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World Soybean Market Competition: The Case of U.S., Brazil, and Argentina*

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Introduction

The decline in world market shares of U.S. agricultural exports over time has been explained by the existence of trade barriers, the increased foreign competition, and the real exchange rate. The financial factors in capital account of balance of trade which may be influential on the same exports of foreign countries were not modeled properly. Taking the world soybean industry as the example, the increasing foreign liabilities in the competing exporter countries faced by the U.S. have increased the demand for foreign exchange earnings since the 1960s. To pay off these liabilities, these developing countries treat agricultural exports as a top priority not only for self sufficiency but for foreign exchange earnings. Thus, the demand for foreign exchange earnings in the agricultural exporter countries becomes one important factor affecting the competitiveness of U.S. agricultural exports. This liability factor is argued as an important variable for the soybean complex competition in the world markets.

The other important factor is the targeted product chosen for export promotion in the exporting countries. While the U.S. dominates world soybean production, Brazil and Argentina set up a policy of encouraging exports of processed soybeans. Moreover, Brazil and Argentina have comparative advantage in soybean production which puts pressures on the competitiveness of U.S. soybean exports. Even though Brazil/Argentina government is depressing soybean exports through export tax or quota, the after tax soybean profit is also attractive to Brazil/Argentina farmers and exporters. It turns out that the competitive position of U.S. soybean and the by-product exports in the world market may be caused by policy directions between two competing countries.

Another important factor is the different attitude toward agricultural import policies in major importing countries. The product forms are the most important concern of imports. If the processed agricultural products are highly value added, the tendency to import raw instead of processed products becomes strong. However, the tendency to expand crushing capacity is limited by the volatility of world prices and exchange rates. To reduce the trade risk, importing countries would maintain imports of both raw and processed products for domestic demand. As a result, the raw and processed agricultural products are themselves competitive in the importing countries and thus in the exporting countries.

The objective of this study is to determine the effects of the financial and target export promotion factors among the export competing countries and the government import policies in the importing country on the long-run competitive power of U.S. soybean exports. The induced discussion

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will include the expected changes of the world soybean export competition after free trade is prevailed. Using annual data from 1970 to 1985, export behavior of competitor (Brazil and Argentina), import behavior of EC-12 and Japan, and U.S. exports are examined. This analysis provides more information to our understanding of the current agricultural trade and the insight of future world agricultural trade competition.

The paper is organized as followings: a) a review of previous researches is synthesized, b) a brief review of the world soybean trade competition is addressed, c) the conceptual trade competition model is developed, d) empirical model and estimation results are discussed, and e) the conclusions are drawn from the estimation results.

Previous Research

Previous research on world soybean trade model has focused on both the market structure of specific products and the export demand function(Griffith and Meilke, Witzke and Houck, Johnson and Grennes and Thursby, Chambers and Just, Collins and Meyers and Bredahl, Longmire and Morey, Belongia, and Haley). On the research of market structure, papers have focused on the formation of detailed disappearance behavioral equations which include acreage harvested, production, demand, stocks, imports, exports, and crushing margin. As a result, a large structural model is specified and the trade competition was indirectly discussed. On the research of export demand equation, many focus on the effects of exchange rate, inflation, and monetary policy on agricultural exports and other explanatory variables in the equation. As a result, the exchange rate, cross-effect price, and other policy variables are argued to be important in the export or import equations. However, none of these researches put efforts directly on the trade competition position among exporting and importing countries.

Haley is the first one to model a two-country agricultural trade competition. World price and traded quantity are estimated in the reduced form. The paper further proves the importance of the exchange rate and policy variables. However, the model did not show the competition among exporting and importing countries. As a result, Haley's model is only adopted as the basic structure for the development of a three-country trade competition model.

