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Characteristics of the Declining U.S. Agricultural Trade Surplus

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TABLE OF CONTENTS

Page

List of Tables ii

List of Figures iii

Abstract iv

Highlights v

Introduction 1

Aggregate Agricultural Trade By Region 2

Types of Agricultural Products Traded 11

Bulk, Intermediate, and Consumer-Oriented 11

Product Groups 13

Specific Products 15

Types of Agricultural Products Traded by Country 15

U.S. and Foreign Import Demand Models for Agricultural Goods 17

Empirical Model 17

Data and Estimation Procedure 19

Results 20

Conclusions 22

References 24

List of Tables

No.		Page
1	Change in U.S. Agricultural Trade, 1992-94 to 2002-04, by Region	3
2	Change in U.S. Agricultural Trade, 1992-94 to 2002-04, by Region, Real Dollars (base=2004)	9
3	U.S. Agricultural Imports by Source Country	10
4	U.S. Agricultural Exports by Destination	11
5	U.S. Agricultural Trade by Product Groups	14
6	Estimated Results of U.S. Import and Export Equations	21

List of Figures

No.		Page
1	Total U.S. Agricultural Trade	1
2	U.S. Agricultural Trade with NAFTA Countries	3
3	U.S. Agricultural Trade with East Asia	4
4	U.S. Agricultural Trade with the European Union	4
5	U.S. Agricultural Trade with Central America and the Caribbean	5
6	U.S. Agricultural Trade with South America	5
7	U.S. Agricultural Trade with the Former Soviet Union	6
8	U.S. Agricultural Trade with the Middle East	6
9	U.S. Agricultural Trade with South Asia	7
10	U.S. Agricultural Trade with Southeast Asia	7
11	U.S. Agricultural Trade with Oceania	8
12	U.S. Agricultural Trade with Africa	8
13	U.S. Imports of Bulk, Intermediate, and Consumer-Oriented Agricultural Products	12
14	U.S. Exports of Bulk, Intermediate, and Consumer-Oriented Agricultural Products	13

Abstract

The U.S. agricultural trade surplus has fallen from $26.9 billion in 1996 to $7.3 billion in 2004, and it is shrinking even further in 2005. The objective of this paper is to examine the characteristics of the decreasing agricultural trade surplus and determine the factors causing this decline. U.S. imports from Canada and Mexico have more than doubled under NAFTA, and imports from non-NAFTA countries have also increased considerably. Most increases in imports are consumer-ready and horticultural products. U.S. exports to Canada and Mexico have also been increasing steadily, but exports to other important markets have been stagnant or declining. Much of the declining trade surplus can be accounted for by trade with the European Union. Results from an econometric analysis indicate that an increase in disposable income and free trade agreements have contributed significantly to the increase in U.S. imports of consumer-oriented products. U.S. exports are found to be significantly influenced by per capita income and free trade agreements. Moreover, a strong U.S. dollar is found to have had a negative impact on the value of exports of consumer-oriented products, but not bulk or intermediate products. Results show that exports of bulk and intermediate products have been trending downward while exports of consumer-oriented products and imports of intermediate and consumer-oriented products have been trending upward.

Keywords: agricultural trade balance, free trade agreements, consumer-oriented products

Highlights

Because of rising imports and stagnant exports, the U.S. agricultural trade surplus declined from $26.9 billion in 1996 to $7.3 billion in 2004, and the trade surplus is expected to decrease further, if not disappear, in 2005. During the first six months of 2005, U.S. imports are up 9.0 percent to $29.6 billion, while U.S. exports are unchanged from 2004 at $30.6 billion. Much of the increase in imports is consumer-ready and horticultural products, including processed foods, beverages, and fresh or processed fruits and vegetables. U.S. agricultural exports peaked in 1996 and declined for a few years before rebounding in 2003 and 2004. Much of this decline can be accounted for by a drop in exports to important East Asian and European markets.

While imports from Canada and Mexico have increased substantially under NAFTA, exports to those countries have also increased. Since 1995, U.S. imports and exports with Canada and Mexico have been increasing at nearly the same rate. Trade with the European Union (EU) accounts for a large share of the declining trade surplus. Imports from the EU have steadily risen and exports to the member countries have decreased. Most of the increase in imports from Europe consists of consumer-oriented products. The increase in imports from other regions such as Australia, New Zealand, South America, and East Asia, and the significant drop in exports to East Asian countries in the late 1990s, have also contributed to the decline in the agricultural trade surplus.

Results from an import demand model indicate that a growing economy and an increase in disposable income has contributed significantly to the increase in imports of consumer-oriented products. U.S. exports are found to be significantly influenced by per capita income in importing countries. Some of the decline in exports to East Asian markets in the late 1990s could be attributed to declining or stagnant income in these countries during the Asian financial crisis.

Exchange rate is also found to have a significant effect for the trade of some products. An appreciating U.S. dollar is found to have had a negative impact on the value of exports of consumer-oriented products, but no evidence is found that the values of bulk and intermediate product exports have been negatively affected or that an appreciating dollar caused an increase in the value of imports. Results actually show that, due to inelastic demand, an appreciating dollar causes a decrease in the value of intermediate and consumer-oriented imports and an increase in the value of bulk and intermediate exports. Examining the quantity of exports instead of the value, however, could provide different results.

Free trade agreements are found to have had a positive impact on exports of bulk products and imports of consumer-oriented products. Trade liberalization could also have an indirect positive effect on trade flows by increasing purchasing power in importing countries. Trade agreements often lead to increased economic activity and income, which leads to increased demand for imports.

After accounting for these factors, results show that exports of bulk and intermediate products have been trending downward while exports of consumer-oriented products and imports of

intermediate and consumer-oriented products have been trending upward. These trends could be due to changes in consumer preference, changes in export competitiveness of other countries, or other factors.

The declining agricultural trade surplus is largely due to a rising trade deficit for consumer-oriented products. The increase in the trade deficit for consumer-oriented products can be explained by greater income growth in the United States than in important U.S. export markets, free trade agreements, and other possible factors such as changes in U.S. consumer preferences or increased competitiveness of other exporting countries. Because of stagnant exports of bulk commodities, the trade surplus for bulk products has not increased over the last decade. Even though bulk commodity exports have benefitted from free trade agreements, exports have been stagnant due to slower income growth in foreign markets and a downward trend over time that could be due to increased competitiveness from other exporting countries or other factors.

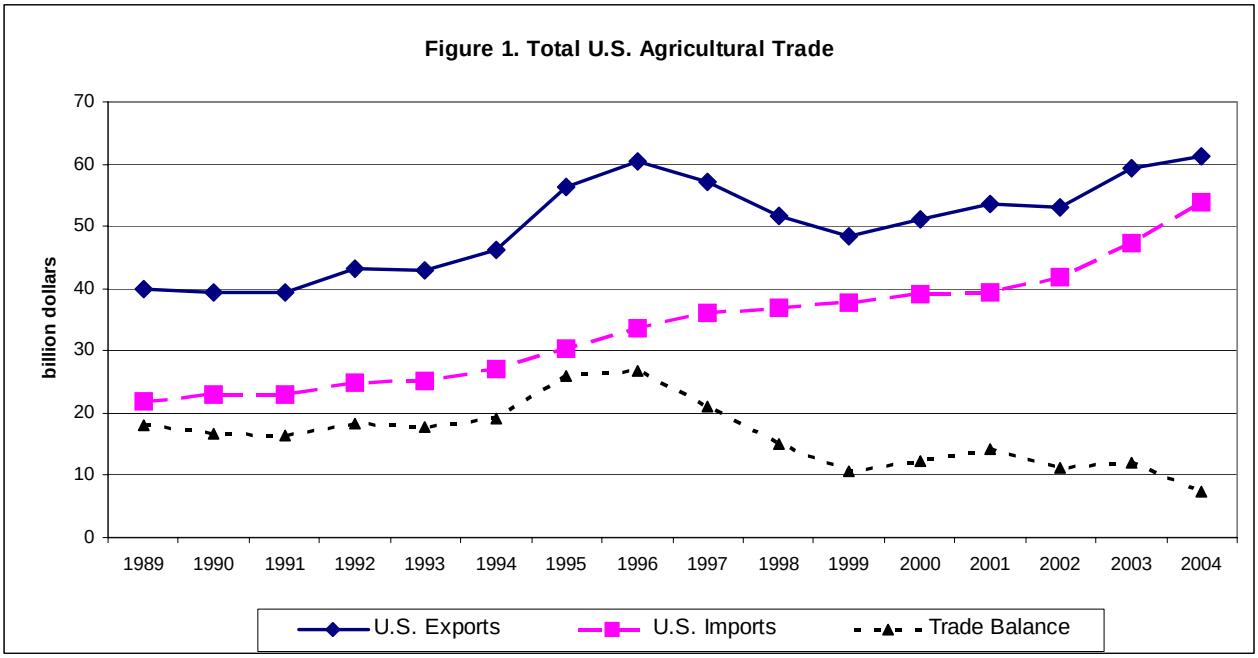
U.S. imports of consumer-oriented products are likely to continue increasing as the economy continues to grow and demand for these products remains strong. U.S. exports could increase if foreign economies grow and populations in export markets increase. Growth in developing markets could provide an opportunity for increased exports. The largest increases in population are likely to occur in developing countries in Africa, Asia, and Latin America. Increased trade liberalization could also lead to increased exports. U.S. exporters, however, are facing increased competition from other exporting countries.

Characteristics of the Declining U.S. Agricultural Trade Surplus

Jeremy W. Mattson and Won W. Koo*

INTRODUCTION

In 1996, the United States had an agricultural trade surplus of $26.9 billion. This surplus has fallen significantly in recent years and could nearly disappear in 2005. U.S. agricultural exports had risen quickly during the early 1990s, from $39.5 billion in 1990 to $60.4 billion in 1996 (Figure 1). Exports declined after 1996, however, before rebounding to $61.3 billion in 2004. Meanwhile, U.S. imports have risen by more than $20 billion since 1996, resulting in a drop in the trade surplus to $7.3 billion in 2004. During the first six months of 2005, U.S. imports are up 9.0 percent to $29.6 billion, while U.S. exports are unchanged from 2004 at $30.6 billion, resulting in a trade surplus that is shrinking even further.



