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# U.S. Processed Food Exports and Foreign Direct Investment in the Western Hemisphere

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**TABLE OF CONTENTS**

## List of Tables



## List of Figures

**Abstract**

U.S. exports of processed food products and sales by foreign affiliates of U.S. companies in the industry have been growing rapidly. Canada and Mexico are the United States' two major trading partners in the Western Hemisphere, while small quantities of processed food products are exported to a number of other countries in the hemisphere. U.S. Foreign Direct Investment (FDI), like exports, is also largest in Canada and Mexico, but there is also significant FDI in the processed food industry in South American countries such as Brazil and Argentina. U.S. FDI, measured as sales by foreign affiliates, is significantly greater than U.S. processed food exports.

The relationship between FDI and trade is subject to much debate and analysis. An econometric model is developed and estimated to determine the factors affecting U.S. processed food exports and sales by affiliates in eight Western Hemisphere countries, as well as the relationship between exports and FDI. Results suggest that U.S. FDI and exports are complements. U.S. exports are also positively influenced by real GDP in the importing country and are negatively influenced by tariffs. There are also large regional differences in U.S. exports after economic variables are accounted for. U.S. exports are higher to Canada and, to a lesser extent, Mexico and are lower to Brazil and Argentina.

U.S. FDI is positively influenced by real GDP in the host country, which indicates that U.S. firms invest in countries with greater market opportunities. FDI is negatively influenced by exchange rate volatility, which indicates that U.S. firms try to avoid unstable economies. Free trade agreements with Canada and Mexico also have significant positive effects on U.S. FDI. Results indicate that taking advantage of lower labor costs is not a motivating factor for U.S. firms, and that the real exchange rate does not have a significant effect on either FDI or exports.

**Keywords:** processed foods, foreign direct investment, Western Hemisphere

# U.S. Processed Food Exports and Foreign Direct Investment in the Western Hemisphere

**Jeremy W. Mattson and Won W. Koo***

## Introduction

U.S. exports of processed food products have been increasing, but sales by foreign affiliates of U.S. companies in the industry are larger than exports and are growing more rapidly. Canada and Mexico are the United States' two major trading partners in the Western Hemisphere, while small quantities of processed food products are exported to a number of other countries in the hemisphere. U.S. Foreign Direct Investment (FDI), like exports, is also largest in Canada and Mexico, but there is also significant FDI in the processed food industry in South American countries such as Brazil and Argentina.

The relationship between FDI and trade is subject to much debate. One theory suggests that FDI and trade are substitutes (Gopinath et al. 1999). A firm may have a choice between exporting products to a country or building a plant in that country. FDI and trade could be viewed as substitutes because choosing one option may result in the other option being abandoned. Another set of theories, however, suggest that trade and FDI could be complements (Koo and Uhm 2001; Bolling et al. 1998; Banerjee 1997). If a firm builds a plant in another country, it may be able to create a market for similar products, which could result in an increase in exports to that country. U.S. processed food exports and FDI have both increased in most Western Hemisphere countries during the last decade, which may suggest that exports and FDI are complements. On the other hand, the large increase in FDI could be slowing the growth in exports. Some research suggests the FDI-export relationship is ambiguous or that it can be either a complement or substitute relationship, depending on factors such as the state of economic development of the host country, the similarities in the development of the two countries, or the nature of the industry to which the FDI is directed (Overend et al. 1997; Murirathinam et al. 1998; Malanoski et al. 1997; Somwaru and Bolling 1999).

It is important to understand the extent to which significant outflows of FDI influence U.S. exports to the FDI-hosting countries because the United States has had a processed food trade deficit in the Western Hemisphere during the last few years. Specific objectives of this study are to 1) analyze U.S. processed food trade and FDI in the Western Hemisphere, 2) analyze factors affecting U.S. processed food trade and FDI in the Western Hemisphere, and 3) determine the relationship between FDI and exports in the processed food industry. An econometric model is developed and estimated to determine this relationship and the factors affecting exports and FDI.

## Relationship Between FDI and Trade

FDI may affect trade flows. This effect may be either positive or negative, depending on the relationship between FDI and exports (i.e., complement or substitute in nature). FDI and trade are substitutes if FDI replaces trade in a foreign country . In theory, FDI and exports could

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be viewed as competing strategies for a firm attempting to penetrate a foreign market. The firm could either export the product to the country or invest and produce the product in the country. Exports and FDI could, therefore, be viewed as substitutes. Processed food production by foreign plants with U.S. parents has historically been much larger than U.S. processed food exports, indicating that FDI is the preferred strategy (Ning and Reed 1995). On the other hand, FDI and trade are complements if FDI creates more trade with that country. A complementary relationship may exist if the affiliate in the foreign country can create a market for products to be exported from the home country, or if the affiliate needs intermediate products imported from the home country.

A number of studies have focused on the relationship between trade and FDI in the processed food industry. A major finding by Onnen (1997) is that U.S. FDI and U.S. processed food exports are complements, rather than substitutes, indicating that foreign direct investment increases trade. Banerjee (1997) states that FDI can have a significant effect on the host country by stimulating capital formation, competition, innovation, productivity, and savings. These factors can impact the country's import and export activities. One reason for a complementary relationship is that foreign investments may cause the host country to increase imports of intermediate products. Affiliates often import intermediate inputs from the home country (Banerjee 1997).

Bolling et al. (1998) state that FDI has, for the most part, complemented U.S. exports rather than competed with them. They studied U.S. FDI in the Western Hemisphere processed food industry. The data show that both U.S. processed food exports and FDI have increased. They state that population and income growth in the Western Hemisphere countries have created an increase in demand for a variety of processed foods. The growth in demand has been able to support growth in both affiliate sales and U.S. exports (Bolling et al. 1998).

Munirathinam et al. (1998) state that if FDI sales had a positive effect on exports it would indicate that FDI and exports are synergistic marketing strategies, while a negative relationship would indicate that they are competing strategies. Their study finds that affiliate sales in Canada are positively related to U.S. exports, which indicates that U.S. exports and U.S. FDI in Canada are synergistic market strategies, rather than competing strategies. Banerjee (1997) also concludes that there is a strong complementary relationship between trade and FDI in Canada. He finds that foreign-owned manufacturing affiliates in Canada have higher export and import propensities than do the domestic companies. Munirathinam et al., however, find a substitute relationship between Canadian FDI in the United States and trade. They determine that sales by U.S. affiliates of Canadian companies are negatively related to Canadian exports, which indicates that Canadian exports and Canadian investment in the United States are competing market strategies.

Possible factors that may contribute to a complementary relationship are given by Malanoski et al. (1997). They state that a firm with an increasing presence in a foreign country through FDI may be able to discover opportunities to export products from the home country that are not produced by their affiliates; host country production and marketing staffs and distribution facilities could be used to find and service export customers in the host country and neighboring countries; U.S. parent companies could exploit trade opportunities with their affiliates. Malanoski et al. (1997) also state reasons that may contribute to a substitute relationship. Companies may find it is more cost-effective to build plants in the foreign country instead of

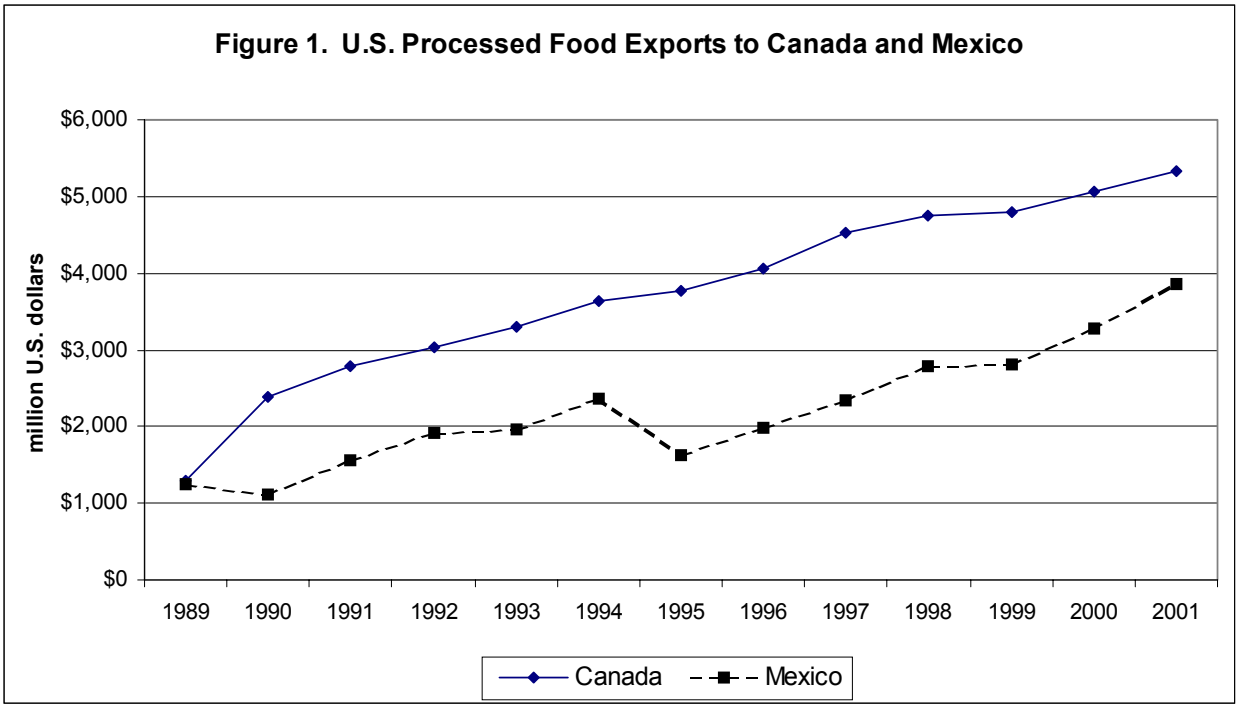
exporting; exports would be replaced with local production. Also, the desire to maximize control over marketing and distribution may lead food companies to prefer FDI over exports. Malanoski et al. find that exports may serve as a precursor to FDI, but they find no strong support for either a complement or substitute relationship between FDI and exports. They conclude that the trade-FDI relationship differs depending on the level of economic development in the host country.

