

A PROFILE OF FOREIGN DIRECT INVESTMENT BY THE
U.S. FRUIT AND VEGETABLE INDUSTRY

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ABSTRACT

The analysis revealed incentives for foreign direct investment (FDI) for the U.S. fruit and vegetable industry. A relationship was found between U.S. tariffs on fruits and vegetables and FDI by U.S. produce firms in Latin America. Other factors affecting FDI were also investigated. The analysis revealed that a majority of the commodities produced as a result of FDI by U.S. fruit and vegetable firms were exported to the United States. Significant implications for the U.S. market in light of trade agreements such as NAFTA are presented. These implications include the likelihood of increased FDI and a more internationally oriented marketplace for the U.S. fruit and vegetable industry.

INTRODUCTION

The United States is a major producer of fruits and vegetables, valued at over \$20.3 billion in 1995 (U.S. Department of Agriculture, April and November 1995). The U.S. fruit and vegetable industry has been largely seasonal in nature with respect to production. In the past, U.S. imports of fruits and vegetables have been mainly supplemental. That is, in general, foreign produced fruits and vegetables have entered the United States when production in the United States has not been in season or when prices have been sufficiently high to attract additional supplies from foreign sources. Imports of fruits and vegetables in dollar value have risen steadily over the past ten years from nearly \$1.8 billion in 1986 to almost \$2.7 billion in 1995 dollars (U.S. Department of Agriculture, September/October 1986 and 1995).

With the passage of time rapid advances in technology have occurred. Advances in information and communication systems, distribution systems, and large-scale production systems have changed markets dramatically, becoming more global and less regional in scope. Moreover, artificial trade barriers between countries are falling. Important examples of such action are the General Agreement on Tariffs and Trade (GATT), the Caribbean Basin Initiative (CBI), and the North American Free Trade Agreement (NAFTA).

Although much progress has been made under GATT, negotiations have been far more sweeping under NAFTA in the reduction of trade barriers. NAFTA, which is an agreement among Canada, Mexico, and the United States, was implemented on January 1, 1994. Under NAFTA all non-tariff barriers are to be converted to tariffs and all tariffs are to be reduced to zero within fifteen years, depending on the sensitivity of the product (American Farm Bureau, 1995). NAFTA also provides for the free movement of capital without restrictions on its ownership and control among the participating countries.

Foreign Direct Investment (FDI) is the investment by a company, group, or individual in new facilities, existing enterprises, a share of existing enterprises, or land or natural resources within another country (Bolling and Valdes). The purpose of this paper is to analyze the incentives and factors affecting the likelihood of decisions to engage in FDI by U.S. fruit and vegetable firms. The paper is organized as follows. An analysis of data obtained through a survey of U.S. fruit and vegetable growers/importers is presented. Patterns in the data are described with special attention given to similarities among firms involved in FDI. The development of a probit model that estimates the probability that a firm is engaged in FDI is presented. Model results relevant to U.S. produce companies and policy makers are provided. Finally, conclusions are drawn and implications are presented.

U.S. FRUIT AND VEGETABLE FIRM SURVEY

The types of fruit and vegetable firms targeted in the survey were firms that produce or obtain the same commodity both domestically and internationally. Firms with this characteristic are labeled produce growers/importers. These firms were targeted because they were deemed most likely to be involved in foreign investment.

According to the Produce Reporter Company, there were almost 480 produce importers in the United States in 1994. At least 80 of these were importers only. This status nullifies their inclusion leaving a maximum of 400 growers/importers (Produce Reporter Company).

A firm-level, cross-sectional analysis was carried out, giving specific information concerning the possible incentives for FDI. The questionnaire solicited annual figures for the most recent year. Due to seasonality, most fruit and vegetable firms in the United States begin

their year at a different time than January, the beginning of the calendar year. Information was typically obtained from a particular month in 1994 to the same month in 1995.

The questionnaire included items such as the firms total sales, total imports, origin of imports and whether or not they are the result of purchases or investment, and the costs of obtaining commodities domestically and internationally. Most questions, except items such as total sales, were in percentage form. This allowed the participants to answer the questions more easily and provided clearer responses.