Source: Foreign Agricultural Service, USDA

The objective of this paper is to examine the characteristics of the decreasing agricultural trade surplus and determine the factors causing this decline. U.S. agricultural trade is increasing or decreasing at varying rates with different countries and regions of the world. Much of the decline in the agricultural trade surplus could be attributed to trade with particular countries or regions. Section two of this paper examines how U.S. agricultural trade has changed with these foreign markets over the last 15 years. The type of products being traded has also changed over

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this period. While imports and exports of some products may be growing at slow rates or even declining, trade of other types of products have increased substantially. The types of products traded are presented in the third section of the paper, which examines those products that increased the most in exports and imports in recent years; the fourth section describes the types of products traded with certain countries. In the fifth section, an import demand model is developed to determine factors influencing changes in U.S. agricultural exports and imports. A pooling technique is used, with data from 1989-2004 for 15 countries that are the top agricultural trading partners of the United States. Results are presented in the following section, and the final section provides a summary and conclusion.

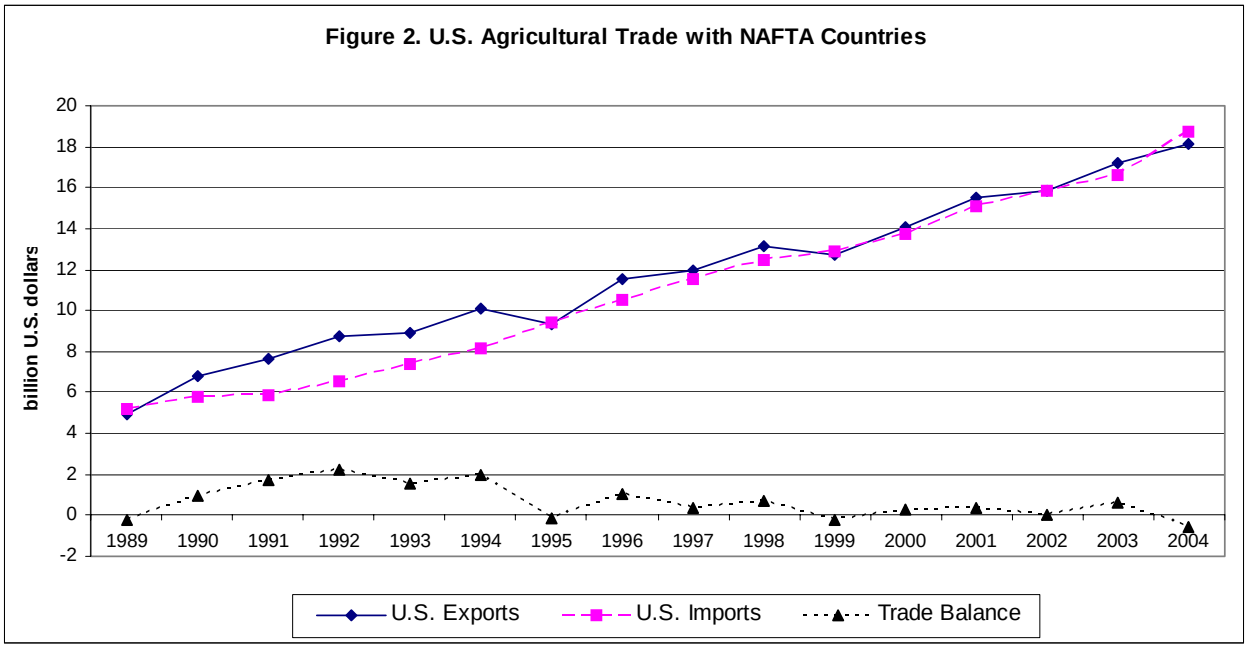
AGGREGATE AGRICULTURAL TRADE BY REGION

Table 1 and Figures 2-12 show how U.S. agricultural trade has changed with different regions of the world over the last 10-15 years. Table 1 shows the change in agricultural exports to and imports from 15 regions of the world, as well as the change in trade balance from the 1992-94 three-year average to the 2002-04 three-year average, in nominal dollar terms. Over this period, exports and imports increased $13.8 billion and $22.1 billion, respectively, resulting in a drop in the trade surplus of $8.3 billion. Total exports increased by 31 percent, while imports increased by 86 percent. Much of the change in exports was to Canada and Mexico, whose imports of U.S. goods increased by $7.8 billion, or 84 percent. Exports to the important East Asian markets (i.e., Japan, Korea, Hong Kong, Taiwan, and China) grew by $3.7 billion, but this is an increase of just 25 percent in nominal dollar terms. Furthermore, exports to East Asia peaked in 1996, and although they increased after their drop in the late 1990s, exports to these countries in 2004 were still below the 1996 level (Figure 3). The increase in exports to East Asia in 2003 and 2004 was due to a large increase in shipments to China. Exports to Japan, Korea, Taiwan, and Hong Kong are still well below the levels from the mid 1990s. Exports to other markets have also declined. Shipments to the EU-25 dropped by 11 percent from the 1992-94 average to the 2002-04 average, while exports to the Former Soviet Union decreased by 47 percent. Besides Canada and Mexico, the largest percentage increases in exports over the last decade have been to Central America, Southeast Asia, and the Caribbean. These are growing markets, but they are not yet major markets.

Table 1. Change in U.S. Agricultural Trade, 1992-94 to 2002-04, by Region

	U.S. Exports Increase		U.S. Imports Increase		Trade Balance Change
	million $	% change	million $	% change	million $
World Total	13,807	31%	22,117	86%	-8,311
North America	7,813	84%	9,692	132%	-1,879
Caribbean	645	64%	36	11%	610
Central America	646	93%	574	37%	73
South America	338	22%	1,609	42%	-1,271
European Union-25	-842	-11%	5,387	101%	-6,229
Other Europe	39	9%	74	28%	-34
Former Soviet Union	-748	-47%	19	65%	-767
Middle East	769	43%	46	9%	723
South Asia	56	9%	377	87%	-321
Southeast Asia	1,320	78%	960	39%	360
East Asia	3,652	25%	1,128	113%	2,524
Oceania	98	21%	1,722	91%	-1,623
North Africa	-103	-7%	71	128%	-174
Sub-Saharan Africa	197	21%	423	71%	-226

Source: Foreign Agricultural Service, USDA



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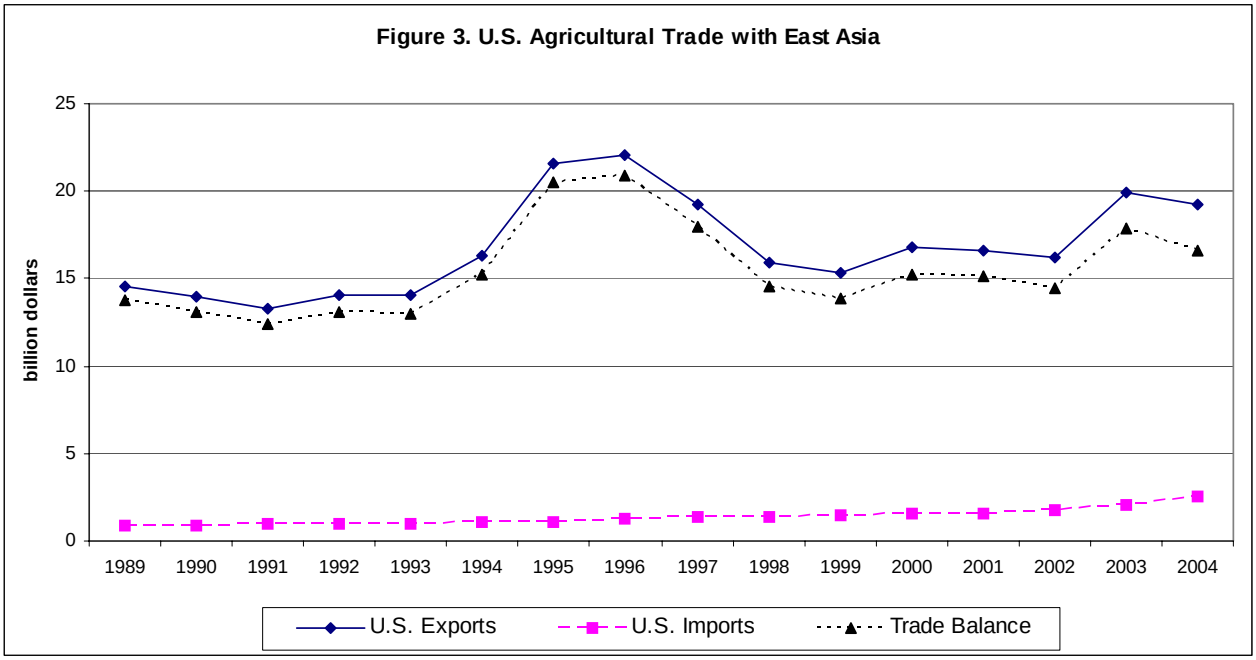

