associated with the Armington assumption that goods originating from different geographic sources are imperfect substitutes for one another.

- *Government revenue effect* is the change in customs fees resulting from tariff changes, which combine changes in revenue per unit of imports and changes in import volumes resulting from the *total trade effect*.
- *Consumer welfare effect* refers to the changes that consumers obtain from price changes on imported goods when tariffs are changed.

The *indirect effects* of the FTA can be measured only within a general equilibrium framework, and consist of the following:

- *Sector production effect* refers to changes in domestic output levels associated with the changes in the allocation of resources brought about by the movements of factors of production.
- *International competitiveness effect* arises from the changes in access to factors of production for export-oriented goods, and resulting changes in export prices relative to competing suppliers of foreign markets.
- *Terms-of-trade effect* is brought about from the changes in prices of tradables that arise from exchange rate effects and other changes in the foreign and domestic economies.

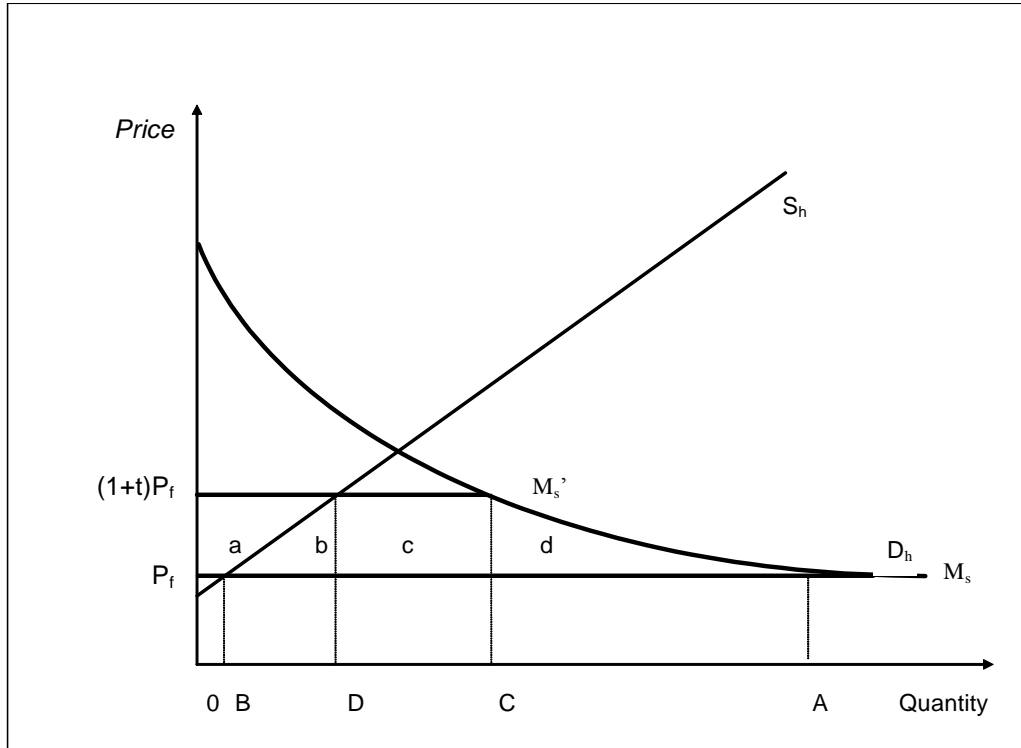
The *direct effects* of the FTA are demonstrated in Figures 3-1 and 3-2.<sup>7</sup> Figure 3-1 shows the domestic demand schedule,  $D_h$ , and the domestic and foreign supply schedules,  $S_h$  and  $M_s$ , respectively, of a product. At the border-equivalent price  $P_f$  the amount  $OA$  is consumed,  $OB$  is produced in Colombia, and the difference  $BA$  is imported. With an ad valorem tariff of  $t$ , the foreign supply schedule (import supply schedule) shifts from  $M_s$  to  $M'_s$ . The domestic-equivalent price is  $P_d = P_f + tP_f = P_f(1+t)$ . At that price the quantity demanded decreases to  $OC$  and the domestic supplied increases to  $OD$ . The tariff produces the following effects:

1. Consumer surplus declines by  $a + b + c + d$ .
2. Producer surplus increases by  $a$ .
3. Government revenue increases by  $c$ .
4. The deadweight loss for consumers is  $d$ .
5. The deadweight production or efficiency loss is  $b$ .
6. Total welfare loss is  $d + b$ .

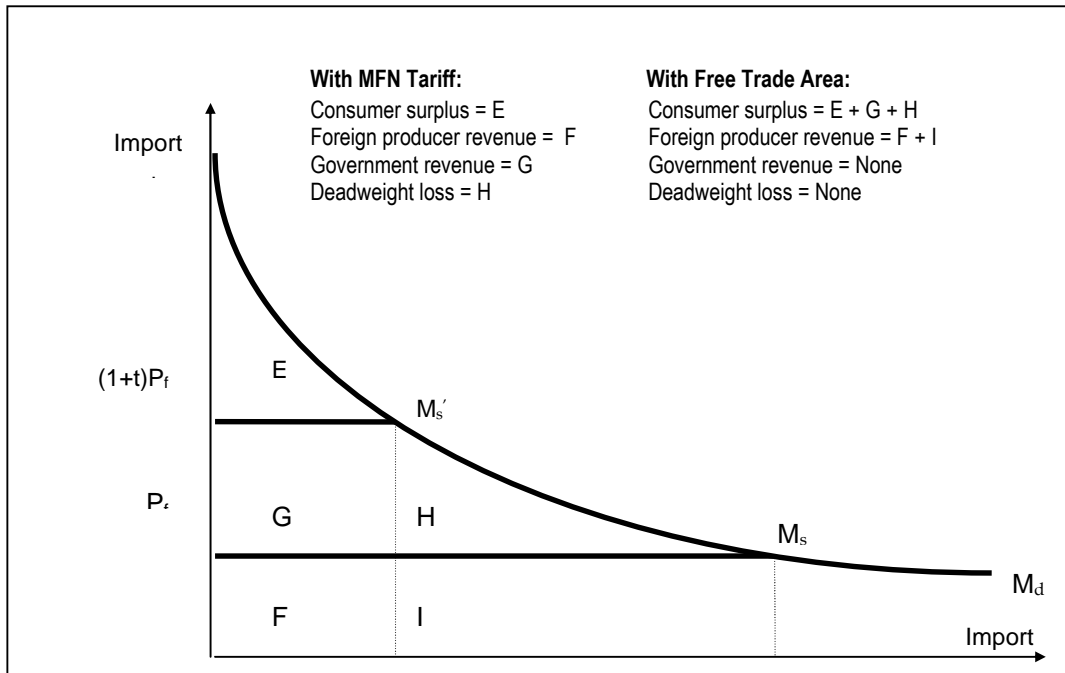
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<sup>7</sup> Roussland and Suomela (1993) offer a description of those effects for a small open economy in a partial equilibrium framework.

**Figure 3-1**  
FTA Impact on Colombia's Production and Consumption



**Figure 3-2**  
FTA Effects on Imports



The effect of the FTA is now straightforward: the foreign supply schedule of the United States shifts to  $M_s$  and the domestic-equivalent price reverts to  $P_d = P_f$ .

The same conditions are represented for the industry in Figure 3-2 in terms of the amount imported at the domestic and border-equivalent prices. The industry's import demand function is  $M^d$  and, as in Figure 3-1, the import supply function is again shown to be perfectly elastic with respect to prices. As a result, the import supply schedules are shown by the horizontal lines at  $(1+t)P_f$  and  $P_f$ . Under the FTA, import demand for U.S. goods is given by  $P_f$  and  $M_s$ , while import demand for goods from the rest of the world is given by  $(1+t)P_f$  and  $M'_s$ . With the FTA, consumer surplus increases by the areas defined by G+H, foreign producer revenue increases by the area I and the deadweight loss H is eliminated. Government revenue, however, falls in the area defined by G.

We can separate these FTA effects on Colombia's imports into the following five measurable components:

- Trade creation effect
- Trade diversion effect
- Balance of payments effect
- Government revenue effect
- Consumer cost effect.

The *trade creation effect* refers to the change in the level of domestic demand for imported goods from the preferential trading partner, i.e., the United States, resulting from tariff-associated foreign price reductions relative to domestically-produced goods. It is given by:

$$\Delta M_{ij} = \varepsilon^p [\Delta t_i / (1+t_i)] M_{ij} \quad (3.1)$$

where  $M_{ij}$  is the import quantity of product  $i$  by country  $j$ ;  $\varepsilon^p$  is the price elasticity of import demand; and, as before,  $t$  is the ad valorem tariff rate. The trade creation effect therefore depends on the price elasticity of import demand, the percentage change in the ad valorem tariff, and the level of imports.

The *trade diversion effect* is the substitution between supplies originating from the United States and those originating from foreign suppliers subject to MFN rates, and it is given by:

$$\Delta V_{jk} = -\varepsilon^p (V_{ij}/V_i) [\Delta t_i / (1+t_i)] V_{ik} \quad (3.2)$$

where  $V_{jk}$  is the value of imports from the preferential suppliers,  $\varepsilon^p$  is the own price elasticity of demand,  $V_{ij}$  is the value of imports from the nonpreferential suppliers, and  $V_i$  is the total value of imports of the product  $i$  into Colombia. Trade with the United States currently constitutes nearly 40 percent of Colombia's total trade (imports plus exports). This percentage may rise during the next few years, despite the preferential agreement with the European Union. The amount of the shift to the U.S. market will depend on the extent to which importers respond to relative price changes, and the amount by which trade in a particular

good will shift from the nonpreferential suppliers to preferential suppliers will depend on the cross-price elasticity between the price of goods originating from nonpreferential area and the imports from U.S. sources (for details, see Appendix A).

The *balance of payments effect* is the sum of the value of changes in individual product imports, and is therefore the sum of the trade creation and trade diversion effects:

$$\Delta V = [1 - (V_{ik}/V_i)] \mathcal{E} [\Delta t_i/(1+t_i)] V_i \quad (3.3)$$

Consequently, for those products having a price-elastic import demand schedule, tariff reductions should lead to a net increase in the value of imports over the level that existed before the tariff cuts.

The *government revenue effect* includes both the lower revenue per unit of imports and the higher import volumes resulting from the trade creation effect:

$$\Delta T/T = \Delta t/t + \Delta M/M \quad (3.4)$$

where  $T$  denotes the customs revenue. In Colombia, trade taxes represent nearly 9 percent of total tax revenue of the Central Government, and revenue generated from the value added tax (VAT) represents about 40 percent of the total. It is difficult, however, to estimate the percentage of the VAT revenue that is attributed to imports since aggregate figures are presented in the national budget. In any event, the government revenue effect is important from a policy point of view, even though in principle, customs duties should be used mainly as an instrument of protection, whereas the sales tax and customs fees should act as revenue instruments.

The *consumer cost effect* refers to the gains that consumers obtain from lower prices on imported goods when tariffs are lowered, and welfare gain,  $\Delta W$ , is normally calculated as the average increase in the quantity of imports,  $i$ , valued at the average between the tariff incidence before and after liberalization:

$$\Delta W = \Delta t \Delta M/2 \quad (3.5)$$

The magnitude of these effects depends on the price elasticity of import and export demand of Colombia, and is therefore an empirical issue. By its very nature, the econometric modeling approach provides internally consistent empirical results at a detailed level. In the following section, we specify the system of equations to be estimated and present the empirical results in the following chapter. The estimate takes into account changes in the levels of demand arising from the imposition of tariffs, and time-related adjustments arising from the lagged response of imports and exports to possible changes in those tariffs.

## Estimation Procedure—Specification of Import Demand Relationships

The elasticities approach to the balance of payments suggests that the demand for imports of Colombia and the United States is related to relative price movements as well as income. The specifications of the import demand relationships for Colombia and the United States are derived in Appendix A. In this section we summarize their main features.

Imports have a steady-state, or long-term, response to the growth of domestic income, but that response is not necessarily proportional. This characteristic suggests that the dynamic specification of the import demand equation should not introduce restrictions that would impose long-term unitary elasticity with respect to income. In contrast, the model should encompass long-term proportionality responses when they exist.

The demand for imports is determined by the local currency price of imports. For Colombia we can break down the (Colombian peso) price variable into the U.S. dollar price and the real effective exchange rate as follows:

$$P^n = P^c(1+t)/R = P/R \quad (3.6)$$

where  $P^n$  is the Colombian peso price of the imported product,  $P^c$  is c.i.f. (cost, insurance, and freight) import price in U.S. dollars of the product,  $P$  is the U.S. dollar import price of the good with the tariff,  $t$  is the tariff rate, and  $R$  is the real exchange rate.

The real exchange rate takes into account changes in the price of domestic goods,  $P^n$ , relative to foreign goods,  $P^f$ , and the nominal exchange rate,  $R^n$ . It is defined as follows:<sup>8</sup>

$$R = P^n / (R^n P^f) \quad (3.7)$$

The demand for imports by Colombia is therefore directly affected by c.i.f. price in U.S. dollars of the imported good, the tariff on that good, and the real exchange rate.<sup>9</sup>

We adopt an error-correction mechanism (ECM) for the import-demand relationship because the growth rate of Colombia's imports depends on the expansion path of economic activity. The ECM specification adjusts for any disequilibrium between cointegrated variables and thus provides the means by which the observed short-term behavior of variables is associated with their long-term equilibrium growth paths. The expression for imports,  $M$ , in terms of

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<sup>8</sup> This definition is the one used by the IMF, while the more traditional definition is  $R = R^n P^f / P^c$ . To facilitate the interpretation of the results for readers, we have adopted the IMF definition. See Edwards (1988: Appendix) for alternative definitions of the real exchange rate.

<sup>9</sup> If the import supply elasticity is less than infinite, then the pass-through of exchange rate changes from import price changes in foreign currency terms to import prices in local currency terms will be less than complete (see Branson, 1972, and the summary by Goldstein and Khan, 1985). Consequently, the estimated price and exchange rate coefficients may differ from one another. For a derivation of the import supply schedule, see Lord (1991: Annex D).



income,  $Y$ , the price of the product,  $P$ , in U.S. dollar terms and including the tariff, and the real effective exchange rate,  $R$ , is then:

$$\begin{aligned} \Delta m_t = & \alpha_{20} + \alpha_{21}(m - y)_{t-1} + \alpha_{22}\Delta y_t + \alpha_{23}y_{t-1} + \alpha_{24}\Delta p_t + \alpha_{25}p_{t-1} \\ & + \alpha_{26}\Delta r_t + \alpha_{27}r_{t-1} + u_{2t} \end{aligned} \quad (3.8)$$

where  $-1 < \alpha_{21} < 0$ ;  $\alpha_{22} > 0$ ;  $\alpha_{23} > \alpha_{21}$ ;  $\alpha_{24}$  and  $\alpha_{25} < 0$ ;  $\alpha_{26}$  and  $\alpha_{27} > 0$ ; and where all variables are measured in logarithmic terms. The use of the logarithmic specification provides a means by which the elasticity can be calculated directly from the estimated equation; the results are consistent when the elasticities remain constant over time. Tests of parameter constancy provide a means of validating that hypothesis.

On a steady-state growth path, the long-term dynamic equilibrium relationship implicit in equation (3.8) is:

$$M = kY^{\epsilon_y}P^{\epsilon_p}R^{\epsilon_r} \quad (3.9)$$

The income, price and exchange rate elasticities in (3.9) are defined as follows:

*Income elasticity of import demand –*

$$\epsilon_y = 1 - (\alpha_{23}/\alpha_{21}) \quad (3.10)$$

Its value is positive since the expected sign of  $\alpha_{21}$  is negative and  $\alpha_{23} > \alpha_{21}$ . When  $\alpha_{21} < \alpha_{23} < 0$ , import demand is inelastic with respect to income; when  $\alpha_{23} = 0$ , it has a unitary elasticity; and when  $\alpha_{23} > 0$ .

*Price elasticity of import demand –*

$$\epsilon_p = -\alpha_{25}/\alpha_{21} \quad (.3.11)$$

It has a negative value since the expected signs of both  $\alpha_{25}$  and  $\alpha_{21}$  are negative.

*Real cross-rate elasticity of import demand –*

$$\epsilon_r = -\alpha_{27}/\alpha_{21} \quad (3.12)$$

It has a positive value since the expected sign of  $\alpha_{21}$  is negative and that of  $\alpha_{27}$  is positive.

At the bilateral trade level, the real exchange rate is measured by the “real cross-rate,” which takes into account changes in the nominal exchange rate of Colombia with the United States and the relative price levels between those two countries. The decomposition allows us to separate the own-price (transmitted through their effect on the domestic currency-denominated price level) and cross-rate effects.

Note that the demand for imports is determined by the local currency (Colombian peso) price of imports. We therefore can define the price variable into the U.S. dollar prices and the real exchange rate. Because the real exchange rate takes into account changes in the price of domestic goods relative to foreign goods, and the nominal exchange rate, the real exchange rate, as well as the foreign currency-denominated import price, directly affect the demand for imports in Colombia.

Also note that a rise in the real exchange rate represents a real *revaluation* in a fixed exchange rate system, and an *appreciation* in a flexible exchange rate system, which under the purchasing power definition can be brought about by either a fall in the nominal exchange rate or a rise in the relative price of domestic goods (equivalent to a relative fall in the price of foreign goods). Conversely, a fall in real exchange rate represents a real *devaluation* under a fixed exchange rate system, and a *depreciation* under a flexible exchange rate system. The fall is associated with a rise either in the nominal exchange rate or in relative prices of foreign goods (equivalent to a rise in relative prices of domestic goods).

Finally, it should be emphasized that the analysis is based on an 11 observations (1991–2001). Earlier data were not available, and the major structural changes that occurred in the Colombian economy in the early 1990s significantly complicated the interpretation of any results derived from a data set that extended into the previous decade. The few observations about data should be taken into account in interpreting the results of the analysis that follows.



## 4. Empirical Estimates

### Colombia's Import Demand

Table 4-1 presents the unweighted income, price, and exchange rate elasticities of Colombia's principal product imports. The long-term price elasticities vary from -0.02 for helicopters to -7.1 for taps cocks, with an unweighted average of -2.1. The trade-weighted average elasticity is -2.4 in the long term, and in the short term between -1.9 (unweighted) and -2.1 (unweighted), with most responses occurring in the first period. Within product categories, agricultural and textile product imports have a stronger response to price changes (-2.7) than industrial products (-2.4). The price elasticity estimates suggest that tariff reductions are likely to have important consequences for Colombia's imports of products such as transmission apparatus, and instruments for vehicles and wheat, among others. Tariff reductions are less likely to affect the demand for products with low price elasticities, such as potassium chloride, tractor chassis, and helicopters.

The income elasticity of Colombia's major imports averages 3.5 on an unweighted basis and 4.5 on a trade-weighted basis. Among individual products, elasticities vary from a low of 0.8 for urea to a high of more than 15 for transmission apparatus. Other than urea, all products have either a unitary elasticity or an elasticity greater than unity. The average trade-weighted short-term elasticity, 4.9, is similar to that of the unweighted elasticity, 4.4. Within product groups, agricultural products have a greater long-term response to income changes (5.1) than industrial products (4.3) or textiles (3.7).

The inclusion of the exchange rate as an explanatory variable in the import demand relationship is important because any change in Colombia's exchange rate policy could have significant consequences for the demand of most imports.<sup>10</sup> In general, however, imports are

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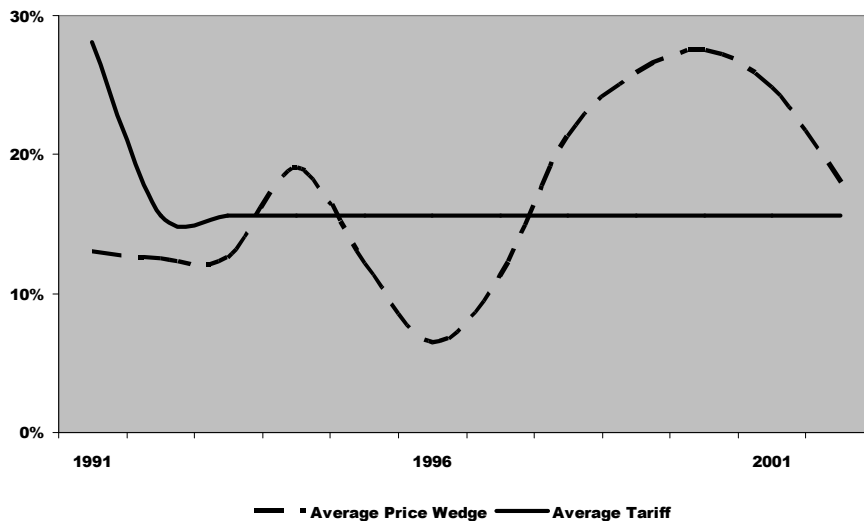
<sup>10</sup> Recall that the real exchange rate of Colombia relative to the United States (i.e., the real cross-rate) has been defined according to the IMF definition. A rise in real cross-rate represents a real *revaluation* in a fixed exchange rate system, and an *appreciation* in a flexible exchange rate system, which under the purchasing power definition can be brought about by either a fall in the nominal exchange rate or a rise in the relative price of domestic goods (equivalent to a fall in the relative price of foreign goods). Conversely, a fall in real

less responsive to exchange rate variations than they are to own-price changes. The trade-weighted average exchange elasticity is 0.7 in the short term and 0.4 in the long term. This average refers to products for which import demand is statistically significant to exchange rate variations, which represented about 25 percent of all the products.

In the case of agricultural products, we used the price difference between domestic and border prices rather than the nominal tariff to reflect actual conditions affecting importers. The so-called price wedge captures both tariffs and nontariff barriers bringing about a difference between the domestic and border price of products. Figure 4-1 shows the extent to which those nontariff barriers affected Colombia's border prices in 1991-2002, and how their effect varied substantially over the period. In Colombia these forms of intervention are designed to ensure that price movements of the products remain within targeted bands. Apparently, the intervention levels were below the nominal tariffs in the first half of the 1990s but then substantially exceeded them during the second half of the decade.

**Figure 4-1**

*Average Tariff versus Price Wedge of Major Agricultural Goods, 1991-2002*



cross-rate represents a real *devaluation* under a fixed exchange rate system, and a *depreciation* under a flexible exchange rate system. The fall is associated with either a rise in the nominal exchange rate or a rise in relative prices of foreign goods (equivalent to a fall in relative prices of domestic goods).

## U.S. Import Demand

Concurrent with the much lower import duties of the United States are that country's generally lower price elasticities of import demand than those found in Colombia. Table 4-2 shows that the trade-weighted price elasticity of U.S. import demand for Colombia's major imports equals only -0.31, while the comparable elasticity in Colombia is -2.4. Individual product elasticities vary from a low of -0.1 for bananas and shrimp to a high of -5.7 for socks and other types of hosiery. These price elasticity estimates are similar across the three major types of goods imported: agriculture (-0.5), industrial goods (-0.3) and textiles (-0.7). The simple unweighted averages are, however, considerably higher: -1.2 for all products, -1.3 for textiles, -1.2 for industrial products, and -0.9 for agriculture. These unweighted averages are, nevertheless, lower than the comparable elasticities of Colombia.

The income elasticity of demand for U.S. imports of Colombia's major exports averages 4.2 based on an unweighted average and 3.4 based on a trade-weight average. Among individual products, elasticities vary from a high of nearly 10 for gold and gold powder to a low of unity for a wide range of products such as men's underpants, socks, cut flowers, coal, and lobster. Among the major product groups, that for textile and industrial products have the highest average income elasticity (4.0 on a trade-weighted basis), followed by that of agricultural products (1.8). For Colombia, agricultural products average 5.1; industrial products average 4.3; and textiles average 3.7.

