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The Competitive Structure of U.S. Agricultural Exports

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Recognizing the link between imperfect competition and international trade policy, a diverse set of models of imperfect competition have been developed to explain price formation in international agricultural trade (McCalla; Sarris and Freebairn; Paarlberg and Abbott; Kolstad and Burris). This paper is motivated by Krugman's observation that tests for imperfect competition in international trade can be based on the observed pricing decisions of exporters. Exporters may exercise market power by adjusting prices to different export destinations, resulting in a form of price discrimination. This pricing to market (PTM) behavior, pertains to decisions by exporters to maintain or even increase export prices when facing currency depreciation relative to the importer's currency.

The PTM phenomenon has been largely neglected in agricultural trade analysis. Given the dominant U.S. trade shares of many agricultural commodities, pricing decisions by U.S. exporters should be examined for behavior consistent with PTM. For example, the U.S. has been a major exporter of wheat, corn, soybeans and cotton throughout the 1980s and, until the late 1970s, soybean meal and soybean oil.

In this paper, a model of PTM is applied to U.S. exports of wheat, corn, cotton, soybean, and soybean meal and oil. The main objective is to develop testable hypotheses about the existence of market power in international commodity trade using the PTM framework. A model of imperfect competition is presented based on pricing decisions by exporting firms across destinations. The model is modified to account for price discrimination by government interventions such as the Export Enhancement Program (EEP).

The first section summarizes previous studies on the competitiveness of international agricultural markets. The second section outlines the basic model and presents an empirical specification designed to test exporter behavior. Sections three and four discuss the data sources, results, estimation and a model extension. The model extension is proposed to account for the possibility that importers exercise monopsony power in the wheat market. Conclusions and directions for future research then are presented.

Imperfect Competition in Agricultural Markets

The literature review first considers the main approaches to modeling imperfect competition in agricultural commodity trade, mainly in wheat, and then considers models based on industrial organization approaches to imperfect competition in international trade. Imperfectly competitive pricing behavior in the international wheat market was mentioned by Mendelsohn and Farnsworth in the 1950s, but McCalla first introduced a duopoly model of the international wheat market. His model included Canada and the U.S., with Canada as the price leader. Alaouze, Watson and Sturgess developed a triopoly model which incorporated Australia as a major exporter. Carter and Schmitz proposed a model in which wheat importers exercised monopsony power and imposed import tariffs on wheat to maximize welfare gains. An informal test of the model was based on a comparison of actual prices with empirical estimates derived from the optimal tariff solution.

Oligopoly theory spurred the development of other models investigating imperfect competition in agricultural trade. Sarris and Freebairn modeled international prices as the outcome of a Cournot equilibrium in which pricing policies for individual countries were determined by maximizing domestic welfare. Simulations of the world wheat market were performed to examine the effects of various trade liberalization scenarios. Karp and McCalla applied a Nash cooperative dynamic game to the international corn market and developed multiperiod reaction functions for both importers and exporters. Kolstad and Burris developed a spatial equilibrium model in which countries acted as Nash quantity competitors in the international wheat market. Actual trade flows and predicted trade flows from the model were compared to validate the model.

Paarlberg and Abbott combined a model of oligopoly in international markets with domestic interest group influence to endogenize domestic agricultural policy formation. Model validation was based on comparisons of actual and predicted trade and price levels for wheat.

Two key points should be emphasized. First, price discrimination based on pricing to market and incomplete pass-through of exchange rate movements to export prices has not been addressed for trade in agricultural commodities. Second, the models reviewed here reflect a diverse set of behavioral assumptions, sets of agents and countries, and modeling and validation techniques for imperfect competition in international agricultural trade. The models provide indirect evidence for the validity of their underlying behavioral assumptions using simulation analysis and comparisons of observed and predicted market conditions. Statistical tests for market power which distinguish directly between perfect competition and imperfectly competitive pricing decisions have not been presented.