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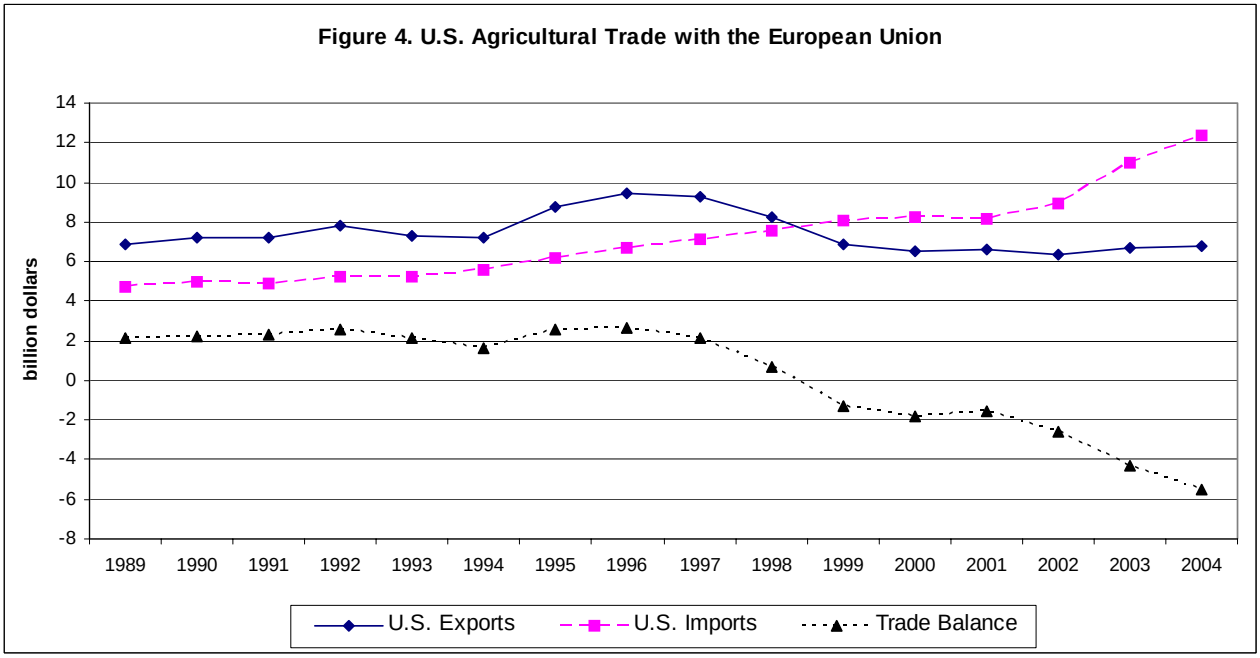

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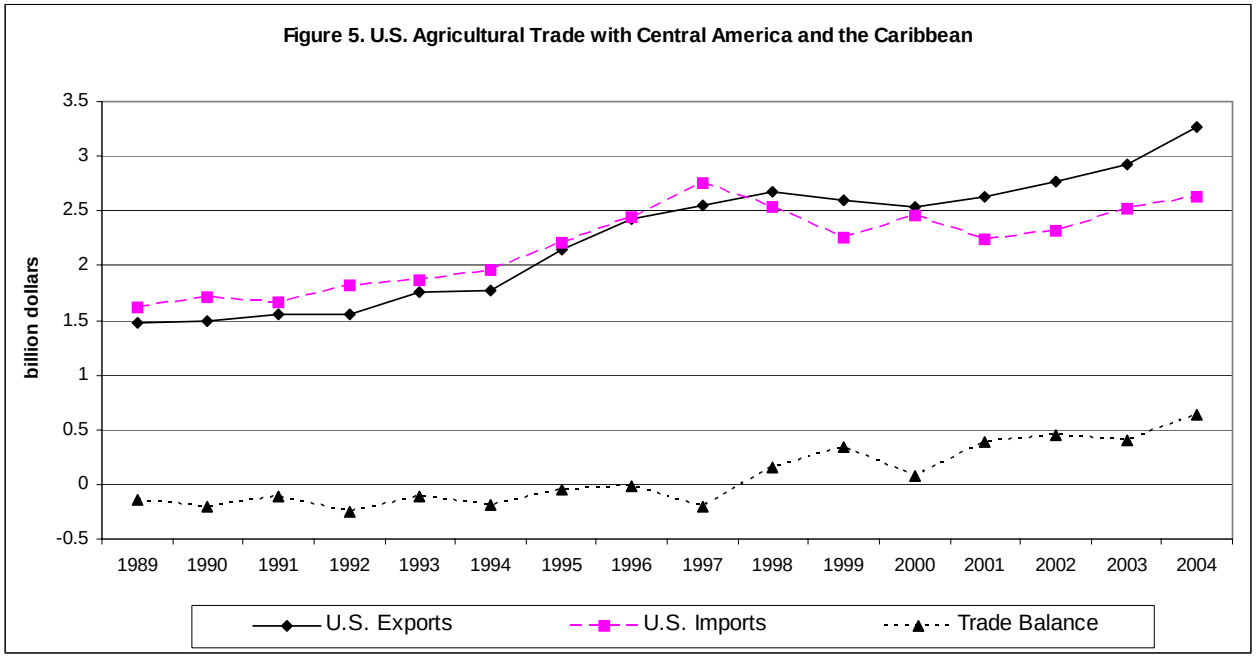

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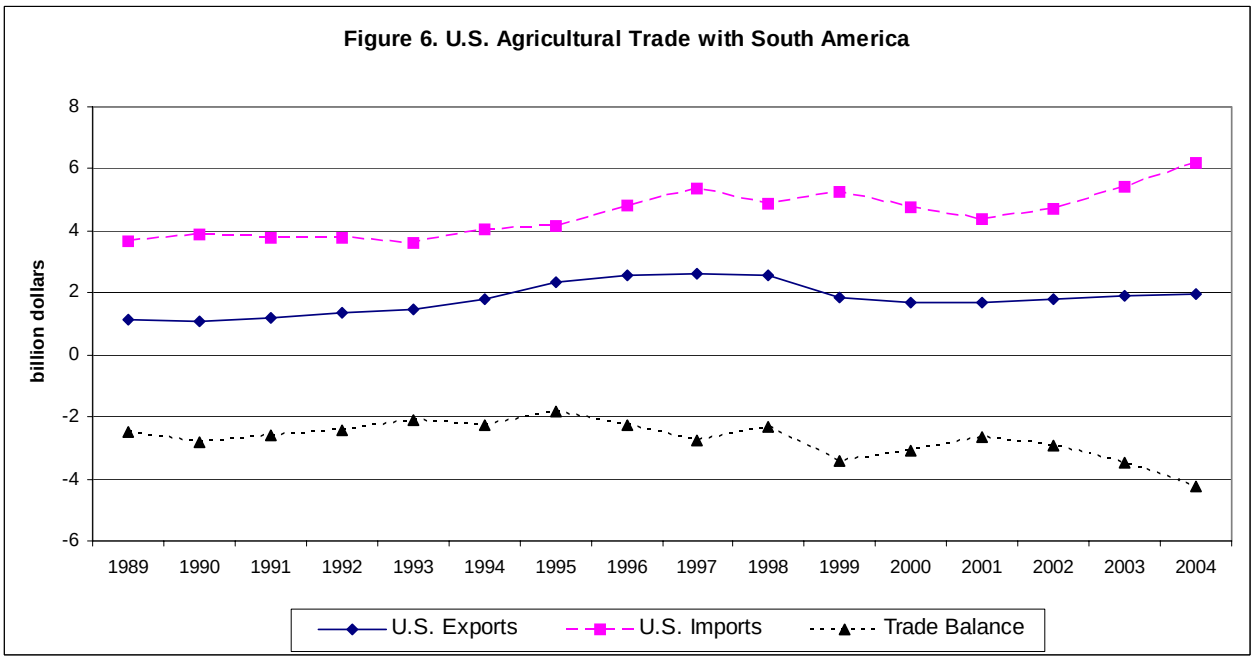

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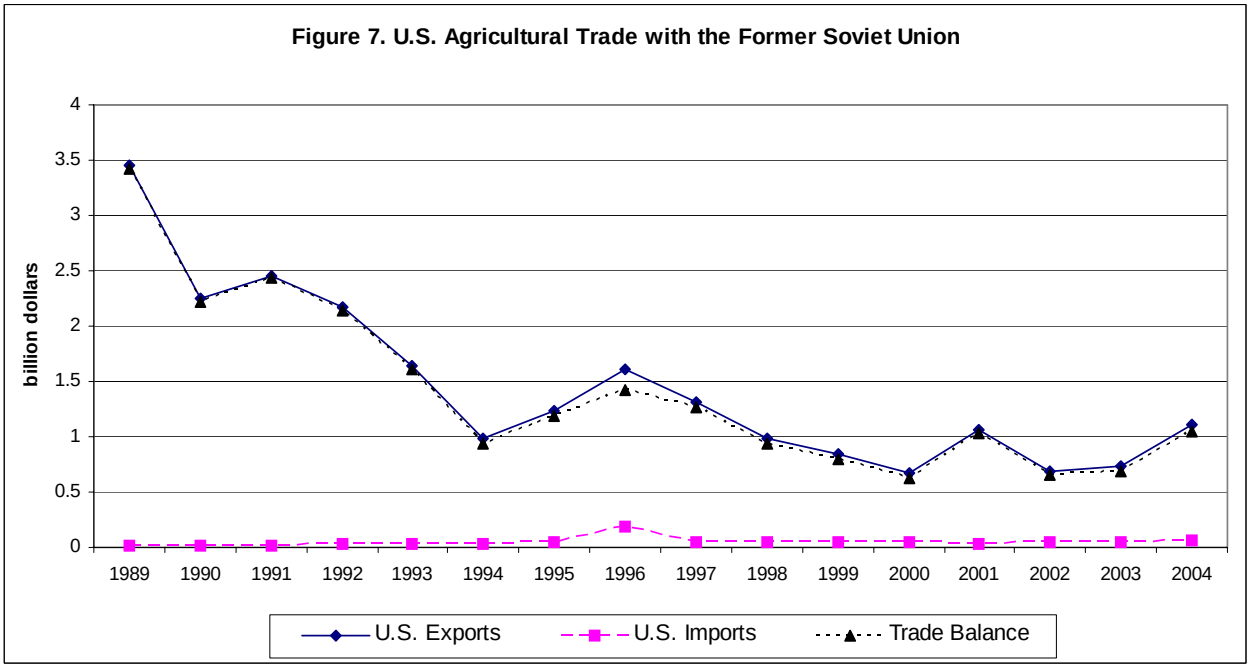