The questionnaire was administered through telephone interviews with follow-ups via facsimile and telephone. The participants were assured of confidentiality and the analysis does not reveal details about any particular firm. Over 90% of the entire population of approximately 400 U.S. fruit and vegetable growers/importers were contacted. Complete questionnaires, and therefore usable observations, were obtained from 81 firms.

According to the survey the most popular imported commodities in 1994-1995 among the survey participants in order of importance were green onions, tomatoes, berries (excluding strawberries), melons, and grapes. The fruit and vegetable firms participating in the survey had average annual gross sales of \$26.9 million. Firms involved in FDI reported average sales of \$29.6 million and non-investors reported an average of \$22.8 million in annual gross sales.

The survey participants indicated that an average of about half of their domestic sales were a result of imports. This average for foreign investors was almost twice that of firms that strictly imported. Mexico was the leading source for imports, followed by Chile and Guatemala. Reportedly, there were no U.S. tariffs on produce originating in Guatemala under the Caribbean Basin Initiative (CBI). Over half of all survey participants received most of their imports from

Mexico. Concerning international sales, over three-fourths of the participants' total sales in countries other than the United States were a result of U.S. supplies exported to the relevant country.

Over half of the firms surveyed reported involvement in foreign production in 1994-1995. Mexico was the leading destination for FDI among the survey participants, distantly followed by Guatemala and Chile. Over half foreign supplies in 1994-95 for firms engaged in FDI were from their own foreign operations. Almost all of the firms surveyed cited cheaper labor and, to an extent, seasonality as the most important factors influencing their historical FDI practices. Survey participants indicated that most of their supplies received from their primary source country were a result of their investment there, and very few supplies were purchased from local producers. Most of the supplies produced internationally as a result of FDI were exported to the United States while very few were sold locally and/or exported to another country.

Imports were reported from survey participants to be significantly cheaper on average than produce obtained domestically in the United States. The foreign investors indicated that U.S. imports were much less expensive than that indicated by firms strictly importing fruits and vegetables in 1994-1995. Several firms indicated provision of start-up funds in order to determine whether or not certain fruits and vegetables could be grown profitably internationally. Mexico was indicated as the most popular place for this practice. Almost half of the firms indicated that they imported fruits and vegetables year-round and a little over half seasonally.

Tariffs were reported as the most important trade barrier among survey participants followed by phytosanitary regulations and other rules and regulations set by the U.S. Department of Agriculture and the Environmental Protection Agency. About half of the firms surveyed

indicated expectations that NAFTA would directly affect their operation. The responses concerning NAFTA from foreign investors and non-investors were almost identical. Of the firms surveyed that were not involved in foreign production, over a third indicated that they would consider FDI as a result of NAFTA or a similar trade agreement that would involve their country of interest.

The survey results included several special concerns and details. Among these were indications that NAFTA has improved international transportation but has caused increases in the amount of paperwork and general red tape involved with exporting to and from Mexico. In addition, some firms indicated that they engaged in foreign production primarily for diversification and other risk reduction purposes.

ECONOMETRIC ANALYSIS

The Probit model was used to estimate the probability that a firm is engaged in FDI. A description and simple statistics for the variables included in the probit model are presented in table 1. The dependent variable (INV) is binary and is indicated as either 0 or 1. Firms reporting that they strictly imported fruits and/or vegetables in 1994-1995 and were not involved in FDI for the production of their commodities were assigned a value of zero. Firms reporting to have been involved in foreign production of fruits and/or vegetables during this time period were assigned a value of one. Measures of the levels of investment were not obtainable. A majority of firms found it difficult to measure the percentage of their total assets used in foreign production.

The vectors of explanatory variables, as indicated earlier, were a result of survey responses as well as a vector of tariff rates (LTAR) indicating the import tariff (cents/kg) associated with a firm's most important commodity. There were at least two tariff rates associated with each commodity, one for the out-of-season period and one for the in-season period in the United States (U.S. International Trade Commission). Due to collinearity only the lower tariff rate (out-of-season or LTAR) was used. LTAR was designed to capture the incentive for a firm to engage in FDI given lower tariffs charged on imports into the United States. This was expected to be a significant variable given the survey results indicating that most of the FDI undertaken by U.S. fruit and vegetable firms was for the purpose of exporting to the United States. The impact of LTAR was expected to be negative indicating that higher tariff rates are associated with a lower probability that a firm engages in FDI.