Hwang became the first one to develop a three-country trade competition model by partially endogenize the exchange rate in the market system. The focus was put on the effects of U.S. monetary policy on the trade competition. The result proves that the monetary factor is an important factor affecting the competitive position of U.S. soybean exports through the exchange rate changes. However, the financial factor and the inter-product competition were not discussed. As a result, the trade competition model may need further modification.

Based on the criteria that an econometric model needs to be as simple as possible and must include all important variables in the structural equations, all previous researches are important references for the specification of the trade competition model here. These important

variables are the exchange rate, inflation, competing prices, and policy factors in each product specific market structure. For soybeans and soybean products, the structural equations of these three products will be estimated together in order to make arguments on the relationships of inter-product competition. For the trade competition, two exporting countries are needed to find out the competitive position of each country.

Soybean Market competition Background

The demand for soybeans is the derived demand for the processed products: soybean meal, an important ingredient in livestock feed; and soybean oil, a major vegetable oil used for both human consumption and industrial purposes. Production and trade in soybeans have significantly increased since the early 1960s, resulting from the rising demand for livestock products and the changes in preferences for vegetable oils over animal fats.

The trade competition has also exhibited significant increase since the early 1960s, Table 1. The dominant exporters are the United States, Brazil, and Argentina. Over 90 percent of the exports of soybeans and soybean meal are imported by the European Economic Community (EC-12) and Japan. In the EC-12/Japan soybean market, U.S. market share decreased from 90 percent in the early 1970s to 79 percent in the late 1970s. By 1985, the U.S. market share was nearly 65 percent while Brazil/Argentina market share has nearly 35 percent. In the soybean meal and oil markets, U.S. market share has decreased significantly since the early 1970s. Brazil/Argentina soybean meal export has competed away U.S. share and become dominant exporter since the mid 1970s. In addition, U.S. exports of soybean oil have never dominated Brazil/Argentina exports. All of these show that Brazil and Argentina have successfully promoted the exports of processed products instead of the exports of raw product.

Associated with the targeted export promotion in Brazil and Argentina, other policy changes in the three exporting countries are also attributed to the decreasing U.S. market shares. The 1972 change of financial government in Brazil stimulated the production of agricultural products. The boom of poultry industry in 1975 further attracts soybean production (Williams and Thompson). The 1973 embargo of U.S. soybean exports provides the incentive for the major importing countries to diversify their suppliers.

Although Brazil and Argentina have comparative advantage in soybean production, there are some restrictions for their exports. High fright rates, longer shipping time, and quality are factors constraining Brazil/Argentina soybean exports (Kalmbach, Sharp, and Walker). A lower cost of soybean production may lower the input cost of soybean crush. However, the increasing demand for livestock feed and vegetable oil consumption in the domestic market frequently force Brazil/Argentina government to restrict exports of soybean meal and oil.

In the importing countries, Japan exhibits great interest in imports of soybeans only while EC-12 countries have little restrictions on imports of all three products. Soybeans and soybean products are imported into EC-12 and Japan duty free. Even though the imports of all three products in EC-12

are free, EC-12 importers have to make the decision on the portions to import either raw or processed products for the intra-regional demand.

Conceptual Framework

The framework extends Haley's model to a three-country trade competition model for soybeans and soybean products. Two exporting countries, the U.S. and Brazil and Argentina, competing with each other in one importing country, EC-12 and Japan. Equations (1) to (5) represent the complete trade competition model for one product. It can be expressed as follows:

(1) the aggregate U.S. exports to EC-12 and Japan:

$$USXP = ESA(WP, CAPa, Za),$$

(2) the aggregate Brazil/Argentina exports to EC-12 and Japan:

$$BAXP = ESB(EXb*WP, CAPb, LIAB, Zb),$$

(3) the aggregate EC-12/Japan imports from the two exporting countries:

$$EJIMP = ED(EXm*WP, Ym, Zm),$$

(4) total exports of the U.S., Brazil, and Argentina:

$$TXP = USXP + BAXP,$$

(5) the market clearing condition:

