A Probit Analysis of the Characteristics of Firms Engaged in the Fruit and Vegetable Trade Between the United States and Latin America

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Abstract

This research analyzed characteristics of 109 firms engaged in international fruit and vegetable trade. A Probit model was used to determine the probability that a firm was of U.S. or Latin American origin. Results indicated that firms were rather homogenous, similar in structure, market outlets, and price setting information and strategies.

INTRODUCTION

Historically, U.S. fruit and vegetable exports have been largely for Canadian destinations but in recent years, exports of fruits and vegetables have expanded to other regions of the world. In the last ten years, U.S. exports of fruits and vegetables have increased from $2.6 billion in 1984 to $8.1 billion in 1994, an increase of 211 percent. These exports now represent 18.6 percent by value and 5.2 percent by volume of total agricultural exports. Imports have also increased from $2.9 billion in 1984 to $7.3 billion in 1994, which represents 27.8 percent by value and 16.3 percent by volume of total U.S. agricultural imports (U.S.D.A., August, 1995).

In 1994, about 10 percent of U.S. fruit exports and 15 percent of U.S. vegetable exports went to Latin America. On the import side, 50 percent of U.S. vegetable imports and 59 percent of fruit imports came from Latin America (U.S.D.A., Nov./Dec., 1995). The primary suppliers of U.S. imports are Mexico, Chile, Costa Rica, and Guatemala.

The creation of bilateral and multilateral free trade agreements in the Western Hemisphere between major trading partners has increased the flow of agricultural products across borders. The creation of the Caribbean Basin Initiative in 1983 and the North American Free Trade Agreement in 1994 have stimulated investment, production, and exports and imports of fruits and vegetables. These agreements have eliminated protective tariffs on products thus stimulating trade. However, the lowering of tariff barriers has become secondary since many agricultural products already receive low tariffs. What has become more important is the elimination of nontariff barriers according to a survey of 109 firms actively involved in the fruit and vegetable trade.

OBJECTIVES

The objectives of this study are: (1) to describe the characteristics of a sample of U.S. and Latin American firms engaged in the international fruit and vegetable trade, (2) to describe barriers to trade in fruits and vegetables as identified by these firms, and (3) to determine if U.S. and Latin American firms have similar structural and operational characteristics.

FRUIT AND VEGETABLE FIRM SURVEY

A questionnaire was used to gather information on the structure of U.S. and Latin American companies engaged in trading fresh fruits and vegetables, factors that affected their pricing and marketing practices, and problems encountered in the perishable commodity trade. A list of companies was collected through *The Blue Book*, which lists companies engaged in the fruit and vegetable trade in the U.S., Canada, Mexico, and other international locations (Produce Reporter Company).

A total of 800 survey questionnaires were sent out to companies in various states, particularly California, Texas, Florida, Washington, and Arizona, since these states have substantial volumes of fruits and vegetables moving into and/or out of the United States. For Latin American firms, the design of the questionnaire was the same as that for the U.S. companies, but it was translated to Spanish to obtain a higher response rate. The list of companies was collected by contacting the U.S. Agricultural Trade Offices in Mexico, Guatemala, Costa Rica, Argentina, Chile, Ecuador, Dominican Republic, Colombia, and Venezuela. The U.S. Agricultural Trade Offices serve neighboring countries as well as those where they are specifically located. Questionnaires were sent to 210 Latin American firms. Finally, a total of 63 U.S. based firms and 46 Latin American firms made up the sample population.

CHARACTERISTICS OF FIRMS IN THE FRUIT AND VEGETABLE TRADE

The organizational structure of the firms reflected different business practices in the two regions. Sixty-three percent of the U.S. companies were registered as corporations, followed by partnerships and individual owners. Latin American firms were almost equally divided among corporations, partnerships and individual owners.

Companies were heavily engaged in exporting and/or importing. U.S. firms exported 33 percent of their fruits and 34 percent of their vegetables. Latin American firms had a much higher dependence on exports; 85 percent of their fruits and 81 percent of their vegetables were exported. The Latin American companies shipped over 53 percent of their fruit and 66 percent of their vegetable exports to the U.S. market. The U.S. companies shipped about 40 percent of their fruit and 43 percent of their vegetable exports to Latin America (Table 1).