Annual gross sales (SAL) from a month in 1994 to the same month in 1995 represented another explanatory variable. SAL was designed to account for firm size. It was expected that higher levels of SAL would indicate a higher probability that a firm is engaged in FDI. This is an ownership-specific advantage concerning foreign production as a large firm can finance a foreign operation easier than a small firm. A variable closely related to SAL, that for domestic sales, was omitted due to collinearity.

Also included was an explanatory variable for the percentage of sales in the United States as a result of imports (FRIMP). FRIMP was designed to account for the firm's reliance upon imports to satisfy domestic demand. Reliance on imports was hypothesized to be an incentive for FDI .

Imports from the most important source country as a percentage of total imports (TOTIMP) was also included in the model. Concentration of sourcing activities allows the possibility of economies of size. The probability of a firm engaging in FDI was expected to be higher for the firm receiving most of its imports from a single country.

Another variable (SAVE) was included to account for the percentage savings that a firm receives from foreign produced fruits and vegetables relative to domestically obtained product. A cost advantage from international sourcing was expected to be positively related to the probability of engaging in FDI.

A dummy variable indicating whether a firm imported year-round or seasonally (SEAS), where 1 indicates seasonally and 0 otherwise, was also included in the model. SEAS was included in the model because seasonality historically has been important in the U.S. produce industry as previously indicated in the introduction. However, given the post-NAFTA timing of this study, a more internationally oriented marketplace in the future, and greater utilization of investment costs with year-round shipping, SEAS was expected to be negatively relative to the likelihood of FDI.

Table 2 presents the coefficients, t-ratios, p-values, and marginal probabilities for the probit model. All variables were significant as expected, except SEAS, at the 0.01 level. All variables had the expected sign. Though the negative coefficient for SEAS (seasonal imports) was not significant at the 0.01 level, it was significant at the 0.15 level.

The “goodness of fit” of the model as indicated by the likelihood ratio index is 0.449. The likelihood ratio test determining the significance of the X matrix in explaining FDI yielded a test statistic, distributed as a chi-square, of 12.592. The level of significance was 0.734E-08. These

values indicate that the model is significant and has good explanatory power for cross-sectional data.

The coefficients on the explanatory variables are related to an index and thus, not directly related to the dependent variable, INV. In order to determine the relative strength of the variables and to predict the effects of change in each of the independent variables on the probability of FDI activities undertaken by a fruit and vegetable firm, the marginal probability concept is useful. Derivatives of a probability function evaluated at the mean values of independent variables can be calculated by multiplying the coefficients by the standard normal probability density function of the Probit model (Maddala). Since these derivatives embody the marginal concept, the change in probability of a fruit and vegetable firm engaging in FDI can be calculated by multiplying the amount of the change in the independent variable by the derivative of that variable, table 2 (Epperson et al.).

The marginal probability on SAL indicates that the probability of a firm engaged in FDI increases by approximately 0.007 as gross sales increase by \$1 million, all else equal, table 2. The marginal probability for FRIMP indicates that as the composition of a firm's domestic sales as a result of imports increases by 1%, the probability that the firm is engaged in FDI increases by about 0.008, all else equal. The marginal probability for TOTIMP indicates that as a firm's interest in one particular source country increases by 1%, in terms of its total imports, the probability that the firm engages in FDI decreases by approximately 0.010, all else equal. The marginal probability on LTAR reveals that as tariff levels in the United States decrease by 1 cent/kg, the probability that a firm engages in FDI increases by approximately 0.076, all else equal. The marginal probability on SAVE suggests that for each 1% savings in cost from

international sourcing, the probability that a firm engages in FDI increases by approximately 0.016, all else equal.

CONCLUSIONS AND IMPLICATIONS

The results of the U.S. fruit and vegetable company survey indicated patterns among firms that were involved in FDI for the production of fruits and vegetables. Furthermore, the econometric analysis estimated the probability that firms with certain characteristics were engaged in FDI. It was determined that larger fruit and vegetable firms receiving a large amount of imports, interested in one particular region internationally, and facing a relatively small U.S. import tariff, had a higher probability of being involved in FDI.