$$TXP = EJIMP.$$

Where ES and ED represent the excess supply and excess demand functions, respectively. The real world price (WP) is the U.S. dollar import price per metric ton at the port of the importing country deflated by the consumer price index. The subscripts represent different groups of countries, a for the U.S., b for Brazil and Argentina, and m for EC-12 and Japan. The exchange rate is represented by EX which is the dollar price of local currency. CAP denotes the export capacity and is defined as the total domestic supply, including the carry-over stocks, over domestic use. LIAB in the Brazil/Argentina export equation represents the net liability to the U.S. in the dollar term. The variable Z represents a vector of other exogenous variables such as policy variables and substituting product prices. The substituting product prices are rapeseed price for soybeans, rapeseed meal price for soybean meal, and palm oil price for soybean oil.

In the system of equations from (1) to (5), the world price in local currency faced by excess suppliers is positively related to excess exports. If the dollar depreciates (appreciates) against the currency of Brazil and Argentina, EXb decreases (increases) and the world price in Brazil/Argentina currency decreases (increases) which will depress (strengthen) foreign competition with U.S. exports. However, the competitive position of U.S. exports also depends on the exchange rate between the U.S. dollar and the

currency of EC-12 and Japan. If the dollar depreciates against the currency of EC-12 and Japan, EXm, and appreciates against the currency of Brazil and Argentina, the competitive position of U.S. exports will depend the relative magnitude of both depreciation and appreciation. In addition, the world price faced by EC-12 and Japan is negatively related to the imported quantity.

The export capacity is positively related to the export quantity in the exporting countries. This variable CAP captures both domestic supply and demand structural behaviors as an important indicator for available excess exports. As long as domestic available supply is relatively higher than domestic use, an increase in exports is expected.

In Brazil and Argentina, the net liability to the U.S. (LIAB) is positively related to their exports. As Brazil and Argentina increase their foreign borrowing for domestic development, the demand for foreign exchange earnings will increase. The falling oil price and world recession in the early 1970s forced Brazil and Argentina to export more agricultural products to support foreign exchange earnings. Thus, it is assumed that the net liability to the U.S. serves as an important stimulator for Brazil/Argentina agricultural exports including soybean exports.

In EC-12 and Japan, the income level (Y) is positively related to their imports of soybeans and soybean products. It is argued that the soybean products are normal goods in the importing country. The income effect on the derived demand for soybeans has to be positive. During the period of rapid economic growth, the consumption behavior changes to the preference of consuming more livestock products and vegetable oil.

Empirical Results

Equations (1) to (5) are applied for the markets of soybeans, soybean meal, and soybean oil and a fifteen-equation system is built for the analysis of world soybean trade competition. It is argued that the residual terms of equations in these three product markets may be correlated due to policy induced distortions and the inter-industry competition. Brazil and Argentina encourage exports of processed soybeans while EC-12 and Japan may intend to import raw beans for domestic huge processing capacity. Moreover, EC-12 may prefer the imports of both soybeans and soybean meal from Brazil and Argentina due to an artificially lowered price rather than an increased crushing margin. Thus, the estimation uses the Seemingly Unrelated Regression technique for the nine structural equations. Data used are the 1970-1985 annual time series.

Table 2 shows the estimated trade-competition model for the markets of soybeans, soybean meal, and soybean oil. In the world soybean market, U.S. and Brazil/Argentina exports do not exhibit statistically significant response to current real world price in local currency. However, their exports do respond to the lagged export quantities which implies that the export adjustments in the two exporting countries follow a positive relationship to the world price of last period. Thus, the price elasticity of U.S. exports is implicitly greater than that of Brazil/Argentina export.

Brazil/Argentina soybean exports are positively related to their export

capacities, their liability to the U.S., and the change of financial government in 1972. Exports of soybeans are constrained in Brazil and Argentina by its export capacity while U.S. domestic soybean supply has been always larger than domestic demand and export capacity is not a constraint for U.S. soybean exports. Moreover, Brazil and Argentina tend to export more of soybeans while foreign debt is increasing and the changing financial government is promoting exports for foreign exchange earnings.