**Table 4-1***Income, Price, and Exchange Rate Elasticities of Colombia's Import Demand*

Rank <sup>a</sup>	Description	HS	Product Type	Value (US\$ 000)	Income			Price			Exchange Rate		
					Short-Term		Long-Term	Short-Term		Long-Term	Short-Term		Long-Term
3	Corn (maize)	100590	Agriculture	248,295	11.70		5.50	-0.30		-0.30	0.90		0.40
6	Wheat	100190	Agriculture	195,841	3.30		10.90	-1.10		-6.50	-		-
9	Soybeans	120100	Agriculture	129,934	5.50		1.00	-4.10		-4.70	-		-
18	Food Preparations	210690	Agriculture	78,479	3.10		5.50	-1.60		-1.40	-		-
19	Soybean Oilcake	230400	Agriculture	74,208	0.80		2.60	-1.00		-1.70	0.80		1.70
21	Cotton	520100	Agriculture	62,856	0.90		2.10	-0.50		-1.30	-		-
22	Soybean Oil	150710	Agriculture	61,527	5.40		1.00	-0.80		-1.40	1.10		1.50
32	Animal Feed	230990	Agriculture	47,249	2.60		2.30	-1.40		-1.70	-		-
1	Airplanes >15000kg	880240	Industrial	411,606	0.90		1.00	-0.20		-0.40	-		-
2	Transmission appr	852520	Industrial	338,162	3.80		15.70	-2.70		-7.00	-		-
4	Medicaments	300490	Industrial	217,931	4.30		9.70	-0.90		-1.20	-		0.00
5	Autos 1000cc-1500cc	870322	Industrial	214,160	5.30		5.80	-13.10		-5.50	10.70		4.00
7	Automobiles >1500cc	870323	Industrial	160,767	17.90		1.00	-4.40		-3.90	-		-
8	Helicopters >2000Kg	880212	Industrial	145,605	6.90		1.00	-0.50		-0.20	-		-
10	Digital Adap Machines	847149	Industrial	124,070	3.30		1.00	-1.20		-1.70	-		-
11	Vinyl Chloride	290321	Industrial	105,877	2.10		1.00	-0.10		-0.40	-		-
12	Propane	290122	Industrial	103,470	4.50		5.30	-0.50		-0.60	-		-
13	Aircraft Parts	880330	Industrial	102,955	0.50		1.00	-1.40		-1.20	-		-
14	Televising Sets	852812	Industrial	100,642	5.10		1.00	-1.50		-2.80	-		-
15	Airplanes <15000kg	880230	Industrial	99,669	0.90		1.00	-3.30		-6.40	-		-
17	Adaptor Units	847160	Industrial	81,252	3.60		1.00	-2.40		-1.00	-		-

Rank <sup>a</sup>	Description	HS	Product Type	Value (US\$ 000)	Income			Price			Exchange Rate		
					Short-Term		Long-Term	Short-Term		Long-Term	Short-Term		Long-Term
20	Adaptr Marchinery Parts	847330	Industrial	68,540	1.10		1.00	-0.70		-0.90	-		-
23	Tractor Chassis	870600	Industrial	60,426	4.00		7.60	-0.30		0.00	-		-
24	Tires for autos	401110	Industrial	59,251	1.80		3.30	-1.80		-1.50	-		-
25	Polyethy gravity >.94	390120	Industrial	58,912	0.40		4.20	-1.50		-1.80	-		-
26	Urea	310210	Industrial	55,407	2.80		0.80	-8.70		-0.40	-		-
27	Auto Parts	870899	Industrial	55,340	8.80		8.30	-1.40		-1.80	0.30		0.50
28	Polyethy gravity <.94	390110	Industrial	52,136	5.40		1.00	-0.70		-1.30	-0.70		0.90
29	Telephone Switchg App	851730	Industrial	51,814	15.80		6.50	-1.20		-0.70	-		-
30	Telecom Apparatus	851750	Industrial	51,745	11.20		8.80	-1.60		-1.20	-		-
31	Tires for buses/trucks	401120	Industrial	48,792	3.40		1.00	-0.40		-4.30	1.90		2.00
33	Chemical Wood pulp	470321	Industrial	46,756	0.40		1.00	-0.60		-0.50	-		-
34	Flat Hot-Rolled Iron	720839	Industrial	46,423	0.90		1.00	-1.00		-1.60	-		-
35	Taps Cocks	848180	Industrial	43,927	2.30		11.60	-2.60		-7.10	2.10		5.00
36	Potassium Chloride	310420	Industrial	43,680	4.00		1.00	-2.60		0.00	-		-
37	Dimethyl Terephthalate	291737	Industrial	43,603	1.40		1.00	-0.30		-0.30	-		-
38	Unwrought Aluminum	760110	Industrial	41,568	4.30		4.60	-0.50		-1.40	-		-
39	Medical Instruments	901890	Industrial	41,337	6.10		1.00	-1.00		-1.00	0.30		0.30
40	Instruments for Vehcles	870431	Industrial	40,803	7.10		1.00	-7.00		-6.60	-		-
41	Instr. for Pass. Cars	870321	Industrial	40,315	2.00		1.00	-2.70		-1.20	-		-
42	Polymers of Ethylene	390190	Industrial	39,615	23.90		10.40	-4.10		-1.70	-		-
43	Copper Wire	740811	Industrial	39,583	7.40		1.00	-0.80		-0.60	0.60		0.70



Rank <sup>a</sup>	Description	HS	Product Type	Value (US\$ 000)	Income		Price		Exchange Rate	
					Short-Term	Long-Term	Short-Term	Long-Term	Short-Term	Long-Term
44	Newsprint	480100	Industrial	39,177	4.00	1.00	-0.70	-2.90	0.40	1.00
45	Antibiotics	300420	Industrial	39,095	5.50	1.00	-1.00	-1.30	-	-
46	Acrylic Polymers	390690	Industrial	37,063	3.50	1.00	-1.10	-1.30	-	-
16	Cotton Fabrics	520942	Textile	81,357	4.80	3.70	-0.80	-2.70	-	-
Unweighted Average				4,331,222	4.40	3.50	-1.90	-2.10	1.90	1.60
Agriculture				898,389	4.16	3.86	-1.35	-2.38	0.93	1.20
Industrial				3,351,474	5.04	3.39	-2.07	-1.99	1.95	1.60
Textile				81,357	4.80	3.70	-0.80	-2.70	-	-
Weighted Average				4,331,222	4.90	4.50	-2.10	-2.40	0.70	0.40
Agriculture				898,389	5.65	5.07	-1.30	-2.72	0.39	0.35
Industrial				3,351,474	4.63	4.32	-2.36	-2.38	0.75	0.40
Textile				81,357	4.80	3.70	-0.80	-2.70	0.00	0.00

NOTE: The elasticities measure the percentage change in Colombia's import volume brought about by a 1 percent change in either real GDP of Colombia, the own US dollar price of imports, or the real exchange rate of Colombia.

<sup>a</sup> Ranked in terms of percentage contribution to total imports.

<sup>b</sup> One-period lag.

-- Estimated coefficient had incorrect sign and therefore was not included in the model.

**Table 4-2***Regression Results of U.S. Import Demand for Colombia's Major Exports*

Rank <sup>a</sup>	Description	HS	Product Type	Value (US\$ 000)	Income		Price			
					Short-Term	Long-Term	Short-Term		Long-Term	
2	Cut flowers and flower buds, fresh	060310	Agriculture	289,414	0.1	a	1.0	-0.4		-1.2
3	Coffee, not roasted, not decaffeinated	090111	Agriculture	276,520	1.5	a	2.5	-0.2		-
5	Bananas and plantains, fresh or dried	080300	Agriculture	186,557	1.4	a	1.5	-0.1		-0.1
16	Coffee, not roasted, decaffeinated	090112	Agriculture	38,999	1.8		1.0	-0.3		-1.5
21	Cigarettes containing tobacco	240220	Agriculture	28,231	0.3	a	1.0	-		-
36	Dead horses, swine etc	051199	Agriculture	13,931	4.9	a	7.8	-0.9		-1.6
43	Sugar confection	170490	Agriculture	11,139	3.6	a	4.4	-0.1	a	-0.1
1	Crude oil from petr/bituminous minerals	270900	Industrial	1,161,591	0.9	a	3.2	-		-
4	Bituminous coal, not agglomerated	270112	Industrial	248,374	2.9	a	4.8	-0.5	a	-0.8
6	Petroleum coke, not calcined	271311	Industrial	171,123	0.7	a	1.0	-		-
7	Petroleum gases etc., in gaseous state	271129	Industrial	150,424	0.6	a	1.0	-0.4	a	-0.6
8	Gold, nonmonetary, unwrought	710812	Industrial	129,652	9.8	a	13.6	-		-
10	Rubies, sapphires and emeralds	710391	Industrial	68,738	0.7	a	1.0	-		-
12	Portland cement	252329	Industrial	52,039	2.0		5.8	-1.0		-1.1
13	Ethylene (ethene)	290121	Industrial	48,473	0.3	a	1.0	-0.5		-1.7
14	Ethylene, propylene, and butadiene liq	271114	Industrial	47,886	9.1	a	10.9	-0.7		-1.0
15	Propene (propylene)	290122	Industrial	46,434	5.4	a	9.2	-0.7		-1.4
17	Oils & products as coal tar distillates etc	270799	Industrial	32,737	1.2	a	1.0	-0.5		-
18	Non-aq pigments for paint mfr, dyes etc	321290	Industrial	31,860	5.4		4.4	-0.1		-0.1
19	Cane sugar, raw, solid form	170111	Industrial	29,883	0.5	a	1.0	-	a	-
20	Benzene	270710	Industrial	29,142	4.6	a	4.7	-1.5	a	-1.6

Rank <sup>a</sup>	Description	HS	Product Type	Value (US\$ 000)	Income			Price		
					Short-Term		Long-Term	Short-Term		Long-Term
22	Acyclic hydrocarbons, saturated	290110	Industrial	27,178	0.4	a	1.0	-1.3		-3.5
23	Anthracite coal, not agglomerated	270111	Industrial	26,722	1.7	a	7.5	-2.0		-2.9
24	Plates, sheets cell poly vinyl chlorid	392112	Industrial	25,693	0.7	a	1.6	-0.4		-0.4
25	Shrimps and prawns, frozen	030613	Industrial	25,530	1.0	a	2.1	-0.3		-0.1
26	Petroleum gases etc., liquified	271119	Industrial	24,953	7.9		1.0	-0.9		-1.0
27	Benzene	290220	Industrial	22,022	3.7	a	7.9	-0.4		-
28	Butanes, liquefied	271113	Industrial	18,140	2.2	a	2.8	-		-
29	Cumene	290270	Industrial	16,705	2.1	a	3.8	-0.4		-0.9
31	Ferronickel	720260	Industrial	16,028	0.5	a	1.0	-0.2		-
32	Xylenes	270730	Industrial	15,511	7.8	a	9.7	-0.3		-0.4
33	Para-xylene	290243	Industrial	15,274	5.6	a	5.0	-1.2		-
34	Gold powder, nonmonetary	710811	Industrial	15,188	9.8	a	13.6	-		-
35	Ceramic sanitary fixtures of porcelain	691010	Industrial	14,304	3.2	a	8.0	-		-
37	Mixed xylene isomers	290244	Industrial	13,912	2.6	a	4.0	-1.0		-2.0
38	Printed books, brochures	490199	Industrial	13,123	1.6	a	2.5	-0.2		-0.3
40	Petroleum bitumen	271320	Industrial	12,884	4.2	a	10.4	-0.4		-2.7
46	Casing etc oil or gas drilling, iron or steel	730620	Industrial	10,500	0.4	a	1.0	-		-
47	Rock lobster and other crawfish, frozen	030611	Industrial	10,410	1.0	a	1.0	-		-
50	Coal, not agglomerated	270119	Industrial	9,001	0.2	a	1.0	-		-
52	Toluene	290230	Industrial	8,304	1.8		9.2	-0.7		-0.8
9	Men's or boys' trousers not knit, cotton	620342	Textile	71,850	3.3		4.2	-0.2		-0.2
11	Women's or girls' trousers not knit, cotton	620462	Textile	56,853	4.2	a	4.6	-0.2	a	-0.2
30	M/b suit-type jackets and blazers of wool	620331	Textile	16,346	0.2	a	1.0	-0.5		-0.9

Rank <sup>a</sup>	Description	HS	Product Type	Value (US\$ 000)	Income			Price		
					Short-Term		Long-Term	Short-Term		Long-Term
39	M/b trouser overalls breeches shorts wool	620341	Textile	13,021	2.5	a	4.7	-0.5		-0.6
41	Socks & other hosiery of cotton, knit	611592	Textile	12,033	0.1	a	1.0	-0.5		-5.7
42	Brassieres, knit or crocheted or not	621210	Textile	11,901	2.3	a	2.5	-0.1	a	-0.1
44	Toilet & kitchen linen of terry fabrics	630260	Textile	10,961	2.7	a	6.0	-0.2		-0.7
45	Women's or girls' swimwear , knit	611241	Textile	10,505	11.3		6.8	-0.5		-
48	Gimp yrn & strip, 5404/5405	560600	Textile	9,956	5.6	a	6.5	-1.1		-1.6
49	Men's or boys' suits of wool, not knit	620311	Textile	9,881	3.7		3.1	-0.3		-0.5
51	Men's or boys' underpants and briefs	610711	Textile	8,868	0.2	a	1.0	-0.4	a	-2.1
Unweighted Average				3,666,702	2.93		4.18	0.55		-1.1
Agriculture				844,791	1.96		2.74	0.34		-0.8
Industrial				2,589,736	3.02		4.61	0.68		-1.2
Textiles				232,175	3.28		3.76	0.39		-1.2
Weighted Average				3,666,702	1.95		3.38	0.20		-0.3
Agriculture				844,791	1.07		1.76	0.26		-0.5
Industrial				2,589,736	2.12		3.97	0.23		-0.3
Textiles				232,175	3.37		4.00	0.29		-0.7

Note: The elasticities measure the percentage change in U.S. import volume brought about by a 1 percent change in either real GDP of the United States or the own US dollar price of imports.

<sup>a</sup> Ranked in terms of percentage contribution to total imports.

<sup>b</sup> One-period lag.

--Estimated coefficient had incorrect sign and therefore was not included in the model.



# 5. Impact Analysis

## Staging Tariff Reductions

Although market access negotiations on the U.S.-Colombia FTA have yet to start, a useful starting point for this analysis could be to examine the tariff schedule negotiated under the U.S.-Chile FTA.<sup>11</sup> The US-Chile FTA will eliminate tariffs on U.S. and Chilean goods and services over a 10-year period for industrial goods and a 12-year period for agricultural products in both countries. However, fully 85 percent of bilateral trade in consumer and industrial products will immediately become duty-free, with other product tariff rates being reduced over time. In the case of the United States, about 75 percent of U.S. farm exports will enter Chile duty-free within 4 years and all duties will be fully phased out within 12 years of the agreement's implementation. For Chile, 95 percent of its export products will gain duty-free status immediately, and only about 1 percent will be covered by the longest 12-year phase-out period.

Other guidelines for Colombia are provided by other recent agreements that the United States has concluded, including those with Israel and Jordan, NAFTA, and most recently CAFTA. Under the U.S.-Jordan FTA, for example, tariffs on virtually all trade between Jordan and the United States are to be eliminated within 10 years. The tariff reductions are set to take place in four stages: (1) tariffs of less than 5 percent will be phased out in 2 years; (2) tariffs between 5 and 10 percent will be eliminated in 4 years; (3) tariffs between 10 and 20 percent will be removed in 5 years; and (4) tariffs that are more than 20 percent will be eliminated in 10 years.

Notwithstanding the transparency inherent in Jordan's FTA, Chile's staging for tariff reductions probably represents a more relevant simulation benchmark for Colombia. It is therefore Chile's staging that is adopted as the benchmark against which other staging scenarios are assessed by the present model. Finally, it is important to note that Colombia already receives preferential access to the U.S. market and therefore reduced tariffs on most

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<sup>11</sup> The U.S.-Chile FTA was concluded at the end of 2002, Annex 3.3 of the Agreement provides for staging of tariff reductions for five categories.

exports under ATPADEA. The present exercise simulates the differential impacts of an FTA and the expiration of ATPADEA benefits, rather than just the impacts of an FTA with the United States.

## Measuring the FTA Impact

In the first instance, we have evaluated the impact of the FTA on Colombia's imports and exports to the United States for staging of tariff reductions between 1 and 10 years. Tables 5-1 and 5-2 summarize the effects on imports of U.S. goods and exports to U.S. markets. As expected, the effect of the FTA on imports is large both because of the relatively high price elasticity of Colombia's import demand (-2.4 trade-weighted average) and the initially high tariffs (over 11 percent on average). In contrast, the price elasticity of U.S. import demand is -0.3 and tariffs average about 4 percent.

The cumulative impact of imports varies from 17 percent to 19 percent over 10 years, depending on how tariff reductions are staged. If tariffs are reduced immediately, the effect is greater, as imports adjust with a lag to actual changes that have occurred recently (in 2003). Spreading the reduction over a longer period, for example, 10 years, tends to ameliorate recent changes and produce a smaller effect. The difference in staging from the point of view of the direct impact on import value is not, however, large. One other observation that is worth noting is that, because imports tend to adjust with a lag to price changes, there is a lag between tariff reductions and adjustments in the volume of imports demanded. Hence, the initial adjustment in imports is observed in Figure 5-1 to begin in period 2.

Table 5-2 shows the anticipated effect on U.S. imports of Colombia's major exports to that market to be minimal. Apart from the comparatively low tariffs on U.S. imports, the average price elasticity of U.S. import demand is less than unity (-0.3). The result is that for every one percent change in the tariff-adjusted price of imports, there is a less-than-proportional increase in the demand for imports. Although changes in the *volume* of Colombia's exports are proportional to changes in U.S. imports of those products resulting from tariff-induced price changes, the same does not hold for the *value* of Colombia's exports. Although tariff cuts lead to price reductions for U.S. consumers, those cuts do not affect the price received by Colombian exports to the U.S. market. As a result, tariff-induced price changes cause Colombia's exports to expand, without affecting the corresponding prices of those exports in Colombia.

**Table 5-1***Impact of FTA on Colombia's Import Value under Different Tariff Staging Reductions*

Years over which Tariffs Eliminated	Percent Change in Import Value from Previous Year												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
1	3.6	6.2	3.1	1.9	1.2	0.8	0.6	0.4	0.3	0.2	0.2	0.1	18.7
2	0.8	5.3	5.1	2.6	1.6	1.0	0.7	0.5	0.4	0.3	0.2	0.2	18.6
3	0.40	2.85	4.66	4.30	2.23	1.36	0.88	0.61	0.44	0.32	0.24	0.19	18.5
4	0.25	1.95	3.04	4.09	3.70	1.93	1.18	0.78	0.5	0.39	0.29	0.22	18.3
5	0.18	1.49	2.25	2.92	3.61	3.24	1.69	1.04	0.69	0.48	0.35	0.26	18.2
6	0.13	1.20	1.79	2.27	2.74	3.22	2.87	1.51	0.93	0.62	0.43	0.31	18.0
7	0.11	1.00	1.48	1.86	2.20	2.54	2.89	2.57	1.35	0.84	0.56	0.39	17.8
8	0.09	0.86	1.27	1.57	1.84	2.10	2.35	2.62	2.32	1.23	0.76	0.51	17.5
9	0.08	0.76	1.10	1.36	1.58	1.78	1.98	2.18	2.40	2.12	1.12	0.70	17.2
10	0.07	0.68	0.98	1.20	1.39	1.55	1.71	1.87	2.03	2.20	1.94	1.03	16.6

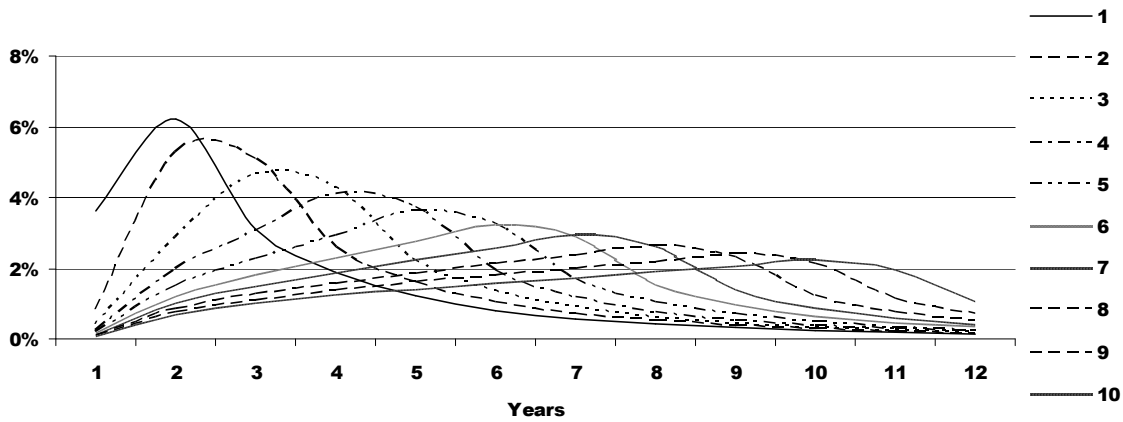


**Table 5-2***Impact of FTA on Colombia's Major Export Value to the United States under Different Tariff Staging Reductions*

<b>No. of Years over which Tariffs are Eliminated</b>	<b>Percent Change in Export Value from Previous Year</b>												<b>TOTAL</b>
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	
1	0.96	0.48	0.24	0.12	0.07	0.04	0.03	0.03	0.02	0.02	0.02	0.02	2.07
2	0.30	0.68	0.44	0.25	0.13	0.07	0.05	0.03	0.03	0.03	0.02	0.02	2.04
3	0.19	0.27	0.58	0.41	0.23	0.12	0.07	0.04	0.03	0.03	0.03	0.02	2.02
4	0.14	0.18	0.25	0.53	0.38	0.21	0.11	0.07	0.04	0.03	0.03	0.03	2.00
5	0.11	0.14	0.17	0.25	0.50	0.35	0.19	0.11	0.06	0.04	0.03	0.03	1.98
6	0.09	0.11	0.13	0.17	0.25	0.47	0.32	0.18	0.10	0.06	0.04	0.03	1.96
7	0.08	0.09	0.11	0.13	0.17	0.24	0.45	0.30	0.17	0.09	0.06	0.04	1.94
8	0.07	0.08	0.09	0.11	0.13	0.17	0.24	0.43	0.28	0.16	0.09	0.06	1.91
9	0.06	0.07	0.08	0.09	0.11	0.13	0.17	0.24	0.41	0.27	0.15	0.08	1.87
10	0.05	0.06	0.07	0.08	0.10	0.11	0.13	0.17	0.24	0.39	0.25	0.14	1.80

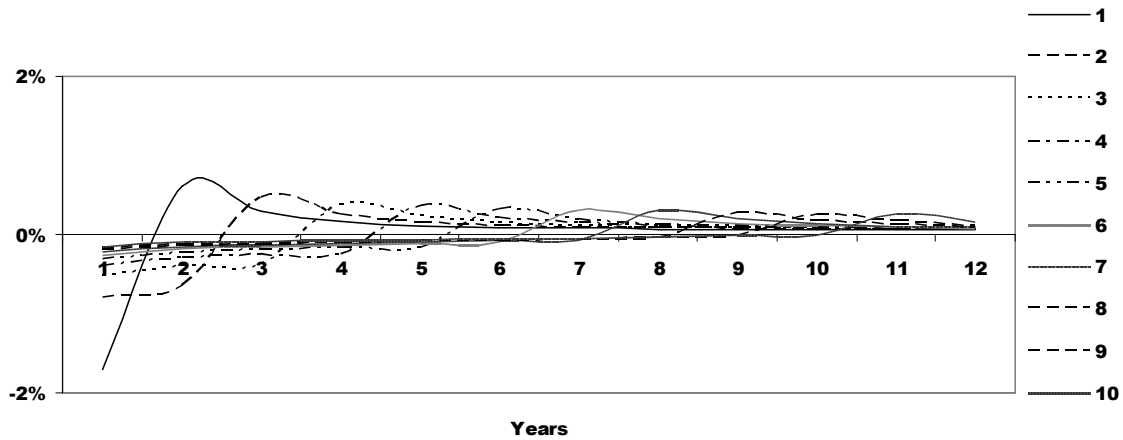
**Figure 5-1**

*Colombia – Impact of FTA on Import Value under Alternative Tariff Staging Reductions*



**Figure 5-2**

*Colombia – Impact of FTA on Export Value under Alternative Tariff Staging Reductions*



Finally, we evaluate the impact of the FTA on Colombia’s exports and imports based on the broad guidelines of the U.S.-Chile FTA, whereby tariffs on agricultural products are eliminated over 12 years and tariffs on other products are eliminated over 10 years. Table 5-3 summarizes the effects on Colombia’s trade balance with the United States. As expected, the expansion of Colombia’s imports is larger than that of its exports to the U.S. market, with the result that the trade balance with the United States deteriorates somewhat. It is important to note, however, that while exports to the U.S. market generally have a dampened response to tariff-induced price changes, a number of export products have considerably higher than average responses to those changes. For example, petroleum gases, anthracite coal, propane, and some cotton knits have particularly high price elasticities of import demand, for example, and imports in the U.S. market therefore tend to respond strongly to price variations. Overall, Colombia’s trade balance with the United States remains in surplus.

**Table 5-3***Impact of FTA on Colombia's Trade Based on Chile's Tariff Staging Schedule*

	Year											
	1	2	3	4	5	6	7	8	9	10	11	12
Imports from U.S. (% change)	0.09	0.6	0.91	1.10	1.26	1.41	1.54	1.68	1.82	1.97	1.52	1.15
Exports to U.S. (% change)	0.05	0.06	0.07	0.08	0.09	0.11	0.13	0.16	0.23	0.39	0.27	0.16
U.S. Trade Balance (billion US\$)	\$1.68	\$1.66	\$1.62	\$1.58	\$1.53	\$1.48	\$1.42	\$1.36	\$1.29	\$1.22	\$1.17	\$1.12

Other studies have also found the price elasticities of import demand in the United States to be generally low. Taylor (1994), for example, found the price elasticity of import demand in the United States to be -0.22 in the short term, and -0.39 in the long term, a result that is consistent with our corresponding -0.31 long-term, trade-weighted elasticity of U.S. import demand. Similarly, Chinn (2002) found the price elasticity of import demand for U.S. imports to be less than unity. Elsewhere in developed countries, the results are similar: Crozet and Erkel-Rousse (1999) found the price elasticity of import demand to be less than unity in the European Community. These results contradict the conventional perception of the sensitivity of imports to price changes but are nevertheless consistent with other empirical estimates. In contrast, the relatively high price elasticities of Colombia's demand for imports are consistent with estimates for other countries in Latin America. Lord (1991) found the average long-term price elasticity of import demand for Latin America's major commodity imports to be -2.1, which is similar to Colombia's trade-weighted average price elasticity of import demand of -2.4.

Our conclusions are further supported by the recent study by Santos-Paulino (2004) using a panel of 22 developing countries, including Colombia, on the impact that trade liberalization has had on export growth, import growth, the balance of trade, and the balance of payments. They found that export growth has expanded by about 2 percent, but that the effect on import growth has been much greater—about 6 percent. The result has been a deterioration of the trade balance by, on average, at least 2 percent of GDP. The impact on the balance of payments, however, has been less. This phenomenon suggests that other factors, such as foreign direct investment growth resulting from a more attractive investment environment, have compensated for the trade balance deterioration.

Moreover, concurrent with tariff-induced price variations in Colombia-U.S. bilateral trade is the anticipated growth of trade associated with economic expansion in both countries. The good deal of work on the relation between trade liberalization and economic growth was recently summarized by Rodriguez and Rodrick (2000). Additionally, greater openness, or so-

called globalization, has important implications for economic growth, poverty, and income inequality. Dollar and Kraay (2004) recently assessed those relationships and concluded that evidence from individual cases and cross-country analysis supports the view that globalization leads to faster growth and poverty reduction in countries such as Colombia.

The partial equilibrium approach used in the present analysis excludes consideration of feedback effects between the external and domestic sectors, and therefore does not take into account the sectoral adjustments and indirect macroeconomic impact that would accompany trade liberalization. Moreover, a major issue raised by partial equilibrium analysis of trade liberalization is the small size of the estimated effects, a phenomenon that has been attributed to the nature of the partial equilibrium calculations. These limitations suggest two directions for further analysis of Colombia's FTA with the United States. First, tariff cuts in Colombia will probably influence the industries that provide both material and other inputs to the final goods industries through changes in relative prices of factors of production and the final products themselves. These linkages will, in turn, affect the allocation of domestic resources and influence the competitive position of Colombia's products in the domestic and U.S. markets. The effective rate of protection measures the effect of tariff changes on domestic production, how tariffs on Colombia's products and their tradable inputs jointly affect the value added of particular activities. When only the nominal rate of protection is calculated, the tariff on imports suggests that domestic producers will be encouraged to increase their output. However, whether they increase their output depends not only on the tariff on imports of final products, but on the tariffs applied to inputs used in their manufacture. The effective rate of protection therefore measures the net protection on production processes rather than simply gross protection on output of industries. We use this approach in the next chapter to measure domestic production adjustments in Colombia resulting from the FTA.

Although it is beyond the scope of this study, a second extension is the macroeconomic framework of external sector adjustments. While not offering the same level of detail, estimates of the effects of trade liberalization in a macroeconomic framework incorporate dynamics and allow for calculations of feedback effects between import and export adjustments and the macroeconomy. As a consequence, the sizes of the estimates are likely to more accurately reflect adjustments to trade liberalization associated with broad-based reforms. From an analytical point of view, the appropriate framework for Colombia is the Mundell-Fleming model of a small open economy. Data requirements for the macroeconomic model, though not considerable, would require careful data selection to ensure integrity of the underlying relationships. Together with the industry-level assessment, macroeconomic analysis of the FTA would offer a more complete appreciation or approximation of its potential impact on the Colombian economy.