This paper develops a modeling approach based on firm pricing decision which yields simple statistical tests of market power, encompassing perfect competition and two models of imperfect competition. The technique can account for specific market characteristics of a commodity. It is proposed as a prelude to the development of full-scale models of imperfect competition. A prime motivation for this study is to apply the theoretical developments and empirical tests developed in industrial organization to trade in agricultural commodities (Dornbusch; Knetter; Feinberg).

Price Discrimination in International Trade

The scenario developed to identify markets' competitive structure is based on the incomplete pass-through of changes in the exchange rate to import prices. Krugman discussed the possibility that incomplete pass-through will result from price discrimination by exporters towards importing countries. When export prices of foreign firms are maintained or even increased as the currency of the importing country appreciates, PTM has occurred.

Knetter proposed a model which distinguishes between a competitive market and two models of imperfectly competitive behavior. The exporter is assumed to export to N different markets with individual import demand in each market, i=1,....,N represented as:

$$(1)\quad q_{it} = f_i(s_{it}p_{it})\upsilon_{it}$$

where q_{it} is the quantity demanded by market i in period t, p_{it} is the export price to market i in the exporter's currency in period t, s_{it} is the ith importer's currency per exporter's currency exchange rate in period t, and υ_{it} is a demand shifter. The cost structure for the exporter is a function of the total quantity exported and a cost function shifter δ_t:

$$(2)\quad C_t = C(\Sigma q_{it})\delta_t$$

Given (1) and (2), the profit maximization problem is:

$$(3)\quad \text{Max } \pi = \sum_{i=1}^{N}(p_{it}q_{it}) - C_t$$

The first order condition is derived by differentiating (3) with respect to the choice variable p_{it}, and expressed in terms of elasticities:

$$(4)\ p_{it} = c_t[\epsilon_{it}/(\epsilon_{it}-1)] \qquad i=1,\ldots,N \quad t=1,\ldots,T$$

where c_t is the exporter's marginal cost in period t, and ϵ_{it} is the demand elasticity for imports in each of the importing countries in period t.

Expression (4) represents the familiar optimal profit maximization conditions for the price discriminating monopolist, equating marginal cost to marginal revenue in each market. When the exporter behaves as a perfect competitor, demand elasticities are infinite and do not vary across destinations. Price then equals marginal cost ($p_{it}=c_t$), and prices are equal across all destinations.

In order to test for alternative market structures, Knetter proposed the following cross sectional - time series equation:

$$(5)\ \ln p_{it} = \theta_t + \lambda_i + \beta_i \ln s_{it} + u_{it}$$

where θ_t is the time effect, λ_i is the country effect, and u_{it} is the error term. Equation (5) can be used to distinguish between three models of market structure. In the competitive market structure, export prices will be the same for all destinations; because there is no country effect, $\lambda=0$. Changes in the bilateral exchange rates will not affect bilateral export prices, implying $\beta=0$. The time effects represented by θ_t will measure the common price for all destinations.

The second and third structural models involve imperfect competition with price discrimination across destination markets. The second model assumes constant elasticity of demand with respect to the domestic currency price in each of the importing countries, a reasonable approximation for slight movements along the demand curve. In such a model, the markup over marginal cost as given in (4) is constant, but may vary over time and across destinations, implying $\lambda \neq 0$. Shifts in bilateral exchange rates do not influence export prices to various destinations, implying $\beta = 0$.

The third model is based on price discrimination with varying elasticity of demand. Under this scenario, the demand elasticities may vary with changes in the exchange rate. Consider a depreciation of the domestic (importer) currency relative to the foreign (exporter) currency. The price faced by domestic consumers then increases. If the demand elasticities remain constant, then the second case results in which exporters are faced with a constant elasticity demand schedule. However, if demand elasticities change, then the optimal markup over marginal cost will change and export price will thus depend on exchange rates. Krugman referred to this scenario as pricing to market because the optimal markup by a price-discriminating monopolist will vary across destinations and with changes in bilateral exchange rates. In terms of (5), this model implies that $\lambda \neq 0$ and $\beta \neq 0$.