In the importing country, EC-12 and Japan have a negatively sloped import demand structure and their imports are positively related to the substituting product price and the real domestic income level. As long as the world price in real local currency is increased, resulting from the nominal increase in world price or the stronger dollar or both, EC-12 and Japan will decrease their imports of soybeans. While the rapeseed price is lower than the soybean price, EC-12 as the major importing market will tend to import more rapeseed rather than soybeans for domestic crush. Moreover, the increasing real income level shows the long-run trend of the demand for more meat and thus for soybean imports.

In the soybean meal market, U.S. soybean meal exports show a positive relationship to the world price and the export capacity and Brazil/Argentina soybean meal exports only respond statistically significant to U.S. claims. It implies that Brazil/Argentina soybean meal exports may not put so much attention to the level of world price and export capacity is not a constraint which due much to government policy of promoting exports of value-added products. While crushing capacity in the U.S. is not expanded as fast as that in Brazil and Argentina, export capacity becomes a constraint for U.S. soybean meal exports. Moreover, the 1973 U.S. soybean embargo was the starting point for the importers to search for alternative suppliers of soybean complex because of the uncertainty of U.S. supply.

The same as the soybean market, EC-12 and Japan face a negatively sloped import demand structure while the real domestic income level and the 1973 U.S. embargo are statistically significant factors affecting the imports. The magnitude of the import price elasticity of soybean meal is smaller than that of soybeans. It dues largely to both the price and non-price incentives in Brazil/Argentina soybean meal exports. Brazil and Argentina tried to lower their export prices to compete with U.S. exports and was once accused to dump soybean meal to EC-12 in the early 1980s. The demand for foreign exchange earnings in Brazil and Argentina further encourages soybean meal exports despite of the level of the world price. Since the soybean meal price paid by EC-12 importers is distorted by Brazil/Argentina exporters, the substituting meal price is not significantly related to EC-12/Japan imports. Finally, the 1973 U.S. embargo has a negative effect on the imports of soybean meal in EC-12 and Japan.

In the world soybean oil market, the price elasticities are elastic except for the distorted Brazil/Argentina exports. It reflects the largely spread suppliers and importers around the world oil markets. U.S. soybean oil exports to EC-12 and Japan will increase significantly in the magnitude if the world price increases and vice versa. The export capacity is negatively related to U.S. exports to EC-12 and Japan which implies that a large amount of U.S. soybean oil is exported to the rest of the world market which reflects the small U.S. market share in the EC-12/Japan market. On

the other hand, Brazil/Argentina soybean oil exports respond to their export capacity, liability to the U.S., and the changing financial government in 1972 with statistical significance. This situation further proves that Brazil/Argentina government supports the exports of processed products and EC-12 countries are the targeted markets.

The imports of soybean oil in EC-12/Japan market respond negatively to the real world price in local currency and positively to the substituting product price and real income level. Palm oil is the major substituting product of soybean oil and is largely produced in Southeast Asia such as Malaysia. As long as the price of palm oil is increased, EC-12/Japan importers will import more soybean oil for domestic consumption. The positive relationship between the real income level and soybean oil imports further provides the evidence of the changing consumption preferences from animal fats to vegetable oils in EC-12 and Japan.

The stability of the coefficient estimates is also tested by F statistic. The 1982-1985 data are excluded from the regression and the sum of squared residuals (SSR1) has degree of freedom n-K, where K is the number of regressors. The difference of the SSR of the original data and the SSR1 has the degree of freedom 4. The F ratio is calculated with the degrees of freedom 4 and n-K. The F test supports the stability of the coefficient estimates of the original regression.