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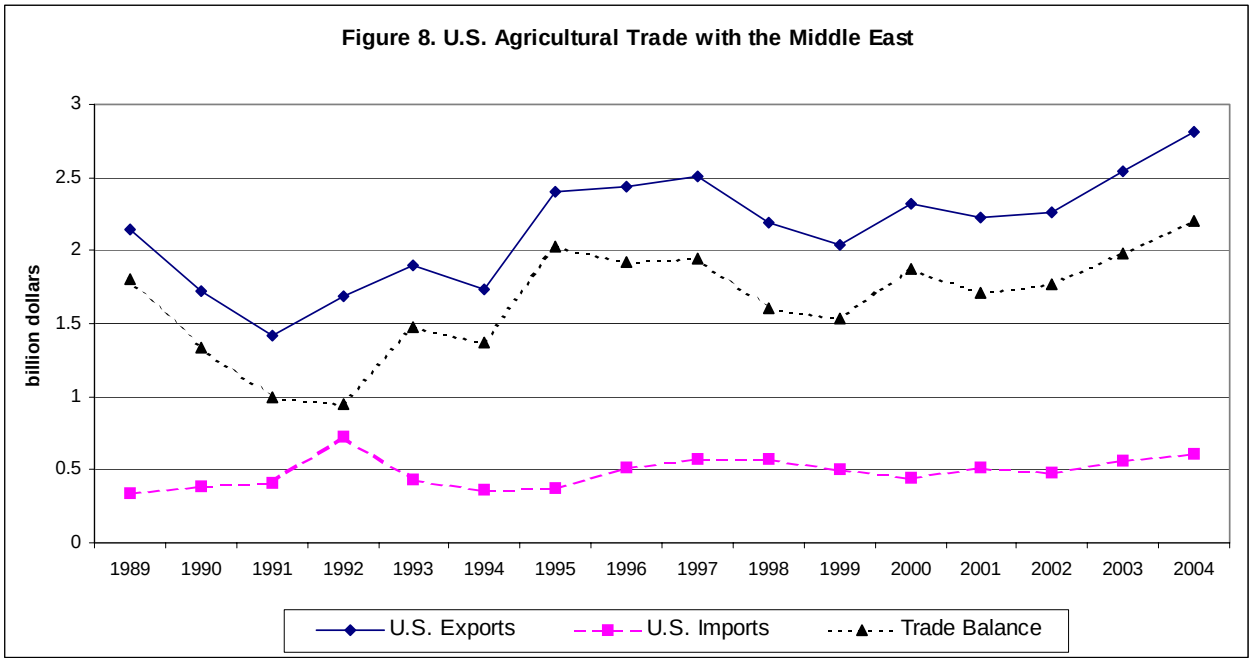

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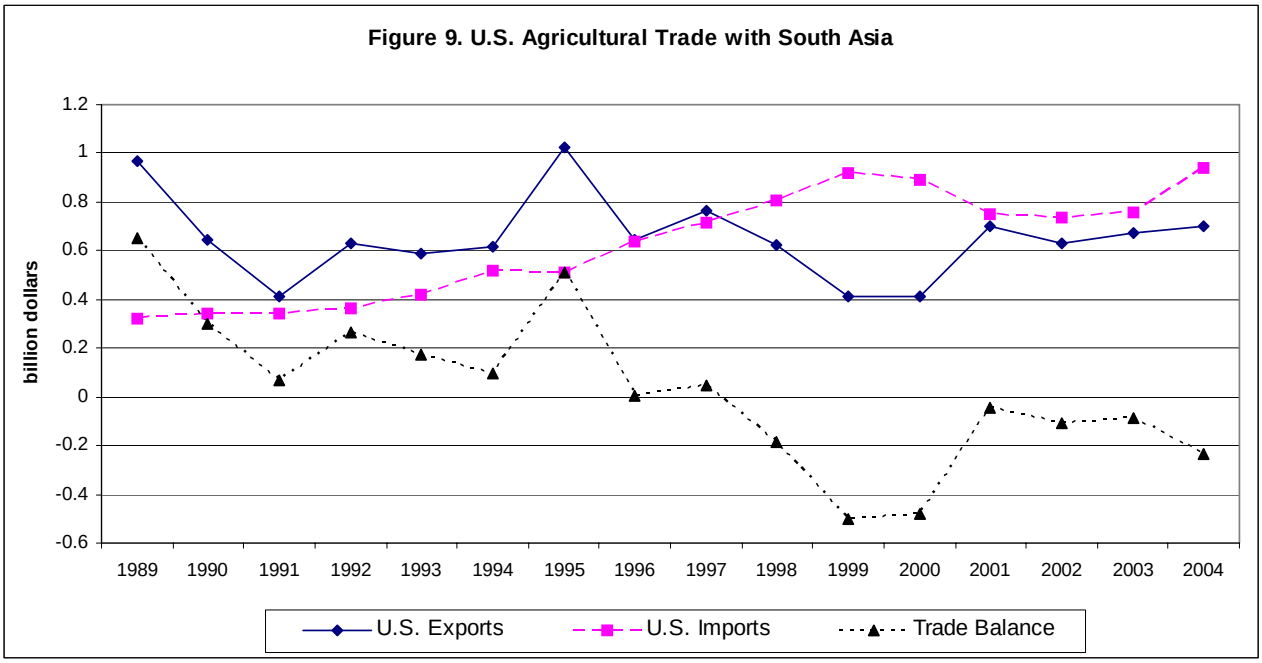

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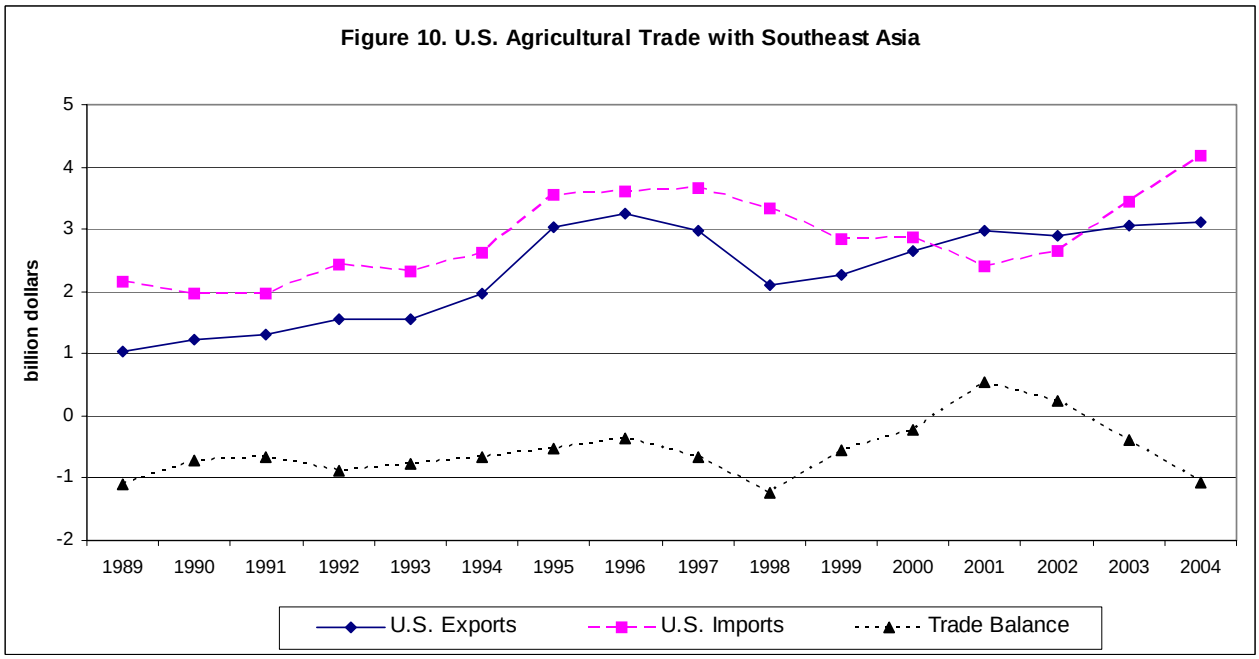

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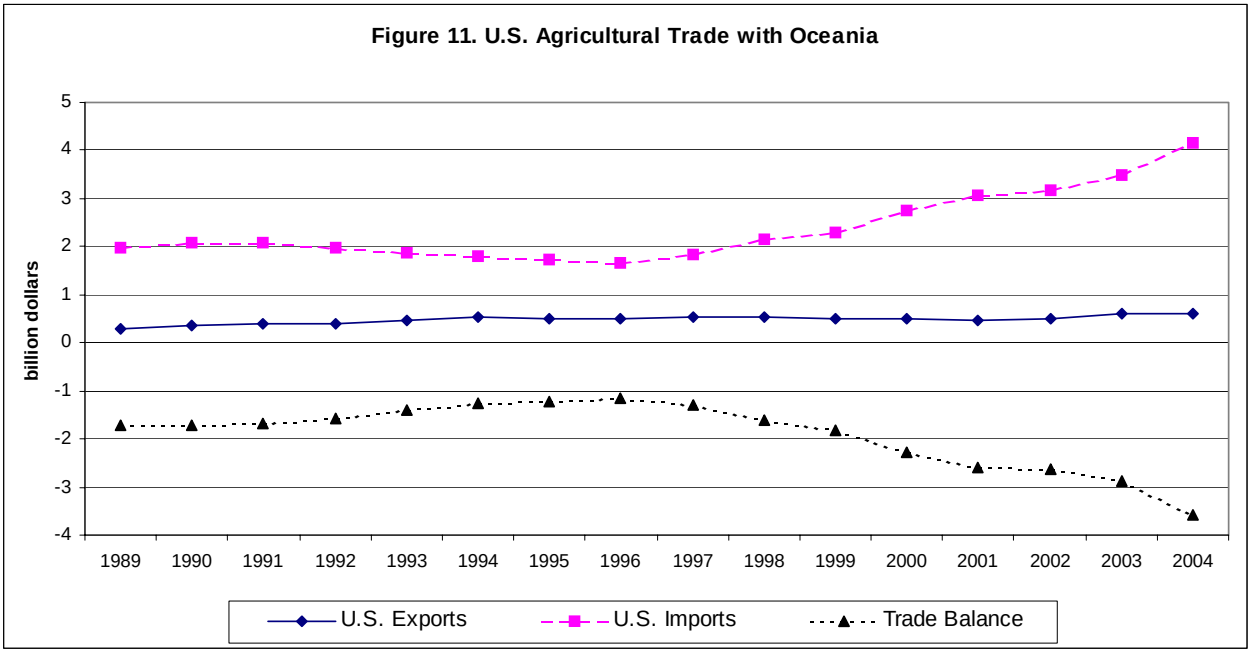