U.S. companies received over 84 percent of their imports from Latin American suppliers, largely from Chile, Mexico, and Guatemala. For Latin American companies, their primary supplier was the United States which accounted for 60 percent of their fruit and 76 percent of their vegetable imports.

The majority of the U.S. imports from Latin America competed seasonally in the winter fresh market when U.S. domestic supplies are low. Forty-eight percent of the U.S. firms responded that seasonal demand, late October to the beginning of June, was their peak import demand period which corresponded to the Latin American firms' peak period. The United States imported large quantities of temperate zone fruits such as apples, grapes, and pears as well as vegetables in the winter season.

Firms in both regions depended on personal contacts and networking (relationships) as their primary source of market information. Trade publications were also important. About one-third of the respondents in both regions knew of electronic information systems. These information systems included the Data Transmission Network Corporation, Internet, California Department of Food and Agriculture, and U.S. Department of Agriculture sources.

Comparison pricing was a widely used price setting methodology. In Latin America this was the predominant price setting practice for both importers and exporters. Other forms of price setting included price determination by the company or the import/export client.

Decisions to buy from a particular source were heavily influenced by the ability to provide consistent quality, adequate volume, and timely shipments. Previous transactions, contacts by buyers or sellers, and whether or not trade restrictions existed also influenced the firm's decision to import or export fruits and vegetables from regional sources.

The companies dealt with a maze of confusing, inhibiting, country-specific nontariff restrictions for both imports and exports. Nontariff barriers as a category was the most important factor in limiting trade, both for U.S. and Latin American companies. The predominant nontariff barriers were food safety regulations, maturity, color, appearance, and size of the produce. U.S. and Latin American companies alike recommended deregulation and simplification of the procedures as well as harmonization of the phytosanitary regulations.

ECONOMETRIC ANALYSIS

The sample population was separated into two categories for the econometric analysis: those firms engaged in exporting and those engaged in importing. A Probit model was used to estimate the probability that a firm is of U.S. origin. That is, the dependent variable is: US = a binary variable indicating whether the firm is of U.S. or Latin American origin (1=U.S., 0=Latin American). Explanatory variables included in the exporters' Probit model are: CORP = Company is structured as a corporation (1=yes, 0 otherwise); OPER = Special person in charge of exporting (1=yes, 0 otherwise); FFORW = Use of freight forwarding agent for sales (1=yes, 0 otherwise); PRES = President of company is the decision maker for export sales (1=yes, 0 otherwise); MGR = General manager of company is the decision maker for sales (1=yes, 0 otherwise); TFRUX = percentage of total fruit sales that are exported; FRUIT = The firm exports fruits (1=yes, 0 otherwise); FOOD = A country's food safety regulations are the most important nontariff barrier (1=yes, 0 otherwise); XTERM = The use of the export terminal in the country of origin as the place of the final food safety inspection before entering the importing country (1=yes, 0 otherwise); ENTRY = The use of the port of entry in the country of destination as the place of the final food safety inspection before entering the importing country (1=yes, 0 otherwise).

The dependent variable in the importers' Probit model is: US = a binary variable indicating whether the firm is of U.S. or Latin American origin (1=U.S., 0=Latin American). Explanatory variables included in the importers' Probit model are: PRES = President of company as decision maker (1=yes, 0 otherwise); PCX = Special person in charge of importing (1=yes, 0 otherwise); TVEGM = Proportion of total vegetable purchases imported; VEGM = Proportion of vegetable imports that came from the area in question (U.S. or Latin America); FRUM =

Proportion of fruit imports that came from the area in question (U.S. or Latin America); VEGS = The firm imports vegetables (1=yes, 0 otherwise); SHIP = The ability to provide shipments within the specified time frame as the factor influencing the firm's decision to purchase a product from a specific supplier (1=yes, 0 otherwise); PACK = The ability to supply special packaging as the factor influencing the firm's decision to purchase from specific supplier (1=yes, 0 otherwise); EXC = Exchange rates as the factor influencing the firm's decision to purchase from a specific country (1=yes, 0 otherwise); COMP = Price of imports set by comparison with competition (1=yes, 0 otherwise); ENTRY = The use of the port of entry in the country of destination as the place of the final food safety inspection before entering the importing country (1=yes, 0 otherwise).