## 6. Production-Shift Analysis

Colombia has a cascading tariff structure, insofar as trade taxes on final goods are generally higher than on intermediate and capital goods used in the production of those goods. That structure implies that the resource allocation of industries is more influenced by the lower tariff rates applied to production inputs than by those applied to final goods. In this chapter we examine the incentives provided to Colombian industries under the current tariff regime and the implications that the U.S.-Colombian FTA has for those industries. We begin by discussing the concept and measurement of the effective rate of protection and suggest the need to separate its

### Measuring the Effective Rate of Protection

The effective rate of protection measures the cascading effects by considering tariffs applied to imports of raw materials and intermediate goods that affect the price of the final good. (See Appendix A, section A.3, for the derivation of the effective rate of protection.) The effective rate of protection measures how tariffs on a product and its tradable inputs jointly affect the added value of a particular activity. Calculating only the nominal rate of protection suggests that the tariff on imports will encourage domestic producers to increase their output. But whether they increase output depends also on the tariffs applied to inputs used in manufacturing. Domestic producers enjoy an implicit subsidy on production when there are tariffs on imports, but they face a tax on their imported inputs, which can neutralize the effect of the subsidy. The effective rate of protection therefore measures the net protection on the production process, rather than simply the gross protection on the industry's output.

The formula for the effective rate of protection is as follows:

$$\text{ERP} = (V_j^* - V_j) / V_j \quad (6.1)$$

where ERP = effective rate of protection

$V_j^*$  = Value added per unit of  $j$  in activity  $j$  at tariff-applied price

$V_j$  = Value added per unit of  $j$  in activity  $j$  at tariff-free price

Alternatively, we can specify the effective rate of protection in terms of tariffs on the applied inputs and output of the industry as follows:

$$\text{ERP} = (1 - \sum_i a_i) / [1 / (1+t)] - \sum_i [a_i / (1+t_i)] - 1 \quad (6.2)$$

where  $t$  = nominal tariff rate on imported equivalent to the domestic output.

$t_i$  = nominal tariff rate on tradable input  $i$  in the production of the good.

$a_i$  = value of input  $i$  per unit of output.

Like the nominal rate of protection, a positive effective rate of protection indicates that the returns earned from production are greater than those earned without intervention. Likewise, a negative effective rate of protection indicates that the reverse is true. In the case where the effective rate of protection is zero, the effect is the same as without intervention.

The effective rate of protection formula suggests the following

- $t = t_i$  implies that the effective rate of protection will equal the nominal rate of protection (NRP), i.e.,  $\text{ERP} = \text{NRP}$ .
- $t < t_i$  implies that the effective rate of protection will be positive, suggesting that the effective protection for the industry is greater nominal protection on both the final and imported inputs.
- $t > t_i$  implies that the effective rate of protection for the industry is smaller than the nominal protection on both the final and imported inputs.

The incidence of tariff reductions on inputs and final products differs between import-substitution industries and export-oriented ones. In measuring the incidence of the effective rate of protection in Colombia and its elimination under the FTA we therefore separate calculations for export-oriented industries from those for import-competing industries. The distinction is critical to the output and employment effects arising from the U.S.-Colombia FTA because tariffs protect import-substituting but not export-oriented industries.

For *import-substituting industries*, the tariff on the final good acts as a subsidy while the tariff on inputs acts as a tax. Protection granted to final goods therefore increases returns to value-adding factors in those industries. Higher protection on outputs raises the domestic prices for import-competing goods and increases the returns for their production. Taxes on intermediate inputs, however, reduce the returns to value-adding factors.

*Export-oriented industries* derive no benefits from domestic protection of their output. Instead, they confront world prices for their sales while being taxed on their inputs through tariffs paid on imported inputs. Because Colombia's tariff regime raises prices for intermediate goods its effect on the country's export-oriented industries is always negative.

The *anti-export bias* is found by combining the effects of the tariffs on import-substitution activities and export-oriented activities within the same industry. We can measure the anti-export bias, denoted  $A$ , for any given industry as follows:

$$A = [(1 + ERP_m) / (1 + ERP_x) - 1] * 100 \quad (6.3)$$

Where  $ERP_m$  = the effective rate of protection on the import-substitution activities of the industry, and

$ERP_x$  = the effective rate of protection on the export-oriented activities of the industry.

Table 6-1 presents the nominal and effective rates of protection of Colombia's industries, as well as the resulting anti-export bias. The first column reports the nominal rate of protection and the next two columns report the effective rates of protection for the import-substitution and export-orientation activities, respectively. In general, agricultural industries have lower nominal and effective rates of protection than mining and industrial activities, while industrial activities have higher effective rates of protection.

## Industry-level Supply Responses to the FTA

While estimates of effective rates of protection are suggestive of which industries are more or less favored or threatened by current tariffs and proposed reforms, the effective rates of protection are more indicative of the potential direction of change in resource pull than of the output magnitudes involved. Predicting the quantitative impact of reforms requires a supply-side analysis. In this section, we provide an industry-level analysis of some potential consequences of tariff reform.

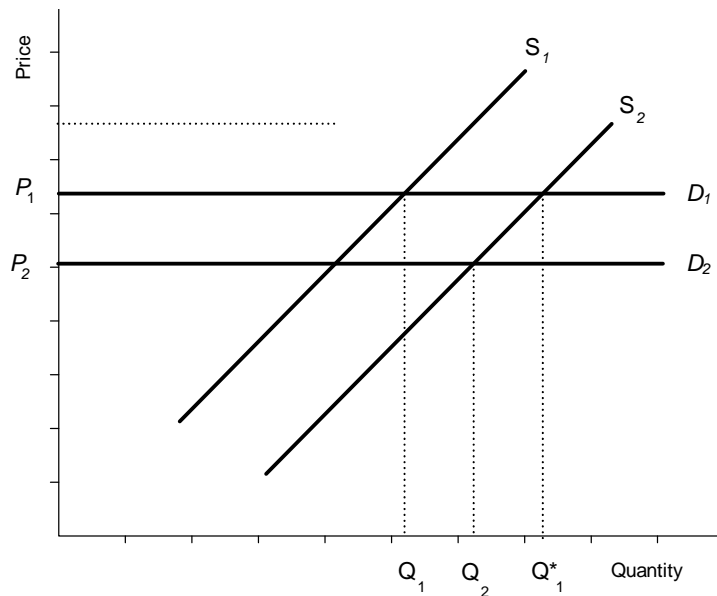
To motivate the analysis, we begin with a graphic illustration of the impact of the FTA on an industry. Our approach assumes constant nontradable factor prices except owing to tariff changes directly, and so is legitimate only to the extent that this is approximately the case. Naturally, a significant restructuring of relative output prices would lead to changes in the demand for such nontraded factors (e.g., labor or land) and so to changes in the factor prices. Tradable input prices are assumed fixed on world markets and so the domestic prices of these inputs depend only on changes in the input tariff rates, which are accounted for in our analysis. This maintained assumption of fixed nontraded factor prices in Colombia following the FTA may be viewed as roughly legitimate—overall output in the industries under consideration does not dominate the economy—or it may be viewed as a simplifying assumption that could then be relaxed to mitigate the findings in a thoughtful way. For example, as labor-intensive industries expand and wages eventually rise the cost structure will be affected and expansion will be moderated.

We estimate the impact of the FTA on the industries being considered. The approach is illustrated in Figure 6-1 which represents an industry supply curve diagram with initial price and quantity supplied given by  $P_1$  and  $Q_1$ . When tariffs are changed on inputs and output simultaneously, two forces are at work in the industry. First, a change in the input tariffs will



alter costs and so shift the supply curve up or down depending on if unit costs have increased or decreased due to the tariff changes. In Figure 6-1, the assumption is that input tariffs have been reduced, causing unit costs of production to fall and the supply curve to shift downward to  $S_2$ . For export-oriented industries, the output price remains at the initial level  $P_1$ , and output expands to  $Q_1^*$  by an amount dependent upon the magnitude of the cost reduction and the price elasticity of supply. In the case of import-substitution industries, however, the output price is also altered by tariff elimination on the final product, so that there is an additional adjustment represented by a movement along the new supply curve. In Figure 6-1, the assumption is that the output tariff is lowered so that price falls to  $P_2$ , inducing a new equilibrium price and quantity at  $P_2$  and  $Q_2$ , the quantity change depending again on the magnitude of the output price change and the supply elasticity. Clearly, even if all tariffs are reduced, output may rise or fall. And, more generally, the net effect of tariff reform on output and so employment at the industry level is an empirical issue.

**Figure 6-1**  
*Geometry of Output Resources*



To calculate the effects of tariff reform, we first estimated the industry supply elasticities using a distributed lag model of the supply relationship for production,  $Q$ , with independent variables price,  $P$ , domestic income,  $Y$ , and a technology trend,  $T$ :

$$\ln Q_t = \alpha_{30} + \alpha_{31} \ln Q_{t-1} + \alpha_{32} \ln P_t + \alpha_{33} \ln Y_t + \alpha_{34} T + \mu_3 \quad (6.4)$$

The expected signs are  $0 < \alpha_{31} < 1$ ;  $\alpha_{32}, \alpha_{33} > 0$ ;  $\alpha_{34} > 0$ .

Table 6-2 (and Table B-11 in Appendix B) report the estimates, some diagnostics, and the elasticities. Overall, the production-weighted price elasticity of supply is 0.5 in the short term, and 1.6 in the long term (unweighted: 0.7 and 1.8 respectively). Among the different types of industries, industrial activities have the highest price elasticity, averaging 2.0 in the long term, and mining activities have the lowest, averaging 1.0 in the long term, with agriculture not far behind at 1.1. From an analytical viewpoint, the distinction between export-oriented and import-substituting industries is central to the FTA impact analysis. Export-oriented activities have a significantly low price elasticity of supply (1.1) than those involved in import-substituting activities (1.9). Consequently, we would expect larger adjustments in the import-substituting industries than in the export substituting ones if all of them confronted the same tariff structure on inputs and their final products.

## Output and Employment Adjustments to the FTA

Shifts in the supply curves associated with input tariff changes were calculated as the FTA-induced change in input tariffs weighted by each input's total nonfactor costs. Movements along the new supply curve resulting from output tariff changes and cost change-induced equilibrating changes were then calculated using the elasticity estimates. As indicated earlier, for import-substituting industries, both cost-induced supply adjustments and price-induced changes in output were calculated, whereas only cost-induced supply adjustments were estimated for export-oriented industries not enjoying a protected market, and consequently pre-FTA higher prices.

The impact of the FTA on Colombia's output is shown in Table 6-3 for individual industries, industry types, and the total. The FTA leads to contractions for most import-substituting industries, but cost reductions substantially mitigate those declines. For instance, the NRP declines by 12.7 percent, but for import-substituting industries the benefits of cost-associated price declines averaging -9.3 nearly offset the price-declines averaging 11.1 percent for these types of activities.<sup>12</sup>

The results presented in Table 6-3 clearly point to the benefits to be derived from the FTA for export-oriented industries, which are expected to expand production by nearly 10 percent on average as a result of lower costs on their inputs. Especially large production increases are expected for fruits, nuts and beverages; cattle farming; forestry products; coal mining; petroleum; canning of fruits and vegetables; and manufactures of vegetable and animal oils. For the import-substituting industries output is expected to contract by nearly 4 percent as producers face competition from foreign suppliers. The largest adjustments are expected to

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<sup>12</sup> The ISIC classification used in this section for the agricultural sector corresponds to Revision 3, while the ISIC classification for manufacturing industry and mining corresponds to Revision 2. Under ISIC Revision 3 one can obtain a wider breakdown for the agricultural sector at the 4-digit level.

occur in (1) finished textiles, (2) wearing apparel, (3) canning of fish, (4) manufactures of sporting goods, (5) cordage and rope, (6) electrical apparatus, and (7) cement, lime and plaster. Overall, gains from expansion in output from export-oriented industries significantly outweigh contractions likely to be experienced by import-substituting industries. Colombia's overall output could expand by about 5 percent. Especially large output gains are likely in mining, followed by export-oriented industries.

The employment effects associated with the FTA-induced adjustments in Colombia's industries assume fixed labor-output coefficients in production. For this reason, the same export-oriented industries likely to expand their employment are those that will significantly increase their output, while those experiencing the largest contractions in employment are those with larger output adjustments. Table 6-4 calculates possible changes in industry employment parameterized to 2000 levels that would ensue following the FTA. These employment changes are of course suggestive of the quantities involved. Using the output adjustment estimates above, we calculated the percentage change in employment resulting from the FTA-related tariff adjustments. We then calibrated the actual levels of employment by industry to calculate the estimated change in labor demand by sector. Overall, total employment of Colombia increases by more than 5 percent, with the largest gains occurring in mining industries, followed by export-oriented industrial activities. Naturally the biggest gains in employment will occur in export-oriented industries, which are shown to increase employment by 7.5 percent. Import-competing industries are likely to experience contractions in their labor force, which in our estimates average less than 4 percent.

Trade liberalization in Colombia can be expected to increase demand for labor in the long term. Removing policies that favor capital-intensive import-substitution sectors at the expense of more competitive export sectors ultimately results in expansion of the export sectors and a contraction of the import-substitution sectors. The net effect in the long term is higher wages and expanding employment. During the transition, however, import-substituting industries are likely to experience contraction in employment. The export sector growth, however, is likely to absorb displaced workers and require additional workers.

There is considerable evidence that adjustment costs are likely to be small. Twenty percent of the formal labor force works in the most vulnerable sector, import-substituting activities in manufacturing. Even if 4 percent of those workers have to change jobs, as is suggested by our analysis, the adjustment would represent less than 1 percent of the labor force. The annual labor turnover rate in manufacturing is normally 7–8 percent, so this adjustment could be accommodated in two years. Many of these displaced workers are likely to be absorbed into other sectors, especially the service and export-oriented industries, which are expected to increase employment by 7.5 percent, which will add another 1.5 percent to Colombia's total employment figures. Moreover, the evidence of significant Colombian labor force mobility clearly suggests that workers could adjust from import-substituting industries to those

directed to export markets because the phasing of tariff reductions are likely to take place over several years.

**Table 6-1**  
*Nominal and Effective Rates of Protection*

ISIC	Description	NRP (%)	ERP (%)		Anti-Export Bias
			Import-Subs.	Export-Oriented	
0111	Growing of cereal and other crops	10.3	10.8	-1.8	12.8
0113	Growing of fruits, nuts, beverage	4.2	3.7	-1.3	5.0
0121	Farming of cattle	13.1	14.7	-1.2	16.1
0122	Other animal farming	12.0	18.1	-10.5	31.9
0130	Growing of crops	0.0	-1.3	-1.3	0.0
0140	Agricultural	10.8	11.3	-0.7	12.0
0200	Forestry	5.0	4.6	-1.4	6.0
1010	Mining and agglomeration of hard coal	5.0	5.4	-1.1	6.6
1020	Mining and agglomeration of lignite	10.0	12.0	-0.1	12.2
1110	Extraction of crude petroleum and natural gas	5.0	4.9	-0.2	5.1
1310	Mining of iron ores	18.4	29.8	-17.4	57.1
3111	Manufacture of dairy products	17.9	40.1	-8.6	53.2
3112	Canning and preserving of fruits and vegetables	18.7	72.3	-20.5	116.9
3113	Canning, preserving and processing of fish	16.1	32.5	-9.9	47.1
3114	Manufacture of vegetable and animal oils and fats	17.3	30.1	-21.7	66.2
3115	Grain mill products	19.9	75.6	-30.1	151.1
3116	Manufacture of bakery products	20.0	28.4	-7.2	38.3
3117	Sugar factories and refineries	15.8	36.8	-15.8	62.4
3118	Manufacture of food products not elsewhere classified	13.1	21.9	-28.2	69.7
3121	Manufacture of prepared animal feeds	10.0	-3.9	-37.4	53.5
3122	Manufacture of prepared animal feeds	11.4	23.3	-37.9	98.4
3123	Distilling, rectifying and blending spirits	19.3	32.4	-8.9	45.4
3131	Wine industries	20.0	49.0	-21.0	88.6
3132	Malt liquors and malt	20.0	79.0	-18.2	118.8
3133	Soft drinks and carbonated waters industries	19.2	67.6	-14.3	95.5
3134	Tobacco manufactures	20.0	27.4	-5.7	35.2
3140	Spinning, weaving and finishing textiles	9.6	67.6	-4.1	74.8
3211	Manufacture of made-up textile goods except wearing apparel	20.0	281.1	-34.1	478.0
3212	Cordage, rope and twine industries	15.0	51.6	-17.4	83.4
3215	Cordage, rope and twine industries	19.7	30.7	-6.2	39.3
3216	Cordage, rope and twine industries	20.0	28.7	-4.4	34.6
3217	Cordage, rope and twine industries	18.1	146.5	-21.8	215.3
3218	Manufacture of textiles not elsewhere classified	14.9	115.2	-35.7	234.4
3219	Manufacture of wearing apparel, except footwear	20.0	26.7	-5.4	33.9
3220	Manufacture of wearing apparel, except footwear	20.0	28.2	-5.2	35.3
3221	Tanneries and leather finishing	9.7	6.6	-16.9	28.3

ISIC	Description	NRP (%)	ERP (%)		Anti-Export Bias
			Import-Subs.	Export-Oriented	
3231	Fur dressing and dyeing industries	15.0	200.4	-33.5	351.5
3232	Manufacture of products of leather and leather substitutes	19.5	29.2	-4.3	35.0
3233	Manufacture of footwear	19.9	33.0	-6.4	42.1
3240	Sawmills, planing and other wood mills	8.6	12.0	-2.6	15.0
3311	Manufacture of wooden and cane containers	19.5	35.7	-5.5	43.7
3312	Manufacture of wood and cork products	12.8	18.5	-2.7	21.8
3319	Manufacture of furniture and fixtures, except primarily of metal	11.0	13.7	-5.2	20.0
3320	Manufacture of pulp, paper and paperboard	12.1	25.0	-10.9	40.3
3411	Manufacture of containers and boxes of paper and paperboard	17.2	34.6	-12.4	53.7
3412	Manufacture of pulp, paper and paperboard articles	10.7	20.7	-22.4	55.5
3419	Printing, publishing and allied industries	11.0	14.4	-3.5	18.5
3420	Manufacture of fertilizers and pesticides	6.3	10.6	-11.9	25.7
3512	Manufacture of synthetic resins, plastic materials	9.1	17.4	-16.7	41.0
3513	Manufacture of paints, varnishes and lacquers	14.5	33.9	-12.4	53.0
3521	Manufacture of drugs and medicines	6.9	10.3	-7.7	19.6
3522	Manufacture of soap and cleaning preparations	15.5	45.8	-10.9	63.7
3523	Manufacture of soap and cleaning preparations	12.8	20.5	-5.1	26.9
3528	Manufacture of chemical products not elsewhere classified	9.7	17.1	-9.7	29.7
3529	Petroleum refineries	7.6	20.6	0.0	20.6
3530	Manufacture of miscellaneous products of petroleum and coal	5.2	2.8	-9.0	12.9
3540	Tyre and tube industries	13.8	32.5	-17.8	61.1
3551	Manufacture of rubber products not elsewhere classified	12.8	29.7	-13.2	49.4
3559	Manufacture of plastic products not elsewhere classified	11.2	26.1	-14.9	48.2
3560	Manufacture of pottery, china and earthenware	18.0	65.8	-10.5	85.3
3610	Manufacture of glass and glass products	15.8	64.3	-12.5	87.8
3620	Manufacture of glass and glass products	14.0	31.1	-12.4	49.7
3621	Manufacture of structural clay products	14.3	15.4	-0.2	15.7
3691	Manufacture of cement, lime and plaster	-2.3	22.2	-5.4	29.2
3692	Manufacture of nonmetallic mineral products	14.4	69.6	-20.1	112.2
3699	Iron and steel basic industries	9.7	13.0	-6.1	20.4
3710	Non-ferrous metal basic industries	8.6	17.1	-18.4	43.6
3720	Non-ferrous metal basic industries	5.4	7.7	-12.9	23.6
3721	Non-ferrous metal basic industries	6.2	10.2	-8.3	20.1
3722	Non-ferrous metal basic industries	9.9	12.0	-57.2	161.3
3723	Manufacture of cutlery, hand tools and general hardware	14.7	19.4	-2.3	22.2
3811	Manufacture of furniture and fixtures primarily of metal	16.0	23.3	-5.8	30.8
3812	Manufacture of structural metal products	10.9	14.1	-5.3	20.4
3813	Manufacture of structural metal products	13.5	18.1	-2.3	20.9

ISIC	Description	NRP (%)	ERP (%)		Anti-Export Bias
			Import-Subs.	Export-Oriented	
3814	Manufacture of fabricated metal products	13.9	20.8	-6.8	29.7
3819	Manufacture of agricultural machinery and equipment	9.7	18.7	-11.2	33.7
3822	Manufacture of metal and woodworking machinery	9.8	27.1	-13.3	46.6
3823	Manufacture of special industrial machinery and equipment	6.7	9.4	-15.0	28.8
3824	Manufacture of office, computing and accounting machinery	5.1	4.9	-13.9	21.8
3825	Manufacture of office, computing and accounting machinery	6.2	6.5	-7.8	15.5
3826	Manufacture of office, computing and accounting machinery	12.2	34.0	-24.0	76.3
3827	Machinery and equipment except electrical	10.8	33.4	-25.4	78.7
3829	Manufacture of electrical industrial machinery and apparatus	11.5	24.5	-17.0	50.0
3831	Manufacture of radio, television and communication equipment	7.3	10.7	-14.4	29.3
3832	Manufacture of electrical appliances and housewares	15.8	153.4	-30.4	263.8
3833	Manufacture of electrical apparatus and supplies	10.7	20.8	-13.6	39.9
3839	Shipbuilding and repairing	3.9	4.1	-0.4	4.5
3841	Manufacture of motor vehicles	17.1	32.2	-26.3	79.4
3843	Manufacture of motorcycles and bicycles	19.3	40.6	-23.4	83.6
3844	Manufacture of aircraft	0.6	0.4	-0.9	1.3
3845	Manufacture of transport equipment not elsewhere classified	20.0	69.2	-22.2	117.6
3849	Manufacture of professional controlling equipment	5.8	-3.2	-31.2	40.7
3851	Manufacture of photographic and optical goods	6.3	10.8	-25.3	48.3
3852	Manufacture of jewelry and related articles	16.4	23.1	-2.4	26.1
3901	Manufacture of musical instruments	5.7	4.7	-3.1	8.0
3902	Manufacture of sporting and athletic goods	19.6	30.6	-6.0	39.0
3903	Manufacture of sporting and athletic goods	16.9	23.1	-3.0	26.8
3904	Manufacturing industries not elsewhere classified	13.0	16.6	-1.9	18.9
3909	Manufacturing industries not elsewhere classified	10.3	10.8	-1.8	12.8
	Agricultural Products	8.9	7.3	-3.8	11.6
	Mining Products	9.0	10.7	-0.3	11.0
	Industrial Products	14.4	24.5	-9.0	36.8
	TOTAL	12.7	16.9	-6.3	24.7

**Table 6-2***Regression Results of Colombia's Production Supply Equation (6.4)*

Description	ISIC	Class	Price		Capacity	
			Short-Term	Long-Term	Short-Term	Long-Term
Growing of cereal and other crops <sup>a</sup>	0111	Import-Subs	0.4	2.3	-	-
Growing of fruits, nuts, beverage <sup>a</sup>	0113	Export-Orient	0.1	0.5	-	-
Farming of cattle <sup>a</sup>	0121	Export-Orient	0.5	1.1	-	-
Other animal farming <sup>a</sup>	0122	Export-Orient	0.3	1.0	-	-
Growing of crops <sup>a</sup>	0130	Export-Orient	0.3	0.9	-	-
Forestry <sup>a</sup>	0200	Export-Orient	0.1	0.7	-	-
Mining and agglomeration of hard coal <sup>b</sup>	1010	Export-Orient	0.5	1.0	-	-
Mining and agglomeration of lignite <sup>b</sup>	1020	Export-Orient	0.5	1.0	-	-
Extraction of crude petroleum and natural gas <sup>b</sup>	1110	Export-Orient	0.5	1.0	-	-
Mining of iron ores <sup>b</sup>	1310	Export-Orient	0.5	1.0	-	-
Manufacture of dairy products	3111	Import-Subs	0.8	4.9	-	-
Canning and preserving of fruits and vegetables	3112	Export-Orient	0.4	1.3	1.3	3.9
Canning, preserving and processing of fish	3113	Import-Subs	2.8	3.4	-	-
Manufacture of vegetable and animal oils and fats	3114	Export-Orient	0.3	1.0	0.2	0.5
Grain mill products	3115	Import-Subs	0.5	0.8	-	-
Manufacture of bakery products	3116	Import-Subs	0.4	0.5	-	-
Sugar factories and refineries	3117	Export-Orient	0.5	-2.9	-	-
Manufacture of food products not elsewhere classified	3118	Export-Orient	0.5	1.5	-	-
Manufacture of prepared animal feeds	3121	Export-Orient	1.0	1.7	1.8	3.0
Manufacture of prepared animal feeds	3122	Import-Subs	0.1	0.2	-	-
Distilling, rectifying and blending spirits	3123	Import-Subs	1.3	2.4	0.7	1.4
Wine industries	3131	Import-Subs	0.1	0.8	-	-
Malt liquors and malt	3132	Import-Subs	0.2	0.9	-	-
Soft drinks and carbonated waters industries	3133	Import-Subs	0.5	2.9	1.2	6.9
Tobacco manufactures	3134	Export-Orient	0.7	1.5	-	-
Spinning, weaving and finishing textiles	3140	Import-Subs	0.7	5.5	-	-
Manufacture of made-up textile goods	3211	Import-Subs	0.4	0.5	-	-
Cordage, rope and twine industries	3212	Export-Orient	0.4	0.6	-	-
Cordage, rope and twine industries	3215	Import-Subs	0.1	0.4	-	-
Cordage, rope and twine industries	3216	Import-Subs	2.2	3.0	-	-
Cordage, rope and twine industries	3217	Import-Subs	0.6	1.7	-	-
Manufacture of textiles not elsewhere classified	3218	Import-Subs	0.7	1.7	-	-
Manufacture of wearing apparel, except footwear	3219	Import-Subs	7.3	9.8	1.7	2.2
Manufacture of wearing apparel, except footwear a	3220	Export-Orient	1.0	1.8	-	-