Based on the estimation results, the elasticities of the world price, exports, and imports with respect to Brazil/Argentina liability to the U.S. can be calculated as shown in Table 3. The elasticities are calculated by differentiate the nine structural equations with respect to the liability variable (LIAB) and using the identity equations to find out the effcts of the liability variable on the world price. The complete derivation can be obtained in Hwang. An one percent increase in Brazil/Argentina liability to the U.S. will result in more Brazil/Argentina soybean and by-product exports which will lower the world prices in the three market. As the world prices are lowered, EC-12 and Japan would increase imports and hence both U.S. and Brazil/Argentina exports will increase.

The elasticities shown in Table 3 express some ideas of possible competitive results. As long as Brazil/Argentina liability to the U.S. increases one percent, the world prices of soybeans, soybean meal, and soybean oil will be decreased. The soybean meal price decreases at a degree greater than other two prices which is because of the large market share of Brazil/Argentina soybean meal exports in EC-12 and Japan. However, soybean meal and oil exports of the U.S. will be increased more in percentage than that of Brazil and Argentina from the increased demand. It turns out that Brazil/Argentina liability to the U.S. may serve as a stimulator for Brazil/Argentina exports but may not serve as the factor to increase the competitiveness of soybean meal and oil exports. The reason for this situation may be because that Brazil/Argentina exports are not responding with statistical significance to the world price while U.S. exports are responding to the world price with statistical significance except for soybeans.

As a result, U.S. soybean and soybean product exports are facing strong competition from Brazil and Argentina in the EC-12 and Japan market. The

competition pressure is greater in the magnitude for soybean meal than that for soybeans which dues much to the policy oriented distortions of Brazil/Argentina agricultural exports. In the oil market, U.S. exports face even greater competing pressure from Brazil and Argentina and the rest of the world in the EC-12/Japan market. In the rest of world vegetable oil market, U.S. soybean oil may find a way to expand its exports but not in the EC-12/Japan market.

The market distortion may be originated by the expanding Brazil/Argentina liability to the U.S. which forces Brazil/Argentina government to urge the demand for foreign exchange earnings and thus exports of soybean meal and oil. However, the liability to the U.S. may not serve to increase the competitiveness of Brazil/Argentina soybean meal and oil exports. The important reason is that Brazil/Argentina exports may not respond to the changes in the world prices.

Moreover, the structural equations further provide that there are inter-industry competition among all three related products. All traders in these three countries are willing to export or import soybeans, soybean meal, and soybean oil. However, U.S. exporters favor more on the exports of soybeans while Brazil/Argentina exporters prefer more to the exports of soybean meal and oil. The EC-12/Japan importers, however, prefer the imports of both soybeans and soybean meal from the two major exporting regions. For the imports of soybean oil, EC-12/Japan importers would be more elastic in their choices among alternative supplying sources.

Conclusion

This paper investigates the soybean trade competition between the U.S., Brazil and Argentina in the EC-12 and Japan importing market. It is argued that the net liability to the U.S. may have great impacts on the demand for foreign exchange earnings and hence the demand for more agricultural exports in Brazil and Argentina. In addition, Brazil and Argentina follow a trade policy of devaluing their currency against the U.S. dollar in response to their domestic rate of inflation. Therefore, both the net liability and the devaluation in Brazil and Argentina may have important impacts on the competitive position of U.S. soybean exports.

It is further argued that there is inter-industry competition in all trading countries. While the U.S. dominates world soybean production, Brazil and Argentina promote their exports of processed soybeans. In EC-12 and Japan, the importers wish to increase their profitability of imports and choose the import combination between soybeans and soybean meal and oil. The fast expanding crushing capacity in EC-12 and Japan may attract the imports of soybeans rather than soybean meal.

A three-country trade competition model with nine behavioral equations are built for the exports and imports of soybeans, soybean meal and soybean oil. Two exporting countries are the U.S. and Brazil and Argentina and one importing country is the EC-12 and Japan as a whole market. Empirical estimations adopt the Seemingly Unrelated Regression technique on the nine simultaneous equations for the period between 1970 and 1985.