EMPIRICAL RESULTS

The econometric analysis estimated the impacts of firm characteristics on the probability that the companies were of U.S. origin as opposed to Latin American. An import and exporting firm was more likely to be of U.S. origin if it was primarily a corporation with one person in charge of exporting, if its final decisions were made by someone other than the general manager of the company, and if it used a freight forwarding agent. For the exporters' model, all variables except PRES and ENTRY were significant at the 10 percent level; all variables except TFRUX had the expected signs (Table 2). A firm ranking food safety regulations (FOOD) as the most important nontariff barrier also had a higher probability of being a U.S. firm.

An importing firm was likely to be of U.S. origin when its decision maker was either the president of the company (PRES) or the person in charge of imports (PCX), was concerned with on-time shipments, and had its final food safety inspection at the port entry (ENTRY). All

variables in the importers' model except VEGS were significant at the 10 percent level (Table 3). Coefficients of all variables except TVEGM and FRUM had the expected signs.

The "goodness of fit" of the model given by the likelihood ratio index is 0.676 for the exporters' model and 0.816 for the importers' model. The chi-square statistic, which determines the significance of the model in explaining the origin of the firm, was highly significant: 64.622 with 10 degrees of freedom for the exporters' model and 82.561 with 11 degrees of freedom for the importers' model. These values indicate that the models are significant and explain about 68 percent of the variation for U.S. versus Latin American exporting firms and about 82 percent of the variation for U.S. versus Latin American importing firms.

SUMMARY and CONCLUSIONS

The results indicate the most important nontariff barriers -- FOOD (food safety regulations), the place of the final food safety inspection, XTERM (export terminal), and ENTRY (port of entry) -- capture perhaps the significant implications derived from the econometric analysis. The explanatory variable FOOD has significant implications concerning the type of nontariff barriers faced by firms in the fruit and vegetable business. Forty-one percent of the exporters considered nontariff barriers to be the most important obstacles to the expansion of trade. Both the U.S. and Latin American countries use nontariff barriers to control the safety of produce coming across their borders. However, it appears that U.S. companies consider nontariff barriers to be more important, since these variables serve to differentiate U.S. from Latin American firms. U.S. exporting firms perceived food safety regulations to have the most impact on their trade. Latin American companies were constrained by other factors, such as restrictions on size, maturity, color, and appearance of fruits and vegetables. Many of the U.S. quality

standards have their origins in Section 8e of the Agricultural Marketing Agreements Act of 1954 (Tweeten).

For the importer, the positive sign for the ENTRY coefficient in the importers' model indicates that control is passed on to officials at the U.S. border. For U.S. firms importing from a Latin American country the burden of having the produce inspected at the border can result in bottlenecks, delays and damage to fruits and vegetables. This, of course, also implies a burden to Latin American exporting firms. Remedies to this problem may include expansion of services by International Services (IS), an organization within the Animal and Plant Health Inspection Service (APHIS). APHIS conducts its inspections outside the United States, assisting foreign plant health organizations to establish and modernize their plant health programs, providing information on U.S. import requirements to exporters, and coordinating the development and operation of pre-clearance programs.

The fruit and vegetable trade in the Western Hemisphere is growing but facing many obstacles. As both importers and exporters mentioned, better service in the form of understanding their customers' needs, culture, and language are becoming more and more important as these firms realize that their survival depends on their interdependence with one another, inside and outside of their own countries. Companies must remain abreast of changes in other parts of the world since preferential trade agreements foster more interdependence and competition among firms. As technology and information systems become more efficient and readily available, firms are able to access the same information almost simultaneously. They need to be able to respond quickly to be competitive in a global market place.