Description	ISIC	Class	Price		Capacity	
			Short-Term	Long-Term	Short-Term	Long-Term
Tanneries and leather finishing	3221	Export-Orient	1.6	10.6	-	-
Fur dressing and dyeing industries	3231	Export-Orient	0.6	1.9	-	-
Manufacture of products of leather and leather substitutes	3232	Export-Orient	0.1	0.1	-	-
Manufacture of footwear	3233	Export-Orient	0.4	0.5	-	-
Sawmills, planing and other wood mills	3240	Import-Subs	1.0	2.1	-	-
Manufacture of wooden and cane containers	3311	Export-Orient	0.3	0.4	0.1	0.1
Manufacture of wood and cork products	3312	Export-Orient	0.3	0.4	0.3	0.4
Manufacture of furniture and fixtures	3319	Import-Subs	0.8	1.2	-	-
Manufacture of pulp, paper and paperboard	3320	Import-Subs	0.6	3.7	-	-
Manufacture of containers and boxes of paper	3411	Import-Subs	0.1	0.6	-	-
Manufacture of pulp, paper and paperboard articles	3412	Export-Orient	0.4	0.4	0.8	0.9
Printing, publishing and allied industries	3419	Import-Subs	0.1	0.7	-	-
Manufacture of fertilizers and pesticides	3420	Export-Orient	0.3	0.6	-	-
Manufacture of synthetic resins, plastic materials	3512	Export-Orient	0.6	0.7	-	-
Manufacture of paints, varnishes and lacquers	3513	Import-Subs	0.3	2.0	-	-
Manufacture of drugs and medicines	3521	Export-Orient	0.8	3.3	-	-
Manufacture of soap and cleaning preparations	3522	Import-Subs	0.5	-1.3	4.0	-9.9
Manufacture of soap and cleaning preparations	3523	Export-Orient	0.5	5.7	-	-
Manufacture of chemical products	3528	Import-Subs	0.7	2.5	-	-
Petroleum refineries	3529	Import-Subs	0.5	1.5	-	-
Manufacture of miscellaneous products of petroleum	3530	Export-Orient	1.1	7.9	0.6	4.3
Tyre and tube industries	3540	Export-Orient	0.4	1.1	-	-
Manufacture of rubber products not elsewhere classified	3551	Import-Subs	0.1	0.1	-	-
Manufacture of plastic products not elsewhere classified	3559	Import-Subs	0.1	0.2	-	-
Manufacture of pottery, china and earthenware	3560	Import-Subs	0.2	0.2	-	-
Manufacture of glass and glass products	3610	Export-Orient	0.1	0.5	0.3	1.0
Manufacture of glass and glass products	3620	Export-Orient	0.7	1.8	-	-
Manufacture of structural clay products	3621	Import-Subs	1.1	2.0	-	-
Manufacture of cement, lime and plaster	3691	Import-Subs	0.7	2.6	-	-
Manufacture of nonmetallic mineral products	3692	Export-Orient	0.9	1.8	2.1	4.2
Iron and steel basic industries	3699	Export-Orient	1.4	2.2	-	-
Non-ferrous metal basic industries	3710	Import-Subs	0.3	1.8	-	-
Non-ferrous metal basic industries	3720	Import-Subs	0.9	1.6	-	-
Non-ferrous metal basic industries	3721	Import-Subs	0.6	1.8	-	-
Non-ferrous metal basic industries	3722	Import-Subs	2.3	3.3	1.2	1.7
Manufacture of cutlery, hand tools and general hardware	3723	Export-Orient	0.7	0.8	-	-
Manufacture of furniture and fixtures primarily of metal	3811	Import-Subs	0.2	0.4	-	-
Manufacture of structural metal products	3812	Export-Orient	0.4	1.0	-	-

Description	ISIC	Class	Price		Capacity	
			Short-Term	Long-Term	Short-Term	Long-Term
Manufacture of structural metal products	3813	Import-Subs	1.1	1.3	1.0	1.2
Manufacture of fabricated metal products	3814	Import-Subs	0.7	1.9	-	-
Manufacture of agricultural machinery and equipment	3819	Import-Subs	1.0	1.8	-	-
Manufacture of metal and woodworking machinery	3822	Import-Subs	0.1	0.1	-	-
Manufacture of special industrial machinery	3823	Import-Subs	1.0	4.7	-	-
Manufacture of office, computing	3824	Import-Subs	0.8	1.2	-	-
Manufacture of office, computing	3825	Import-Subs	0.1	0.1	-	-
Manufacture of office, computing	3826	Import-Subs	0.2	0.3	-	-
Machinery and equipment except electrical	3827	Import-Subs	0.4	0.5	-	-
Manufacture of electrical industrial machinery	3829	Import-Subs	1.1	12.0	-	-
Manufacture of radio, television	3831	Import-Subs	0.9	1.1	-	-
Manufacture of electrical appliances and house wares	3832	Import-Subs	0.5	1.9	-	-
Manufacture of electrical apparatus and supplies	3833	Import-Subs	1.0	5.0	-	-
Shipbuilding and repairing	3839	Import-Subs	0.2	2.1	-	-
Manufacture of motor vehicles	3841	Import-Subs	0.4	1.2	-	-
Manufacture of motorcycles and bicycles	3843	Import-Subs	2.1	2.2	-	-
Manufacture of aircraft	3844	Import-Subs	0.3	1.2	-	-
Manufacture of transport equipment	3845	Import-Subs	0.2	0.2	-	-
Manufacture of professional controlling equipment	3849	Import-Subs	0.7	2.0	-	-
Manufacture of photographic and optical goods	3851	Import-Subs	0.7	0.9	-	-
Manufacture of jewellery and related articles	3852	Import-Subs	0.6	2.0	-	-
Manufacture of musical instruments	3901	Export-Orient	0.4	5.8	-	-
Manufacture of sporting and athletic goods	3902	Import-Subs	0.3	0.6	-	-
Manufacture of sporting and athletic goods	3903	Import-Subs	3.2	3.8	4.0	4.7
Manufacturing industries not elsewhere classified	3904	Import-Subs	0.6	1.2	-	-
Manufacturing industries not elsewhere classified	3909	Import-Subs	0.1	0.5	-	-
<b>U N W E I G H T E D A V E R A G E S</b>						
Agriculture			0.30	1.08		
Mining			0.50	1.00		
Industry			0.73	1.93		
Export-Oriented Industries			0.55	1.69		
Import-Substituting Industries			0.79	1.93		
TOTAL			0.70	1.84		
<b>W E I G H T E D A V E R A G E S</b>						
Agriculture			0.34	1.29		
Mining			0.50	1.00		
Industry			0.72	1.99		

Description	ISIC	Class	Price		Capacity	
			Short-Term	Long-Term	Short-Term	Long-Term
Export-Oriented Industries			0.61	1.55		
Import-Substituting Industries			0.57	1.63		
TOTAL			0.54	1.63		

<sup>a</sup> Calculations are based on Ministerio de Agricultura y Desarrollo Ruara, publicado en L.J. Garay y A. E. Fenwrth, "Borrador de Avance Preliminar sobre los estudios preparatorios para la negociacion del TLC con los Estados Unidos." Republica de Colombia.

<sup>b</sup> Hypothetical parameters due to lack of time-series needed to calculate elasticities.

**Table 6-3***Colombia: Industrial Production FTA-related Shift-Analysis*

	ISIC	Class	Base Output Value (Colombian pesos)	Percent Change				Change in Value
				Cost	Qty1	Price	Qty2	
Growing of cereal and other crops	0111	Import-Subs	12,098,727,803	-7.9	18.1	-9.3	-21.4	-398,931,948
Growing of fruits, nuts, beverage	0113	Export-Orient	8,148,171,021	-6.7	3.1	0.0	0.0	251,471,346
Farming of cattle	0121	Export-Orient	6,610,249,657	-7.9	8.9	0.0	0.0	589,846,581
Other animal farming	0122	Export-Orient	3,454,336,727	-9.1	8.7	0.0	0.0	300,874,779
Growing of crops	0130	Export-Orient	5,210,025,828	-7.9	7.1	0.0	0.0	368,579,859
Forestry	0200	Export-Orient	1,725,353,065	-8.8	6.3	0.0	0.0	107,899,346
Mining and agglomeration of hard coal	1010	Export-Orient	159,048,050	-8.8	8.8	0.0	0.0	14,009,119
Mining and agglomeration of lignite	1020	Export-Orient	4,179,212,158	-8.8	8.8	0.0	0.0	368,109,397
Extraction of crude petroleum and natural gas	1110	Export-Orient	22,796,461,710	-8.8	8.8	0.0	0.0	2,007,936,294
Mining of iron ores	1310	Export-Orient	1,114,503,112	-8.8	8.8	0.0	0.0	98,166,605
Manufacture of dairy products	3111	Import-Subs	1,926,240,872	-12.4	60.4	-15.5	-75.8	-296,737,978
Canning and preserving of fruits and vegetables	3112	Export-Orient	2,984,418,821	-7.5	9.8	0.0	0.0	293,683,374
Canning, preserving and processing of fish	3113	Import-Subs	484,465,002	-8.8	30.3	-15.8	-54.2	-115,732,190
Manufacture of vegetable and animal oils and fats	3114	Export-Orient	418,875,511	-10.0	10.2	0.0	0.0	42,568,547
Grain mill products	3115	Import-Subs	1,480,260,901	-13.0	9.9	-14.7	-11.2	-19,674,933
Manufacture of bakery products	3116	Import-Subs	3,020,607,359	-8.8	4.1	-16.6	-7.7	-108,972,819
Sugar factories and refineries	3117	Export-Orient	1,209,205,763	-8.8	-25.3	0.0	0.0	-305,683,134
Manufacture of food products not elsewhere classified	3118	Export-Orient	1,772,400,339	-12.4	18.9	0.0	0.0	335,336,319
Manufacture of prepared animal feeds	3121	Export-Orient	1,815,868,211	-12.9	21.7	0.0	0.0	394,438,023
Manufacture of prepared animal feeds	3122	Import-Subs	1,846,193,690	-12.6	2.3	-9.1	-1.6	11,664,852
Distilling, rectifying and blending spirits	3123	Import-Subs	93,220,874	-13.2	31.4	-10.3	-24.5	6,464,430
Wine industries	3131	Import-Subs	540,558,804	-13.2	11.0	-16.2	-13.5	-13,401,360
Malt liquors and malt	3132	Import-Subs	39,412,050	-13.0	11.7	-16.7	-15.0	-1,298,602
Soft drinks and carbonated waters industries	3133	Import-Subs	1,866,805,594	-13.5	38.6	-16.6	-47.5	-167,343,946
Tobacco manufactures	3134	Export-Orient	1,939,981,926	-11.5	16.7	0.0	0.0	324,749,296

	ISIC	Class	Base Output Value (Colombian pesos)	Percent Change				Change in Value
				Cost	Qty1	Price	Qty2	
Spinning, weaving and finishing textiles	3140	Import-Subs	388,114,993	-11.8	64.5	-16.7	-91.5	-104,539,667
Manufacture of made-up textile goods	3211	Import-Subs	702,313,934	-9.0	4.1	-8.7	-3.9	980,565
Cordage, rope and twine industries	3212	Export-Orient	146,006,755	-12.0	7.7	0.0	0.0	11,199,280
Cordage, rope and twine industries	3215	Import-Subs	33,730,102	-8.4	3.6	-13.0	-5.5	-659,079
Cordage, rope and twine industries	3216	Import-Subs	798,420,036	-9.3	28.1	-16.5	-49.9	-174,620,489
Cordage, rope and twine industries	3217	Import-Subs	51,927,777	-8.3	14.3	-16.7	-28.7	-7,449,738
Manufacture of textiles not elsewhere classified	3218	Import-Subs	393,709,848	-8.8	14.7	-15.3	-25.5	-42,688,906
Manufacture of wearing apparel, except footwear	3219	Import-Subs	121,405,242	-10.3	101.0	-12.9	-126.4	-30,823,663
Manufacture of wearing apparel, except footwear	3220	Export-Orient	2,218,615,336	-14.7	26.2	0.0	0.0	581,543,210
Tanneries and leather finishing	3221	Export-Orient	200,053,030	-12.5	132.6	0.0	0.0	265,198,544
Fur dressing and dyeing industries	3231	Export-Orient	241,360,819	-12.1	23.5	0.0	0.0	56,629,526
Manufacture of products of leather and leather substitutes	3232	Export-Orient	47,789,136	-8.8	1.2	0.0	0.0	583,355
Manufacture of footwear	3233	Export-Orient	91,178,930	-10.3	5.5	0.0	0.0	5,039,558
Sawmills, planing and other wood mills	3240	Import-Subs	321,964,682	-10.5	22.5	-16.6	-35.6	-42,325,587
Manufacture of wooden and cane containers	3311	Export-Orient	281,908,859	-9.7	4.2	0.0	0.0	11,788,791
Manufacture of wood and cork products	3312	Export-Orient	4,801,141	-8.0	3.1	0.0	0.0	147,261
Manufacture of furniture and fixtures	3319	Import-Subs	20,255,756	-7.3	8.6	-11.3	-13.3	-948,984
Manufacture of pulp, paper and paperboard	3320	Import-Subs	263,825,473	-9.9	36.7	-9.9	-36.7	104,869
Manufacture of containers and boxes of paper	3411	Import-Subs	1,414,282,500	-7.8	4.4	-10.8	-6.1	-23,778,036
Manufacture of pulp, paper and paperboard articles	3412	Export-Orient	723,868,366	-10.6	4.4	0.0	0.0	31,507,075
Printing, publishing and allied industries	3419	Import-Subs	948,012,583	-10.7	7.7	-9.7	-7.0	6,714,875
Manufacture of fertilizers and pesticides	3420	Export-Orient	2,128,075,665	-10.4	6.1	0.0	0.0	129,874,455
Manufacture of synthetic resins, plastic materials	3512	Export-Orient	1,342,241,004	-5.6	4.2	0.0	0.0	56,051,454
Manufacture of paints, varnishes and lacquers	3513	Import-Subs	1,573,487,869	-7.1	14.4	-8.3	-16.9	-39,772,762
Manufacture of drugs and medicines	3521	Export-Orient	478,937,942	-8.2	27.6	0.0	0.0	132,125,324
Manufacture of soap and cleaning preparations	3522	Import-Subs	2,457,645,038	-7.5	-9.9	-6.4	8.5	-35,663,438
Manufacture of soap and cleaning preparations	3523	Export-Orient	2,326,553,708	-9.3	52.7	0.0	0.0	1,227,251,670

	ISIC	Class	Base Output Value (Colombian pesos)	Percent Change				Change in Value
				Cost	Qty1	Price	Qty2	
Manufacture of chemical products	3528	Import-Subs	25,481,812	-7.8	19.2	-11.3	-27.8	-2,174,236
Petroleum refineries	3529	Import-Subs	630,603,295	-8.0	12.0	-8.8	-13.1	-7,191,244
Manufacture of miscellaneous products of petroleum	3530	Export-Orient	5,671,662,479	0.0	0.1	0.0	0.0	6,454,609
Tyre and tube industries	3540	Export-Orient	413,763,616	-7.5	8.5	0.0	0.0	35,166,212
Manufacture of rubber products not elsewhere classified	3551	Import-Subs	366,830,431	-9.1	0.6	-12.1	-0.9	-781,490
Manufacture of plastic products not elsewhere classified	3559	Import-Subs	152,048,678	-8.6	1.6	-11.3	-2.1	-763,912
Manufacture of pottery, china and earthenware	3560	Import-Subs	2,931,075,366	-8.6	1.6	-10.1	-1.9	-8,343,556
Manufacture of glass and glass products	3610	Export-Orient	511,571,696	-9.5	5.2	0.0	0.0	26,472,095
Manufacture of glass and glass products	3620	Export-Orient	580,151,028	-8.8	15.7	0.0	0.0	90,864,723
Manufacture of structural clay products	3621	Import-Subs	33,575,747	-9.0	17.6	-12.3	-24.0	-2,149,302
Manufacture of cement, lime and plaster	3691	Import-Subs	164,685,475	-5.4	14.0	-12.5	-32.6	-30,617,240
Manufacture of nonmetallic mineral products	3692	Export-Orient	1,422,279,610	-8.3	15.3	0.0	0.0	216,991,443
Iron and steel basic industries	3699	Export-Orient	745,083,479	-8.7	19.0	0.0	0.0	141,508,302
Non-ferrous metal basic industries	3710	Import-Subs	1,856,108,191	-8.0	14.0	-8.8	-15.5	-27,243,239
Non-ferrous metal basic industries	3720	Import-Subs	245,152,213	-7.7	12.2	-7.9	-12.6	-1,057,777
Non-ferrous metal basic industries	3721	Import-Subs	11,404,013	-5.2	9.4	-5.1	-9.2	22,889
Non-ferrous metal basic industries	3722	Import-Subs	16,710,839	-5.2	17.2	-5.9	-19.3	-350,665
Manufacture of cutlery, hand tools and general hardware	3723	Export-Orient	124,116,353	-9.1	7.5	0.0	0.0	9,259,192
Manufacture of furniture and fixtures primarily of metal	3811	Import-Subs	211,348,818	-9.0	3.7	-12.8	-5.3	-3,312,735
Manufacture of structural metal products	3812	Export-Orient	169,530,046	-10.1	10.4	0.0	0.0	17,695,412
Manufacture of structural metal products	3813	Import-Subs	299,414,242	-9.6	12.8	-9.8	-13.2	-969,087
Manufacture of fabricated metal products	3814	Import-Subs	70,549,297	-7.9	14.7	-11.9	-22.1	-5,212,913
Manufacture of agricultural machinery and equipment	3819	Import-Subs	713,691,355	-9.2	16.6	-12.2	-21.9	-37,926,458
Manufacture of metal and woodworking machinery	3822	Import-Subs	19,500,262	-9.0	1.0	-8.8	-1.0	4,324
Manufacture of special industrial machinery	3823	Import-Subs	10,887,846	-8.5	39.6	-9.0	-41.7	-227,451
Manufacture of office, computing	3824	Import-Subs	68,727,739	-8.5	9.8	-6.3	-7.2	1,778,785
Manufacture of office, computing	3825	Import-Subs	7,140,267	-8.8	1.0	-4.8	-0.6	33,083

	ISIC	Class	Base Output Value (Colombian pesos)	Percent Change				Change in Value
				Cost	Qty1	Price	Qty2	
Manufacture of office, computing	3826	Import-Subs	50,117,422	-8.5	2.4	-5.8	-1.6	374,970
Machinery and equipment except electrical	3827	Import-Subs	473,676,594	-9.4	4.5	-10.9	-5.2	-3,351,721
Manufacture of electrical industrial machinery	3829	Import-Subs	274,686,991	-9.4	112.3	-9.7	-116.3	-11,040,993
Manufacture of radio, television equipment	3831	Import-Subs	349,534,016	-10.0	10.9	-10.3	-11.2	-1,333,856
Manufacture of electrical appliances and house wares	3832	Import-Subs	166,840,759	-8.9	16.6	-6.8	-12.6	6,591,533
Manufacture of electrical apparatus and supplies	3833	Import-Subs	46,207,505	-9.4	47.0	-13.6	-68.5	-9,957,354
Shipbuilding and repairing	3839	Import-Subs	678,834,471	-8.6	17.9	-9.7	-20.1	-15,012,961
Manufacture of motor vehicles	3841	Import-Subs	14,576,634	-7.1	8.8	-3.8	-4.7	610,706
Manufacture of motorcycles and bicycles	3843	Import-Subs	2,596,126,322	-13.5	30.5	-14.6	-32.9	-63,682,351
Manufacture of aircraft	3844	Import-Subs	254,212,459	-14.1	17.0	-16.2	-19.4	-6,123,725
Manufacture of transport equipment	3845	Import-Subs	143,930,200	-1.5	0.3	-0.6	-0.1	265,197
Manufacture of professional controlling equipment	3849	Import-Subs	10,878,590	-11.7	23.5	-16.7	-33.5	-1,094,317
Manufacture of photographic and optical goods	3851	Import-Subs	355,233,835	-9.7	8.4	-5.5	-4.8	12,859,720
Manufacture of jewellery and related articles	3852	Import-Subs	24,669,917	-9.7	18.9	-11.5	-22.5	-877,900
Manufacture of musical instruments	3901	Export-Orient	14,532,032	-8.9	51.8	0.0	0.0	7,530,053
Manufacture of sporting and athletic goods	3902	Import-Subs	1,439,038	-9.9	6.1	-5.4	-3.3	39,634
Manufacture of sporting and athletic goods	3903	Import-Subs	6,355,159	-10.1	38.0	-16.4	-61.5	-1,496,196
Manufacturing industries not elsewhere classified	3904	Import-Subs	255,133,624	-9.8	11.4	-14.5	-16.7	-13,689,379
Manufacturing industries not elsewhere classified	3909	Import-Subs	83,676,980	-9.7	5.0	-11.5	-5.9	-783,600
<b>V A L U E</b>								
Agriculture			37,246,864,100					1,219,739,963
Mining			28,249,225,030					2,488,221,415
Industry			62,506,518,110					3,008,024,543
Export-Oriented Industries			83422192928					8,252,867,295
Import-Substituting Industries			46506655184					-1,833,619,352
TOTAL			129,928,848,112					6,419,247,943





**Table 6-4**  
Colombia – Employment Effects of Industrial Production Shifts

	ISIC	Classification	Employment in 2000	Change in Employment	
				Amount	Percent
Growing of cereal and other crops	0111	Import-Subs	463,133	-15,270.9	-3.3
Growing of fruits, nuts, beverage	0113	Export-Orient	751,112	23,181.0	3.1
Farming of cattle	0121	Export-Orient	447,900	39,967.1	8.9
Other animal farming	0122	Export-Orient	400,000	34,840.2	8.7
Growing of crops	0130	Export-Orient	312,130	22,081.4	7.1
Forestry	0200	Export-Orient	336,207	21,025.6	6.3
Mining and agglomeration of hard coal a	1010	Export-Orient	34,387	3,028.8	8.8
Mining and agglomeration of lignite a	1020	Export-Orient	30,000	2,642.4	8.8
Extraction of crude petroleum and natural gas /	1110	Export-Orient	28,129	2,477.6	8.8
Mining of iron ores	1310	Export-Orient	1,000	88.1	8.8
Manufacture of dairy products	3111	Import-Subs	13,652	-2,103.1	-15.4
Canning and preserving of fruits and vegetables	3112	Export-Orient	13,846	1,362.5	9.8
Canning, preserving and processing of fish	3113	Import-Subs	3,832	-915.4	-23.9
Manufacture of vegetable and animal oils and fats	3114	Export-Orient	4,275	434.5	10.2
Grain mill products	3115	Import-Subs	9,002	-119.7	-1.3
Manufacture of bakery products	3116	Import-Subs	11,098	-400.4	-3.6
Sugar factories and refineries	3117	Export-Orient	19,636	-4,963.9	-25.3
Manufacture of food products not elsewhere classified	3118	Export-Orient	8,277	1,566.0	18.9
Manufacture of prepared animal feeds	3121	Export-Orient	13,001	2,824.0	21.7
Manufacture of prepared animal feeds	3122	Import-Subs	4,711	29.8	0.6
Distilling, rectifying and blending spirits	3123	Import-Subs	839	58.2	6.9
Wine industries	3131	Import-Subs	2,960	-73.4	-2.5
Malt liquors and malt	3132	Import-Subs	538	-17.7	-3.3
Soft drinks and carbonated waters industries	3133	Import-Subs	8,124	-728.3	-9.0
Tobacco manufactures	3134	Export-Orient	11,217	1,877.7	16.7
Spinning, weaving and finishing textiles	3140	Import-Subs	1,075	-289.6	-26.9
Manufacture of made-up textile goods	3211	Import-Subs	12,081	16.9	0.1
Cordage, rope and twine industries	3212	Export-Orient	3,471	266.2	7.7
Cordage, rope and twine industries	3215	Import-Subs	523	-10.2	-2.0
Cordage, rope and twine industries	3216	Import-Subs	12,091	-2,644.4	-21.9
Cordage, rope and twine industries	3217	Import-Subs	1,082	-155.2	-14.3
Manufacture of textiles not elsewhere classified	3218	Import-Subs	5,165	-560.0	-10.8
Manufacture of wearing apparel, except footwear	3219	Import-Subs	808	-205.1	-25.4
Manufacture of wearing apparel, except footwear	3220	Export-Orient	57,883	15,172.3	26.2
Tanneries and leather finishing	3221	Export-Orient	3,500	4,639.7	132.6
Fur dressing and dyeing industries	3231	Export-Orient	2,831	664.2	23.5

	ISIC	Classification	Employment in 2000	Change in Employment	
				Amount	Percent
Manufacture of products of leather and leather substitutes	3232	Export-Orient	584	7.1	1.2
Manufacture of footwear	3233	Export-Orient	2,627	145.2	5.5
Sawmills, planing and other wood mills	3240	Import-Subs	9,075	-1,193.0	-13.1
Manufacture of wooden and cane containers	3311	Export-Orient	3,720	155.6	4.2
Manufacture of wood and cork products	3312	Export-Orient	142	4.4	3.1
Manufacture of furniture and fixtures	3319	Import-Subs	1,218	-57.1	-4.7
Manufacture of pulp, paper and paperboard	3320	Import-Subs	5,690	2.3	0.0
Manufacture of containers and boxes of paper	3411	Import-Subs	6,104	-102.6	-1.7
Manufacture of pulp, paper and paperboard articles	3412	Export-Orient	5,196	226.2	4.4
Printing, publishing and allied industries	3419	Import-Subs	4,553	32.2	0.7
Manufacture of fertilizers and pesticides	3420	Export-Orient	26,073	1,591.2	6.1
Manufacture of synthetic resins, plastic materials	3512	Export-Orient	3,546	148.1	4.2
Manufacture of paints, varnishes and lacquers	3513	Import-Subs	3,872	-97.9	-2.5
Manufacture of drugs and medicines	3521	Export-Orient	2,522	695.7	27.6
Manufacture of soap and cleaning preparations	3522	Import-Subs	16,567	-240.4	-1.5
Manufacture of soap and cleaning preparations	3523	Export-Orient	15,079	7,954.1	52.7
Manufacture of chemical products not elsewhere classified	3528	Import-Subs	441	-37.6	-8.5
Petroleum refineries	3529	Import-Subs	4,430	-50.5	-1.1
Manufacture of miscellaneous products of petroleum	3530	Export-Orient	3,961	4.5	0.1
Tyre and tube industries	3540	Export-Orient	946	80.4	8.5
Manufacture of rubber products not elsewhere classified	3551	Import-Subs	2,178	-4.6	-0.2
Manufacture of plastic products not elsewhere classified	3559	Import-Subs	3,097	-15.6	-0.5
Manufacture of pottery, china and earthenware	3560	Import-Subs	31,349	-89.2	-0.3
Manufacture of glass and glass products	3610	Export-Orient	5,235	270.9	5.2
Manufacture of glass and glass products	3620	Export-Orient	4,233	663.0	15.7
Manufacture of structural clay products	3621	Import-Subs	565	-36.2	-6.4
Manufacture of cement, lime and plaster	3691	Import-Subs	5,365	-997.4	-18.6
Manufacture of nonmetallic mineral products	3692	Export-Orient	3,914	597.1	15.3
Iron and steel basic industries	3699	Export-Orient	7,289	1,384.3	19.0
Non-ferrous metal basic industries	3710	Import-Subs	8,728	-128.1	-1.5
Non-ferrous metal basic industries	3720	Import-Subs	2,215	-9.6	-0.4
Non-ferrous metal basic industries	3721	Import-Subs	101	0.2	0.2
Non-ferrous metal basic industries	3722	Import-Subs	287	-6.0	-2.1
Manufacture of cutlery, hand tools and general hardware	3723	Export-Orient	144	10.7	7.5