The estimation results suggest that the structural model captures the

policy differences among the trading countries. In all three markets, U.S. exports possess higher price elasticities than Brazil/Argentina exports. The price elasticity of soybean imports is greater than that of soybean meal imports. In addition, the demand elasticity of soybean oil is the largest in magnitude due to the widely spread of suppliers and the demand from the rest of the world. However, both U.S. and Brazil/Argentina exporters show great interests to export soybean oil.

Due to increasing liability to the U.S. in Brazil and Argentina, U.S. exports of all three products face strong competition from Brazil and Argentina. It is obvious that Brazil/Argentina soybean meal exports respond to their net liability to the U.S. with high statistical significance. This further proves that Brazil and Argentina have the policy of encouraging the exports of processed or value-added products rather than the exports of raw soybeans. However, the increased Brazil/Argentina exports are not resulted from the increased competitiveness but from policy distortion. As the world prices are decreased because of the increased Brazil/Argentina exports for the foreign exchange earnings, U.S. exports become more competitive than Brazil/Argentina exports in the world soybean meal and oil markets.

Empirical results further suggest that the U.S. is focusing on the exports of soybeans while Brazil and Argentina are promoting exports of soybean meal and oil. U.S. soybean exports are not constrained by its export capacity while Brazil and Argentina are not constrained by their export capacity of soybean meal. This competitive situation is further strengthened by the attitude of EC-12/Japan imports. The importing countries are searching for the diversification of suppliers to guarantee the imports of beans and meal. As long as the U.S. does not provide certainty of supply to importing country and Brazil/Argentina show great interests to export, EC-12 and Japan would increase their imports from Brazil and Argentina. As a result, U.S. exports of soybeans and soybean meal are loosing the competitive power to Brazil and Argentina.

The results further suggest some policy implications under the development of freer world trade. The devaluation of Brazil/Argentina currency may distort the trade competition condition. If the exchange rate is not allowed to distort, U.S. exports may face a lower degree of competition from Brazil and Argentina. Furthermore, U.S. competitive power may be stronger if export subsidies are not allowed under free trade. The only possible factor to depress the future U.S. export competition may be the comparative advantage of Brazil/Argentina soybean production.

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Table 1. Export Shares of U.S. and Brazil and Argentina in the EC-12 and Japan Market. * (%)

Year	Soybeans		Soymeal		Soyoil	
	U.S.	Brazil & Argentina	U.S.	Brazil & Argentina	U.S.	Brazil & Argentina
1965 - 69	97.11	2.89	91.09	8.91	na	na
1970 - 74	89.99	10.01	69.48	30.52	36.36	63.64
1975 - 79	79.35	20.65	39.15	60.85	1.93	90.07
1980	78.99	21.01	36.51	63.49	0.12	99.88
1981	82.59	17.41	29.51	70.49	1.86	98.14
1982	89.10	10.90	31.32	68.68	2.84	97.16
1983	85.36	14.64	29.54	70.46	0.27	99.73
1984	74.02	25.98	14.94	85.06	0.33	99.67
1985	64.93	35.07	15.69	84.31	0.15	99.85

Source : U.S. Department of Agriculture and Foreign Agricultural Trade of the U.S..

* : na represents data not available.
Brazil/Argentina exports are proxy data.

Table 3. The Elasticities of the World Price, Exports, and Imports with respect to Brazil/Argentina Liability to the U.S. (1970-1985 average)/*

	World Price (WP)	United States (Export)	Brazil & Argentina (Export)	EC-12 & Japan (Import)
Soybeans	-1.99	1.20 (0.83)	3.63 (0.17)	2.00
Soymeal	-2.70	2.17 (0.40)	0.73 (0.60)	1.87
Soyoil	-0.74	48.13 (0.02)	0.46 (0.98)	1.02

* : Figures in the parenthesis are average export market shares.