## Overview of U.S. Processed Food Exports and FDI in the Western Hemisphere

*U.S. Processed Food Trade with Western Hemisphere Countries*

Canada and Mexico are two of the United States' largest trading partners for processed foods. Figure 1 shows U.S. processed food exports to Canada and Mexico from 1989-2001. Processed food products are defined as products classified by the Standard Industrial Classification (SIC) code as food and kindred products (major group 20). During the 1989-2000 period, Japan was the leading destination for U.S. processed food exports and Canada was the second leading destination. In 2001, processed food exports to Canada surpassed exports to Japan, making Canada the current top market for U.S. processed food products. Mexico has been the third largest market for U.S. processed food products throughout this period.

**Figure 1. U.S. Processed Food Exports to Canada and Mexico**




Source: U.S. International Trade Commission

During the 1989-2001 period, 16.1 percent of U.S. processed food exports were imported by Canada and 9.5 percent were imported by Mexico (Figure 2). Canada and Mexico's import shares of U.S. exports have increased throughout the time period. In 2001, 18.4 percent of U.S. processed food exports were imported by Canada and 13.3 percent were imported by Mexico. Just over three-fourths of U.S. processed food exports to the Western Hemisphere have been imported by Canada and Mexico; in 2001, 81 percent of U.S. exports in the hemisphere were sent to Canada or Mexico.

The United States exports small amounts of processed foods to a number of other Western Hemisphere countries; the leading destinations for U.S. products among these countries are Venezuela, the Dominican Republic, Haiti, Brazil, Colombia, and Guatemala. None of these other Western Hemisphere countries, however, import more than 1 percent of U.S. exports. Figure 3 shows U.S. exports to these other Western Hemisphere countries.

The Western Hemisphere accounts for 30-40 percent of U.S. processed food exports. Similarly, about 40 percent of U.S. processed food imports are from the Western Hemisphere. The values of U.S. exports and imports in the hemisphere have been fairly close, though there has been a small trade deficit for the last few years (Figure 4). As with exports, a large and increasing share of U.S. processed food imports from Western Hemisphere sources has originated from Canada and Mexico: 58 percent in 1989 and 81 percent in 2001 (of which 61 percent was from Canada). As Figure 4 shows, U.S. processed food exports and imports in the hemisphere have been increasing quite rapidly in nominal dollar terms. Trade has also been increasing in real terms. For a more complete description of U.S. processed food exports and imports, see Mattson and Koo (January, 2002); and for a more complete description of U.S. agricultural trade within the Western Hemisphere, see Mattson and Koo (February, 2002).

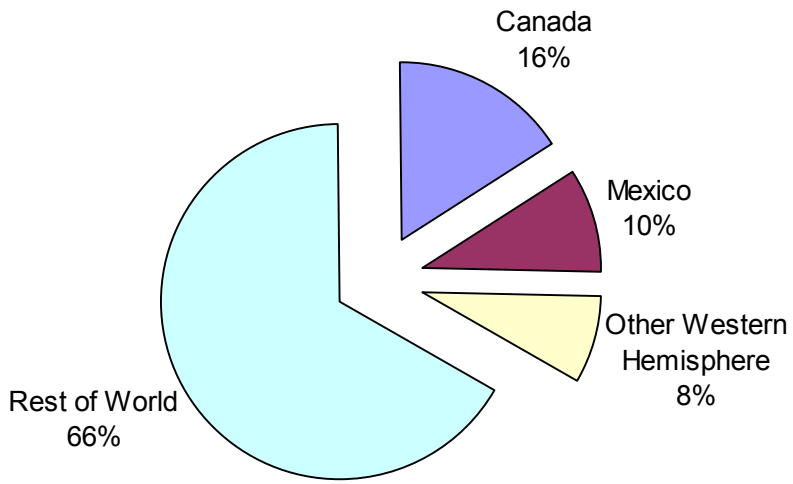
*U.S. FDI in Western Hemisphere Countries*

Canada and Mexico are the top Western Hemisphere countries for U.S. FDI in the processed food industry. However, there is also substantial U.S. FDI in South America. Figure 5 shows the U.S. FDI position in Western Hemisphere regions on a historical cost basis. U.S. FDI in the processed food industry in Canada, Mexico, and South America has increased substantially since 1989. FDI in South America and Canada has leveled off since 1996, but FDI in Mexico has continued to grow and has exceeded FDI in Canada. FDI in South America is nearly as large as that in Canada; over half of the FDI in South America is in Brazil, and a large share of the remainder is in Argentina. Other Western Hemisphere countries that have significant U.S. FDI include Venezuela, Colombia, Honduras, Costa Rica, and Guatemala.

Another measure of FDI is sales by foreign affiliates. Figure 6 shows sales by foreign affiliates of U.S. companies in the processed food industry in Canada, Mexico, South America, and other regions in the Western Hemisphere through 1998. This figure shows that sales in South America have exceeded sales in Canada and Mexico as of the most recent data (1998). (Data were not reported in 1992 for Canada, South America, or other Western Hemisphere areas.)

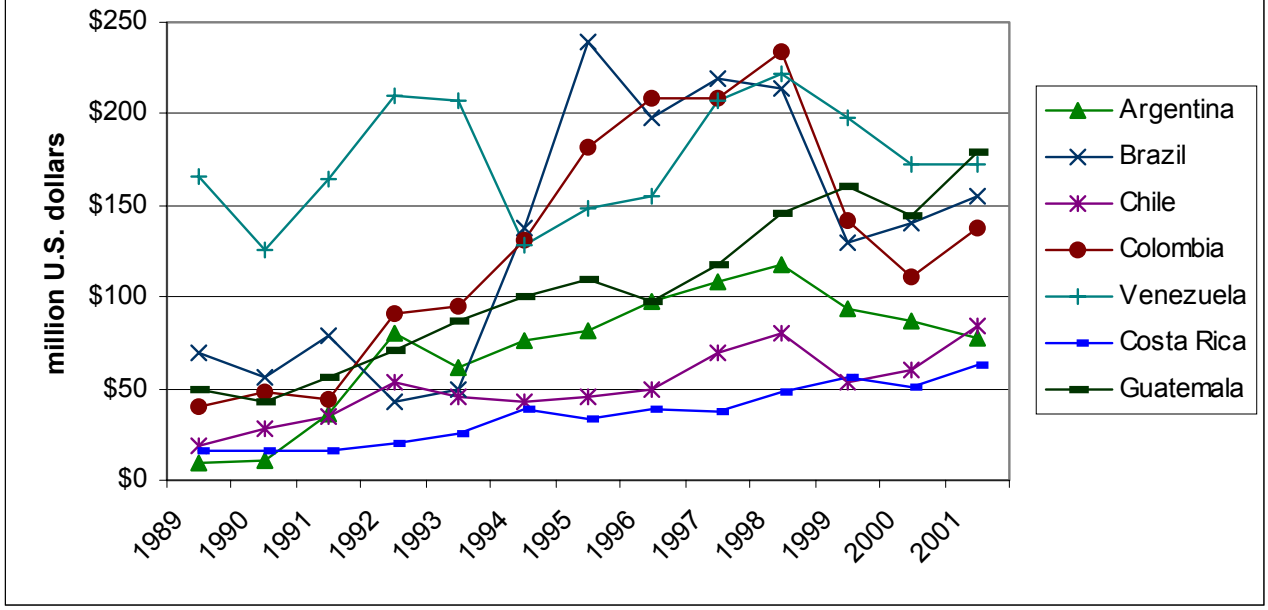
Figure 7 compares the U.S. FDI position in the processed foods industry in the Western Hemisphere with that in other parts of the world. U.S. FDI in Europe is slightly higher than that in all of the Western Hemisphere.