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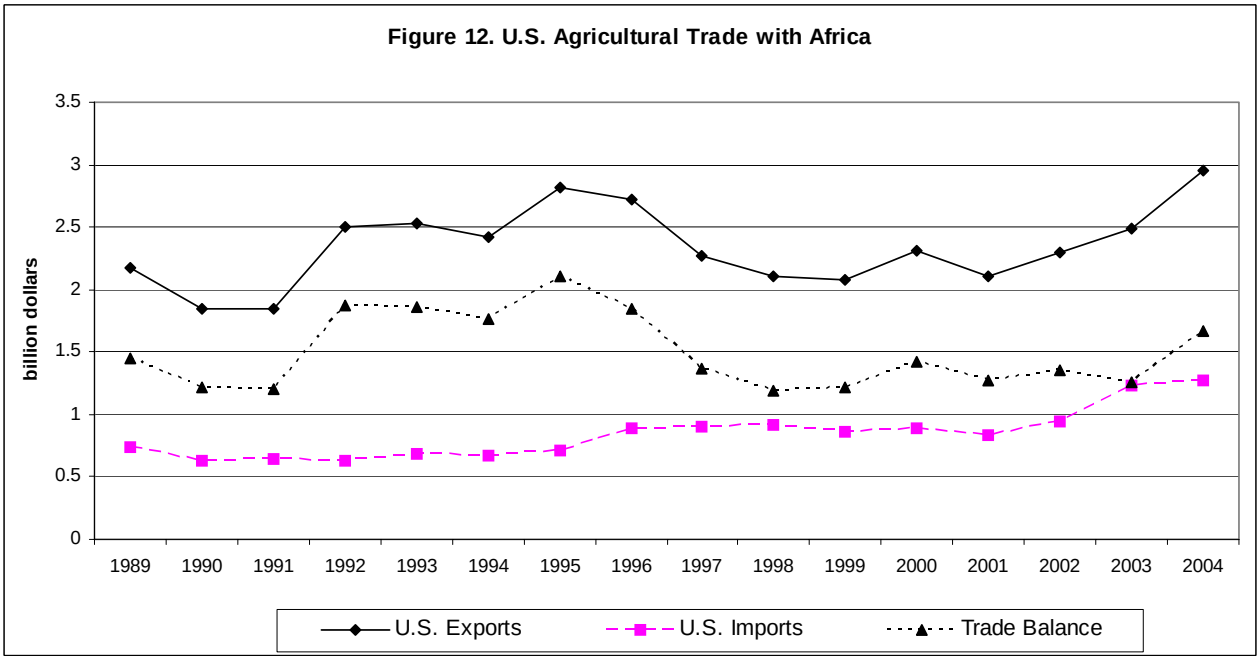


Source: Foreign Agricultural Service, USDA

Beyond exports, NAFTA also had a major impact on U.S. imports, as Canadian and Mexican sales to the United States increased by $9.7 billion, or 132 percent, over this period. Unlike U.S. exports, however, U.S. imports from non-NAFTA countries also increased considerably. Imports from the EU-25 increased by $5.4 billion, or 101 percent, and imports also increased significantly from Oceania (i.e., Australia and New Zealand), South America, and East Asia.

A substantial portion of the declining trade surplus can be accounted for by the EU (Figure 4). A $2.7 billion trade surplus with the EU in 1996 became a $5.5 billion trade deficit in 2004. The trade balances with North America, Oceania, and South America have also fallen by more than a billion dollars over the last decade. The trade balance with Canada and Mexico decreased in the early 1990s but has been relatively stable since 1995 as exports and imports have been increasing at nearly the same rate (Figure 2). The trade deficit with Oceania has increased as imports from Australia and New Zealand have steadily risen and exports to those countries have remained flat (Figure 11). The only regions where the trade balance improved over the decade are East Asia, the Middle East, the Caribbean, Southeast Asia, and Central America. Although the trade surplus increased for the important East Asian market, imports from the region more than doubled, while exports grew by just 25 percent (since the previous level of imports was low, a 113 percent increase in imports is less than a 25 percent increase in exports), and the increase in exports is largely due to greater shipments to China.

The decrease in the trade balance is even more significant when the export and import data are adjusted for inflation. Table 2 shows the same data as in Table 1 after adjusting for inflation with the Consumer Price Index, using the 2004 dollar value as the base. Total exports in real terms increased by just 3 percent over this period, while imports increased by 46 percent. Inflation-adjusted exports decreased to a number of markets over the last decade.

Table 2. Change in U.S. Agricultural Trade, 1992-94 to 2002-04, by Region, Real Dollars (base=2004)

	U.S. Exports Increase		U.S. Imports Increase		Trade Balance Change
	million $	% change	million $	% change	million $
World Total	1,612	3%	15,336	46%	-13,724
North America	5,382	44%	7,848	82%	-2,466
Caribbean	375	29%	-57	-13%	431
Central America	467	52%	147	7%	320
South America	-87	-4%	559	11%	-647
European Union-25	-2,987	-31%	3,983	57%	-6,970
Other Europe	-87	-14%	-2	-1%	-85
Former Soviet Union	-1,237	-59%	11	29%	-1,249
Middle East	283	12%	-102	-15%	385
South Asia	-117	-15%	264	46%	-380
Southeast Asia	875	39%	276	9%	599
East Asia	-450	-2%	868	66%	-1,318
Oceania	-33	-5%	1,221	50%	-1,255
North Africa	-544	-27%	56	78%	-600
Sub-Saharan Africa	-71	-6%	262	33%	-334

Source: Foreign Agricultural Service, USDA

Tables 3 and 4 examine data for the top 15 import sources and export markets for the 1995-2004 period in nominal dollars. These countries account for close to three-fourths of U.S. agricultural imports and exports. While exports have increased considerably to Canada, Mexico, and China, exports to many of the other large markets have declined over the last decade. Imports have increased from a wide range of countries.

Table 3. U.S. Agricultural Imports by Source Country

	1996	2000	2004	1995-2004 average
	----------million dollars----------			
Canada	6,789	8,661	11,453	8,625
Mexico	3,764	5,077	7,257	5,069
Italy	1,313	1,548	2,303	1,587
Netherlands	1,175	1,552	1,937	1,502
Australia	855	1,592	2,486	1,492
France	1,064	1,453	1,746	1,401
Brazil	1,346	1,144	1,659	1,318
Indonesia	1,539	998	1,490	1,237
Colombia	1,128	1,123	1,162	1,135
New Zealand	761	1,132	1,598	1,079
Chile	751	1,026	1,344	950
China	595	812	1,621	881
Thailand	904	779	1,084	832
Germany	770	808	922	802
Costa Rica	681	812	903	786

Source: Foreign Agricultural Service, USDA

Table 4. U.S. Agricultural Exports by Destination

	1996	2000	2004	1995-2004 average
	----------million dollars----------			
Japan	11,731	9,290	8,148	9,496
Canada	6,122	7,640	9,669	7,615
Mexico	5,441	6,410	8,494	6,333
Korea	3,849	2,546	2,489	2,830
China	2,079	1,716	5,542	2,479
Taiwan	2,963	1,996	2,063	2,197
Netherlands	2,050	1,442	1,098	1,533
Hong Kong	1,490	1,262	912	1,301
United Kingdom	1,205	1,035	1,164	1,117
Germany	1,453	905	1,156	1,108
Egypt	1,257	1,050	938	1,024
Spain	1,064	609	781	864
Russia	1,326	580	802	854
Philippines	891	901	694	782
Indonesia	850	668	925	773

Source: Foreign Agricultural Service, USDA

TYPES OF AGRICULTURAL PRODUCTS TRADED

Bulk, Intermediate, and Consumer-Oriented

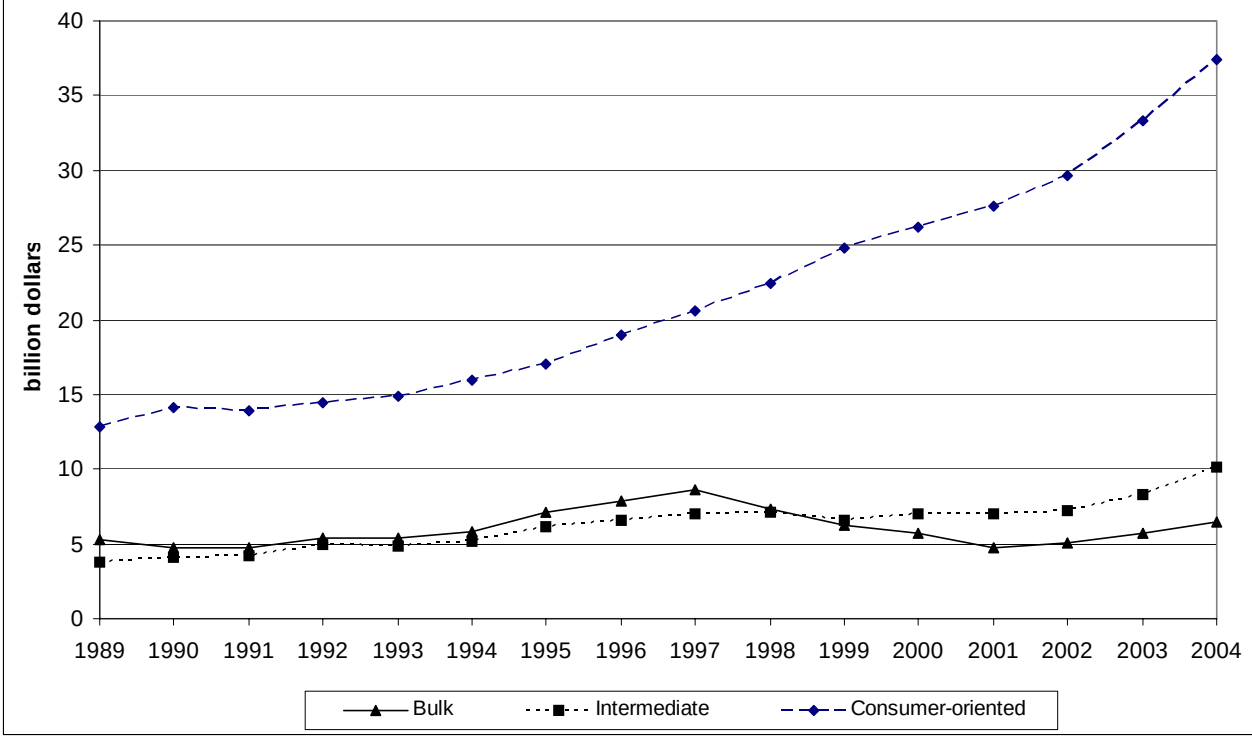
Consumer-oriented products account for most of the increase in agricultural imports over the last 15 years (Figure 13). The Foreign Agricultural Service's (FAS) BICO data classifies agricultural imports and exports into bulk, intermediate, and consumer-oriented products. Bulk products include grains, oilseeds, and other bulk commodities; the intermediate group includes products such as wheat flour, soybean meal, vegetable oils, and live animals; and consumer-oriented products include wine and beer, snack foods, red meats, processed or fresh fruits and vegetables, nursery products, and other processed or ready-to-eat products.