Perhaps the most significant conclusion to be drawn from this analysis is associated with the relationship between U.S. import tariffs on fruits and vegetables and FDI in Latin America by U.S. fruit and vegetable firms. In the second most popular country among survey participants, Chile, the low percentage of investors can probably be attributed to the fact that most of the commodities produced in Chile were charged a relatively high tariff upon entering the United States. In contrast, all of the firms involved in Guatemala practiced FDI. Imports from Guatemala were not charged a tariff due to the Caribbean Basin Initiative (CBI).

U.S. tariff rates are important because most of the firms engaging in FDI reported that they export a majority of their output produced internationally to the United States. A majority of U.S. fruit and vegetable importers obtained their commodities primarily from Mexico. With NAFTA and diminishing tariff levels, this effect could have significant implications for the future of the U.S. fruit and vegetable industry.

According to the survey results, there were many characteristics present among U.S. fruit and vegetable producers who were engaged in FDI that were not as prevalent among firms that strictly imported. Perhaps the most significant implication realized from the survey results was that policy makers can no longer simply consider the effects on imports and exports when considering trade policies. The effects on FDI and the objectives of such investment must also be taken into consideration.

The tariff rate variable captured perhaps one of the most significant implications to be derived from the econometric model. A linkage was indicated between lower U.S. tariffs and an increased likelihood of FDI. The relationships ascertained for the firms total sales, percentage of total sales in the United States resulting from imports, and the percentage of total imports from the country where most of the firm's imports originated, have significant implications concerning the type of U.S. fruit and vegetable firm that will be competitive in the future. Large U.S. firms receiving a large amount of imports during the year from one particular region are more likely to engage in foreign production.

Corroborating this was the fact that less expensive international commodity sourcing was determined to be a significant decision factor for firms considering or firms involved in FDI. Further, the negative relationship between seasonal importing and the probability of FDI indicates that perhaps firms are making FDI decisions based on cost advantages for greater utilization of investment interests. This supports the idea that rational decision making requires firms to consider shifting production to the most cost-effective and efficient environments whether the commodity is in or out of season in the United States. Smaller, strictly U.S. domestic firms may be seriously affected by this apparent shift in the industry.

The analysis supports the notion that as barriers to entry and exit between markets diminish, factors of production will flow between these markets until marginal productivities equilibrate. Furthermore, it reveals the types of firms that are expected to be most successful as barriers to trade diminish. Firms engaged in FDI seem to have different ideas than those that are not and appear to visualize the U.S. fruit and vegetable market from a more international perspective.

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Table 1. Description, Mean, and Standard Deviation of Variables Included in the Probit Model

Variable	Explanation	Mean	Standard Deviation
INV	Dummy variable indicating the presence of foreign investment (1 - investment, 0 = otherwise)	0.6049	0.4919
SAL	Annual gross sales, from a month in 1994 to the same month in 1995, millions of dollars.	26.8864	39.9504
FRIMP	The percentage of total sales in the United States as a result of imports in 1994-1995.	51.5185	36.7152
TOTIMP	The percentage of total imports from the country where most of the firm's imports originated, 1994-1995.	81.7284	26.7689
LTAR	Import tariff on the most important commodity imported by the firm in 1994-1995 in cents/kg.	2.5384	3.5215
SAVE	The percentage savings from foreign sources for the most important country, 1994-1995.	17.6049	41.7333
SEAS	Dummy variable indicating whether the firm imported year-round or seasonally, 1994-1995 (1=seasonal, 0=otherwise).	0.5432	0.5012

Table 2. Probit Model Coefficients, T-Ratios, P-Values, and Marginal Probabilities

Variable	Coefficient	T-Ratio	P-Value	Marginal Probability
SAL	0.19187E-01	2.605	0.0006	0.007046
FRIMP	0.20597E-01	2.773	0.0056	0.007564
TOTIMP	0.28091E-01	2.929	0.0034	0.01032
LTAR	-0.20791	-3.500	0.0005	-0.07635
CHEAP	0.42949E-01	3.019	0.0025	0.01577
SEAS	-0.68729	-1.448	0.1476	
Intercept	-3.1777	-2.699	0.007	
Likelihood Ratio Index		0.449		
Likelihood Ratio Chi-Square Test Statistic		12.592		
Degrees of Freedom		6		