**Figure 2. U.S. Processed Food Exports, Share by Region, 1989-2001**

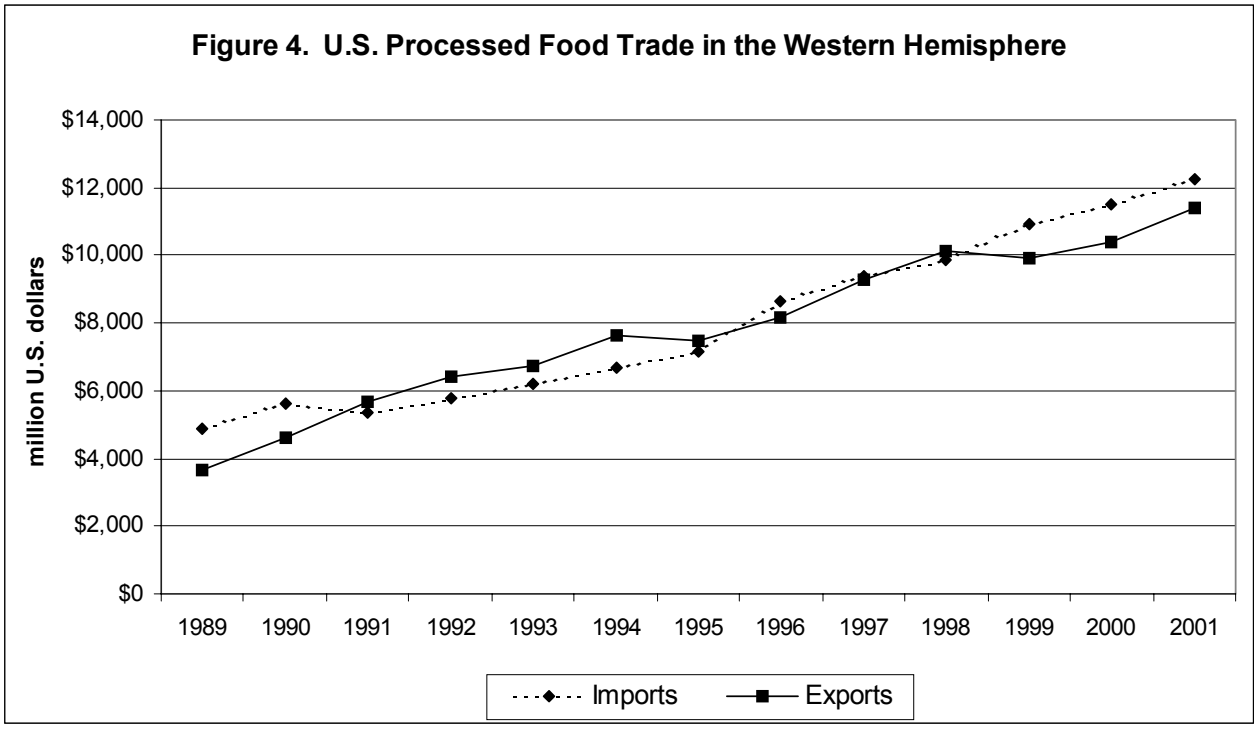



Source: U.S. International Trade Commission

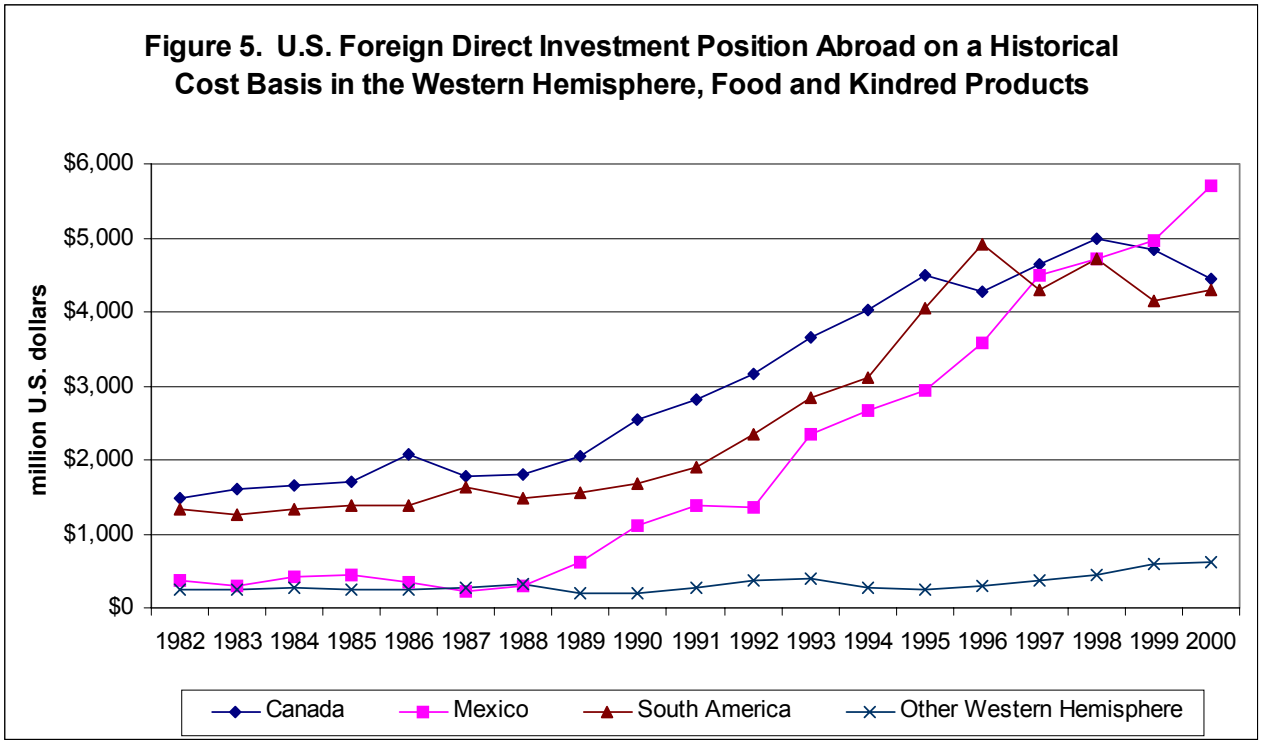
**Figure 3. U.S. Processed Food Exports to Select Latin American Countries**