U.S. imports of consumer-oriented products have increased steadily over the last 10-15 years, while imports of intermediate products have increased to a lesser degree, and imports of bulk products have remained relatively constant in nominal dollar terms. From 1989 to 2004, U.S. imports of consumer-oriented products increased from $12.8 billion to $37.5 billion, imports of intermediate products increased from $3.8 billion to $10.1 billion, and imports of bulk products increased from $5.2 to $6.5 billion. In the mid-1990s, bulk commodities accounted for about 23 percent of agricultural imports, while 20 percent consisted of intermediate products and

approximately 57 percent was consumer oriented. In 2004, these percentages changed to 69 percent for consumer-oriented products, 19 percent for intermediate products, and 12 percent for bulk commodities.

On the U.S. export side, bulk commodities account for a larger percentage of trade. Although bulk commodities' share of exports has declined and consumer-oriented products' share has increased, exports of these product categories have been close to equal in recent years (Figure 14). Exports of bulk products increased from $22.8 billion in 1989 to $28.9 billion in 1996, then decreased for a few years before rebounding to $25.5 billion in 2004. Exports of consumer-oriented products have been steadily increasing from $8.5 billion in 1989 to $23.4 billion in 2004. The largest increase in exports of consumer-oriented products occurred in the early and mid 1990s. Since 1996, exports of consumer-oriented products have increased at a slower rate. Exports of intermediate products increased from $8.7 billion in 1989 to $12.5 billion in 1997 and have since remained relatively stable.

Figure 13. U.S. Imports of Bulk, Intermediate, and Consumer-Oriented Agricultural Products



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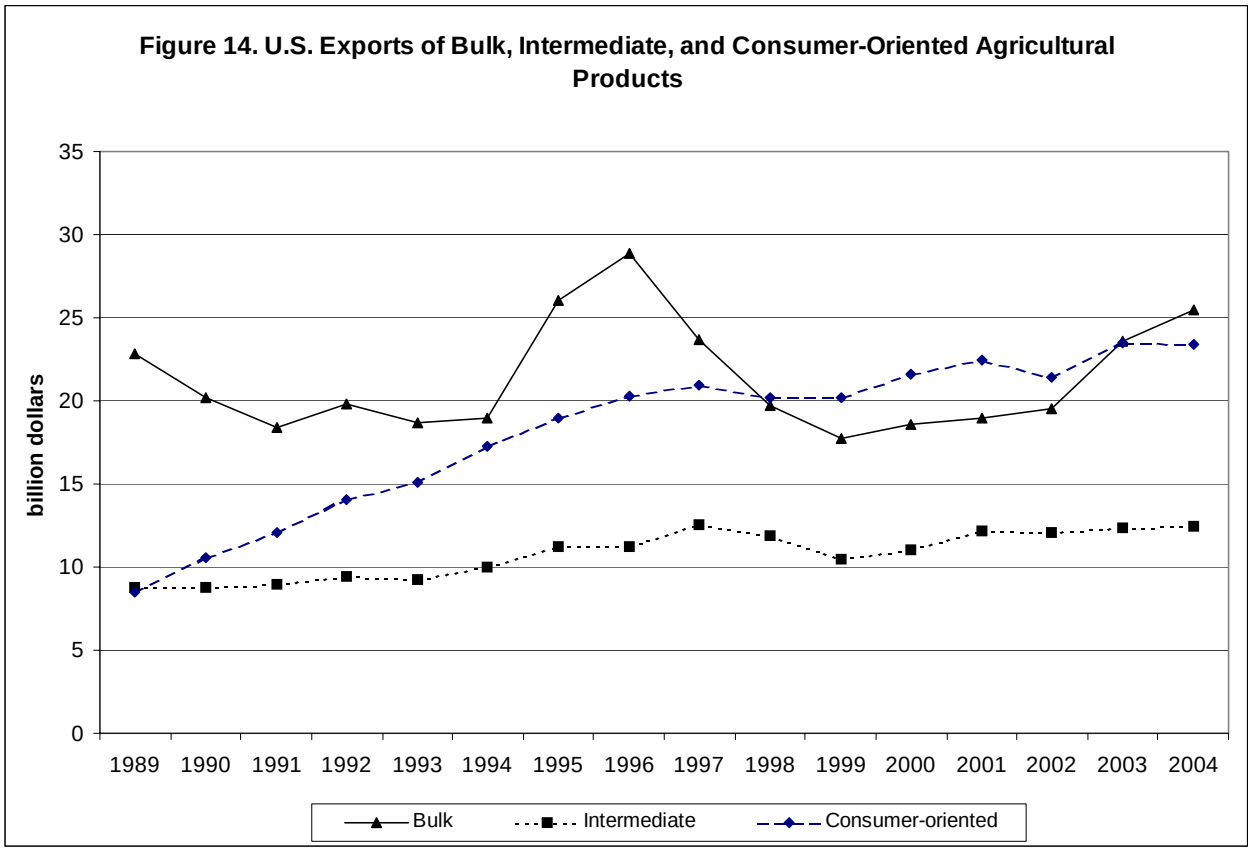

Source: Foreign Agricultural Service, USDA

The trade surplus for bulk products has not changed significantly over the last 15 years, as neither imports nor exports have increased at a significant rate. The bulk product trade surplus reached a high of $21.0 billion in 1996 and a low of $11.4 billion in 1999, and it equaled $19.0 billion in 2004. The trade balance for consumer-oriented products increased in the early 1990s but has declined substantially since 1995. The United States had a trade deficit of $4.4 billion for consumer-oriented products in 1989. This deficit became a surplus in 1993, and it reached a high of $1.9 billion in 1995. However, the trade balance for consumer-oriented products has steadily declined since 1995, reaching a deficit of $14.1 billion in 2004. The United States has maintained an agricultural trade surplus in intermediate products that has ranged from $4-$5 billion in most years, though it declined to $2.4 billion in 2004.

Product Groups

FAS also classifies agricultural trade data into the following categories: grains and feeds; oilseeds and products; cotton, linters, and waste; tobacco and products; planting seeds; livestock and meats; dairy products; poultry and products; horticultural products; and sugar and tropical products. Table 5 shows U.S. imports, exports, and trade balance for these product groups in descending order. Horticultural products account for the largest share of the increase in imports. Over the last decade, imports of horticultural products increased from the 1994-96 average of $11.1 billion to $24.6 billion in 2004. In 2004, 45 percent of agricultural imports consisted of horticultural products, an increase from the 37 percent share in the mid-1990s. Imports of all other categories of products also increased over the last decade.

Table 5. U.S. Agricultural Trade by Product Groups

	1989-91 average	1994-96 average	1999-01 average	2004
Imports		----------million dollars----------		
Horticultural Products	8,307	11,109	16,626	24,629
Sugar & Tropical Products	5,844	7,918	7,699	10,356
Livestock & Meats	4,454	4,701	6,339	7,834
Grains & Feeds	1,279	2,441	3,113	4,262
Oilseeds & Products	911	1,745	1,788	3,035
Dairy Products	837	1,110	1,660	2,331
Tobacco & Products	623	695	672	702
Planting Seeds	161	262	448	442
Poultry & Products	129	165	260	410
Cotton, Linters & Waste	15	117	66	18
Exports				
Grains & Feeds	14,281	17,011	13,371	17,122
Horticultural Products	5,725	9,637	10,673	13,631
Oilseeds & Products	7,100	10,044	9,345	11,099
Livestock & Meats	5,417	7,399	8,328	6,590
Cotton, Linters & Waste	2,527	3,031	1,678	4,248
Poultry & Products	907	2,354	2,331	2,569
Sugar & Tropical Products	1,274	1,955	2,346	2,511
Dairy Products	418	751	994	1,452
Tobacco & Products	1,391	1,366	1,262	1,044
Planting Seeds	590	708	767	1,041
Trade Balance				
Grains & Feeds	13,002	14,570	10,257	12,861
Oilseeds & Products	6,188	8,299	7,557	8,064
Cotton, Linters & Waste	2,512	2,915	1,612	4,230
Poultry & Products	779	2,189	2,071	2,160
Planting Seeds	429	446	319	600
Tobacco & Products	767	670	590	342
Dairy Products	-419	-360	-666	-879
Livestock & Meats	963	2,698	1,989	-1,244
Sugar & Tropical Products	-4,570	-5,963	-5,353	-7,845
Horticultural Products	-2,582	-1,472	-5,953	-10,997

Source: Foreign Agricultural Service, USDA

Grains and feeds account for the largest share of agricultural exports, followed by horticultural products and oilseeds and products. Exports of grains and feeds have increased since 2000 after declining in the late 1990s, but the $17.1 billion exported in 2004 is still below the $20 billion level reached in 1996. Exports of most categories of products have been stagnant over the last decade or have increased slowly. Since 1989, exports of horticultural products have shown the most consistent increases.

Despite the increase in horticultural product exports, the largest trade deficit is in these products. Because of the much more substantial increase in imports of horticultural products, the trade deficit for these products increased from the 1994-96 average of $1.5 billion to $11.0 billion in 2004. This accounts for a large share of the decreasing agricultural trade balance. The second largest deficit is for sugar and tropical products, which reached $7.8 billion in 2004. The trade balances for most categories of products have declined over the last decade or remained relatively the same. The trade balance improved the most for cotton. Grains and feeds continue to have the largest trade surplus, but this surplus has not increased over the last 10-15 years.