Table 1. Characteristics of a Sample of U.S. and Latin American Firms Engaged in

Fruit and Vegetable Trade

Characteristic			U.S.	Latin America
Organizational Structure			---------- percent ----------	
Individual Owner			18.75	34.04
Partnership			17.19	34.04
Corporation			62.50	31.92
Cooperative			1.56	0.00
Imports and Exports as a Share of Transactions				
Fruits	Exports			
		Total Volume Exported	32.48	85.0
		Exports to Latin America/U.S.	38.46	53.96
	Imports			
		Total Volume Imported	51.76	58.71
		Imports from Latin America/U.S.	84.07	60.64
Vegetables	Exports			
		Total Volume Exported	33.53	81.0
		Exports to Latin America/U.S.	42.88	65.5
	Imports			
		Total Volume Imported	59.68	32.36
		Imports from Latin America/U.S.	90.39	76.29
Period of Greatest Demand				
Imports	Year Round		43.92	33.10
	Second Demand		48.63	37.59
	Rest of Year		7.47	29.31
Exports	Year Round		25.38	35.41
	Second Demand		45.01	60.98
	Rest of Year		29.61	3.61
Sources of International Market Information				
Relationship Contacts		40.40		29.03
Trade Publications			16.16	20.97
Public Organizations			13.13	3.23
Specialized Agents			------	16.12
Other			30.31	30.65

Table 1. Continued

Characteristic		U.S.	Latin America
		---------- percent ----------	
Price Setting Methodology			
Imports	Compare With Competition	32.43	61.54
	Set by Respondent's Company	18.92	30.77
	Set by Client	29.73	0.00
	Other	18.92	7.69
Exports	Compare With Competition	33.71	43.24
	Set by Respondent's Company	28.57	21.62
	Set by Client	12.50	29.73
	Other	25.22	5.41
Factors Influencing the Firm's Decision to Buy From a Particular Source			
	Ability to Provide Consistent Quality	29.21	29.21
	Ability to Provide Shipments Within Time Frame	21.39	17.08
	Ability to Provide Adequate Volume	19.22	18.00
	Special Packaging	11.38	21.26
	Other	18.80	14.45
Factors Influencing the Firm's Decision to Export/Import Commodities			
Imports	Previous Transactions	28.85	21.50
	Contacted by Buyer/Seller	26.39	22.71
	Trade Restrictions	21.25	22.32
	Exchange Rates	11.65	25.21
	Other	11.86	8.26
Exports	Previous Transactions	26.91	19.13
	Contacted by Buyer/Seller	22.82	19.44
	Trade Restrictions	21.83	22.84
	Exchange Rates	19.13	20.37
	Other	9.31	18.22

Source: U.S.--Latin American Survey as reported in Marin 1997.

Table 2. Exporters' Probit Model, Coefficients, Standard Errors, and T-Ratios

Variable	Coefficient	Standard Error	T-Ratio
CORP	2.613	1.288	2.029
OPER	2.672	1.262	2.118
FFORW	2.313	1.287	1.797
PRES	-1.286	1.016	-1.266
MGR	-2.830	1.677	-1.688
TFRUX	-0.050	0.022	-2.272
FRUITS	3.727	1.637	2.276
FOOD	3.947	1.911	2.065
XTERM	-1.976	0.983	-2.010
ENTRY	-0.619	0.692	-0.894
Intercept	-5.082	2.390	-2.126
Likelihood Ratio Index	0.676		
Chi-Square Statistic	64.622		
Degrees of Freedom	10		
Number of Observations	69		

Table 3. Importers' Probit Model Coefficients, Standard Errors, and T-Ratios

Variable	Coefficient	Standard Error	T-Ratio
PRES	5.464	2.724	2.006
PCX	10.432	5.014	2.080
TVEGM	-50.695	24.504	-2.069
VEGM	61.040	29.619	2.061
FRUM	-5.741	3.200	-1.794
VEGS	-1.398	1.358	-1.029
SHIP	8.051	3.626	2.220
PACK	-4.230	2.001	-2.114
EXC	-4.434	2.409	-1.840
COMP	-5.108	2.734	-1.868
ENTRY	12.008	5.328	2.254
Intercept	-10.676	4.967	-2.149
Likelihood Ratio Index	0.816		
Chi-Square Statistic	82.561		
Degrees of Freedom	11		
Number of Observations	74		

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