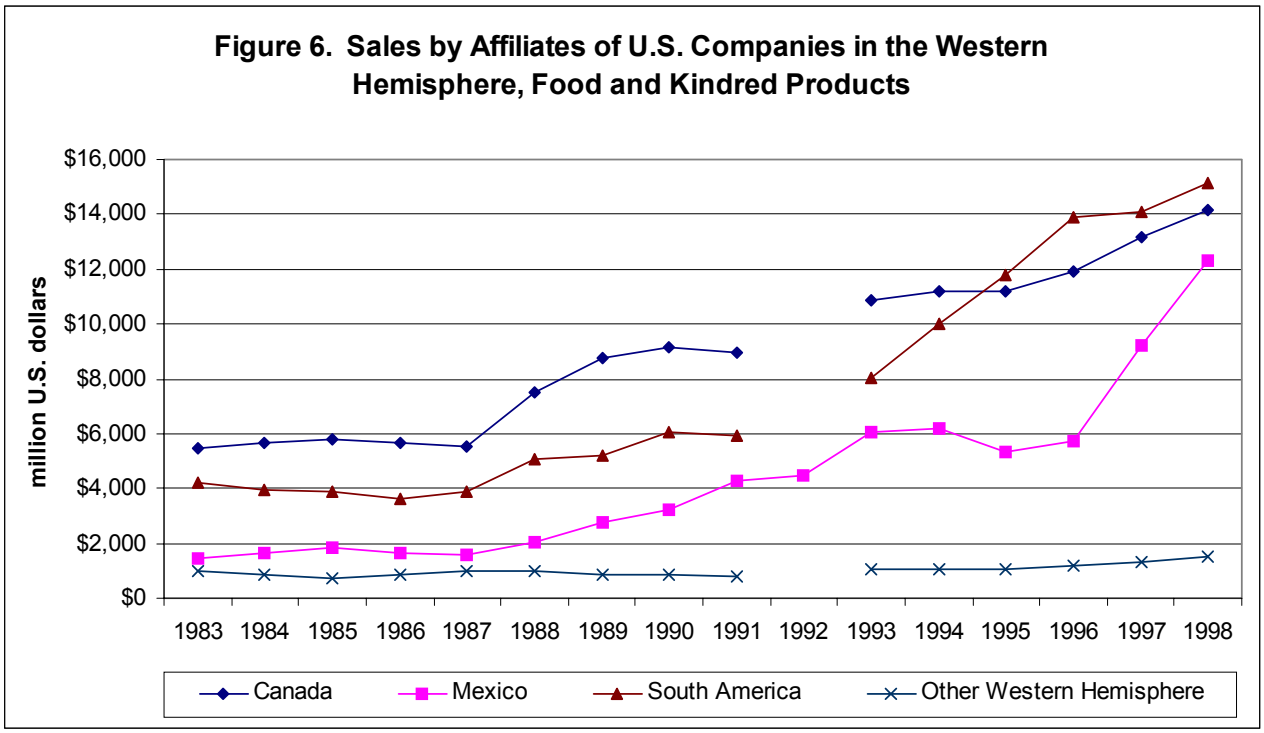

Source: U.S. International Trade Commission




Source: U.S. International Trade Commission

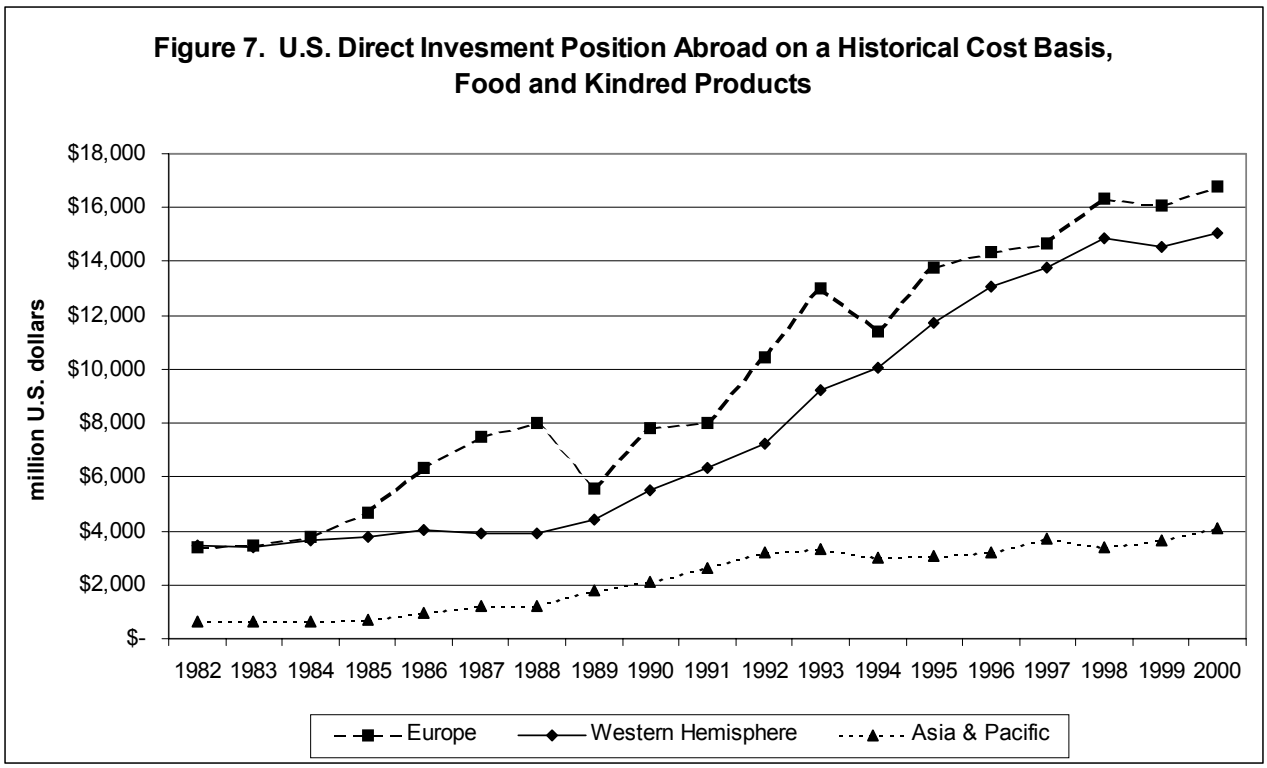



Source: U.S. Department of Commerce, Bureau of Economic Analysis




Source: U.S. Department of Commerce, Bureau of Economic Analysis

*Comparison of U.S. Processed Food Exports and FDI*




Source: U.S. Department of Commerce, Bureau of Economic Analysis

Figures 8-16 compare sales by foreign affiliates of U.S. companies in the processed food industry with U.S. processed food exports from 1989-1998 in nine Western Hemisphere countries: Canada, Mexico, Brazil, Argentina, Venezuela, Colombia, Chile, Guatemala, and Costa Rica. A few countries have data missing for one or more years; estimates were made for those years based on the historical relationship between FDI position and sales by affiliates.

For each country, the value of sales by affiliates is greater than that of exports, and in some cases substantially greater. This indicates that FDI is a preferred strategy to exports and used by many U.S. food processing companies. For many of the countries there appears to be a positive correlation between FDI and U.S. exports. FDI and U.S. exports both tend to increase in most of the countries, which may suggest that FDI and exports are not substitutes and could be complements. However, even though there is a relatively high level of FDI in Argentina and Brazil, U.S. processed food exports to those countries have not been very significant; exports to Venezuela and Colombia have actually been slightly higher. Figure 17 shows the annual average sales by affiliates and U.S. exports for each country for the 1989-1998 period.