Specific Products

Specific products with the greatest increase in imports include wine, beef, beer, vegetables, bakery products, chocolate, nuts, snack foods, confectionary products, cocoa beans, and oils. Much of the increase in horticultural imports can be accounted for by increases in imports of wine, fresh fruits and vegetables, essential oils, nuts, and frozen vegetables. Most of these products would also be classified as consumer-oriented products. Imports of wines increased from $1.2 billion in 1995 to $3.4 billion in 2004. Red meat imports increased from $2.3 billion in 1995 to $5.7 billion in 2004. Imports of a few products, such as coffee and live animals (although this is largely due to a ban on Canadian live cattle imports), have decreased. U.S. exports that have increased the most over the previous decade include soybeans, pork, nuts, vegetables, and dairy products. Very few products, though, have experienced substantial increases in exports since 1996. Exports of a number of products declined from 1995 to 2004. Notable among these products are tobacco, beef, corn, and wheat. The decrease in beef exports was due to the decision by major markets to ban U.S. beef after the December 2003 discovery of bovine spongiform encephalopathy (BSE), commonly referred to as mad-cow disease. After a few years of stagnation and decline, exports of some products did increase significantly in 2003 and 2004, including cotton, wheat, soybeans, corn, nuts, vegetables, and pork.

TYPES OF AGRICULTURAL PRODUCTS TRADED BY COUNTRY

Canada and Mexico are the largest exporters of consumer-oriented products to the United States, followed by Australia, Italy, the Netherlands, New Zealand, France, and Chile. Imports of consumer-oriented products from Canada and Mexico have tripled since the mid-1990s under NAFTA. Imports of these products have also increased substantially from Australia, New Zealand, Chile, China, and a number of European countries. The major consumer-oriented product imports from Canada are red meat and snack foods, while fresh vegetables, beer, and fruit are the major imports from Mexico. Wine is the major consumer-oriented product imported from France and Italy, beer is the major import from the Netherlands, and fresh fruit is the major

import from Chile. The major consumer product imports from Australia are beef and wine, and the top imports from New Zealand are beef and dairy products.

Indonesia was the top exporter of bulk products to the United States in 2004, followed by Canada, Brazil, and Thailand. The major bulk product imported from Indonesia and Thailand is rubber, followed by cocoa beans, raw coffee, and rice. Brazil exports raw coffee and tobacco to the United States, while Canada exports wheat and other bulk commodities. Canada is the largest exporter of intermediate products to the United States, and other exporters include Ireland, Mexico, Italy, and China. Canada's intermediate exports to the United States include live animals and vegetable oils. Italy's intermediate exports are mostly vegetable oils, while Mexico's largest export is live animals. Imports of intermediate products from Ireland increased substantially in 2003 and 2004 as the country exported a significant amount of essential oils to the United States.

Canada, Mexico, and Japan are the main markets for U.S. exports of consumer-oriented products. Exports of these products to Canada and Mexico have increased significantly under NAFTA, but exports to Japan have decreased in recent years. Red meat is the top consumer-oriented product exported to both Japan and Mexico. Exports of red meat have increased to Mexico but decreased to Japan because of concerns related to BSE. Even before the discovery of BSE in the United States, concerns about the disease led to reductions in beef consumption in Japan and negatively impacted imports even from countries believed to be BSE-free (Jin and Koo 2003). The major consumer product exports to Canada are vegetables, fruits, and snack foods.

Exports of bulk products to China increased substantially in 2003 and 2004, making it the largest market for U.S. bulk commodities. Soybeans are the major bulk exports to China, followed by cotton and wheat. Other major markets for U.S. bulk products include Japan, Mexico, Korea, and Taiwan. Bulk exports to Japan, Korea, and Taiwan have decreased since the mid-1990s, while exports to Mexico have increased under NAFTA. Mexico, Canada, Japan, China, and Korea are the major markets for U.S. intermediate products. Exports to Mexico, Canada, and China have increased, while exports to Japan and Korea have stagnated or declined over the last decade. Much of Japan's intermediate product imports are feeds and fodders. The main intermediate products exported to Korea are hides and skins, and Korean imports of these products from the United States have declined. On the other hand, the increase in intermediate product exports to China has been largely due to China's imports of hides and skins.

U.S. AND FOREIGN IMPORT DEMAND MODELS FOR AGRICULTURAL GOODS

Empirical Model

An import demand model is developed to estimate factors influencing U.S. agricultural imports from its trading partners and foreign countries' imports from the United States. Panel data from 1989 to 2004 are used for U.S. imports of agricultural products from the 15 largest exporting countries and U.S. exports to the 15 largest importing countries.

A country's agricultural imports or exports occur when its demand for agricultural products differs from its domestic supply. Thus, a country's imports or exports are influenced by factors affecting both domestic demand and supply. The variables are relative prices, exchange rates, purchasing power, and production capacity reflecting arable land and farming technology. Exchange rates and free trade agreements influence the quantity of imports demanded by affecting the prices paid for imports. Other factors such as a change in consumer preference can affect a country's demand for imports over time. The extent to which a country's domestic production can meet its demand for agricultural products will also influence its level of imports or exports. This can be measured using per capita agricultural GDP.

The price of agricultural products in both exporting and importing countries is important in determining trade flows between them. However, we do not include prices as an independent variable since the dependent variable is bilateral trade value rather than bilateral trade volume. Since agricultural products are divided into three categories - bulk, intermediate, and consumer-oriented - trade flows are better represented by the value term rather than the volume.

Based on the above discussion, U.S. imports are specified as a function of the exchange rate, U.S. disposable income, U.S. per capita agricultural GDP, free trade agreements, a trend variable, and a lagged dependent variable. The trend variable can capture other factors that have changed over time which may affect import demand. Since free trade agreements, which often include a gradual phase in of tariff reductions, may accelerate import trends, a variable is included which multiplies the trend variable with the FTA dummy variable. The lagged dependent variable is added to account for dynamic effects. The equation is specified using the double-log form as follows:

$$\ln(M_{it}) = \alpha_0 + \alpha_1 \ln(RER_{it}) + \alpha_2 \ln(Y_{USt}) + \alpha_3 \ln(AgGDP_{USt}) + \alpha_4 FTA_{it} + \alpha_5 \ln(TR_t) + \alpha_6 \ln(TR_t)*FTA_{it} + \alpha_7 \ln(M_{it-1}) + e_{it} \quad (1)$$

$$i = 1,2,...,15;\ t = 1989\text{-}2004$$

where M_{it} = value of U.S. imports from country i in year t

RER_{it} = real exchange rate with country i in year t

Y_{USt} = real U.S. disposable income in year t

$AgGDP_{USt}$ = real per capita U.S. agricultural GDP in year t

FTA_{it} = dummy variable for free trade agreements

TR_t = trend variable.

Foreign imports of U.S. agricultural products are specified in a way similar to the U.S. import demand model. The foreign import demand is a function of the exchange rate, the importing country's purchasing power and per capita agricultural GDP, free trade agreements, a trend variable, and a lagged dependent variable. The foreign import demand equation, where foreign imports from the United States equals U.S. exports, is specified as follows:

$$\ln(X_{jt}) = \beta_0 + \beta_1 \ln(RER_{jt}) + \beta_2 \ln(Y_{jt}) + \beta_3 \ln(AgGDP_{jt}) + \beta_4 FTA_{jt} + \beta_5 \ln(TR_t) + \beta_6 \ln(TR_t)*FTA_{it} + \beta_7 \ln(X_{jt-1}) + \varepsilon_t \quad (2)$$

$$j = 1,2,...,15;\ t = 1989\text{-}2004$$

where X_{jt} = value of U.S. exports to country j in year t

RER_{jt} = real exchange rate with country j in year t

Y_{jt} = real per capita GDP in country j in year t

$AgGDP_{jt}$ = real per capita agricultural GDP in country j in year t

FTA_{jt} = dummy variable for free trade agreements

TR_t = trend variable.

It is assumed that U.S. imports and exports of different classes of products are affected differently by changes in the independent variables. Therefore, U.S. imports and exports of agricultural products are divided into bulk, intermediate, and consumer-oriented products, and separate equations are estimated for each of these three product classes. The dependent variable in each equation is the real value of U.S. imports or exports of bulk, intermediate, or consumer-oriented agricultural products.[1]

The exchange rate is measured as the foreign currency units per U.S. dollar, so an increase in this variable indicates an appreciation of the U.S. dollar. Appreciation of the U.S. dollar makes foreign goods cheaper in the United States and U.S. goods more expensive abroad. Therefore, an appreciation of the exchange rate is expected to have a positive impact on the quantity of imports and negative effect on the quantity of exports. However, since the dependent variables in Equations 1 and 2 are the value of imports and exports, the expected effect of the exchange rate is uncertain, depending upon price elasticity of import demand. An appreciating U.S. dollar would lead to a decrease in prices of foreign goods. If the price elasticity of import demand is elastic, the total value of imports increases and α_1 is positive. On the other hand, if the price elasticity of import demand is inelastic, the total value of imports decreases as a result of dollar appreciation, and α_1 is negative. Similar arguments can be made for β_1.

Purchasing power is expected to positively influence imports. The increase in disposable income in the United States is expected to have a positive effect on imports ($\alpha_2 > 0$). Similarly, per capita GDP in major importing countries is expected to positively influence U.S. exports to those countries ($\beta_2 > 0$).

[1]We used import and export value rather than volume because the trade volume for aggregated groups of products is not a meaningful representation of the characteristics of the bilateral trade balance.

Imports could also be influenced by the level of domestic production, which is represented by per capita agricultural GDP. It is expected that as per capita agricultural GDP in a country increases, the need for agricultural imports would decrease (α_3, $\beta_3 < 0$). Likewise, a lower level of agricultural GDP could result in a higher level of imports. U.S. agricultural GDP can be separated into GDP from agricultural production and GDP from the food and beverage industry. The U.S. import equations are modified slightly so that the bulk import equation includes the GDP from agricultural production and the consumer products import equation includes GDP from the food and beverage industry. The intermediate import equation includes total agricultural GDP, since both could influence intermediate imports.