	ISIC	Classification	Employment in 2000	Change in Employment	
				Amount	Percent
Manufacture of furniture and fixtures primarily of metal	3811	Import-Subs	5,396	-84.6	-1.6
Manufacture of structural metal products	3812	Export-Orient	4,174	435.7	10.4
Manufacture of structural metal products	3813	Import-Subs	5,005	-16.2	-0.3
Manufacture of fabricated metal products	3814	Import-Subs	1,555	-114.9	-7.4
Manufacture of agricultural machinery and equipment	3819	Import-Subs	9,992	-531.0	-5.3
Manufacture of metal and woodworking machinery	3822	Import-Subs	668	0.1	0.0
Manufacture of special industrial machinery and equipment	3823	Import-Subs	248	-5.2	-2.1
Manufacture of office, computing and accounting machinery	3824	Import-Subs	1,613	41.7	2.6
Manufacture of office, computing and accounting machinery	3825	Import-Subs	177	0.8	0.5
Manufacture of office, computing and accounting machinery	3826	Import-Subs	1,893	14.2	0.7
Machinery and equipment except electrical	3827	Import-Subs	5,880	-41.6	-0.7
Manufacture of electrical industrial machinery and apparatus	3829	Import-Subs	6,032	-242.5	-4.0
Manufacture of radio, television and communication equipment	3831	Import-Subs	5,339	-20.4	-0.4
Manufacture of electrical appliances and housewares	3832	Import-Subs	2,288	90.4	4.0
Manufacture of electrical apparatus and supplies	3833	Import-Subs	697	-150.2	-21.5
Shipbuilding and repairing	3839	Import-Subs	6,483	-143.4	-2.2
Manufacture of motor vehicles	3841	Import-Subs	603	25.3	4.2
Manufacture of motorcycles and bicycles	3843	Import-Subs	11,074	-271.6	-2.5
Manufacture of aircraft	3844	Import-Subs	2,178	-52.5	-2.4
Manufacture of transport equipment not elsewhere classified	3845	Import-Subs	997	1.8	0.2
Manufacture of professional controlling equipment	3849	Import-Subs	246	-24.7	-10.1
Manufacture of photographic and optical goods	3851	Import-Subs	3,631	131.4	3.6
Manufacture of jewellery and related articles	3852	Import-Subs	418	-14.9	-3.6
Manufacture of musical instruments	3901	Export-Orient	758	392.8	51.8
Manufacture of sporting and athletic goods	3902	Import-Subs	60	1.7	2.8
Manufacture of sporting and athletic goods	3903	Import-Subs	122	-28.7	-23.5
Manufacturing industries not elsewhere classified	3904	Import-Subs	5,531	-296.8	-5.4
Manufacturing industries not elsewhere classified	3909	Import-Subs	2,133	-20.0	-0.9
Agriculture			2,710,482	125,824	4.6
Mining			93,516	8,237	8.8
Industry			488,103	27,813	5.7

	ISIC	Classification	Employment in 2000	Change in Employment	
				Amount	Percent
Export-Oriented Industries			2,926,429	219,430	7.5
Import-Substituting Industries			736,808	(28,171)	-3.8
TOTAL			3,292,101	161,875	4.9



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# Appendix A. Technical Descriptions

## A.1 Derivation of the Trade-Related Effects of the FTA

The *direct effects* of an FTA can be separated into five components, described and specified as follows:

*Trade Creation Effect.* The trade creation effect refers to the change in the level of domestic demand for imported inputs and final goods from trading partners resulting from tariff-associated foreign price reductions relative to domestically produced goods. The import price of a product is equal to the trading partner's export price plus transportation and insurance charges plus the ad valorem tariff applied to the good. The import price, including the tariff (i.e., the domestic price),  $P_d$ , of a product can therefore be expressed as follows:

$$P_d = P_f(1+t) \quad (\text{A.1.1})$$

where  $P_f$  is the border import price of the product originating from the nonpreferential supplying country, which implicitly includes freight and insurance, and  $t$  is the ad valorem tariff rate applied to the product.

Because for small markets like Colombia the foreign market export supply to that market is likely to be perfectly price elastic, in the short term the percentage change in demand for the quantity of imports  $M$  of product  $i$  by country  $j$  associated with a change in tariff is equal to:<sup>13</sup>

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<sup>13</sup>The small-market assumption is important for the calculations that follow. In calculating each effect of tariff reductions, the assumption means that the Colombian market represents a fairly small proportion of its trading partners' total exports and, hence, that the import supply schedule is infinite with respect to prices. Prices of each of Colombia's imported products are therefore changed by the full amount of any tariff reduction on the products. Were the import supply schedule to be less than perfectly elastic with respect to prices, a change in tariffs would lead to less than proportional changes in prices and smaller increases in the volume of imports than would otherwise occur under a perfectly priced elastic import supply schedule.



$$\Delta M_{ij}/M_{ij} = \varepsilon_s [\Delta t_i/(1+t_i)] \quad \text{A.1.2}$$

where  $\varepsilon_s$  is the price elasticity of import demand in the short term.

Similarly, in the long term the percentage change in imports of the product corresponding to a change in the associated ad valorem tariff is equal to:

$$\Delta M_{ij}/M_{ij} = \varepsilon^l [\Delta t_i/(1+t_i)] \quad \text{(A.1.3)}$$

where  $\varepsilon^l$  is the price elasticity of import demand in the long term.

The trade creation effect is obtained when equation (A.1.3) is multiplied on both sides of the equation by  $M_{ij}$ :<sup>14</sup>

$$\Delta M_{ij} = \varepsilon^l [\Delta t_i/(1+t_i)] M_{ij} \quad \text{(A.1.4)}$$

The magnitude of trade creation is therefore shown to depend on (a) the price elasticity of demand for imports, (b) the percentage change in the reduction of the MFN rate, and (c) the level of imports of individual products.

*Trade Diversion Effect.* The trade diversion effect is the substitution of imports from one set of suppliers for imports from other sources. For Colombia, that substitution refers to the substitution between supplies originating from the United States and those originating from foreign suppliers subject to MFN rates. In practice, MFN tariff reductions give rise to trade diversion effects in countries participating in preferential trade arrangements. The reason is that MFN tariff reductions lower the import prices of goods originating from countries that are not part of the preferential arrangement relative to goods from countries that enjoy preferential treatment. As prices fall for imports of the nonpreferential sources, the quantity demanded of those imports tends to expand relative to those of countries enjoying preferential treatment, in this case the United States.

The amount of the erosion of preferential trade resulting from MFN tariff reductions depends on the extent to which importers respond to relative price changes. The amount by which trade in a particular good will shift from preferential to nonpreferential suppliers will depend on the elasticity between the price of goods originating from nonpreferential areas and the imports from preferential sources. The cross-price elasticity assumes product differentiation and requires the calculation of separate import and export demand functions for individual markets (for an application, see Lord 1991). Rousslang and Parker (1984) offer a simplified

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<sup>14</sup>Similar calculations have been used by the UNCTAD Trade Policy Simulation Model (Laird and Yeats 1986) and Shiells et al. (1996).

approach based on own-price elasticity estimates of the type estimated in the present study.<sup>15</sup> The own-price elasticity approximates the cross-price elasticity as follows:<sup>16</sup>

$$\varepsilon_{jk}^c = -\varepsilon^p (V_{ij}/V_i) \dots \quad (\text{A.1.5})$$

where the parameters and variables are defined as follows:

$\varepsilon_{jk}^c$  is the cross-price elasticity between the preferential-rate supplier  $k$  and the nonpreferential rate suppliers  $j$ ;

$\varepsilon^p$  is the own price elasticity of demand;

$V_{ij}$  is the value of imports from the nonpreferential suppliers; and

$V_i$  is the total value of imports of the product  $i$  into Colombia.

Then the *trade diversion effect* is given by:

$$\Delta M_{ik} = -\varepsilon^p (V_{ij}/V_i) [\Delta t_i/(1+t_i)] M_{ik} \quad (\text{A.1.6})$$

where  $\Delta M_{ik}$  is the change in the volume of imports from preferred sources due to the preference erosion. The value of the effect is equal to:

$$\Delta V_{jk} = -\varepsilon^p (V_{ij}/V_i) [\Delta t_i/(1+t_i)] V_{ik} \quad (\text{A.1.7})$$

The preference erosion for a trading partner  $k$  is shown to depend on (1) the price elasticity of demand for imports from that source, (2) the share of imports from other (nonpreferential) sources, and (3) the percentage change in tariff reductions from nonpreferential sources. These calculations refer to imports of individual products. Following Shiells, Subramanian and Uimonen (1996), we approximate the price elasticity of demand for imports from preferential-rate suppliers by estimates of the price elasticity of import demand from all supply sources, denoted  $\varepsilon^p$ .

*Balance of Payments Effect.* The balance of payments effect is the sum of the value of changes in individual product imports. It can be calculated from the sum of the trade-creation and trade-diversion effects:

$$\Delta V = [1 - (V_{ik}/V_i)] \varepsilon^p [\Delta t_i/(1+t_i)] V_i \quad (\text{A.1.8})$$

The reduction of tariffs will likely stimulate an increase in the volume of imports. As long as the absolute value of the price elasticity of import demand is greater than unity, a lowering of

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<sup>15</sup>The approach was first devised by Baldwin and Murray (1977) and used in the UNCTAD Trade Policy Simulation Model (TPSM), as described by Laird and Yeats (1986). Laird and Yeats (1990) also provide alternative methods for calculating the effects of the erosion in preferential trade arrangements.

<sup>16</sup>In the Baldwin-Murray (1977) approach the level of imports from non-preference receiving countries is compared with the apparent value of domestic consumption, defined as domestic output of the product *plus* imports *less* exports. Because data on domestic consumption are not available for Colombia, imports were used as a proxy.

import prices resulting from a tariff cut should lead theoretically to a more-than-proportional rise in the volume of imports. Consequently, for products having a price-elastic import demand schedule, tariff reductions should lead to a net increase in the value of imports over the level that existed before the tariff cuts.

*Government Revenue Effect.* The government revenue effect is defined as the change in customs fees resulting from tariff cuts, and it includes both the lower revenue per unit of imports and the higher import volumes resulting from the trade creation effect. The customs revenue effect is calculated from the trade creation effect:

$$\Delta T/T = \Delta t/t + \Delta M/M \quad (\text{A.1.9})$$

where  $T$  denotes the customs revenue. Hence, the change in the government revenue is equal to:

$$\Delta G = (\Delta t/t + \Delta M/M) T \quad (\text{A.1.10})$$

*Consumer Cost Effect.* This effect refers to the gains that consumers obtain from lower prices on imported goods when tariffs are lowered. For the pre-tariff-cut level of imports Cline et al. (1978) noted that the import prices resulting from tariff reductions simply represent a transfer to consumers of revenue formerly collected by the government in the form of customs duties and indirect taxes. There is, however, a welfare gain from the trade creation effect. This effect is normally calculated as the average increase in the quantity of imports,  $\Delta M$ , valued at the average between the tariff incidence before and after liberalization. Following Laird and Yeats (1986), we estimate that *welfare gain*,  $\Delta W$ , as follows:

$$\Delta W = \Delta t \Delta M/2 \quad (\text{A.1.11})$$

## A.2 Estimation Procedure

Measuring the impact of a U.S.-Colombia FTA on the trade balance of Colombia requires that we estimate product-specific relationships for Colombia's import demand and the U.S. import demand. The estimates of these relationships follow a sequence of steps to (1) identify the characteristics of each series, (2) specify the parsimonious model used to characterize the data-generating process, and (3) estimate the model.<sup>17</sup> Here we describe steps for identifying the characteristics of each series and, where appropriate, modeling their relationship to one another.

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<sup>17</sup> For a detailed exposition of the modeling process for international trade, see Lord (1991).

## STEP 1. UNIT ROOT TESTS

An economic relationship generally refers to a state where there is no inherent tendency to change. Such a relationship is, for example, described by the relationship of the log linear form  $x_i = \beta y_j$ , where trade-related changes in country  $i$  are related to changes in the economic activity of a foreign market  $j$ . In practice, however, an equilibrium relationship is seldom observed, so that measures of the observed relationship between  $x_i$  and  $y_j$  include both the equilibrium state and the discrepancy between the outcome and the postulated equilibrium. The discrepancy, denoted  $d$ , cannot have a tendency to grow systematically over time, nor is there any systematic tendency for the discrepancy to diminish in a real economic system because short-term disturbances are continuous occurrences. The discrepancy is therefore said to be stationary insofar as over a finite period of time it has a mean of zero.

Individual time series that are themselves stationary are statistically related to each other, regardless of whether there exists a true equilibrium relationship. Thus, before estimating the export demand for Colombia, it is useful to determine whether the data-generating process of each of the series is itself stationary. Because economic activity variables have a tendency to grow (positively or negatively) over time, the variables themselves cannot be stationary, but changes in those series might be stationary. Series that are integrated of the same order, however, are said to be cointegrated and to have a long-term equilibrium relationship.<sup>18</sup> For trending variables that are themselves nonstationary, but can be made stationary by being differenced exactly  $k$  times, then the linear combination of any two of those series will itself be stationary. It is therefore important to test the order of integration of the key series in the model.

Tests for stationarity are derived from the regression of the changes in a variable against the lagged level of that variable. Consider the following simple levels regression:

$$y_t = a + by_{t-1} + d \quad (\text{A.2.1})$$

where  $a$  and  $b$  are constants and  $d$  is an error term. Then  $y$  is a stationary series if  $-1 < b < 1$ . If  $b = 1$ ,  $y$  is a nonstationary series and is instead a random walk with drift; if the absolute value of  $b$  is greater than one, the series is explosive.

By subtracting  $y_{t-1}$  from both sides, we obtain

$$\Delta y_t = a + (b-1)y_{t-1} + d \quad (\text{A.2.2})$$

The disturbance term  $d$  now has a constant distribution and the t-statistic on  $y_{t-1}$  provides a means for testing nonstationarity. If the coefficient on  $y_{t-1}$  is zero, then  $b$  must be equal to 1,

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<sup>18</sup>A series is said to be integrated of order  $k$ , denoted  $I(k)$ , if the series needs to be differenced  $k$  times to form a stationary series. Thus, for example, a trending series that is  $I(1)$  needs to be differenced one time to achieve stationarity.

and  $y$  is therefore stationary. The Augmented Dickey-Fuller test is a test on the t-statistic of the coefficient on  $y_{t-1}$ . The hypothesis  $H_0 = b-1 = 0$  is called the unit-root hypothesis and it implies that  $y_t$  is nonstationary.

The second test for nonstationarity is the Durbin-Watson (DW) test on the levels regression specified above. Because the DW statistically is given by

$$DW = 2(1-r) \quad (A.2.3)$$

where  $r$  is the correlation coefficient between  $y_t$  and  $y_{t-1}$ , then  $y$  is white noise when  $r$  is zero. The DW is therefore 2 when  $y$  is stationary.

## STEP 2. MODELING DEMAND RELATIONSHIPS

Economic series that are related to the long-term adjustment processes of other variables have been designated by Granger and Weiss (1983) and Engle and Granger (1987) to be cointegrated series. The theory of cointegration states that if two series,  $x$  and  $y$ , grow over time in such a way that the linear combination of these two variables, given by  $d_t = x_t - \alpha y_t$ , is stationary, and if  $\alpha$  is unique, then  $x$  and  $y$  are said to be cointegrated. The series  $d_t$  measures the disequilibrium at period  $t$  when the long-term relationship between the two variables is  $x_t = \alpha y_t$ . The theory of cointegration states that movements in variables are related in a predictable way to the discrepancy between observed and equilibrium states. The sequence of this discrepancy tends to decay to its mean of zero.

Engle and Granger (1987) have demonstrated that a data-generating process of the form known as the error-correction mechanism adjusts for any disequilibrium between variables that are cointegrated, which has been used for instance by Sanso and Montanes (2002) to examine the effects of a tariff cut process on trade flows when the variables are nonstationary. The error-correction mechanism thus provides the means by which the short-term observed behavior of variables is associated with their long-term equilibrium growth paths. Davidson *et al.* (1978) established a closely related specification known as the equilibrium-correcting mechanism that models both the short and long-term relationships between variables. Rearranging the terms of a first-order stochastic difference equation yields the following ECM:

$$\Delta x_t = \alpha_0 + \alpha_1(x - y)_{t-1} + \alpha_2 \Delta y_t + \alpha_3 y_{t-1} + v_t \quad (A.2.4)$$

where  $-1 < \alpha_1 < 0$ ,  $\alpha_2 > 0$  and  $\alpha_3 > -1$ , and where all variables are measured in logarithmic terms.

The second term,  $\alpha_1(x - y)_{t-1}$ , is the mechanism for adjusting any disequilibrium in the previous period. When the rate of growth of the dependent variable  $x_t$  falls below its steady-state path, the value of the ratio of variables in the second term decreases in the subsequent

period. That decrease, combined with the negative coefficient of the term, has a positive influence on the growth rate of the dependent variable. Conversely, when the growth rate of the dependent variable increases above its steady-state path, the adjustment mechanism embodied in the second term generates downward pressure on the growth rate of the dependent variable until it reaches that of its steady-state path. The speed with which the system approaches its steady-state path depends on the proximity of the coefficient to minus one. If the coefficient is close to minus one, the system converges to its steady-state path quickly; if it is near zero, the approach of the system to the steady-state path is slow. Because the variables are measured in logarithms,  $\Delta x$  and  $\Delta y$  can be interpreted as the rate of change of the variables. Thus the third term,  $\alpha_2 \Delta y_t$ , expresses the steady-state growth in  $X$  associated with  $Y$ . Finally, the fourth term,  $\alpha_3 y_{t-1}$ , shows that the steady-state response of the dependent variable  $X$  to the variable  $Y$  is nonproportional when the coefficient has non-zero significance.

The equilibrium solution of equation (A.2.4) is a constant value if there is convergence. Because the solution is unrelated to time, the rate of change over time of the dependent variable  $X$  (given by  $\Delta x_t$ ) and the explanatory variable  $Y$  (given by  $\Delta y_t$ ) are equal to zero. However, in dynamic equilibrium, equation (A.2.4) generates a steady-state response in which growth occurs at a constant rate, say  $g$ . For the dynamic specification of the relationship in (A.2.4), if  $g_1$  is defined as the steady-state growth rate of the dependent variable  $X$ , and  $g_2$  corresponds to the steady-state growth rate of the explanatory variable  $Y$ , then, because lower-case letters denote the logarithms of variables,  $g_1 = \Delta x$  and  $g_2 = \Delta y$  in dynamic equilibrium. In equilibrium the systematic dynamics of equation (A.2.4) are expressed as:

$$g_1 = \alpha_0 + \alpha_1(x - y) + \alpha_2 g_2 + \alpha_3 y \tag{A.2.5}$$

or, in terms of the original (anti-logarithmic) values of the variables:

$$X = k_0 Y^\beta \tag{A.2.6}$$

where  $k_0 = \exp\{-\alpha_0/\alpha_1 + [(\alpha_1 - \alpha_2\alpha_1 - \alpha_3)/\alpha_1^2]g_2\}$ , and where  $\beta = 1 - \alpha_3/\alpha_1$ .

The dynamic solution of equation (A.2.6) therefore shows  $X$  to be influenced by changes in the rate of growth of  $Y$ , as well as the long-term elasticity of  $X$  with respect to  $Y$ . For example, where the rate of growth of the explanatory variable accelerates, say from  $g_2$  to  $g'_2$ , the value of the variable  $X$  would increase. However, it is important to reiterate that the response to each explanatory variable can be either transient or steady-state. When theoretical considerations suggest that an explanatory variable generates a transient, rather than steady-state, response, it is appropriate to constrain its long-term effect to zero.

### STEP 3. MODELING PRICE AND INCOME EFFECTS OF FOREIGN AND DOMESTIC IMPORTS

Several features in the modeling of Colombia's imports need to be incorporated into the present analysis. The first important characteristic of the import demand for any one product is that its long-term response to the growth of domestic income is not necessarily proportional. This suggests that the dynamic specification of the import demand equation should not introduce any restrictions that would impose long-term unitary elasticity with respect to income. In contrast, the model should encompass long-term proportionality responses when they exist.

A second feature of the present modeling approach is that the dynamics for import demand relationships can be restricted to one period because the adjustment of imports to price and income changes tends to decline exponentially over time. Accordingly, in terms of the general stochastic difference specification, the expression for imports,  $M$ , in terms of income,  $Y$ , the price of the product,  $P$ , in US dollar terms and including the tariff, and the real effective exchange rate,  $R$ , can be expressed as:

$$m_t = \alpha_{10} + \alpha_{11}m_{t-1} + \alpha_{12}y_t + \alpha_{13}y_{t-1} + \alpha_{14}p_t + \alpha_{15}p_{t-1} + \alpha_{16}r_t + \alpha_{17}r_{t-1} + u_{1t} \quad (\text{A.2.7})$$

where lower case letters denote logarithms of corresponding capital letters, and the expected signs of the coefficients are  $0 < \alpha_{11} < 1$ ;  $\alpha_{12}$  and  $\alpha_{13} > 0$ ;  $\alpha_{14}$  and  $\alpha_{15} < 0$ ;  $\alpha_{16}$  and  $\alpha_{17} > 0$ . Income is treated as (weakly) exogenous for the parameters of interest. The use of the logarithmic specification in equation (A.2.7) provides a means by which the elasticity can be calculated directly from the estimated equation; the results are consistent when the elasticities remain constant over time. Tests of parameter constancy provide a means of validating that hypothesis.

The third important characteristic is that the demand for imports is determined by the local currency price (in Colombian pesos) of imports. Therefore, we can decompose the price variable into the US dollar price and the real effective exchange rate in equation (A.2.7) as follows:

$$P^n = P^c(1+t)/R = P/R \quad (\text{A.2.8})$$

where  $P^n$  is the Colombian peso price of the imported product,  $P^c$  is c.i.f. (cost, insurance, and freight) import price in U.S. dollars of the product,  $P$  is the U.S. dollar import price of the good with the tariff,  $t$  is the tariff rate, and  $R$  is the real exchange rate.

The real exchange rate takes into account changes in the price of domestic goods,  $P^n$ , relative to foreign goods,  $P^f$ , and the nominal exchange rate,  $R^n$ . It is defined as follows:<sup>19</sup>

$$R = P^n / (R^n P^f) \quad (\text{A.2.9})$$

The demand for imports by Colombia is therefore directly affected by c.i.f. price in U.S. dollars of the imported good, the tariff on that good, and the real exchange rate.

The fourth characteristic is that if the import supply elasticity is less than infinite, then the pass-through of exchange rate changes from import price changes in foreign currency terms to import prices in local currency terms will be less than complete (see Branson 1972 and the summary by Goldstein and Khan 1985). Consequently, the estimated price and exchange rate coefficients in equation (A.2.7) may differ.

It is also appropriate to adopt the error-correction mechanism because the growth rate of Colombia's imports in equation (A.2.7) depends on the expansion path of economic activity. The error-correction mechanism specification adjusts for any disequilibrium between variables that are cointegrated and thus provides the means by which the short-term observed behavior of variables is associated with their long-term equilibrium growth paths. Rearranging the terms of the first-order stochastic difference equation (A.2.7) yields the following error-correction mechanism:

$$\Delta m_t = \alpha_{20} + \alpha_{21}(m - y)_{t-1} + \alpha_{22}\Delta y_t + \alpha_{23}y_{t-1} + \alpha_{24}\Delta p_t + \alpha_{25}p_{t-1} + \alpha_{26}\Delta r_t + \alpha_{27}r_{t-1} + u_{2t} \quad (\text{A.2.10})$$

where  $-1 < \alpha_{21} < 0$ ;  $\alpha_{22} > 0$ ;  $\alpha_{23} > \alpha_{21}$ ;  $\alpha_{24}$  and  $\alpha_{25} < 0$ ;  $\alpha_{26}$  and  $\alpha_{27} > 0$ ; and where all variables are measured in logarithmic terms.

The import price and exchange rate terms in the foregoing specification have been so transformed as to nest the 'differences' formulation of the variables in the levels form of the equation. This transformation reduces the possibility of the occurrence of the spurious correlation typically associated with time-series data when the relationship between import demand and import prices is estimated. On a steady-state growth path, the long-term dynamic equilibrium relationship implicit in equation (A.2.10) is:

$$M = kY^{\varepsilon_y}P^{\varepsilon_p}R^{\varepsilon_r} \quad (\text{A.2.11})$$

The income elasticity of import demand is expressed as

$$\varepsilon_y = 1 - (\alpha_{23} / \alpha_{21}) \quad (\text{A.2.12})$$

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<sup>19</sup>This definition is the one used by the IMF, while the more traditional definition is  $R = R^n P^f / P^e$ . To facilitate the interpretation of the results for readers, we have adopted the IMF definition. See Edwards (1988, Appendix) for alternative definitions of the real exchange rate.



Its value is positive because the expected sign of  $\alpha_{21}$  is negative and  $\alpha_{23} > \alpha_{21}$ . When  $\alpha_{21} < \alpha_{23} < 0$ , import demand is inelastic with respect to income; when  $\alpha_{23} = 0$ , it has a unitary elasticity; and when  $\alpha_{23} > 0$ , the price elasticity of import demand is expressed as

$$\varepsilon_p = -\alpha_{25}/\alpha_{21} \quad (\text{A.2.13})$$

It has a negative value since the expected signs of both  $\alpha_{25}$  and  $\alpha_{21}$  are negative.

The real effective exchange rate elasticity of import demand is expressed as

$$\varepsilon_r = -\alpha_{27}/\alpha_{21} \quad (\text{A.2.14})$$

It has a positive value since the expected sign of  $\alpha_{21}$  is negative and that of  $\alpha_{27}$  is positive.