**Figure 8. U.S. Processed Food Exports and Sales by Affiliates in Canada**

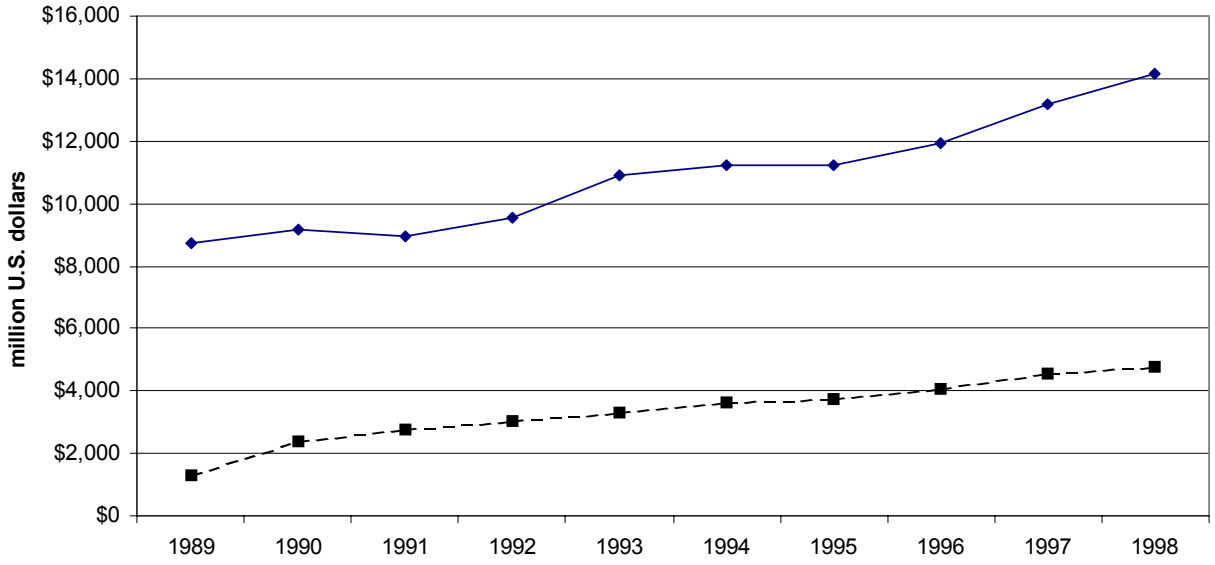


**Figure 9. U.S. Processed Food Exports and Sales by Affiliates in Mexico**

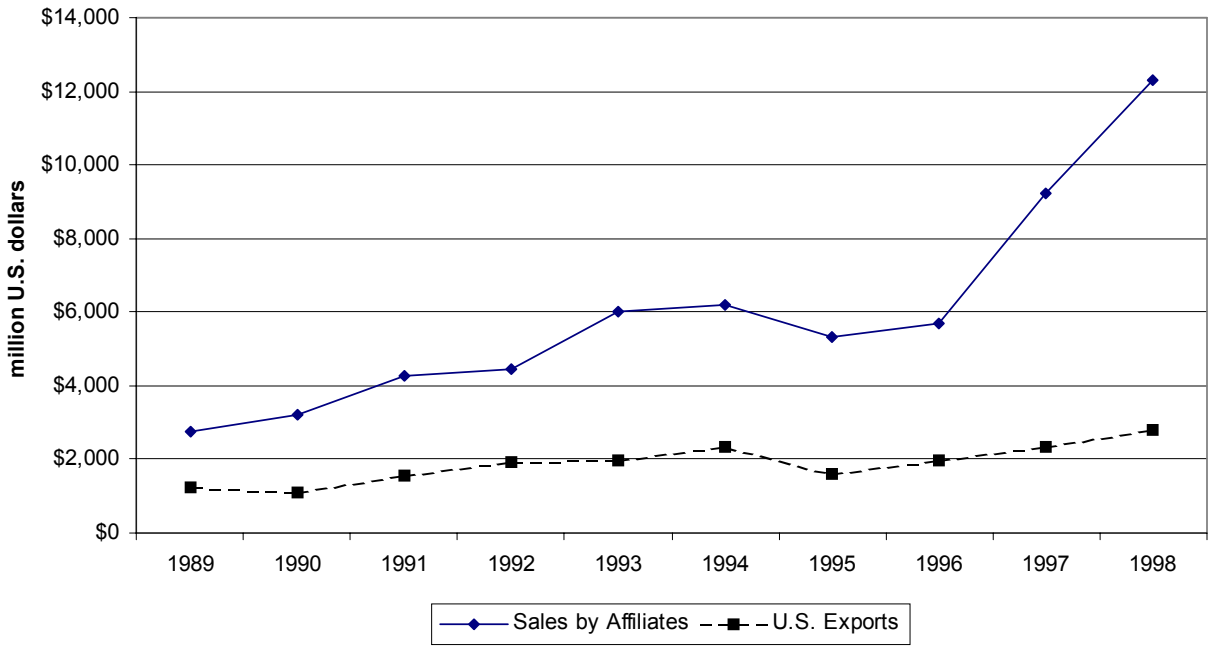



**Figure 10. U.S. Processed Food Exports and Sales by Affiliates in Brazil**

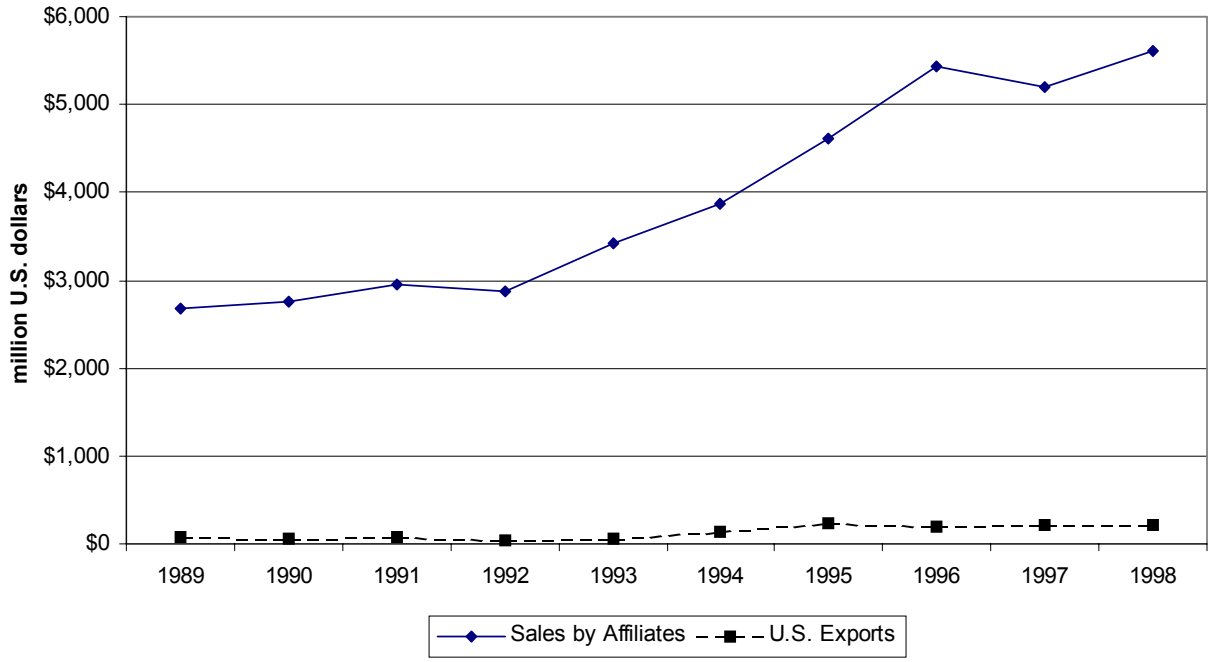


**Figure 11. U.S. Processed Food Exports and Sales by Affiliates in Argentina**

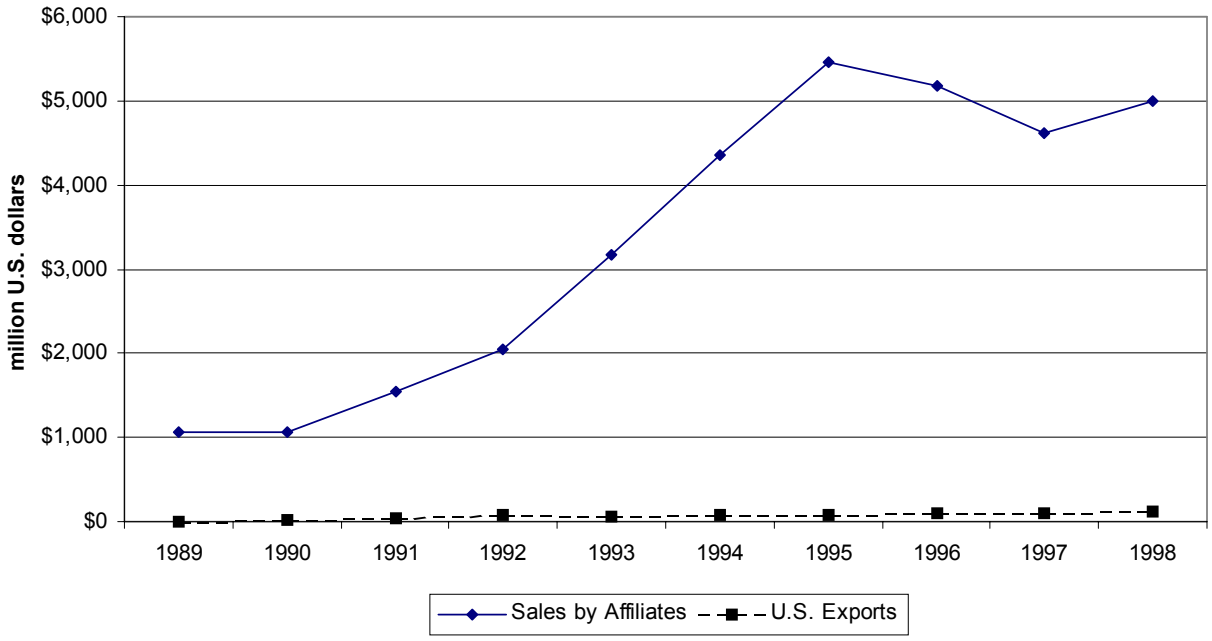



**Figure 12. U.S. Processed Food Exports and Sales by Affiliates in Venezuela**

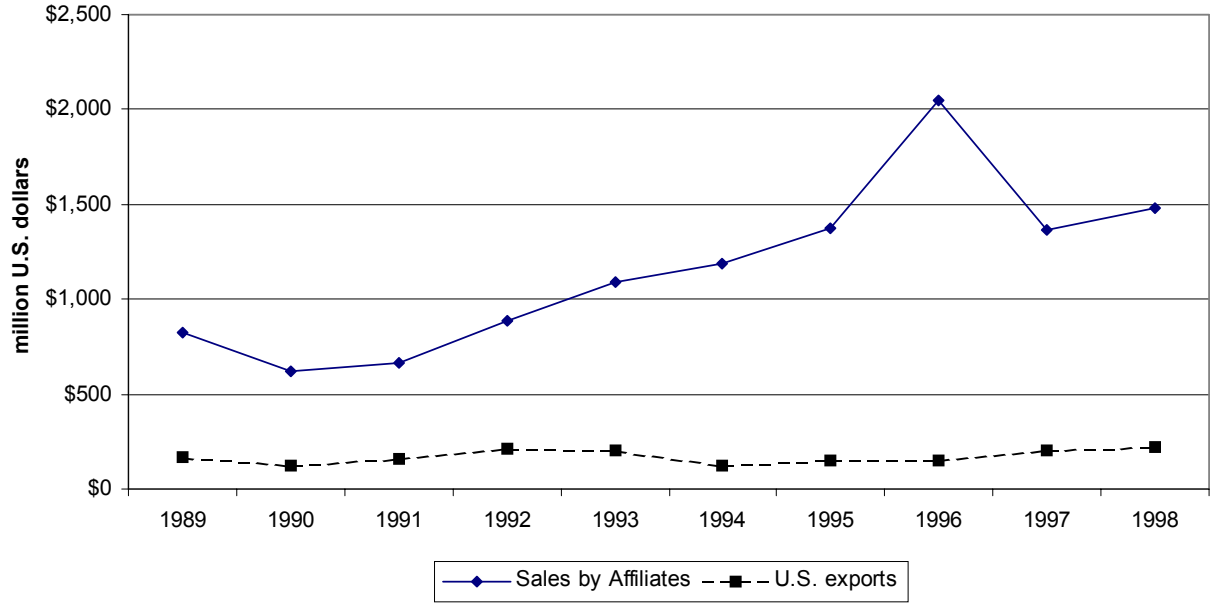