Reducing trade barriers should also affect trade flows. The United States implemented a free trade agreement with Canada in 1989, Mexico in 1994, and Chile in 2004. It is expected that these free trade agreements have had a positive impact on imports and exports (α_4, $\beta_4 > 0$). Free trade agreements signed with Central American countries and Australia, and possible future free trade agreements, could influence future trade flows. The trend variables could be either positive or negative depending on how other factors have affected import demand. For example, changes in consumer preferences could be resulting in an upward trend for U.S. demand of consumer-product imports, while demand for imports from the United States could be negatively affected by factors such as increased competitiveness of other exporting countries. Free trade agreements may have affected these trends. It is expected that the gradual reduction in trade barriers has resulted in an upward trend in trade flows (α_6, $\beta_6 > 0$).

A dummy variable for Canada in 2003 and 2004 is added to the intermediate imports model because the U.S. ban on live cattle from Canada caused intermediate imports to decline. Bans on U.S. beef exports to Japan, Korea, Hong Kong, and Egypt caused U.S. exports of consumer-oriented products to these countries to decline substantially in 2004, so a dummy variable for 2004 for these countries is added to the consumer exports model account for this factor. A dummy variable is also included in the intermediate exports model for China before 1994. A structural change may have occurred in 1994 that caused U.S. exports of intermediate products to China to increase substantially. Prior to 1994, U.S. exports of these products were minimal. The coefficients for all three of these dummy variables are expected to be negative.

Data and Estimation Procedure

A pooling technique is used with U.S. bilateral trade with 15 countries for the 1989-2004 period. The covariance approach is used by allowing the intercept term to vary for each country. The fixed-effects approach is chosen under an assumption that the slopes of the equations remain constant over time and location under a globalized trade environment. A Hausman test was run, and the results show that a fixed-effects model is appropriate. The cross section, or country, dummy variables in the model control for omitted variables that differ between countries but are constant over time.

The import and export value data were obtained from the FAS's U.S. Trade Internet System. The trade data were converted to real dollars using the Consumer Price Index (CPI), which was obtained from the Bureau of Labor Statistics. Real exchange rate data were obtained from the USDA's Economic Research Service (ERS). The U.S. import equations use U.S. real disposable

income, which was obtained from the Bureau of Economic Analysis's National Income and Product Accounts data. The U.S. export equations use per capita GDP based on purchasing power parity in the importing countries, which was obtained from the International Monetary Fund's (IMF) World Economic Outlook Database. GDP for U.S. agricultural production and for the U.S. food and beverage industry were obtained from the Bureau of Economic Analysis, and these data were converted to real terms. Good quality data for agricultural GDP in foreign countries were not available. Therefore, this variable was removed from the model. Differences in agricultural GDP between countries could be captured by the dummy variables.

RESULTS

Table 6 shows the estimation results. The results from the estimation of Equations 1 and 2 show that income in the importing country influences trade flows. Increases in U.S. disposable income has had a significant positive impact on imports of consumer-oriented and intermediate products Disposable income, however, was not found to significantly influence imports of bulk products. U.S. exports of all types of agricultural products increase when per capita GDP in the importing country increases. Results show that when per capita GDP in importing countries increase 1 percent, the value of U.S. exports increases 0.99 percent for consumer products, 1.26 percent for bulk products, and 0.98 percent for intermediate products. The Asian financial crisis in the late 1990s likely had a significant negative impact on U.S. agricultural exports as per capita GDP in many Asian countries declined or remained stagnant for a few years.

The exchange rate is found to have a statistically significant and negative impact on the value of consumer-oriented and intermediate imports, suggesting that the price elasticity of import demand is inelastic. The exchange rate was not found to significantly influence imports of bulk products. Exchange rate is shown to have a statistically significant negative impact on the value of U.S. exports of consumer-oriented products, with results indicating that the value of exports decreases 0.14 percent when the dollar appreciates 1 percent. On the other hand, the value of bulk and intermediate exports was found to increase when the dollar appreciates. These results suggest that the price elasticity of import demand in the major U.S. export markets is elastic for consumer-oriented products and inelastic for bulk and intermediate products.

The FTA dummy variable is not significant in any of the equations, but the FTA trend variable is positive and significant for U.S. imports of consumer products and U.S. exports of bulk products. These results show that FTAs have had a positive impact which has increased over time on imports of consumer-oriented products and exports of bulk products. Trade of other products is not found to be significantly impacted by FTAs. The insignificant effect of FTAs on imports of bulk and intermediate products could be due to the United States not imposing any significant tariffs on imports of these products.

The trend variable is significant and positive for U.S. imports of intermediate and consumer-oriented products and U.S. exports of consumer-oriented products. The trend is significant and negative for U.S. exports of bulk and intermediate products. These results suggest that U.S. demand for intermediate and consumer-oriented products and foreign demand for consumer-

oriented products have increased over time, while foreign demand for U.S. bulk and intermediate products has been declining.

The dummy variables representing countries in the import and export equations are significant (not shown in Table 6), indicating that U.S. trade with exporting and importing countries is also influenced by country-specific characteristics. Shipping distance may be one country-specific effect. Transportation costs are likely to result in a greater level of trade with countries that are closer. Other country-specific effects could include market size, cultural similarities, or previous trading relationships.

Table 6. Estimated Results of U.S. Import and Export Equations

	U.S. Imports			U.S. Exports		
	Bulk	Intermediate	Consumer-oriented	Bulk	Intermediate	Consumer-oriented
Variable	estimated coefficients (t-values in parentheses)					
Exchange rate	-0.160 (-0.85)	-0.500 (-3.15)**	-0.235 (-3.32)**	0.199 (3.15)**	0.102 (2.18)**	-0.142 (-2.55)**
U.S. disposable income	-0.254 (-0.47)	0.968 (2.21)**	1.071 (4.00)**			
Foreign country per capita GDP				1.259 (5.12)**	0.983 (4.20)**	0.991 (4.26)**
U.S. per capita Ag GDP	0.126 (0.42)	1.191 (1.52)	0.008 (0.03)			
Free trade agreement (FTA)	-0.398 (-1.02)	-0.102 (-0.32)	-0.218 (-1.38)	-0.185 (-0.41)	-0.098 (-0.27)	0.377 (0.88)
Trend	0.059 (0.77)	0.221 (3.22)**	0.053 (1.62)*	-0.393 (-7.54)**	-0.146 (-3.58)**	0.291 (6.12)**
FTA*Trend	0.070 (0.51)	-0.141 (-1.22)	0.158 (2.67)**	0.395 (2.31)**	0.128 (0.95)	-0.158 (-0.99)
Canada 2003-04 dummy		-0.395 (-1.45)				
China pre-1994 dummy					-1.509 (-6.81)**	
BSE 2004 dummy						-0.908 (-4.36)**
Lagged dependent variable	0.169 (5.66)**	0.332 (6.75)**	0.254 (6.86)**	0.364 (7.21)**	0.341 (7.78)**	0.130 (3.40)**
R^2	0.96	0.89	0.96	0.87	0.91	0.94

Notes: * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level. Results from the country dummy variables are not shown here.

CONCLUSIONS

Much of the decline in the agricultural trade surplus over the past decade is due to a significant decrease in the trade balance with the EU and a significant increase in imports of consumer-oriented and horticultural products, which include processed foods, beverages, and fresh or processed fruits and vegetables. Imports from the EU have steadily risen and exports to those countries have decreased. Most of the increase in imports from Europe consists of consumer-oriented products. The increase in imports from other regions such as Australia, New Zealand, South America, and East Asia, and the significant drop in exports to East Asian countries in the late 1990s have also contributed to the decline in the agricultural trade surplus. Imports from Canada and Mexico have increase substantially under NAFTA, but exports to those countries have also increased.

U.S. imports of consumer-oriented products are positively affected by U.S. disposable income and free trade agreements, and U.S. exports of agricultural products are significantly influenced by per capita income in importing countries. Exchange rate is also found to have a significant effect for the trade of some products. An appreciating U.S. dollar is found to have had a negative impact on the value of exports of consumer-oriented products, but no evidence is found that the values of bulk and intermediate product exports have been negatively affected or that an appreciating dollar caused an increase in the value of imports. Results actually show that, due to inelastic demand, an appreciating dollar causes a decrease in the value of intermediate and consumer-oriented imports and an increase in the value of bulk and intermediate exports. Examining the quantity of exports instead of the value, however, could provide different results.

Free trade agreements have had a significant positive impact on U.S. imports of consumer-oriented goods and U.S. exports of bulk products, but not U.S. imports of intermediate or bulk products or U.S. exports of intermediate or consumer-oriented products. Trade liberalization could also have an indirect positive effect on trade flows by increasing purchasing power in importing countries. Trade agreements often lead to increased economic activity and income, which leads to increased demand for imports. Much of the increase in exports to Mexico under NAFTA, for example, could be explained by the increase in per capita income in the country, which has led to increased demand for U.S. products.

After accounting for these other variables, results show that exports of bulk and intermediate products have been trending downward while exports of consumer-oriented products and imports of intermediate and consumer-oriented products have been trending upward. These trends could be due to changes in consumer preference, changes in export competitiveness of other countries, or other factors.

The increase in the trade deficit for consumer-oriented products can be partly explained by greater income growth in the United States relative to important U.S. export markets and free trade agreements. Even though bulk commodity exports have benefitted from free trade agreements, bulk exports have declined or stagnated to countries with which the United States does not have free trade agreements. This could be due to slower income growth in foreign

markets or a downward trend over time that could be caused by increased competitiveness from other exporting countries, or other factors.

U.S. imports of consumer-oriented products are likely to continue increasing as the economy continues to grow and demand for these products remains strong. The upward trend in imports of these products could be partly due to increased demand for ethnic foods caused by an influx of immigrants and a diversification of consumer tastes. U.S. exports could increase if foreign economies grow and populations in export markets increase. Growth in developing markets could provide an opportunity for increased exports. The largest increases in population are likely to occur in developing countries in Africa, Asia, and Latin America, while populations in major traditional foreign markets in Europe and Japan are projected be remain steady or even decline. Increased trade liberalization could lead to increased exports. U.S. exporters, however, are facing increased competition from other exporting countries.

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