Table 2. World Soybean Trade-Competition Model 1970-1985./a
(Using Seemingly Unrelated Regression)

USXP, BAXP, and EJIMP	Constant	WP	CAP	LIAB	Other Variables					R**2	d.f.	D-W
					LXP	SWP	Real GNP	D72	D73			
I Soybeans												
a. U.S.	5.407	0.066	0.214	—	0.658***	—	—	—	—	0.783	11	1.45
	(1.71)/b	(0.08)	(0.17)		(0.11)							
b. Brazil & Argentina	5.649	-0.029	1.887***	0.383***	0.307***	—	—	0.920***	—	0.962	9	1.24
	(0.66)	(0.11)	(0.35)	(0.07)	(0.05)			(0.17)				
c. EC-12 & Japan	17.318	-0.502***	—	—	—	0.405***	0.656*	—	—	0.938	11	1.12
	(0.47)	(0.12)				(0.08)	(0.35)					
II Soymeal												
a. U.S.	13.203	0.122*	5.345***	—	—	—	—	—	-0.283**	0.710	11	2.00
	(0.26)	(0.08)	(0.82)						(0.12)			
b. Brazil & Argentina	9.985	0.097	0.024	0.560***	—	—	—	0.122	—	0.963	10	1.24
	(0.81)	(0.16)	(0.08)	(0.03)				(0.15)				
c. EC-12 & Japan	17.341	-0.321**	—	—	—	0.132	3.333***	—	-0.176*	0.916	10	1.53
	(0.66)	(0.14)				(0.14)	(0.59)		(0.11)			
III Soyoil												
a. U.S.	9.635	2.527**	-20.325**	—	—	—	—	—	-1.167	0.111	11	1.82
	(2.80)	(1.00)	(7.09)						(1.3[illegible])			
b. Brazil & Argentina	4.628	0.116	3.147***	0.547***	—	—	—	1.529***	—	0.977	10	1.37
	(0.86)	(0.10)	(0.61)	(0.08)				(0.25)				
c. EC-12 & Japan	13.161	-1.302*	—	—	—	1.393**	5.897**	—	-0.431	0.850	10	1.10
	(3.56)	(0.88)				(0.75)	(2.53)		(0.47)			

a : The Variables are defined in the next page.
b : Figures in parentheses are standard errors.
— : Variables not included in the equation.
***: Significant level is 0.99.
**: Significant level is 0.90.
*: Significant level is 0.80.

Variable Definitions

USXP : Quantity of U.S. soybean or soymeal or soyoil exports to EC-12 and Japan, marketing year, FATUS.

BAXP : Quantity of Brazil/Argentina soybean or soymeal or soyoil exports to EC-12 and Japan, marketing year (a proxy data), ATY.

EJIMP : Quantity of EC-12/Japan soybean or soymeal or soyoil imports from the U.S., Brazil and Argentina, marketing year, FATUS and ATY.

WP : Real world price in local currency. World soybean price at Rotterdam, world soymeal price at European ports, and world soyoil price at Rotterdam are deflated by consumer price index and multiplied by the exchange rates, ATY.

CAP : Export capacity in exporting countries. Total domestic supply, including stocks, is divided by total domestic use, USDA.

LIAB : U.S. net claims to Brazil and Argentina, IMF, IFS.

LXP : Lagged dependent variable.

SWP : Nominal prices of substitutable products of soybeans, soymeal, and soyoil, ATY.

GNP : Real gross national income of EC-12 and Japan, IFS.

D72 : Dummy variable equals 0 prior to 1972 and 1 otherwise for Brazil/Argentina equations.

D73 : Dummy variable equals 1 in 1973 and 0 otherwise for U.S. and EC-12/Japan equations.

FATUS : Foreign Agricultural Trade of the U.S., USDA.

ATY : Agricultural Trade Yearbook, Foreign Agricultural Organization.

IFS : International Financial Statistics, International Monetary Fund.