**Figure 13. U.S. Processed Food Exports and Sales by Affiliates in Colombia**

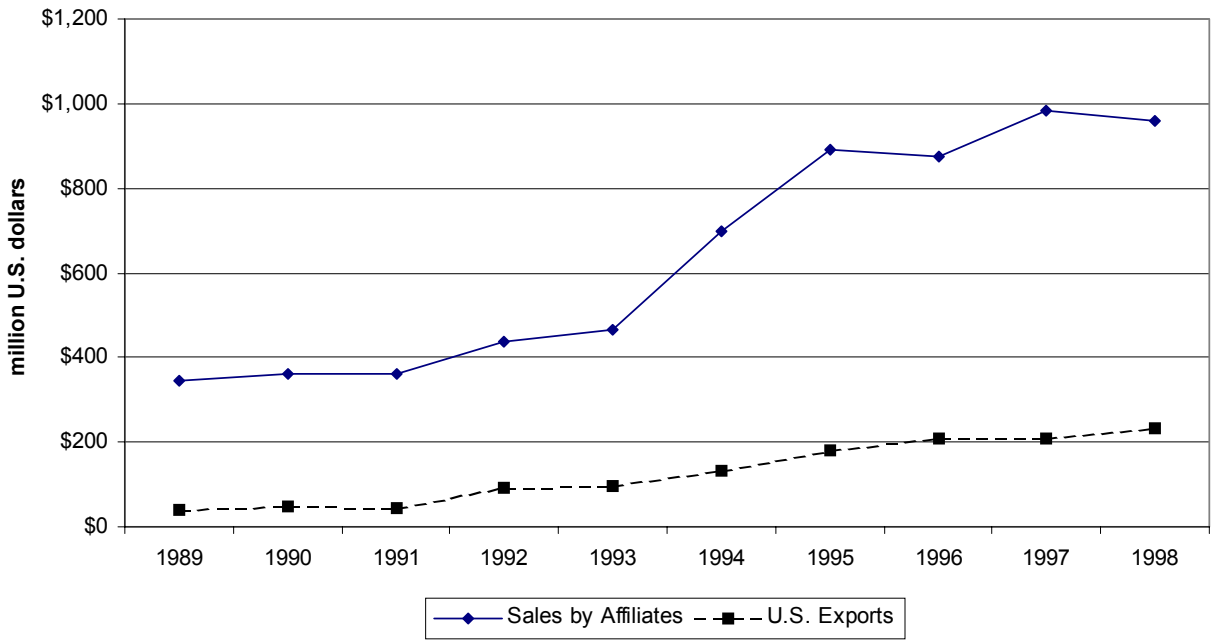



**Figure 14. U.S. Processed Food Exports and Sales by Affiliates in Chile**

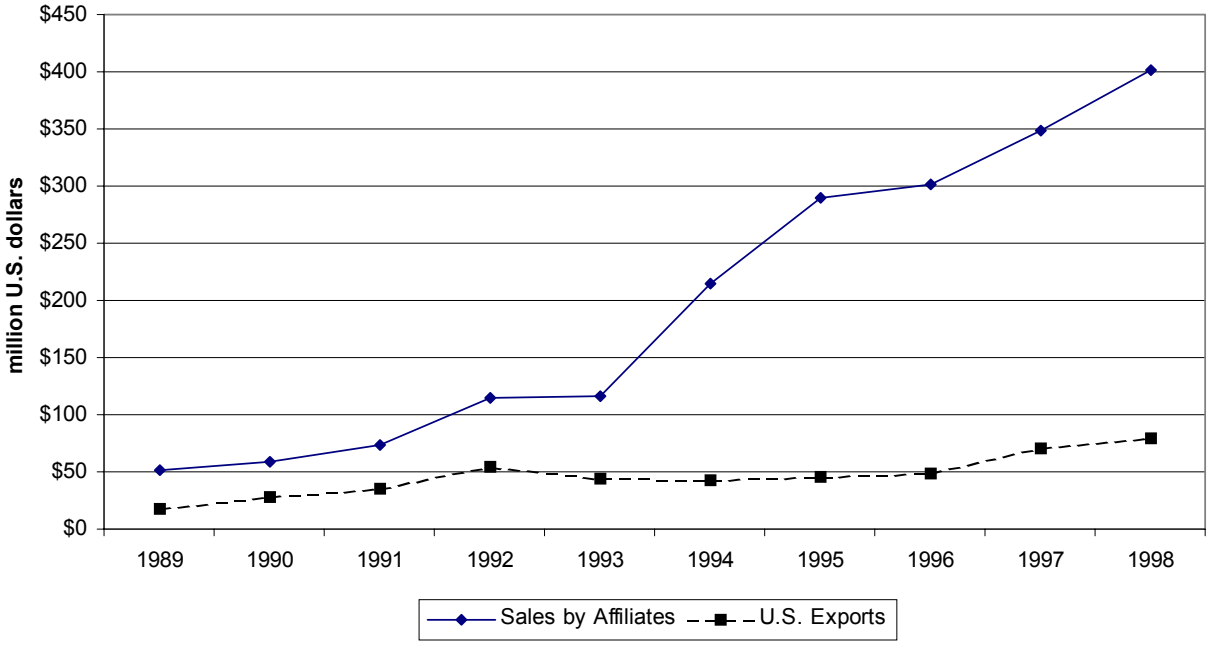


**Figure 15. U.S. Processed Food Exports and Sales by Affiliates in Guatemala**

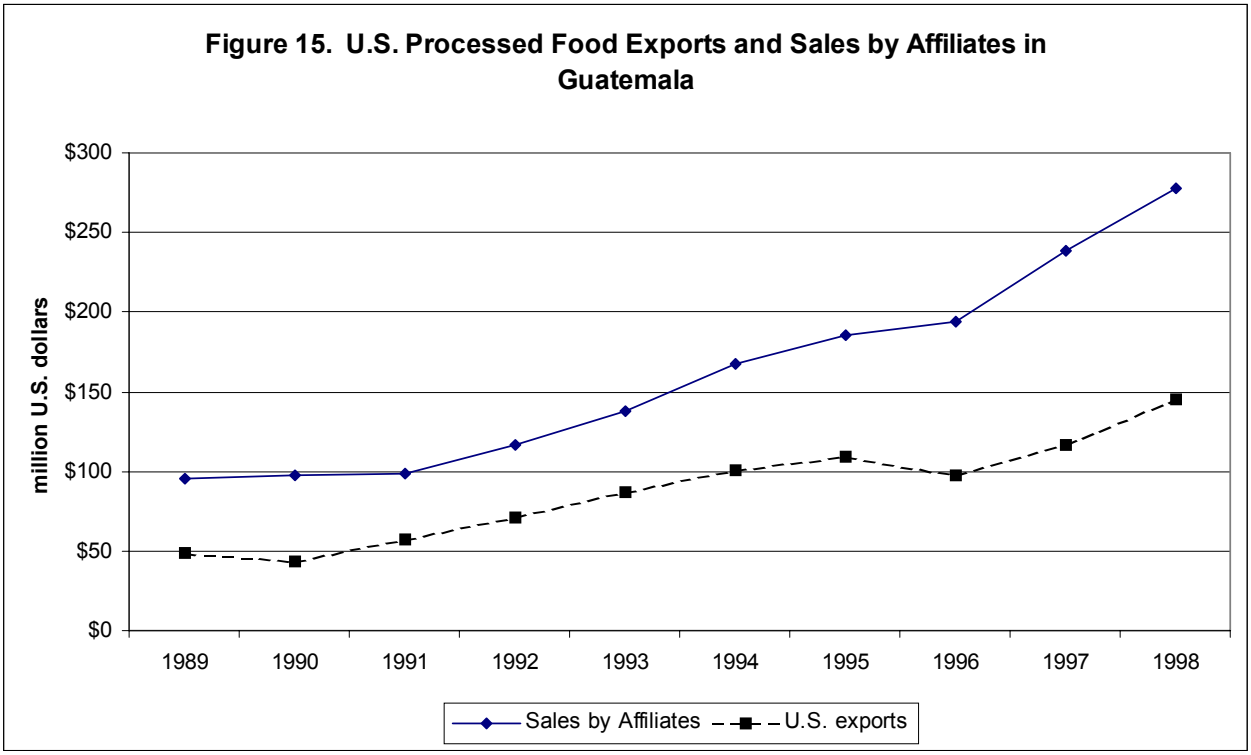



**Figure 16. U.S. Processed Food Exports and Sales by Foreign Affiliates in Costa Rica**

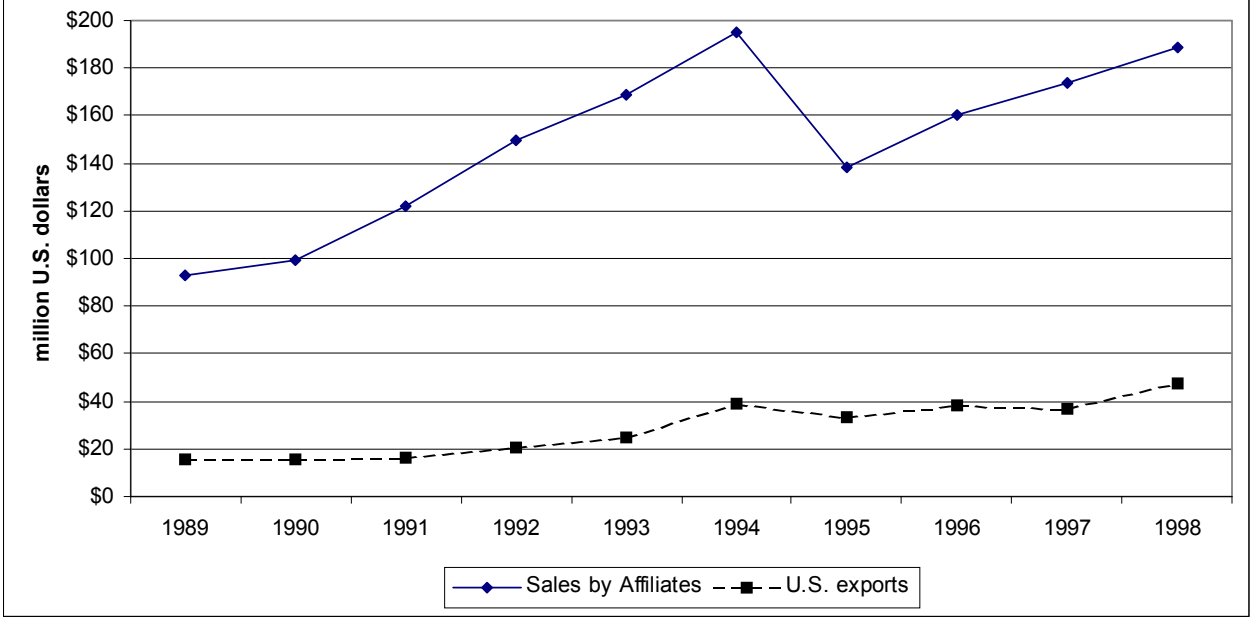
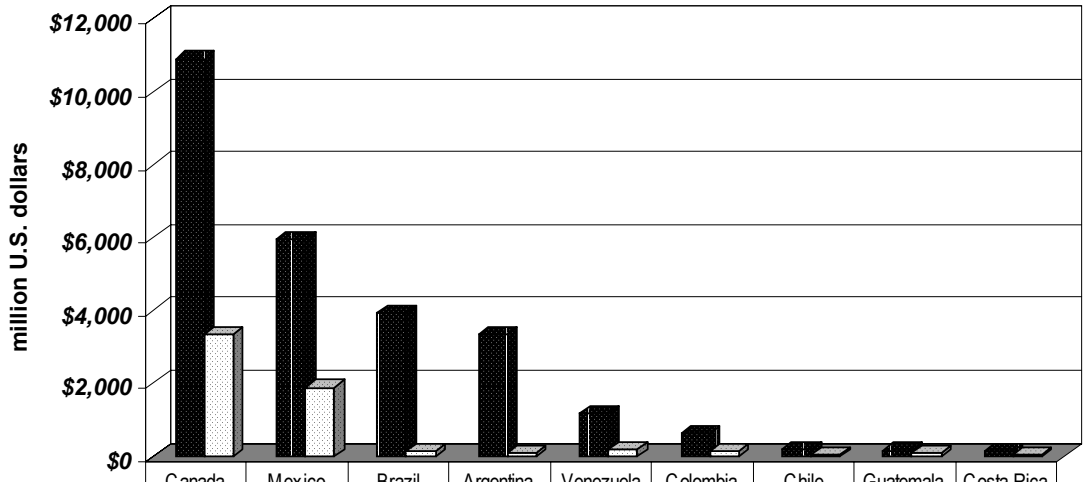