#### **STEP 4. MODELING COLOMBIA'S EXPORT DEMAND IN THE U.S. MARKET**

If changes in the U.S. demand for Colombia's exports are nonproportional to changes in the U.S. overall import demand for a product, then Colombia's export demand by the United States is downward sloping. Lack of proportionality between U.S. imports and its demand for Colombia's exports of a product can be measured by extending the first-order stochastic difference equation to include the relative price variable. Transformation of an autoregressive distributed lag into an ECM with a differences formulation of the relative price,  $r$ , term nested in the levels form of the equation, yields the equation:

$$\Delta x_t = \alpha_{30} + \alpha_{31}(x - y)_{t-1} + \alpha_{32}\Delta y_t + \alpha_{33}y_{t-1} + \alpha_{34}\Delta r_t + \alpha_{35}r_{t-1} + v_t \quad (\text{A.2.15})$$

where  $-1 < \alpha_{31} < 0$ ,  $\alpha_{32} > 0$ ,  $\alpha_{33} > -1$ ,  $\alpha_{34} > 0$  and  $\alpha_{35} > 0$ , and where all variables are measured in logarithmic terms.

# Appendix B. Statistics

**Table B-1**

*Colombia's MFN Tariff Rates on Large and Medium-Size Imports, 2002*

<b>HS</b>	<b>Description</b>	<b>Imports (US\$ 000)</b>	<b>MFN Rate</b>
880240	Aircraft nes of an unladen weight exceeding 15,000 kg	357,528	0.0
852520	Transmission apparatus,for radioteleph incorporatg reception apparatus	301,914	5.0
880212	Helicopters of an unladen weight exceeding 2,000 kg	280,563	0.0
100590	Maize (corn) nes	198,400	15.0
300490	Medicaments nes, in dosage	193,333	10.0
847191	Digital process units whether/not presentd w the rest of a system etc	176,877	5.0
100190	Wheat nes and meslin	174,282	15.0
870322	Automobiles w reciprocating piston engine displacg > 1000 cc to 1500 cc	152,661	35.0
880230	Aircraft nes of an unladen weight > 2,000 kg but not exceedg 15,000 kg	137,641	0.0
870323	Automobiles w reciprocating piston engine displacg > 1500 cc to 3000 cc	99,563	35.0
852810	Television receivers includg video monitors & video projectors,colour	93,564	5.0
120100	Soya beans	88,976	15.0
847192	Input o output units,whether o not presentd w the rest of a system etc	84,548	5.0
290321	Vinyl chloride (chloroethylene)	84,140	5.0
520942	Denim fabrics of cotton,>/=85%, more than 200 g/m2	76,585	20.0
230400	Soya-bean oil-cake&oth solid residues,whether or not ground or pellet	75,310	15.0
290122	Propene (propylene)	71,039	5.0
880330	Aircraft parts nes	68,651	5.0
870600	Chassis fitted w engines for the vehicles of headg Nos 87.01 to 87.05	68,476	15.0
210690	Food preparations nes	65,601	20.0
520100	Cotton, not carded or combed	65,138	10.0
390120	Polyethylene having a specific gravity of 0.94 or more	64,290	15.0
847330	Parts&accessories of automatic data processg machines&units thereof	62,068	5.0
290250	Styrene	61,242	5.0
230990	Animal feed preparations nes	57,810	15.0

<b>HS</b>	<b>Description</b>	<b>Imports (US\$ 000)</b>	<b>MFN Rate</b>
841989	Machinery,plant/laboratory equip f treat of mat by change of temp nes	56,030	10.0
401110	Pneumatic tire new of rubber f motor car incl station wagons&racg cars	55,446	15.0
150710	Soya-bean oil crude, whether or not degummed	55,353	20.0
870899	Motor vehicle parts nes	54,920	10.0
851740	Apparatus, for carrier-current line systems, nes	54,148	10.0
401120	Pneumatic tires new of rubber for buses or lorries	54,124	15.0
270900	Petroleum oils and oils obtained from bituminous minerals, crude	53,557	10.0
310210	Urea,wthr/nt in aqueous solution in packages weighg more than 10 kg	53,101	5.0
470321	Chemical wood pulp,soda or sulphate,coniferous,semi-bl or bleached,nes	52,277	10.0
870210	Diesel powered buses with a seating capacity of > nine persons	52,192	15.0
271095	Petroleum lubricating oils	50,867	10.0
291737	Dimethyl terephthalate	50,496	5.0
382390	Chemical prods,prep&residual prod of the chemical/allid industries,nes	50,427	15.0
870324	Automobiles with reciprocating piston engine displacing > 3000 cc	48,529	35.0
847120	Digital auto data process mach cntg in same housg a CPU input&output	48,002	5.0
843049	Boring or sinking machinery nes, not self-propelled	47,501	5.0
390110	Polyethylene having a specific gravity of less than 0.94	47,391	15.0
480100	Newsprint, in rolls or sheets	45,978	0.0
848180	Taps, cocks, valves and similar appliances, nes	45,068	15.0
847989	Machines & mechanical appliances nes having individual functions	44,394	5.0
901890	Instruments and appliances used in medical or veterinary sciences, nes	43,934	5.0
740811	Wire of refind copper of which the max cross sectional dimension > 6mm	42,562	5.0
310420	Potassium chloride, in packages weighing more than 10 kg	41,234	5.0
720824	Flat rolled prod,i/nas,in coil,hr,>/=600mm wide,less than 3mm thk,nes	40,282	10.0
560300	Nonwovens, whether or not impregnated, coated, covered or laminated	40,045	15.0
760110	Aluminium unwrought, not alloyed	39,363	5.0
852990	Parts suitable f use solely/princ w the app of headings 85.25 to 85.28	37,787	10.0
300420	Antibiotics nes, in dosage	37,148	10.0
100300	Barley	36,600	15.0
240220	Cigarettes containing tobacco	36,584	20.0
330290	Mixtures of odoriferous subst f use as raw materials in industry,nes	36,352	10.0
851730	Telephonic or telegraphic switching apparatus	35,997	10.0
390690	Acrylic polymers nes, in primary forms	35,472	15.0
040221	Milk and cream powder unsweetened exceeding 1.5% fat	34,831	20.0
271013	Petroleum spirit except aviation or motor fuel	34,280	10.0
100630	Rice, semi-milled or wholly milled, whether or not polished or glazed	34,063	20.0
720924	Flat rolled prod,i/nas,in coil,cr,w>/=600mm,less than 0.5mm thk,nes	33,876	5.0
852490	Recorded media for sound or other similarly recorded phenomena, nes	33,863	5.0
380810	Insecticides, packaged for retail sale or formulated	33,758	5.0

<b>HS</b>	<b>Description</b>	<b>Imports (US\$ 000)</b>	<b>MFN Rate</b>
490199	Books, brochures, leaflets and similar printed matter, nes	33,746	0.0
843920	Machinery for making paper or paperboard	33,498	5.0
840999	Parts for diesel and semi-diesel engines	32,664	5.0
380830	Herbicides,anti-sproutg prod&plant growth regs,packd f retail/formltd	32,367	10.0
390190	Polymers of ethylene nes, in primary forms	32,172	5.0
293490	Heterocyclic compesos, nes	32,146	5.0
840991	Parts for spark-ignition type engines nes	30,340	15.0
850164	AC generators, of an output exceeding 750 KVA	30,114	10.0
851790	Parts of electrical apparatus for line telephone or line telegraphy	30,088	5.0
870431	Gas powered trucks with a GVW not exceeding five tonnes	29,102	15.0
300439	Hormones nes, not containing antibiotics, in dosage,o/t contraceptive	28,883	10.0
380820	Fungicides, packaged for retail sale or formulated	28,782	10.0
381710	Mixed alkylbenzenes, nes	28,726	15.0
160413	Sardines,sardinella&brislg o sprats prep o presvd,whole o pce ex mincd	28,646	20.0
080810	Apples, fresh	28,639	15.0
852731	Radio broad rece combind with sound recordg or reproducg apparatus	28,567	20.0
293100	Organo-inorganic compesos, nes	28,470	0.0
870410	Dump trucks designed for off-highway use	28,180	15.0
820712	Rock drillg or earth borg tools with workg part of other material	28,166	15.0
310230	Ammonium nitrate,whether or not in aqueous sol in pack weighg > 10 kg	27,885	5.0
392690	Articles of plastics or of other materials of Nos 39.01 to 39.14 nes	27,745	20.0
401191	Pneumatic tires new of rubber nes,having a 'herring-bone' or sim tread	27,661	15.0
320610	Pigments and preparations based on titanium dioxide	27,643	10.0
841430	Compressors of a kind used in refrigerating equipment	27,297	15.0
293339	Heterocyclic compds cntg an unfused pyridine ring in the structure,nes	27,266	0.0
292910	Isocyanates	27,083	0.0
220300	Beer made from malt	26,835	20.0
730420	Casings,tubg & drill pipe,i or s,smls,for use in drillg for oil or gas	26,080	15.0
870321	Automobiles w reciprocating piston engine displacg not more than 1000 cc	26,079	35.0
481011	Paper,fine,woodfree, in rolls or sheets,</=150 g/m2, clay coated	25,992	15.0
330210	Mixtures of odoriferous substances for the food or drink industries	25,330	10.0
720720	Semi-fin prod,iron/non-alloy steel,containg by weight .25%/more carbon	25,265	5.0
847193	Storage units, whether or not presented with the rest of a system	25,168	5.0
300220	Vaccines, human use	25,015	5.0
841480	Air or gas compressors, hoods	24,467	15.0
640299	Footwear, outer soles/upper of rubber or plastics, nes	24,214	20.0

Source: Government of Colombia, Departamento Administrativo Nacional de Estadísticas.

**Table B-2***United States MFN Tariff Rates on Major Imports from Colombia, 2003*

<b>HS</b>	<b>Description</b>	<b>Imports from Colombia (US\$1000)</b>	<b>MFN Rate</b>
270900	Crude oil from petroleum and bituminous minerals	1,161,591	0
271019	Oil (not crude) from petrol & bitum mineral etc.	519,939	1.7
060310	Cut flowers and flower buds, fresh	289,414	5.7
090111	Coffee, not roasted, not decaffeinated	276,520	0
270112	Bituminous coal, not agglomerated	248,374	0
080300	Bananas and plantains, fresh or dried	186,557	0.5
271011	Light oils& prep (not crude) from petrol & bitum	176,468	1.4
271311	Petroleum coke, not calcined	171,123	0
271129	Petroleum gases etc., in gaseous state, nesoi	150,424	0
710812	Gold, nonmonetary, unwrought nesoi	129,652	2.1
620342	Men's or boys' trousers etc, not knit, cotton	71,850	9.2
710391	Rubies, sapphires and emeralds, otherwise worked	68,738	0
620462	Women's or girls' trousers etc not knit, cotton	56,853	8.3
271112	Propane, liquefied	55,304	0
252329	Portland cement except white portland cement	52,039	0
290121	Ethylene (ethene)	48,473	0
271114	Ethylene, propylene, butylene and butadiene liqifi	47,886	0
290122	Propene (propylene)	46,434	0
090112	Coffee, not roasted, decaffeinated	38,999	0
270799	Oils & products nesoi as coal tar distillates etc	32,737	0.75
321290	Nonaq pigments for paint mfr, dyes etc, retail pk	31,860	3.1
170111	Cane sugar, raw, solid form, w/o added flav/color	29,883	0
270710	Benzene	29,142	0
240220	Cigarettes containing tobacco	28,231	2.1
290110	Acyclic hydrocarbons, saturated	27,178	0
270111	Anthracite coal, not agglomerated	26,722	0
392112	Plates, sheets etc. Nesoi, cell poly vinyl chlorid	25,693	5.6
030613	Shrimps and prawns, including in shell, frozen	25,530	0
271119	Petroleum gases etc., liquified, nesoi	24,953	0
290220	Benzene	22,022	0
250300	Sulfur of all kinds, not sublimed,precip,colloidal	20,951	0
701090	Glass articl. For conveyance/packing of goods,neso	18,813	1.9
271113	Butanes, liquefied	18,140	0
290270	Cumene	16,705	0
620331	M/b suit-type jackets and blazers of wool, nt knit	16,346	18
720260	Ferronickel	16,028	0
270730	Xylenes	15,511	0

<b>HS</b>	<b>Description</b>	<b>Imports from Colombia (US\$1000)</b>	<b>MFN Rate</b>
290243	Para-xylene	15,274	0
710811	Gold powder, nonmonetary	15,188	0
691010	Ceramic sanitary fixtures of porcelain or china	14,304	5.8
051199	Dead horses, swine etc (inedible) & products nesoi	13,931	0.4
290244	Mixed xylene isomers	13,912	0
490199	Printed books, brochures, etc., nesoi	13,123	0
620341	M/b trouser overalls breeches shorts wool, nt knit	13,021	12.7
271320	Petroleum bitumen	12,884	0
711319	Jewelry and parts thereof, of oth precious metal	12,785	5.7
611592	Socks & other hosiery nesoi of cotton, knit	12,033	8.2
621210	Brassieres, knit or crocheted or not	11,901	11.4
170490	Sugar confection (incl wh choc), no cocoa, nesoi	11,139	9.1
630260	Toilet & kitchen linen of cotton terry fabrics	10,961	9.2
611241	Women's or girls' swimwear synthetic fibers, knit	10,505	25.1
730620	Casing etc oil or gas drillng, iron or steel nesoi	10,500	0.4
030611	Rock lobster and other sea crawfish, frozen	10,410	0
761519	Table,kitcen,& other household articles, aluminum	10,034	3.1
560600	Gimp yrn & strip, 5404/5405 chen yrn loop wale-yrn	9,956	8.4
620311	Men's or boys' suits of wool, not knit	9,881	12.7
270119	Coal nesoi, not agglomerated	9,001	0
610711	Men's or boys' underpants and briefs cotton, knit	8,868	7.4
290230	Toluene	8,304	0
210111	Coffee extracts, essences etc. & prep therefrom	8,245	0
761010	Alu dor win and their fra and thres for doors	8,088	5.7
420221	Handbags, surface of composition/patent leather	7,804	8.1
610822	Women's/girls' briefs & panties manmade fiber, kt	7,721	12.4
390410	Polyvinyl chloride, not mixed with other substance	7,422	6.9
420291	Container bags, cases etc nesoi, leather etc.	7,081	4.5
170310	Cane molasses from extraction or refining of sugar	6,984	0
690890	Glazed ceramic flags a paving, hearth a wall tiles	6,904	9.6
611020	Sweaters, pullovers etc, knit etc, cotton	6,866	11
610510	Men's or boys' shirts of cotton, knitted or croche	6,656	19.8
610821	Women's or girls' briefs and panties cotton, knit	6,643	7.6
620343	Men's or boys' trousers etc, not knit, synth fiber	6,544	12.9
620452	Women's/girls' skirts & divided skirts cotton,n kt	6,505	8.1
611120	Babies' garments & clthng access of cotton, knit	6,231	14.3
854459	Elec cond ov 80v nov 1000v not fitted w connector	6,195	4.6
620443	Women's or girls' dresses synthetic fibers, nt kt	6,152	12.4

<b>HS</b>	<b>Description</b>	<b>Imports from Colombia (US\$1000)</b>	<b>MFN Rate</b>
960200	Veg molded resin etc carving material, nesoi	6,021	2.5
620920	Babies' garments & clthng access cotton, not knit	5,981	14.9
711011	Platinum, unwrought or powder	5,889	0
271121	Natural gas, gaseous	5,799	0
411330	Reptile leather furt prepr aft tan/crust,w/o hr,ne	5,736	0
290124	Buta-1, 3-diene and isoprene	5,605	0
610910	T-shirts, singlets, tank tops etc, knit etc cotton	5,176	17
441039	Particle & similar board of wood, nesoi	4,960	0
620463	Women's or girls' trousers etc not knit, syn fiber	4,935	12
940360	Wooden furniture, nesoi	4,738	0
392190	Plates, sheets, film etc, plastic nesoi ncel nesoi	4,697	5.4
730630	Pipe etc nesoi, weld cir cr sect, iron or nonal st	4,639	0.6
200899	Fruit & edible plant parts nesoi, prep etc. Nesoi	4,621	5.6
380820	Fungicides, for retail sale etc.	4,609	3.4
090121	Coffee, roasted, not decaffeinated	4,533	0
190590	Bread, pastry, cakes, etc nesoi & puddings	4,468	2.3
681310	Brake linings a pads, asbestos, oth minrls, celuls	4,465	0
690510	Ceramic roofing tiles	4,222	13.5
281410	Anhydrous ammonia	4,186	0
270750	Arom hydc nesoi 65pct ao dstls a 250dc astm d 86	4,138	0
392020	Plates, sheets etc, non-cell etc, polymr propylene	3,991	4.2
620333	M/b suit-type jackets & blazers synthetic fib,n kt	3,974	24.8
940350	Wooden bedroom furniture, except seats	3,971	0

SOURCE: United States, International Trade Commission.

**Table B-3***Colombia Import Value of 50 Largest Imports, 1991-2002 (US\$ 000)*

HS	Description	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
880240	Airplane & ot ac, unladen weight > 15,000 kg	7,518	77,676	113,286	356,447	67,497	73,111	188,776	241,927	194,742	44,777	357,528	411,606
852520	Transmission appr incorporating reception apparatus	15,371	15,816	33,395	235,938	331,437	257,038	413,404	565,473	162,399	259,153	301,895	338,162
100590	Corn (maize), other than seed corn	2,378	70,919	79,036	143,101	175,961	332,397	271,610	267,174	209,159	215,409	198,400	248,295
300490	Medicaments nesoi, measured doses, retail pk nesoi	5,824	12,132	22,103	45,383	66,109	84,001	120,329	178,185	159,277	174,403	193,306	217,931
870322	Pass mtr veh,spark ign eng, >1000cc but =<1500cc	36,460	14,507	108,934	160,738	134,127	137,038	247,583	195,366	70,127	113,229	152,661	214,160
100190	Wheat (other than durum wheat), and meslin	15,543	12,509	12,940	14,098	24,585	31,835	19,141	48,656	147,887	149,228	174,282	195,841
870323	Pass veh spk-ig int com rcpr p eng >1500 nov 3m cc	55,671	97,821	229,819	236,381	206,049	142,558	210,159	190,084	57,730	85,909	99,534	160,767
880212	Helicopters of an unladen weight exceeding 2000 kg	0	863	56,091	28,090	57,392	24,751	86,647	40,853	93,366	101,354	280,563	145,605
120100	Soybeans, whether or not broken	16,461	31,241	41,080	40,429	35,376	76,623	67,464	44,859	56,240	71,809	88,976	129,934
847149	Digital adp mac & units,entered as systems, nesoi	0	0	0	0	0	41,672	41,319	56,925	54,065	47,010	94,522	124,070
290321	Vinyl chloride (chloroethylene)	47,851	55,026	63,724	89,988	121,890	103,206	118,020	78,645	92,777	138,847	84,140	105,877
290122	Propene (propylene)	32,000	25,177	30,850	38,598	67,239	60,951	69,890	52,034	52,572	78,510	68,256	103,470
880330	Parts of airplanes or helicopters, nesoi	3,704	7,754	21,305	18,483	37,447	20,062	52,123	38,868	31,370	47,221	68,643	102,955
852812	Color tv sts,with/without radios or plays,recorder	0	0	0	0	0	36,329	53,093	55,509	43,118	63,865	92,082	100,642
880230	Aiplane & a/c unladen wght > 2000, nov 15000 kg	27,145	16,139	116,176	113,454	44,783	57,565	62,668	76,899	166,015	136,687	134,611	99,669
520942	Woven cotton fabrics, denim, 85% cot over 200 g/m2	2,366	14,327	24,399	31,901	51,693	72,212	55,392	62,838	50,454	70,078	76,585	81,357
847160	Adp input or output units, storage or not, nesoi	0	0	0	0	0	83,563	111,270	91,794	84,386	99,113	84,547	81,252
210690	Food preparations nesoi	7,473	9,604	14,573	16,675	22,159	27,398	35,346	62,956	56,229	58,959	65,602	78,479
230400	Soybean oilcake & oth solid residue, wh/not ground	2,685	28,159	34,507	62,720	62,377	125,140	119,905	121,676	108,520	98,795	75,310	74,208
847330	Parts & accessories for adp machines & units	14,445	21,155	32,918	43,703	55,440	51,083	52,743	53,230	66,155	67,650	62,068	68,540
870324	Pass veh spk-ig int com rcpr p eng > 3000 cc	12,908	38,033	140,481	143,589	163,587	172,285	208,574	163,200	50,740	57,008	48,501	63,991
520100	Cotton, not carded or combed	926	17,432	39,223	54,724	80,909	47,547	84,156	69,149	48,233	75,212	64,998	62,856
150710	Soybean oil & fractions, crude, wheth/not degummed	10,113	18,403	35,026	36,158	61,647	68,400	59,409	96,437	72,816	63,954	54,725	61,527
870600	Chas w eng f trac, mtr veh f pass/gd & special pur	13,321	3,913	33,318	19,867	10,921	9,478	22,511	24,223	12,491	52,656	68,164	60,426
401110	New pneumatic tires of rubber, for motor cars	3,494	7,450	17,735	22,151	29,469	33,096	38,427	47,763	52,997	59,155	55,447	59,251
390120	Polyethylene having a spec gravity of 0.94 or more	27,568	30,778	32,807	45,540	72,467	64,254	79,593	64,198	52,639	65,132	64,181	58,912
310210	Urea, whether or not in aqueous solution	50,095	48,362	44,705	64,145	82,068	74,331	55,817	51,406	41,446	58,023	53,101	55,407



HS	Description	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
870899	Parts and accessories of motor vehicles, nesoi	25,129	27,436	36,816	43,023	40,228	55,737	76,696	63,666	41,529	49,294	54,917	55,340
390110	Polyethylene having a specific gravity under 0.94	31,708	32,277	48,314	46,157	89,757	63,729	61,639	57,835	50,733	59,667	47,391	52,136
851730	Telephonic or telegraphic switching apparatus	93,930	98,426	142,712	168,680	270,778	276,135	292,164	297,444	95,347	51,560	35,997	51,814
851750	Telecomm apprtus,carrier-cur & digital systm,nesoi	0	0	0	0	0	28,398	32,159	44,056	39,945	47,432	54,147	51,745
382490	Products and residuals of chemical industry, nesoi	0	0	0	0	0	40,711	41,037	45,757	41,585	44,834	50,064	51,128
847150	Digital processing units, n.e.s.o.i.	0	0	0	0	0	33,086	35,790	36,575	93,202	96,212	82,320	50,489
401120	New pneumatic tires of rubber, for buses or trucks	2,064	5,506	21,374	25,808	43,888	51,264	57,377	45,545	35,475	53,598	52,493	48,792
230990	Animal feed prep except dog or cat food, retail pk	7,766	7,781	10,515	10,618	13,832	13,579	15,198	14,437	21,239	33,823	57,810	47,249
470321	Chemical woodpulp, soda etc. N dis s bl & bl conif	20,677	28,415	20,095	32,145	48,411	35,257	37,294	40,569	40,871	59,276	52,277	46,756
720839	Flat-hot-roll im,nonaly stl,coil,>3mm thick,nesoi	0	0	0	0	0	6,217	22,208	34,362	26,388	53,128	38,433	46,423
290250	Styrene	26,064	15,245	32,107	46,381	73,956	58,515	56,615	38,331	36,618	71,250	61,242	44,920
848180	Taps cocks etc f pipe vat inc thermo control nesoi	25,820	25,911	33,709	51,954	47,002	81,692	97,129	53,368	50,775	42,968	45,048	43,927
310420	Potassium chloride	30,453	23,746	26,424	38,687	33,000	32,138	33,713	43,238	42,287	45,451	41,234	43,680
291737	Dimethyl terephthalate	46,048	36,501	44,379	51,728	82,609	57,570	41,744	34,862	36,242	46,638	49,796	43,603
760110	Unwrought aluminum, not alloyed	19,595	20,503	21,152	22,550	34,540	27,147	41,148	31,518	29,101	40,876	39,363	41,568
901890	Instr & appl f medical surgical dental vet, nesoi	11,185	15,482	39,897	43,916	53,886	44,541	49,462	46,272	31,121	41,271	43,918	41,337
870431	Mtr veh trans gds spk ig in c p eng, gvw nov 5 mtn	24,257	11,351	63,404	106,511	89,964	61,052	76,713	61,391	16,832	32,089	29,102	40,803
870321	Pass mtr veh, spark ign eng, not ov 1,000 cc	6,750	2,685	29,914	30,201	18,024	12,573	11,996	14,574	13,347	16,922	26,079	40,315
390190	Polymers of ethylene nesoi, in primary forms	2,584	3,490	3,069	3,178	3,416	11,116	20,066	24,213	20,157	27,041	32,080	39,615
740811	Copper wire, refined copper over 6mm max cr-sec dm	25,855	40,134	45,343	62,429	68,384	68,737	68,792	53,156	29,813	43,731	42,557	39,583
847130	Port digtl automatic data process mach not > 10 kg	0	0	0	0	0	21,412	27,087	27,496	19,035	25,806	29,622	39,485
480100	Newsprint, in rolls or sheets	44,985	38,284	50,337	56,138	79,378	61,475	58,657	54,504	45,496	46,966	45,937	39,177
300420	Antibiotics nesoi, in dosage form	3,148	7,562	11,533	25,953	31,941	40,632	42,242	52,049	40,031	34,045	37,148	39,095
390690	Acrylic polymers nesoi, in primary forms	4,662	8,467	10,992	13,164	16,001	19,145	24,093	25,345	27,462	30,769	35,422	37,063

SOURCE: Departamento Administrativo Nacional de Estadísticas (DANE).