**Figure 17. Comparison of Annual Average U.S. FDI and Exports, Processed Food Products, 1989-1998**




| | Canada | Mexico | Brazil | Argentina | Venezuela | Colombia | Chile | Guatemala | Costa Rica |
|---|---|---|---|---|---|---|---|---|---|
| Sales by Affiliates | 10900 | 5951 | 3941 | 3348 | 1155 | 638 | 197 | 161 | 149 |
| U.S. exports | 3355 | 1890 | 130 | 68 | 173 | 128 | 47 | 88 | 29 |

## Factors Affecting Exports and FDI

*Determinants of Exports*

As previously discussed, U.S. FDI can have either a positive or negative effect on U.S. processed food exports. Economic conditions such as national income of the importing country and the exchange rate affect trade flows; free trade agreements, export price, and transportation costs may also affect trade flows.

GDP in the importing country is expected to have a positive effect on trade flows. GDP is a measure of purchasing power. As national income increases, imports are likely to increase. Koo and Uhm (2001) and Munirathinam et al. (1998) found that income in the importing country has a positive effect on their imports of processed food products.

The exchange rate likely affects trade flows. A depreciating currency can have a positive effect on exports and a negative effect on imports. Likewise, an appreciating currency can have a negative effect on exports and a positive effect on imports. Appreciation of the U.S. dollar makes U.S. goods more expensive in the foreign market and foreign goods less expensive in the U.S. market.

Trade barriers have an effect on processed food trade flows. Trade agreements with Canada and Mexico have eliminated or reduced trade barriers with those countries, which has facilitated the trade of agricultural products.

*Determinants of FDI*

Foreign direct investment may be influenced by the host country market size and market potential, wage rates, interest rates, transportation costs, tax considerations, exchange rates, exchange rate volatility, productivity in the host country, the regional trading area of the host country, and cultural linkages between the host country and the home country. When a firm invests in another country through FDI, they are basically looking to either take advantage of a new market or to decrease costs.

Market size and potential are likely major factors affecting FDI. FDI will likely be greater in countries with a larger market size because those countries provide a greater opportunity for the affiliate to sell its output. Koo and Uhm (2001) found that income and population in the host country have a positive effect on U.S. FDI, while Somwaru and Bolling (1999) found that income growth is a positive determinant of U.S. FDI in the processed food industry in most countries. Ning and Reed (1995) also found that GDP and growth in the host country have a positive effect on U.S. FDI.

Cultural linkages, or similarities between the countries, is also important. Firms are more likely to invest in countries that are similar to their home country because they may feel more comfortable and may be more likely to sell their products. Ning and Reed (1995) found that cultural linkages and trading blocs have significant positive effects on U.S. FDI in the processed food industry.

Volatility of the host country's exchange rate represents the stability of the economy. Less variation in the exchange rate implies greater stability in the economy relative to other economies, and vice versa. Koo and Uhm (2001) found a negative and significant impact of exchange rate volatility on U.S. FDI, which they concluded signals that economic stability is an important factor in determining U.S. FDI.

FDI may occur to take advantage of lower wage rates or lower interest rates in the host country or possibly because of tax advantages. Firms may also take into consideration government regulations when deciding where to invest; they may try to take advantage of countries with fewer environmental regulations, worker safety regulations, etc. Wage rates may be important, but so is labor productivity. Ning and Reed (1995) found wage rate differentials to be unimportant, while Koo and Uhm (2001) found labor productivity important.

## Development of an Empirical Model

An econometric model is developed to estimate the effects of different factors on U.S. processed food exports and FDI in eight Western Hemisphere countries: Canada, Mexico, Argentina, Brazil, Colombia, Costa Rica, Guatemala, and Venezuela. (Chile is not included due to lack of tariff data.) The analysis uses panel data; annual data for 1989-1998 for the eight countries are used in the analysis.

*Export Equation*

U.S. exports are specified as a function of U.S. FDI in the importing country, real GDP in the importing country, the real exchange rate between the United States and the importing country, tariffs in the importing country, U.S. exports lagged one period to capture dynamic effects, and country dummy variables. The specified export model is

$$X_{it} = f(FDI_{it}, RGDP_{it}, RER_{it}, TAR_{it}, X_{it-1}, D) \quad (1)$$

where

$X_{it}$ = U.S. exports to country i in time t
$FDI_{it}$ = U.S. FDI in country i in time t
$RGDP_{it}$ = real GDP in country i in time t
$RER_{it}$ = real exchange rate between the United States and country i in time t
$TAR_{it}$ = agricultural tariffs in country i in time t
$X_{it-1}$ = U.S. exports to country i in time t-1
D = country dummy variables.

Exports are measured in real U.S. dollars. FDI is measured as sales in real U.S. dollars by affiliates of U.S. companies operating in the foreign country. If FDI has a positive sign in the export equation, then it complements exports; if it has a negative sign, it is a substitute for exports.

Real GDP is a measure of purchasing power and market size. An increase in real GDP in the importing country is expected to have a positive effect on imports. Economic theory predicts that U.S. exports should decrease when the U.S. dollar strengthens relative to the currency of the importing country. An increase in the exchange rate variable in this model indicates appreciation of the U.S. dollar; therefore, a negative sign is expected. Tariffs in the importing country are also expected to have a negative effect on U.S. exports. Dummy variables for each country are included in the model to determine if there are regional differences in U.S. exports after the other variables are accounted for.

*FDI Equation*

U.S. FDI abroad is specified as a function of U.S. exports, real GDP, labor cost, real exchange rate, exchange rate volatility, free trade agreements, dummy variables for countries, and a trend variable. The FDI model is specified as

$$FDI_{it} = f(X_{it}, RGDP_{it}, LC_{it}, RER_{it}, ERV_{it}, FTA_{it}, TR_{it}, D) \quad (2)$$

where

$LC_{it}$ = labor cost in country i in time t
$ERV_{it}$ = real exchange rate volatility for country i in time t
$FTA_{it}$ = dummy variable for free trade agreements with country i in time t
$TR_{it}$ = trend variable.

U.S. exports could either have a positive or negative effect on FDI. Real GDP is expected to have a positive effect because U.S. firms are likely to be attracted to larger markets. Labor costs are expected to have a negative effect because U.S. firms may use FDI as an opportunity to

decrease labor costs and are therefore more likely to invest in countries with lower labor costs. Labor productivity could not be added to this model due to a lack of available data.

Exchange rate is hypothesized to have a positive effect on U.S. FDI because a strong U.S. dollar makes it relatively cheaper for U.S. firms to build plants in foreign countries. Exchange rate volatility could have a positive effect on U.S. investment because firms may want to invest in the foreign country to avoid exchange rate risk. On the other hand, a high level of exchange rate volatility could indicate that the country's economy is unstable, and U.S. firms are likely to avoid investment in an unstable economy.

A free trade agreement could have either a positive or negative effect on U.S. FDI. The effect could be positive because the free trade agreement may make it easier for U.S. firms to build in foreign countries. On the other hand, U.S. firms may want to build in countries that do not have a free trade agreement with the United States to avoid tariffs on exports.

Dummy variables for each country are included in the model to determine if there are regional differences in U.S. FDI after the other variables are accounted for. Cultural linkages could cause regional differences in FDI. FDI in Canada, for example, may be greater because of its culture, which is similar to that of the United States. Other factors that may affect FDI but are not included in the model are labor productivity, transportation costs, tax considerations, and regulations. Of these, labor productivity may be important, but data for South American labor productivity were not available. The country dummy variables, though, should partly reflect the regional differences in labor productivity and the other factors not included in the model.

*Estimation Procedures*

The analysis uses panel data for eight countries over ten years. FDI and exports are endogenous since exports are a function of FDI and FDI is a function of exports. The remaining variables are exogenous. The two equations are solved simultaneously using three-stage least squares estimation:

$$X_{it} = \alpha_0 + \alpha_1 FDI_{it} + \alpha_2 RGDP_{it} + \alpha_3 RER_{it} + \alpha_4 TAR_{it} + \alpha_5 X_{it-1} + \alpha_6 D_1 + ... + \alpha_{12} D_7 + \varepsilon_{it} \quad (3)$$

$$FDI_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 RGDP_{it} + \beta_3 LC_{it} + \beta_4 RER_{it} + \beta_5 ERV_{it} + \beta_6 FTA_{it} + \beta_7 TR_{it} + \beta_8 D_1 + ... + \beta_{14} D_7 + e_{it} . \quad (4)$$

*Data*

Annual data from 1989-1998 for eight countries are used. Export and import data were obtained from the U.S. International Trade Commission's Interactive Tariff and Trade DataWeb. Trade data are classified by the SIC code under major group 20: food and kindred products. Export data consist of domestic exports, and the import data shown in the graphs are imports for consumption. These trade data are measured as nominal U.S. dollars and are converted to real dollars in the empirical analysis using the GDP deflator.

Foreign direct investment data were obtained from the U.S. Department of Commerce, Bureau of Economic Analysis (BEA). Nominal sales for foreign affiliates of U.S. companies

were obtained from the table titled "Sales by Affiliates, Country by Industry" in *U.S. Direct Investment Abroad: Operation of U.S. Parent Companies and their Foreign Affiliates*. Nominal sales were converted to real sales by using the GDP deflator. Data for the U.S. direct investment position abroad on a historical-cost basis were also obtained from the BEA. Some sales data has been suppressed to avoid disclosure of data from individual companies. Therefore, sales data are missing for a few years for some of the countries, but the FDI position data are complete. The missing sales data are estimated based on the historical relationship between sales and the FDI position in each country; sales and the FDI position are highly correlated.

Compensation data for affiliates in the food and kindred products industry were obtained from the BEA. Total labor compensation was obtained from the table titled "Compensation of Employees of Affiliates, Country by Industry," and the total number of employees was obtained from the table titled "Employment Affiliates, Country by Industry." Both tables are in *U.S. Direct Investment Abroad: Operation of U.S. Parent Companies and their Foreign Affiliates*. Total compensation is divided by the number of employees to obtain labor cost per employee. This is measured in nominal U.S. dollars and is converted to real dollars using the GDP deflator.

Real exchange rates between the U.S. dollar and each foreign currency were obtained from the ERS. These data are measured as the foreign currency per U.S. dollar, which means that an increase indicates appreciation of the U.S. dollar, and a decrease means depreciation. The exchange rates were converted to an index. It is necessary to convert the exchange rates to an index because, in the panel data, the exchange rate variable includes rates for eight different countries with different units of measure, and this variable needs a consistent unit of measure to be meaningful. The exchange rates are indexed by dividing the exchange rate in each year by the average exchange rate over the 1989-2000 period and then multiplying it by 100, so that 100 equals the average exchange rate between the United States and that country, and values above or below 100 indicate that the exchange rate is above or below the average. Exchange rate volatility is calculated as the real exchange rate index minus the 3-year moving average, squared.

Tariff data were obtained from the Agricultural Market Access Database (AMAD). One of the limitations of this study is the tariff data: data are not available for every year, and some of the data used in the study are estimates. The AMAD database lists tariffs by HS code for each country used in the study for selected years from 1995-1999. It is assumed in this study that tariffs prior to 1995 are the same as they were in that year, and data for missing years are the average of surrounding years. These assumptions are reasonable because the data indicate that there has been little change in tariff levels. The database includes tariffs for agricultural goods classified at the HS 8-digit level. There is no aggregate tariff level for all agricultural goods, so one was calculated. A trade-weighted tariff level for each country is calculated by determining the average tariff level of the major agricultural products imported or exported by the United States, with weights given to each product based on how much that product is traded. Tariffs with Canada were gradually eliminated under the Canada-U.S. Trade Agreement (CUSTA), and tariffs with Mexico have been gradually falling under the North America Free Trade Agreement (NAFTA).

GDP data for each country were obtained from the International Monetary Fund's *World Economic Outlook Database* (May 2001). These data are converted to U.S. dollars to maintain a common unit of measure. The U.S. GDP deflator was obtained from the *International Financial Statistics Yearbook* (International Monetary Fund 2001).

## Results

Table 1 shows the results from the estimated models. Results indicate that U.S. exports and FDI are complements. FDI is found to have a significant and positive effect on U.S. exports, and U.S. exports is found to have a significant and positive effect on FDI.

Table 1. Results from Estimated Model

| *Export Equation* | | | *FDI Equation* | | |
|---|---|---|---|---|---|
| Variable | Parameter estimate | p-value | Variable | Parameter estimate | p-value |
| Intercept | 686 | 0.0024 | Intercept | 191 | 0.8619 |
| FDI | 0.07 | 0.0149 | U.S. Exports | 1.92 | 0.0001 |
| Real GDP | 0.44 | 0.2510 | Real GDP | 4.41 | 0.0153 |
| Real Exchange Rate | -0.39 | 0.7114 | Labor Cost | 76.60 | 0.2091 |
| Tariffs | -50.00 | 0.0002 | Real Exchange Rate | -2.50 | 0.7414 |
| Lagged exports | 0.29 | 0.0005 | Exchange Rate Volatility | -1.31 | 0.0337 |
| $D_{Canada}$ | 1162 | 0.0001 | FTA | 1768 | 0.0005 |
| $D_{Mexico}$ | 485 | 0.0001 | Trend | 22.53 | 0.6671 |
| $D_{Argentina}$ | -596 | 0.0001 | $D_{Canada}$ | -2834 | 0.2174 |
| $D_{Brazil}$ | -699 | 0.0003 | $D_{Mexico}$ | -747 | 0.4268 |
| $D_{Colombia}$ | -11 | 0.8346 | $D_{Argentina}$ | 732 | 0.2927 |
| $D_{Costa\ Rica}$ | -249 | 0.0047 | $D_{Brazil}$ | 228 | 0.7900 |
| $D_{Guatemala}$ | -168 | 0.0294 | $D_{Colombia}$ | -868 | 0.0279 |
| | | | $D_{Costa\ Rica}$ | -468 | 0.2155 |
| | | | $D_{Guatemala}$ | -488 | 0.1921 |
| System Weighted $R^2$ = .9891 | | | | | |
| Elasticities | | | Elasticities | | |
| FDI | 0.313 | | U.S. Exports | 0.429 | |
| Real GDP | 0.142 | | Real GDP | 0.320 | |
| Real Exchange Rate | -0.059 | | Labor Cost | 0.328 | |
| Tariffs | -0.661 | | Real Exchange Rate | -0.084 | |
| | | | Exchange Rate Volatility | -0.038 | |

*Export Equation Results*

U.S. FDI in Western Hemisphere countries is statistically significant and has a positive effect on U.S. exports to those countries. This result indicates that U.S. FDI and exports are complements in Western Hemisphere countries. Elasticities are shown at the bottom of Table 1. A one percent increase in sales by affiliates leads to a 0.313 percent increase in exports. As expected, real GDP in the importing country has a positive effect on U.S. exports, and the real exchange rate has a negative effect. Real GDP and real exchange rate, however, are not statistically significant. Tariffs in the importing country are found to have a negative and significant effect on U.S. exports. A one percent increase in tariffs causes a 0.661 percent decrease in exports. Six of the seven country dummy variables are highly significant, which indicates that there are regional differences in U.S. exports after the other variables are accounted for. If all other variables used in the model were held constant, U.S. exports would be highest to Canada and Mexico and lowest to Brazil.

*FDI Equation Results*

The level of U.S. exports is statistically significant and has a positive effect on U.S. FDI. A one percent increase in exports results in a 0.429 percent increase in sales by affiliates. As expected, real GDP in the host country has a positive and significant effect on FDI, which indicates that U.S. firms increase their investments in countries with a larger market size to take advantage of greater market opportunities. A one percent increase in real GDP in the host country results in a 0.32 percent increase in sales by affiliates. Labor cost, unexpectedly, has a positive effect on U.S. FDI, but this effect is statistically insignificant. This result indicates that U.S. food processing firms may not build in foreign countries to exploit possible lower labor costs. Since the food processing industry is not labor-intensive, labor cost may not be a significant factor for FDI.

The real exchange rate does not have a significant effect on U.S. FDI. Exchange rate volatility, on the other hand, has a negative and significant effect. Exchange rate volatility could indicate an unstable economy, and this result suggests that U.S. firms may be less inclined to invest in a country with an unstable economy. A free trade agreement with the other Western Hemisphere countries may significantly increase U.S. FDI to these countries.

The U.S. free trade agreements with Canada and Mexico have had positive and highly significant effects on FDI by U.S. firms. The high level of FDI in Canada and the huge increase in FDI in Mexico appear to be partly explained by free trade agreements with those countries. Most of the country dummy variables are insignificant, which indicates that any regional differences in U.S. FDI are explained by the other economic variables in the equation, rather than by country characteristics.

## Conclusions

There are conflicting theories regarding the relationship between trade and FDI. This study attempts to determine the relationship between U.S. exports and FDI in the processed food industry in the Western Hemisphere. An econometric model is developed and estimated to determine the factors affecting U.S. processed food exports and sales by affiliates in eight Western Hemisphere countries, as well as the relationship between exports and FDI. Exports and

FDI have both been increasing rapidly, although sales by affiliates are significantly greater than exports.

Results suggest that U.S. FDI and exports are complements. FDI has a positive effect on exports and exports have a positive effect on FDI. U.S. exports are also positively influenced by real GDP in the importing country and are negatively influenced by tariffs. There are also large regional differences in U.S. exports after FDI, real GDP, real exchange rate, and tariffs are accounted for. Holding these variables constant, U.S. exports are greater to Canada and, to a lesser extent, Mexico, while exports are small to Brazil and Argentina.

U.S. FDI is positively influenced by real GDP in the host country, which indicates that U.S. firms invest in countries with greater market opportunities; and FDI is negatively influenced by exchange rate volatility, which indicates that U.S. firms try to avoid unstable economies. Free trade agreements with Canada and Mexico also have significant positive effects on U.S. FDI. Results indicate that taking advantage of lower labor costs is not a motivating factor for U.S. food processing firms, and that the real exchange rate does not have a significant effect on either FDI or exports.

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