**Table B-4***Colombia Import Unit Value of 50 Largest Imports, 1991–2002 (US\$ per metric ton)*

HS	Description	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
880240	Airplane & ot a/c, unladen weight > 15,000 kg	29.6	89.3	91.5	240.1	74.7	135.0	140.1	376.6	303.6	150.0	321.9	278.6
852520	Transmission appr incorporating reception apparatus	113.7	89.8	120.1	96.3	145.3	132.4	130.2	142.5	124.3	133.1	140.1	144.8
100590	Corn (maize), other than seed corn	0.3	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
300490	Medicaments nesoi, measured doses, retail pk nesoi	31.4	17.4	26.5	57.3	47.5	32.2	26.9	27.7	28.0	27.0	26.0	34.8
870322	Pass mtr veh,spark ign eng, >1000cc but =<1500cc	4.5	6.4	5.8	7.0	7.0	7.2	7.2	6.9	6.4	5.6	5.6	4.8
100190	Wheat (other than durum wheat), and meslin	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2
870323	Pass veh spk-ig int com rcpr p eng >1500 nov 3m cc	7.6	9.6	8.5	9.2	9.8	9.1	8.7	8.6	8.3	8.2	7.7	7.5
880212	Helicopters of an unladen weight exceeding 2000 kg		56.6	13.5	553.6	560.7	405.4	353.2	183.9	663.2	876.5	719.7	666.7
120100	Soybeans, whether or not broken	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2
847149	Digital adp mac & units,entered as systems, nesoi						106.9	94.2	220.8	111.2	79.4	37.1	27.9
290321	Vinyl chloride (chloroethylene)	0.4	0.4	0.4	0.6	0.6	0.5	0.5	0.3	0.4	0.6	0.4	0.4
290122	Propene (propylene)	0.5	0.4	0.4	0.4	0.6	0.5	0.5	0.4	0.4	0.6	0.5	0.4
880330	Parts of airplanes or helicopters, nesoi	100.4	157.2	97.0	185.5	89.5	156.3	127.4	165.0	167.1	157.4	162.0	257.2
852812	Color tv sts,with/without radios or playsrs,recordr						9.1	9.1	8.9	6.8	7.1	6.1	6.3
880230	Aiplane & a/c unladen wght > 2000, nov 15000 kg	105.7	221.7	410.5	329.0	291.8	501.4	344.8	428.4	477.3	453.8	278.3	491.3
520942	Woven cotton fabrics, denim, 85% cot over 200 g/m2	5.4	4.8	4.1	4.1	4.3	4.3	3.9	4.0	3.6	3.5	3.8	3.7
847160	Adp input or output units, storage or not, nesoi						27.5	21.4	19.6	15.9	13.0	12.7	11.5
210690	Food preparations nesoi	2.8	4.4	4.5	4.4	4.3	4.0	4.2	3.7	4.4	4.2	3.6	2.6
230400	Soybean oilcake & oth solid residue, wh/not ground	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.3	0.3	0.2
847330	Parts & accessories for adp machines & units	40.8	25.0	22.9	23.9	29.2	26.8	25.1	26.9	33.7	23.1	15.7	16.8
870324	Pass veh spk-ig int com rcpr p eng > 3000 cc	11.2	11.2	9.8	10.2	11.9	11.9	11.8	11.5	10.9	10.5	11.2	10.9
520100	Cotton, not carded or combed	3.1	1.6	1.4	1.6	2.1	1.9	1.8	1.6	1.3	1.3	1.2	1.0
150710	Soybean oil & fractions, crude, wheth/not degummed	0.5	0.5	0.5	0.6	0.7	0.6	0.6	0.7	0.6	0.4	0.4	0.5
870600	Chas w eng f trac, mtr veh f pass/gd & special pur	9.2	6.5	5.4	5.9	6.4	2.1	6.5	7.0	6.9	8.4	8.7	7.6
401110	New pneumatic tires of rubber, for motor cars	3.4	3.6	3.1	3.3	3.4	2.8	3.4	3.1	3.0	2.8	2.7	2.6
390120	Polyethylene having a spec gravity of 0.94 or more	0.9	0.8	0.7	0.8	1.1	0.9	1.0	0.8	0.7	0.9	0.8	0.7
310210	Urea, whether or not in aqueous solution	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1

HS	Description	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
870899	Parts and accessories of motor vehicles, nesoi	3.2	1.3	3.9	4.1	4.4	6.0	5.5	5.6	7.8	7.3	7.7	7.1
390110	Polyethylene having a specific gravity under 0.94	0.9	0.8	0.8	0.8	1.2	1.0	1.0	0.9	0.8	1.0	0.9	0.8
851730	Telephonic or telegraphic switching apparatus	88.4	89.6	73.1	87.2	95.5	84.9	61.4	63.7	78.2	80.5	94.3	130.5
851750	Telecomm apprtus,carrier-cur & digital systm,nesoi						166.4	168.2	163.3	221.3	160.0	117.9	149.8
382490	Products and residuals of chemical industry, nesoi						0.8	0.7	1.1	0.9	0.9	0.9	0.8
847150	Digital processing units, n.e.s.o.i.						110.2	37.0	82.0	53.5	50.5	56.4	66.9
401120	New pneumatic tires of rubber, for buses or trucks	3.1	3.1	3.6	3.0	3.2	3.3	3.2	3.0	2.5	2.6	2.1	1.9
230990	Animal feed prep except dog or cat food, retail pk	0.8	3.4	1.3	1.7	1.7	1.5	1.7	1.9	0.4	0.3	0.3	0.3
470321	Chemical woodpulp, soda etc. N dis s bl & bl conif	0.7	0.6	0.6	0.6	0.9	0.6	0.6	0.5	0.5	0.7	0.6	0.5
720839	Flat-hot-roll irn,nonaly stl,coil,>3mm thick,nesoi						0.3	0.3	0.3	0.2	0.3	0.2	0.2
290250	Styrene	0.6	0.6	0.6	0.7	1.0	0.8	0.6	0.5	0.5	0.8	0.7	0.5
848180	Taps cocks etc f pipe vat inc thermo control nesoi	10.1	9.8	6.1	11.8	12.1	10.5	13.4	12.6	12.0	11.7	10.9	9.8
310420	Potassium chloride	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
291737	Dimethyl terephthalate	0.6	0.6	0.6	0.7	1.0	0.8	0.6	0.5	0.5	0.6	0.6	0.5
760110	Unwrought aluminum, not alloyed	1.5	1.3	1.2	1.4	1.9	1.6	1.6	1.5	1.4	1.7	1.6	1.4
901890	Instr & appl f medical surgical dental vet, nesoi	41.8	34.9	52.2	47.8	49.1	47.4	69.6	57.6	41.8	37.5	35.4	31.3
870431	Mtr veh trans gds spk ig in c p eng, gvw nov 5 mtn	6.5	6.1	6.5	6.5	6.8	6.9	7.4	7.2	7.4	7.1	6.5	6.7
870321	Pass mtr veh, spark ign eng, not ov 1,000 cc	6.2	10.3	9.0	9.6	9.8	6.9	6.4	6.5	5.7	6.0	5.7	5.4
390190	Polymers of ethylene nesoi, in primary forms	2.0	1.7	1.7	2.2	2.2	1.3	1.2	1.0	1.0	1.0	0.9	0.8
740811	Copper wire, refined copper over 6mm max cr-sec dm	2.8	2.7	2.4	2.5	3.4	2.9	2.6	2.0	1.8	2.0	1.8	1.7
847130	Port digtl automatic data process mach not > 10 kg						141.2	146.1	135.6	154.5	135.9	115.2	114.7
480100	Newsprint, in rolls or sheets	0.7	0.6	0.6	0.6	0.7	0.8	0.6	0.6	0.6	0.6	0.7	0.6
300420	Antibiotics nesoi, in dosage form	305.7	135.6	38.4	26.5	65.0	66.1	63.1	59.5	51.0	47.4	42.0	51.0
390690	Acrylic polymers nesoi, in primary forms	3.2	3.1	2.0	2.6	2.8	2.6	2.4	2.1	1.8	1.7	1.5	1.5

SOURCE: Derived from value and volume data from Departamento Administrativo Nacional de Estadísticas (DANE).



HS	Description	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
870899	Parts and accessories of motor vehicles, nesoi	15	10	10	10	10	10	10	10	10	10	10	10
390110	Polyethylene having a specific gravity under 0.94	20	15	5	5	5	15	15	15	15	15	15	15
851730	Telephonic or telegraphic switching apparatus	5	10	10	10	10	10	10	10	10	10	10	10
851750	Telecomm apprtus,carrier-cur & digital systm,nesoi	10	5	5	5	5	5	5	5	5	5	5	5
382490	Products and residuals of chemical industry, nesoi	25	10	10	10	10	10	10	10	10	10	10	10
847150	Digital processing units, n.e.s.o.i.	0	5	5	5	5	5	5	5	5	5	5	5
401120	New pneumatic tires of rubber, for buses or trucks	25	15	15	15	15	15	15	15	15	15	15	15
230990	Animal feed prep except dog or cat food, retail pk	30	15	15	15	15	15	15	15	15	15	15	15
470321	Chemical woodpulp, soda etc. N dis s bl & bl conif	5	10	10	10	10	10	10	10	10	10	10	10
720839	Flat-hot-roll irn,nonaly stl,coil,>3mm thick,nesoi	15	10	10	10	10	10	10	5	5	5	5	10
290250	Styrene	5	5	5	5	5	5	5	5	5	5	5	5
848180	Taps cocks etc f pipe vat inc thermo control nesoi	15	15	15	15	15	15	15	15	15	15	15	15
310420	Potassium chloride	0	5	5	5	5	5	5	5	5	5	5	5
291737	Dimethyl terephthalate	5	5	5	5	5	5	5	5	5	5	5	5
760110	Unwrought aluminum, not alloyed	0	5	5	5	5	5	5	5	5	5	5	5
901890	Instr & appl f medical surgical dental vet, nesoi	0	5	5	5	5	5	5	5	5	5	5	5
870431	Mtr veh trans gds spk ig in c p eng, gvw nov 5 mtn	50	40	40	15	15	15	15	15	15	15	15	15
870321	Pass mtr veh, spark ign eng, not ov 1,000 cc	75	35	35	35	35	35	35	35	35	35	35	35
390190	Polymers of ethylene nesoi, in primary forms	15	15	15	15	5	5	5	5	5	5	5	5
740811	Copper wire, refined copper over 6mm max cr-sec	0	15	15	15	5	5	5	5	5	5	5	5
847130	Port digtl automatic data process mach not > 10 kif	0	5	5	5	5	5	5	5	5	5	5	5
480100	Newsprint, in rolls or sheets	0	0	0	0	0	0	0	0	0	0	0	0
300420	Antibiotics nesoi, in dosage form	15	10	10	10	10	10	10	10	10	10	10	10
390690	Acrylic polymers nesoi, in primary forms	25	15	15	15	15	15	15	15	15	15	15	15

SOURCE: Departamento Administrativo Nacional de Estadísticas (DANE).

**Table B-6***Colombia Import Value from U.S. Origin for 50 Largest Imports, 2000–2002 (US\$ 000)*

<b>HS</b>	<b>Description</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>Average 2000-02</b>
100190	Wheat (other than durum wheat), and meslin	78,153	74,590	112,715	88,486
100590	Corn (maize), other than seed corn	190,168	173,138	210,620	191,308
120100	Soybeans, whether or not broken	22,929	32,676	48,351	34,652
150710	Soybean oil & fractions, crude, wheth/not degummed	3,197	8,017	2,453	4,555
210690	Food preparations nesoi	11,078	10,006	11,485	10,856
230400	Soybean oilcake & oth solid residue, wh/not ground	13,390	10,429	5,447	9,756
230990	Animal feed prep except dog or cat food, retail pk	10,686	16,119	17,798	14,867
290122	Propene (propylene)	43,937	21,645	49,414	38,332
290250	Styrene	68,073	61,242	44,184	57,833
290321	Vinyl chloride (chloroethylene)	138,841	84,140	104,443	109,141
291737	Dimethyl terephthalate	0	32	0	11
300420	Antibiotics nesoi, in dosage form	1,479	1,447	1,012	1,313
300490	Medicaments nesoi, measured doses, retail pk nesoi	13,683	16,264	17,380	15,776
310210	Urea, whether or not in aqueous solution	5,120	1,522	1,977	2,873
310420	Potassium chloride	15,822	15,634	16,868	16,108
382490	Products and residuals of chemical industry, nesoi	24,129	27,442	24,422	25,331
390110	Polyethylene having a specific gravity under 0.94	20,092	14,461	23,678	19,411
390120	Polyethylene having a spec gravity of 0.94 or more	16,813	13,319	15,220	15,117
390190	Polymers of ethylene nesoi, in primary forms	23,034	15,761	10,667	16,487
390690	Acrylic polymers nesoi, in primary forms	19,484	22,883	21,357	21,241
401110	New pneumatic tires of rubber, for motor cars	5,660	3,612	3,513	4,261
401120	New pneumatic tires of rubber, for buses or trucks	6,490	4,343	3,386	4,740
470321	Chemical woodpulp, soda etc. N dis s bl & bl conif	26,508	25,391	22,118	24,672
480100	Newsprint, in rolls or sheets	5,104	3,143	2,480	3,576
520100	Cotton, not carded or combed	27,495	33,770	38,077	33,114
520942	Woven cotton fabrics, denim, 85% cot over 200 g/m2	16,006	10,455	14,879	13,780
720839	Flat-hot-roll iron, nonalloyed, coil, >3mm thick, nesoi	224	976	888	696
740811	Copper wire, refined copper over 6mm max cr-sec	2	12	6	6
760110	Unwrought aluminum, not alloyed	159	105	0	88
847130	Port digitl automatic data process mach not > 10 kg	18,781	18,669	25,404	20,951
847149	Digital adp mac & units, entered as systems, nesoi	36,882	70,598	80,465	62,649
847150	Digital processing units, n.e.s.o.i.	53,037	61,318	27,817	47,390
847160	Adp input or output units, storage or not, nesoi	72,274	50,467	39,934	54,225
847330	Parts & accessories for adp machines & units	56,325	53,069	58,460	55,951
848180	Taps cocks etc f pipe vat inc thermo control nesoi	18,576	22,852	19,360	20,263
851730	Telephonic or telegraphic switching apparatus	7,644	7,547	14,622	9,937
851750	Telecomm apprtus, carrier-cur & digital systm, nesoi	29,345	35,957	32,685	32,662

<b>HS</b>	<b>Description</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>Average 2000-02</b>
852520	Transmission appr incorporating reception apparats	194,719	217,549	153,292	188,520
852812	Color tv sts,with/without radios or plays,recordr	5,088	6,019	6,655	5,921
870321	Pass mtr veh, spark ign eng, not ov 1,000 cc	184	449	483	372
870322	Pass mtr veh,spark ign eng, >1000cc but =<1500cc	44	73	46	54
870323	Pass veh spk-ig int com rcpr p eng >1500 nov 3m cc	4,123	5,066	4,872	4,687
870324	Pass veh spk-ig int com rcpr p eng > 3000 cc	7,976	12,359	12,048	10,794
870431	Mtr veh trans gds spk ig in c p eng, gvw nov 5 mtn	391	971	596	653
870600	Chas w eng f trac, mtr veh f pass/gd & special pur	559	94	298	317
870899	Parts and accessories of motor vehicles, nesoi	23,553	24,774	24,070	24,132
880212	Helicopters of an unladen weight exceeding 2000 kg	92,044	276,921	109,629	159,532
880230	Aiplane & a/c unladen wght > 2000, nov 15000 kg	21,140	67,692	66,929	51,920
880240	Airplane & ot a/c, unladen weight > 15,000 kg	30,300	232,290	141,993	134,861
880330	Parts of airplanes or helicopters, nesoi	44,829	65,112	99,550	69,831
901890	Instr & appl f medical surgical dental vet, nesoi	26,795	25,057	27,283	26,378

SOURCE: Departamento Administrativo Nacional de Estadísticas (DANE).

**Table B-7***Colombia Share of Imports from U.S. Origin for 50 Largest Imports, 2000–2002 (%)*

<b>HS</b>	<b>Description</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>Average 2000-02</b>
100190	Wheat (other than durum wheat), and meslin	52	43	58	51
100590	Corn (maize), other than seed corn	88	87	85	87
120100	Soybeans, whether or not broken	32	37	37	35
150710	Soybean oil & fractions, crude, wheth/not degummed	5	15	4	8
210690	Food preparations nesoi	19	15	15	16
230400	Soybean oilcake & oth solid residue, wh/not ground	14	14	7	12
230990	Animal feed prep except dog or cat food, retail pk	32	28	38	32
290122	Propene (propylene)	56	32	48	45
290250	Styrene	96	100	98	98
290321	Vinyl chloride (chloroethylene)	100	100	99	100
291737	Dimethyl terephthalate	0	0	0	0
300420	Antibiotics nesoi, in dosage form	4	4	3	4
300490	Medicaments nesoi, measured doses, retail pk nesoi	8	8	8	8
310210	Urea, whether or not in aqueous solution	9	3	4	5
310420	Potassium chloride	35	38	39	37
382490	Products and residuals of chemical industry, nesoi	54	55	48	52
390110	Polyethylene having a specific gravity under 0.94	34	31	45	37
390120	Polyethylene having a spec gravity of 0.94 or more	26	21	26	24
390190	Polymers of ethylene nesoi, in primary forms	85	49	27	54
390690	Acrylic polymers nesoi, in primary forms	63	65	58	62
401110	New pneumatic tires of rubber, for motor cars	10	7	6	7
401120	New pneumatic tires of rubber, for buses or trucks	12	8	7	9
470321	Chemical woodpulp, soda etc. N dis s bl & bl conif	45	49	47	47
480100	Newsprint, in rolls or sheets	11	7	6	8
520100	Cotton, not carded or combed	37	52	61	50
520942	Woven cotton fabrics, denim, 85% cot over 200 g/m2	23	14	18	18
720839	Flat-hot-roll iron, nonalloyed, coil, >3mm thick, nesoi	0	3	2	2
740811	Copper wire, refined copper over 6mm max cr-sec	0	0	0	0
760110	Unwrought aluminum, not alloyed	0	0	0	0
847130	Port digitl automatic data process mach not > 10 kg	73	63	64	67
847149	Digital adp mac & units, entered as systems, nesoi	78	75	65	73
847150	Digital processing units, n.e.s.o.i.	55	74	55	62
847160	Adp input or output units, storage or not, nesoi	73	60	49	61
847330	Parts & accessories for adp machines & units	83	86	85	85
848180	Taps cocks etc f pipe vat inc thermo control nesoi	43	51	44	46
851730	Telephonic or telegraphic switching apparatus	15	21	28	21
851750	Telecomm apprtus, carrier-cur & digital systm, nesoi	62	66	63	64



<b>HS</b>	<b>Description</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>Average 2000-02</b>
852520	Transmission appr incorporating reception apparats	75	72	45	64
852812	Color tv sts,with/without radios or plays,recordr	8	7	7	7
870321	Pass mtr veh, spark ign eng, not ov 1,000 cc	1	2	1	1
870322	Pass mtr veh,spark ign eng, >1000cc but =<1500cc	0	0	0	0
870323	Pass veh spk-ig int com rcpr p eng >1500 nov 3m cc	5	5	3	4
870324	Pass veh spk-ig int com rcpr p eng > 3000 cc	14	25	19	19
870431	Mtr veh trans gds spk ig in c p eng, gvw nov 5 mtn	1	3	1	2
870600	Chas w eng f trac, mtr veh f pass/gd & special pur	1	0	0	1
870899	Parts and accessories of motor vehicles, nesoi	48	45	43	45
880212	Helicopters of an unladen weight exceeding 2000 kg	91	99	75	88
880230	Aiplane & a/c unladen wght > 2000, nov 15000 kg	15	50	67	44
880240	Airplane & ot a/c, unladen weight > 15,000 kg	68	65	34	56
880330	Parts of airplanes or helicopters, nesoi	95	95	97	95
901890	Instr & appl f medical surgical dental vet, nesoi	65	57	66	63

SOURCE: Tables B- 3 and B-6.

**Table B-8***Colombia and U.S. Real GDP, and Colombia's Real Exchange Rate, 1991-2004*

Yr	Colombia GDP		Colombia Cross Rate with US \$ <sup>1</sup>			U.S. GDP	
	Constant (Bil.pesos)	GDP deflator (1994=100)	Nominal Rate (Pesos/US\$)	Nominal Index (1994=100)	Real Index (1994=100)	Constant (Bil.1994 \$)	GDP deflator (1994=100)
1991	58,205	45	614	74	65	6,410	93
1992	60,556	55	680	82	70	6,605	96
1993	63,816	69	786	95	74	6,781	98
1994	67,533	100	827	100	100	7,054	100
1995	71,046	119	913	110	105	7,243	102
1996	72,507	139	1,037	125	106	7,501	104
1997	74,994	162	1,141	138	111	7,834	106
1998	75,421	186	1,427	173	100	8,169	107
1999	72,251	210	1,874	227	85	8,505	109
2000	74,364	235	2,229	270	78	8,824	111
2001	75,394	249	2,291	277	79	8,847	114
2002	76,522	264	2,865	347	66	9,063	115
2003	78,053	284	3,051	369	66	9,298	117
2004	80,628	298	3,178	385	65	9,662	118

<sup>1</sup>See text for definitions.



**Table B-9**

Regression Results of Colombia's Import Demand Equation (Eq. 3.8)

$$\Delta mt = a_{20} + a_{21}(m - y)_{t-1} + a_{22}\Delta y_t + a_{23}y_{t-1} + a_{24}\Delta p_t + a_{25}p_{t-1} + a_{26}\Delta r_t + a_{27}r_{t-1} + u_{2t}$$

Description	HS	ln(M)-ln(Y)t-1	Dln(Y)t	ln(Y)t-1	Dln(P)t	ln(P)t-1	Dln(R)t	ln(R)t-1	Con	Summary Statistics		
										R2	dw	Period
Airplanes >15000kg	880240	-0.93			-0.15	-0.37			4.33	0.89	1.95	1992-2002
		-3.82			-0.59	-1.40						
Transmission appr	852520	-0.75		10.97	-2.70	-5.23			-94.36	0.47	1.88	1992-2002
		-1.29		1.17	-0.69	-0.79						
Corn (maize)	100590	-0.96		4.38		-0.26	0.90	0.42	-41.66	0.84	3.15	1992-2002
		-1.88		1.41		-0.50	1.36	0.62				
Medicaments	300490	-0.52	4.27	4.54	-0.90	-0.61			-46.45	0.98	2.74	1992-2002
		-4.08	2.93	2.85	-9.53	-3.25						
Autos 1000cc-1500cc	870322	-0.94		4.52	-13.06	-5.15	10.66	3.76	-50.93	0.97	3.04	1992-2002
		-2.37		0.90	-4.33	-0.80	4.96	0.80				
Wheat	100190	-0.63		6.18	-1.08	-4.06			-70.49	0.89	2.20	1992-2002
		-5.67		6.20	-1.60	-4.93						
Automobiles >1500cc	870323	-0.48	17.86		-4.40	-1.88			6.76	0.92	2.03	1992-2002
		-2.84	5.96		-2.65	-1.83						
Helicopters >2000Kg	880212	-0.94			-0.48	-0.16			1.80	0.98	2.42	1994-2002
		-5.17			-1.70	-0.51						
Soybeans	120100	-0.45				-2.09			1.28	0.78	1.55	1992-2002

Description	HS	ln(M)-ln(Y)t-1	Dln(Y)t	ln(Y)t-1	Dln(P)t	ln(P)t-1	Dln(R)t	ln(R)t-1	Con	Summary Statistics		
										R2	dw	Period
		-3.11				-3.96						
Digital Adap Machines	847149	-0.78			-1.22	-1.31			7.74	0.90	2.54	1997-2002
		-1.12			-4.02	-1.37						
Vinyl Chloride	290321	-0.92	2.15		-0.14	-0.38			7.11	0.97	1.86	1995-2002
		-5.36	2.28		-1.35	-2.11						
Propane	290122	-0.75	4.50	3.20	-0.45	-0.47			-30.52	0.39	1.76	1992-2002
		-0.69	1.20	1.12	-0.84	-0.78						
Aircraft Parts	880330	-0.43			-1.41	-0.51			0.79	0.90	1.56	1992-2002
		-2.79			-5.34	-1.46						
Televising Sets	852812	-0.95	5.10		-1.51	-2.66			10.29	0.99	2.66	1997-2002
		-8.57	6.83		-5.77	-8.65						
Airplanes <15000kg	880230	-0.76			-3.30	-4.86			29.78	0.99	2.12	1993-2002
		-11.25			-12.26	-11.01						
Cotton Fabrics	520942	-0.93	4.81	2.50	-0.82	-2.54			-19.15	0.98	1.42	1993-2002
		-3.21	1.93	0.94	-1.10	-3.54						
Adaptor Units	847160	-0.44	3.60		-2.40	-0.42			2.84	0.99	2.79	1997-2002
		-0.87	3.77		-2.93	-1.18						
Food Preparations	210690	-0.43		1.91	-1.64	-0.59			-18.25	0.84	2.19	1992-2002
		-2.50		1.49	-4.28	-1.00						
Soybean Oilcake	230400	-0.98		1.53	-0.97	-1.67	0.81	1.72	-18.49	0.99	3.61	1992-2002
		-13.00		1.52	-2.94	-3.45	2.25	5.54				

Description	HS	ln(M)-ln(Y)t-1	Dln(Y)t	ln(Y)t-1	Dln(P)t	ln(P)t-1	Dln(R)t	ln(R)t-1	Con	Summary Statistics		
										R2	dw	Period
Adaptr Marchinery Parts	847330	-0.38			-0.72	-0.34			2.54	0.98	2.22	1992-2002
		-7.08			-6.96	-2.37						
Cotton	520100	-0.98		1.06		-1.31			-4.95	0.99	2.53	1992-2002
		-21.91		2.00		-6.98						
Soybean Oil	150710	-0.72				-1.03		1.10	-0.02	0.99	1.87	1992-2002
		-9.22				-4.08		3.89				
Tractor Chassis	870600	-0.73		4.80	-0.26				-50.63	0.75	1.84	1994-2002
		-2.06		1.48	-0.80							
Tires for autos	401110	-0.58		1.32	-1.76	-0.86			-10.58	0.96	2.83	1993-2002
		-3.29		1.21	-4.68	-1.21						
Polyethylene gravity >.94	390120	-0.87		2.79	-1.47	-1.61			-24.66	0.95	1.91	1993-2002
		-3.29		1.78	-3.62	-1.76						
Urea	310210	-1.19		-0.25		-0.42			12.22	0.90	2.40	1993-2002
		-6.99		-1.57		-5.83						
Auto Parts	870899	-0.81	8.85	5.87	-1.37	-1.48	0.34	0.37	-60.68	0.99	2.41	1992-2002
		-2.78	5.74	2.44	-6.96	-2.80	0.91	1.51				
Polyethylene gravity <.94	390110	-0.98	5.45		-0.66	-1.22	-0.71	0.87	2.63	0.90	2.49	1992-2002
		-3.11	2.38		-1.73	-2.78	-1.47	2.37				
Telephone Switching App	851730	-0.82	15.77	4.52	-1.15	-0.60			-45.09	0.94	3.00	1992-1999
		-0.54	3.09	0.68	-1.52	-0.40						
Telecom Apparatus	851750	-0.51		3.98	-1.56	-0.61			-40.77	0.98	3.45	1997-2002

Description	HS	ln(M)-ln(Y)t-1	Dln(Y)t	ln(Y)t-1	Dln(P)t	ln(P)t-1	Dln(R)t	ln(R)t-1	Con	Summary Statistics		
										R2	dw	Period
		-1.90		0.96	-5.48	-1.11						
Tires for buses and trucks	401120	-0.53				-2.25	1.85	1.03	1.02	0.91	2.54	1992-2002
		-3.93				-2.15	1.98	1.23				
Animal Feed	230990	-0.87	2.58	1.10	-1.40	-1.43			-7.34	0.99	3.12	1992-2002
		-3.29	1.11	1.24	-16.20	-3.51						
Chemical Woodpulp	470321	-0.44				-0.23			3.00	0.60	2.01	1992-2002
		-2.96				-1.06						
Flat Hot-Rolled Iron	720839	-0.78				-1.24			4.45	0.98	2.19	1992-2002
		-11.65				-4.00						
Taps Cocks	848180	-0.42		4.46	-2.62	-2.98	2.11	2.11	-49.81	0.98	3.04	1993-2002
		-1.30		3.11	-5.72	-4.38	2.83	3.91				
Potassium Chloride	310420	-0.59			-2.56				4.86	0.76	0.93	1992-2002
		-2.24			-2.27							
99methyl Terephthalate	291737	-0.79	1.40			-0.22			5.40	0.91	2.13	1992-2002
		-4.16	2.44			-3.39						
Unwrought Aluminum	760110	-0.77	4.31	2.72	-0.52	-1.07			-25.65	0.69	1.90	1992-2002
		-0.74	0.84	0.84	-0.58	-0.92						
Medical Instruments	901890	-0.92	6.15		-0.96	-0.92		0.32	4.40	0.97	3.04	1993-2002
		-7.71	5.18		-5.38	-4.27		1.18				
Instruments for Vehicles	870431	-0.63				-4.14			11.39	0.76	2.80	1993-2002
		-2.13				-1.77						

Description	HS	ln(M)-ln(Y)t-1	Dln(Y)t	ln(Y)t-1	Dln(P)t	ln(P)t-1	Dln(R)t	ln(R)t-1	Con	Summary Statistics		
										R2	dw	Period
instruments for Pass.Cars	870321	-0.83			-2.72	-1.02			5.17	0.54	1.48	1992-2002
		-2.17			-1.63	-0.85						
Polymers of Ethylene	390190	-0.97		9.11		-1.64			-96.25	0.56	2.23	1993-2002
		-1.14		2.66		-0.61						
Copper Wire	740811	-0.86	7.41		-0.81	-0.52	0.58	0.63	2.39	0.98	2.33	1993-2002
		-3.20	4.21		-2.13	-2.04	1.59	2.52				
Newsprint	480100	-0.48	4.05		-0.72	-1.37	0.38	0.50	0.46	0.81	2.44	1993-2002
		-0.75	1.65		-0.92	-1.52	0.54	0.98				
Antibiotics	300420	-0.51			-0.96	-0.68			3.99	0.96	2.45	1992-2001
		-4.49			-5.22	-2.97						
Acrylic Polymers	390690	-0.25			-1.09	-0.32			1.65	0.92	1.86	1992-2002
		-2.64			-6.34	-1.09						

Notes: (a) Numbers in parentheses below coefficients refer to t-statistics.; (b) equations were estimated using the econometric software package EVIEWS.



**Table B-10**

Regression Results of U.S. Import Demand for Colombia's Major Exports, Equation (Eq. 3.8)

$$Dmt = a_{20} + a_{21}(m - y)_{t-1} + a_{22}Dy_t + a_{23}y_{t-1} + a_{24}Dp_t + a_{25}p_{t-1} + u_{2t}$$

Description	HS	ln(M)- ln(Y)t-1	Dln(Y)t	ln(Y)t-1	Dln(P)t	ln(P)t-1	Con	Summary Statistics		
								R2	dw	Period
Crude oil from petroleum and bituminous minerals	270900	-0.28		0.63			-5.99	0.96	3.19	1996-02
		-2.07		4.54						
Cut flowers and flower buds, fresh	060310	-0.12			-0.44	-0.14	-0.25	0.98	2.97	1992-00
		-2.01			-8.52	-2.50				
Coffee, not roasted, not decaffeinated	090111	-0.60		0.91	-0.19		-9.25	0.92	2.77	1993-01
		-4.02		3.71	-1.97					
Bituminous coal, not agglomerated	270112	-0.61		2.33		-0.48	-24.87	0.87	2.63	1994--2
		-3.52		3.19		-1.23				
Bananas and plantains, fresh or dried	080300	-0.96		0.44	-0.09	-0.05	-4.48	0.96	2.47	1992-02
		-5.78		3.60	-1.59	-1.33				
Petroleum coke, not calcined	271311	-0.70					-3.95	0.99	1.56	1996-02
		-68.83								
Petroleum gases etc., in gaseous state, nesoi	271129	-0.65				-0.37	-2.17	0.98	2.89	1995-02
		-12.30				-3.09				
Gold, nonmonetary, unwrought nesoi	710812	-0.72		9.09			-87.17	0.99	2.84	1994-02
		-10.15		10.84						
Men's or boys' trousers etc, not knit, cotton	620342	-0.99	3.33	3.21	-0.18	-0.18	-32.99	0.99	3.29	1994-02



Description	HS	ln(M)- ln(Y)t-1	Dln(Y)t	ln(Y)t-1	Dln(P)t	ln(P)t-1	Con	Summary Statistics		
								R2	dw	Period
Benzene	270710	-0.97		3.60		-1.53	-36.88	0.71	2.19	1992-02
		-2.89		1.11		-2.05				
Cigarettes containing tobacco	240220	-0.32					-2.27	0.13	0.43	1994-01
		-0.93								
Acyclic hydrocarbons, saturated	290110	-0.42			-1.28	-1.48	-2.69	0.84	1.46	1992-02
		-3.08			-4.07	-3.86				
Anthracite coal, not agglomerated	270111	-0.23		1.49	-1.97	-0.67	-12.95	0.93	1.42	1992-01
		-2.30		0.60	-4.40	-1.10				
Plates, sheets etc. Nesoi, cell poly vinyl chlorid	392112	-0.45		0.27	-0.36	-0.20	-4.45	0.85	3.20	1993-02
		-1.50		0.86	-1.24	-1.27				
Shrimps and prawns, including in shell, frozen	030613	-0.49		0.54	-0.30	-0.04	-6.21	0.99	2.12	1993-02
		-6.04		9.18	-6.24	-0.69				
Petroleum gases etc., liquified, nesoi	271119	-0.77	7.91		-0.85	-0.75	-1.84	0.91	3.11	1993-02
		-2.74	0.80		-2.40	-1.64				
Benzene	290220	-0.46		3.19	-0.38		-29.72	0.89	3.09	1992-02
		-2.08		1.63	-1.58					
Butanes, liquefied	271113	-0.79		1.39			-16.66	0.62	2.23	1996-02
		-2.11		1.14						
Cumene	290270	-0.56		1.57	-0.45	-0.53	-15.94	0.86	2.26	1992-02
		-2.80		1.12	-1.72	-2.80				
M/b suit-type jackets and blazers of wool, nt knit	620331	-0.16			-0.49	-0.14	-0.50	0.95	3.07	1994-02

Description	HS	ln(M)- ln(Y)t-1	Dln(Y)t	ln(Y)t-1	Dln(P)t	ln(P)t-1	Con	Summary Statistics		
								R2	dw	Period
		-1.71			-2.22	-0.98				
Ferronickel	720260	-0.52			-0.24		-2.42	0.58	1.35	1992-02
		-1.75			-2.18					
Xylenes	270730	-0.80		6.96	-0.33	-0.33	-66.38	0.94	2.48	1992-02
		-4.14		3.21	-0.61	-0.61				
Para-xylene	290243	-0.11		5.52	-1.18		-49.69	0.79	2.27	1995-02
		-0.98		1.47	-2.54					
Gold powder, nonmonetary	710811	-0.72		9.09			-87.17	0.99	2.84	1994-02
		-10.15		10.84						
Ceramic sanitary fixtures of porcelain or china	691010	-0.40		2.84			-28.28	0.99	1.80	1994-02
		-16.82		26.80						
Dead horses, swine etc (inedible) & products nesoi	051199	-0.63		4.30	-0.93	-1.01	-40.76	0.84	2.42	1992-02
		-3.94		3.08	-3.36	-3.19				
Mixed xylene isomers	290244	-0.63		1.92	-0.96	-1.23	-20.46	0.95	3.00	1992-02
		-2.61		0.93	-2.90	-4.14				
Printed books, brochures, etc., nesoi	490199	-0.62		0.93	-0.23	-0.19	-9.54	0.92	2.77	1992-02
		-3.05		2.47	-1.88	-3.14				
M/b trouser overalls breeches shorts wool, nt knit	620341	-0.53		1.96	-0.46	-0.31	-20.60	0.88	2.26	1992-02
		-0.88		0.76	-2.13	-1.89				
Petroleum bitumen	271320	-0.40		3.80	-0.38	-1.11	-31.59	0.87	2.20	1992-02
		-2.66		1.66	-1.59	-4.29				

Description	HS	ln(M)- ln(Y)t-1	Dln(Y)t	ln(Y)t-1	Dln(P)t	ln(P)t-1	Con	Summary Statistics		
								R2	dw	Period
Socks & other hosiery nesoi of cotton, knit	611592	-0.11			-0.48	-0.64	1.21	0.78	2.01	1992-02
		-1.77			-1.25	-2.59				
Brassieres, knit or crocheted or not	621210	-0.94		1.37		-0.08	-16.94	0.75	1.53	1992-01
		-2.98		2.08		-0.47				
Sugar confection (incl wh choc), no cocoa, nesoi	170490	-0.83		2.81		-0.12	-27.82	0.78	2.13	1993-02
		-2.44		2.74		-0.94				
Toilet & kitchen linen of cotton terry fabrics	630260	-0.44		2.22	-0.18	-0.32	-20.92	0.61	2.45	1993-02
		-0.79		1.41	-0.70	-1.26				
Women's or girls' swimwear synthetic fibers, knit	611241	-0.76	11.30	4.37	-0.47		-45.38	0.99	3.34	1993-00
		-5.64	4.56	6.49	-6.03					
Casing etc oil or gas drilling, iron or steel nesoi	730620	-0.38					-1.27	0.63	1.96	1993-01
		-1.71								
Rock lobster and other sea crawfish, frozen	030611	-0.99					-6.34	0.51	2.05	1992-01
		-2.91								
Gimp yrn & strip, 5404/5405 chen yrn loop wale-yrn	560600	-0.87		4.77	-1.09	-1.40	-45.50	0.62	2.13	1992-02
		-2.37		2.14	-1.68	-2.27				
Men's or boys' suits of wool, not knit	620311	-0.69	3.68	1.43	-0.25	-0.34	-16.23	0.94	2.21	1993-02
		-2.14	1.52	1.88	-1.41	-2.47				
Coal nesoi, not agglomerated	270119	-0.18					-2.23	0.77	0.61	1993-02
		-1.21								
Men's or boys' underpants and briefs cotton, knit	610711	-0.19				-0.38	0.11	0.82	2.06	1992-01

Description	HS	ln(M)- ln(Y)t-1	Dln(Y)t	ln(Y)t-1	Dln(P)t	ln(P)t-1	Con	Summary Statistics		
								R2	dw	Period
		-4.16				-2.05				
Toluene	290230	-0.60	1.82	4.94	-0.67	-0.46	-46.47	0.96	2.46	1994-02
		-1.82	0.35	2.34	-3.40	-1.71				

Notes: (a) Numbers in parentheses below coefficients refer to t-statistics.; (b) equations were estimated using the econometric software package EVIEWS.

**Table B- 11**

Regression Results of Colombia's Production Supply (Eq. 6.4)

$$\ln Qt = a30 + a31\ln Qt-1 + a32\ln Pt + a33\ln Yt + a34\ln Y^*t + a35T + a3$$

ISIC	Description	Classification	ln(Q)t-1		lnPt		lnY		T		Con	Summary Statistics			
			coff.	t-stat	coff.	Lag	t-stat	coff.	t-stat	coff.		t-stat	R2	dw	Period
3111	Manufacture of dairy products	Import-Subs	0.84	17.2	0.78	-1	4.1					-2.95	0.99	2.5	1994-2001
3112	Canning and preserving of fruits and vegetables	Export-Orient	0.68	6.0	0.42	-1	1.1	1.27	1.3			-5.41	0.97	2.2	1992-2001
3113	Canning, preserving and processing of fish	Import-Subs	0.17	1.0	2.85	-1				0.08	1.7	-5.94	0.99	1.2	1993-2001
3114	Manufacture of vegetable and animal oils and fats	Export-Orient	0.66	1.8	0.35	-1	0.6	0.16	0.6			-0.89	0.99	2.9	1992-2001
3115	Grain mill products	Import-Subs	0.41	0.9	0.45	-1				0.09	1.3	0.84	0.99	1.6	1992-2001
3116	Manufacture of bakery products	Import-Subs	0.15	0.6	0.39	-1				0.12	2.4	2.54	0.97	3.0	1992-2001
3117	Sugar factories and refineries	Export-Orient	1.19	3.9	0.53	-2	1.5			0.04	0.6	-3.27	0.99	3.2	1993-2001
3118	Manufacture of food products not elsewhere classified	Export-Orient	0.68	4.2	0.49	-2	1.8					0.19	0.89	2.4	1993-2001
3121	Manufacture of prepared animal feeds	Export-Orient	0.40	2.8	1.01	0	7.0	1.79	19.6	0.15	7.4	-7.97	1.00	2.3	1995-2001
3122	Manufacture of prepared animal feeds	Import-Subs	0.26	0.8	0.13	2	0.4			0.19	2.4	2.66	0.96	1.1	1993-2001
3123	Distilling, rectifying and blending spirits	Import-Subs	0.47	1.0	1.26	0	2.7	0.72	1.4	0.24	3.4	-6.67	0.91	2.5	1992-2001
3131	Wine industries	Import-Subs	0.89	3.9	0.09	-1	0.2					0.57	0.93	1.5	1993-2001
3132	Malt liquors and malt	Import-Subs	0.81	5.6	0.17	-1	0.4					0.50	0.90	2.5	1992-2001
3133	Soft drinks and carbonated waters industries	Import-Subs	0.83	4.5	0.48	-1	1.3	1.17	2.9			-6.57	0.95	2.2	1992-2001
3134	Tobacco manufactures	Export-Orient	0.54	15.4	0.67	-2	10.2					-0.94	1.00	3.1	1994-2001
3140	Spinning, weaving and finishing textiles	Import-Subs	0.87	1.5	0.70	-1	0.6			0.06	0.8	-2.99	0.98	2.0	1993-2001
3211	Manufacture of made-up textile goods except	Import-Subs	0.17	1.8	0.37	-3	3.5			0.12	13.3	2.44	1.00	3.0	1995-2001

ISIC	Description	Classification	ln(Q)t-1		lnPt			lnY		T		Con	Summary Statistics		
			coff.	t-stat	coff.	Lag	t-stat	coff.	t-stat	coff.	t-stat		R2	dw	Period
	wearing apparel														
3212	Cordage, rope and twine industries	Export-Orient	0.44	1.2	0.36	-2	0.8			0.20	2.2	0.76	0.98	2.3	1993-2001
3215	Cordage, rope and twine industries	Import-Subs	0.69	5.4	0.13	0	0.7			0.09	2.3	0.91	1.00	2.4	1993-2001
3216	Cordage, rope and twine industries	Import-Subs	0.28	2.1	2.19	-2	6.1			0.14	7.4	-6.84	1.00	1.5	1993-2001
3217	Cordage, rope and twine industries	Import-Subs	0.65	1.1	0.61	-1	0.9					-1.54	0.32	2.6	1994-2001
3218	Manufacture of textiles not elsewhere classified	Import-Subs	0.57	1.4	0.71	-2	0.5			0.17	1.8	-1.78	0.89	2.6	1994-2001
3219	Manufacture of wearing apparel, except footwear	Import-Subs	0.25	0.8	7.32	-1	4.7	1.66	4.5	-0.25	-3.2	-29.10	0.98	2.3	1994-2001
3220	Manufacture of wearing apparel, except footwear	Export-Orient	na	na	na		na					na	na	na	na
3221	Tanneries and leather finishing	Export-Orient	0.85	8.5	1.58	-1	11.9			0.06	3.1	-7.56	1.00	2.7	1992-2001
3231	Fur dressing and dyeing industries	Export-Orient	0.70	1.8	0.58	-3	1.5					-1.06	0.44	1.6	1994-2001
3232	Manufacture of products of leather and leather substitutes	Export-Orient	0.41	0.9	0.08	-3	0.2			0.22	2.0	1.05	0.94	3.1	1994-2001
3233	Manufacture of footwear	Export-Orient	0.19	0.9	0.43	-2	2.5			0.14	4.6	2.10	0.95	2.6	1993-2001
3240	Sawmills, planing and other wood mills	Import-Subs	na	na	na		na					na	na	na	na
3311	Manufacture of wooden and cane containers	Export-Orient	0.23	0.5	0.33	-2	1.6	0.08	1.6			2.33	0.99	1.6	1993-2001
3312	Manufacture of wood and cork products	Export-Orient	0.19	0.9	0.31	-1	1.5	0.32	0.8			2.00	0.66	2.2	1992-2001
3319	Manufacture of furniture and fixtures, except primarily of metal	Import-Subs	0.33	0.9	0.79	-2	1.8			0.13	1.5	-0.47	0.65	1.9	1993-2001
3320	Manufacture of pulp, paper and paperboard	Import-Subs	0.85	1.2	0.57	-1	0.4			-0.04	-0.4	-0.98	0.79	2.5	1992-2001
3411	Manufacture of containers and boxes of paper	Import-Subs	0.77	3.9	0.13	-1	1.7			0.02	0.9	0.61	1.00	2.1	1992-2001
3412	Manufacture of pulp, paper and paperboard articles	Export-Orient	0.12	0.8	0.36	-2	2.2	0.75	4.8	0.03	1.9	-0.12	0.98	3.1	1993-2001
3419	Printing, publishing and allied industries	Import-Subs	0.87	36.1	0.09	-1	1.0					0.46	1.00	2.6	1992-2001



ISIC	Description	Classification	ln(Q)t-1		lnPt	Lag	t-stat	lnY		T		Con	Summary Statistics		
			coff.	t-stat	coff.				coff.	t-stat	R2		dw	Period	
3420	Manufacture of fertilizers and pesticides	Export-Orient	0.52	2.7	0.28	-2	0.8			0.10	2.5	1.12	1.00	3.4	1993-2001
3512	Manufacture of synthetic resins, plastic materials	Export-Orient	0.26	1.0	0.55	-3	1.4			0.09	1.8	0.85	0.98	2.4	1994-2001
3513	Manufacture of paints, varnishes and lacquers	Import-Subs	0.83	10.4	0.34	-1	2.6					2.60	0.99	3.5	1995-2001
3521	Manufacture of drugs and medicines	Export-Orient	0.76	5.6	0.81	-1	1.5					-2.33	0.89	3.0	1993-2001
3522	Manufacture of soap and cleaning preparations	Import-Subs	1.40	2.5	0.53	-3	1.0	4.01	2.5			-22.53	0.96	2.8	1994-2001
3523	Manufacture of soap and cleaning preparations	Export-Orient	0.92	8.8	0.48	-3	0.7					-1.51	0.96	2.3	1994-2001
3528	Manufacture of chemical products not elsewhere classified	Import-Subs	0.70	5.2	0.73	-2	0.4			-0.05	-1.0	-1.48	0.95	3.2	1993-2001
3529	Petroleum refineries	Import-Subs	0.67	2.4	0.49	-2	1.9			0.09	1.5	-0.74	0.98	2.8	1993-2001
3530	Manufacture of miscellaneous products of petroleum and coal	Export-Orient	0.86	29.1	1.09	-2	5.5	0.60	5.0			-6.45	1.00	2.5	1993-2001
3540	Tyre and tube industries	Export-Orient	0.62	2.3	0.42	-2	1.8			0.19	1.9	-0.05	0.77	2.5	1993-2001
3551	Manufacture of rubber products not elsewhere classified	Import-Subs	0.21	0.6	0.06	-1	0.1			0.08	2.8	2.95	0.89	1.6	1992-2001
3559	Manufacture of plastic products not elsewhere classified	Import-Subs	0.60	1.2	0.07	-2	0.2			0.04	0.7	1.51	0.93	1.3	1993-2001
3560	Manufacture of pottery, china and earthenware	Import-Subs	0.15	2.1	0.16	-2	2.4			0.20	15.9	3.09	1.00	2.5	1993-2001
3610	Manufacture of glass and glass products	Export-Orient	0.73	1.1	0.15	-1	0.2	0.26	0.7	-0.02	-0.2	0.76	0.99	2.1	1992-2001
3620	Manufacture of glass and glass products	Export-Orient	0.58	3.4	0.74	-1	1.5					-0.95	0.66	2.8	1993-2001
3621	Manufacture of structural clay products	Import-Subs	0.46	2.1	1.06	-1	1.4			0.04	1.9	-1.82	0.82	2.1	1992-2001
3691	Manufacture of cement, lime and plaster	Import-Subs	0.72	4.2	0.72	-1	1.7					-1.71	0.89	1.7	1992-2001
3692	Manufacture of nonmetallic mineral products	Export-Orient	0.51	1.1	0.91	-1	1.5	2.09	1.4			-9.47	0.66	1.6	1992-2001
3699	Iron and steel basic industries	Export-Orient	0.35	0.6	1.42	-1	0.9			0.07	1.1	-8.98	0.94	1.3	1992-2001

ISIC	Description	Classification	ln(Q)t-1		lnPt	Lag	t-stat	lnY		T		Con	Summary Statistics		
			coff.	t-stat	coff.				coff.	t-stat	coff.		t-stat	R2	dw
3710	Non-ferrous metal basic industries	Import-Subs	0.85	4.9	0.27	-2	1.6			0.05	3.9	-0.51	1.00	1.9	1993-2001
3720	Non-ferrous metal basic industries	Import-Subs	0.40	1.5	0.95	-3	2.5			0.08	1.7	-1.59	0.97	2.6	1994-2001
3721	Non-ferrous metal basic industries	Import-Subs	na	na	na		na					na	na	na	na
3722	Non-ferrous metal basic industries	Import-Subs	0.30	1.6	2.32	-1	5.5	1.20	3.8			-12.55	0.97	2.4	1992-2001
3723	Manufacture of cutlery, hand tools and general hardware	Export-Orient	0.18	0.4	0.68	-1	1.0			-0.18	-0.6	0.21	0.86	1.6	1992-2001
3811	Manufacture of furniture and fixtures primarily of metal	Import-Subs	0.51	5.1	0.20	-2	0.8					1.93	0.94	2.1	1993-2001
3812	Manufacture of structural metal products	Export-Orient	0.63	5.6	0.38	-2	2.5					-0.26	0.94	2.6	1993-2001
3813	Manufacture of structural metal products	Import-Subs	0.21	1.1	1.07	-1	2.7	0.96	3.6	-0.07	-1.8	-4.44	0.97	2.8	1992-2001
3814	Manufacture of fabricated metal products	Import-Subs	0.61	0.8	0.73	-3	0.9					-0.96	0.42	1.2	1994-2001
3819	Manufacture of agricultural machinery and equipment	Import-Subs	0.46	7.4	0.97	-2	4.8	0.56	4.9			-3.65	0.98	2.7	1993-2001
3822	Manufacture of metal and woodworking machinery	Import-Subs	0.12	0.4	0.10	-2	0.3					4.00	0.58	1.6	1993-2001
3823	Manufacture of special industrial machinery and equipment	Import-Subs	0.79	2.4	0.96	-3	1.4					-3.51	0.80	1.8	1994-2001
3824	Manufacture of office, computing and accounting machinery	Import-Subs	0.33	1.5	0.77	-1	3.5					-0.44	0.95	1.9	1992-2001
3825	Manufacture of office, computing and accounting machinery	Import-Subs	0.25	1.2	0.09	-1	0.4			0.06	2.7	3.32	0.92	2.1	1992-2001
3826	Manufacture of office, computing and accounting machinery	Import-Subs	0.33	2.8	0.19	-1	0.8					2.91	0.91	1.6	1993-2001
3827	Machinery and equipment except electrical	Import-Subs	0.11	0.4	0.43	-1	1.0			0.07	2.0	2.37	0.88	2.5	1992-2001
3829	Manufacture of electrical industrial machinery and apparatus	Import-Subs	0.91	7.0	1.07	-1	2.8					-3.43	0.94	2.1	1992-2001

ISIC	Description	Classification	ln(Q)t-1		lnPt			lnY		T		Con	Summary Statistics		
			coff.	t-stat	coff.	Lag	t-stat	coff.	t-stat	coff.	t-stat		R2	dw	Period
3831	Manufacture of radio, television and communication	Import-Subs	0.14	0.6	0.94	-1	2.6					0.08	0.81	2.2	1992-2001
3832	Manufacture of electrical appliances and housewares	Import-Subs	0.71	0.8	0.53	-3	0.5					-1.40	0.49	0.9	1995-2001
3833	Manufacture of electrical apparatus and supplies	Import-Subs	0.79	2.1	1.04	-2	2.0			0.04	1.8	-3.64	0.75	1.8	1993-2001
3839	Shipbuilding and repairing	Import-Subs	0.90	59.1	0.20	-3	2.2					-0.29	1.00	1.6	1994-2001
3841	Manufacture of motor vehicles	Import-Subs	0.68	2.1	0.39	-1	1.1					-1.25	0.67	1.7	1992-2001
3843	Manufacture of motorcycles and bicycles	Import-Subs	0.08	0.2	2.07	-2	2.1					-4.59	0.73	1.9	1993-2001
3844	Manufacture of aircraft	Import-Subs	0.76	12.1	0.29	-1	1.5					0.35	0.98	1.6	1992-2001
3845	Manufacture of transport equipment not elsewhere classified	Import-Subs	0.15	1.5	0.18	-1	1.3					2.56	0.77	2.6	1995-2001
3849	Manufacture of professional controlling equipment	Import-Subs	na	na	na		na					na	na	na	na
3851	Manufacture of photographic and optical goods	Import-Subs	0.16	0.5	0.73	-1	1.5					0.93	0.49	1.6	1995-2001
3852	Manufacture of jewellery and related articles	Import-Subs	na	na	na		na					na	na	na	na
3901	Manufacture of musical instruments	Export-Orient	0.93	4.1	0.41	-3	1.9					-2.10	0.83	2.2	1995-2001
3902	Manufacture of sporting and athletic goods	Import-Subs	0.45	1.5	0.34	-2	0.7					2.40	0.63	1.5	1993-2001
3903	Manufacture of sporting and athletic goods	Import-Subs	0.16	0.9	3.17	-1	2.6	3.99	4.5	0.25	3.5	-25.76	0.97	2.8	1992-2001
3904	Manufacturing industries not elsewhere classified	Import-Subs	0.51	2.7	0.57	-1	1.4					0.32	0.72	0.9	1993-2001
3909	Manufacturing industries not elsewhere classified	Import-Subs	0.90	2.9	0.05	-1	0.1					0.49	0.73	2.7	1994-2001