U.S. Agricultural Exports

The model in equation (5) is applied to five major commodities to test for non-competitive market structure in United States agricultural exports. The five commodity groups and their respective commodity codes (SITC) included corn (0440045), wheat not donated (0410040), cotton (2631040), soybeans (2222040), and soybean oil, cake and meal (0810024). Data were compiled on a quarterly basis for the 1978-1988 period. Quantity and value data were available from the U.S. Department of Commerce Schedule E. The value data are FAS (free alongside ship) which exclude of the cost of loading or any other charges or transportation costs beyond the port of exportation. The quantity and value data were used to generate the price (unit value) variable.

Exchange rate data were available from the International Financial Statistics published by the International Monetary Fund, while the real exchange rates were calculated using the respective CPI as deflator. Official exchange rates for the Soviet Union, the People's Republic of China (PRC), and Thailand were used in the study.[1]

For each commodity a pooled cross sectional-time series model was specified with T×N observations for each model. There are T-1 time dummy effects (θ_t) and N-1 country dummy effects (λ_i). Only the major importers were considered in the analysis.

Tables 1 through 5 summarize the results for each commodity, using both nominal and real exchange rate measures. A significant relationship between export prices in any export destination and the bilateral exchange rate implies a rejection of the constant elasticity model. The number of non-zero coefficients, or violations of the constant elasticity model, was approximately the same for each regression using either nominal exchange rates or real exchange rates.

Positive and significant coefficients on the exchange rate variable occurred four times for both specifications of the exchange rate variable. A negative coefficient is consistent with a model of price discrimination in which exporting firms adjust prices in export markets to offset local exchange rate movements. Positive coefficients imply that exporters in the United States adjust prices upward as the local currency appreciates, exacerbating the impact of exchange rate movements.

Results for the cotton market in Table 1 do not support price discriminating behavior across destination markets. Using the nominal exchange rate measure, only the exchange rate coefficient for Portugal differed significantly from zero at the 10% level. The remaining country effects were not statistically significant. Using the real exchange rate measures produced three significant country effects (Canada, Italy, and South Korea) and no significant exchange rate coefficients. F-tests for $\forall\lambda_i=0$ and $\forall\beta_i=0$ were not significant.

Knetter noted that the influence of any particular foreign supplier on prices in a specific market will be reduced as the number of foreign suppliers to a particular country increases. These results, which indicate the absence of market power, are consistent with the structure of the international cotton market in which a relatively large number of exporters makes it difficult for the United States to exercise market power.

Table 2 summarizes the results of the corn market. The results do not support the hypothesis that the United States as the largest exporter of corn engages in price discriminating behavior in the international corn market. A possible explanation for the results is that corn is usually exported as feed grain; therefore, the importers face various substitution possibilities among feed grains. Only Mexico, in the nominal exchange rate regression, yielded significant country and exchange rate coefficients. Mexico imports corn for tortilla production and, therefore, corn is imported as food rather than feed grain. The relevant F-tests were not significant.

These results are consistent with Karp and McCalla's model of the international corn market using a noncooperative difference game. The results from the difference game suggested that U.S. producers gain most when the U.S. behaves competitively even though the U.S. is in the strongest position to disrupt world trade. By contrast, an oligopoly model developed by Mitchell and Duncan provided weak support for U.S. price leadership in the coarse grain market during the period 1965-1981.

The soybean market results are summarized in Table 3. The United States is the major exporter of soybeans, accounting for about 70% of global soybean trade. Increased production and exports from Argentina, Brazil and Paraguay have diminished only slightly the U.S. share. Brazil's trade policy is designed to insure an adequate supply of soybeans for the domestic crushing industry. Trade restrictions and value-added taxes have discouraged the export of soybeans while tax credits have been used to promote the exports of soybean oil and meal.

The characteristics of international trade in soybeans and processed soybeans suggest that an imperfectly competitive market structure could result. However, the results do not support this hypothesis, due mainly to various substitutes and other exporters for oilseed products. Only in the case of Netherlands, behind Japan as the second largest importer of soybeans from the United States, did the results yield significant coefficients for the exchange rate variable (both nominal and real) and the country effect. These significant coefficients for Netherlands may reflect the importance of the crushing industry in the Netherlands. Both F-tests were not significant.

The soybean oil, cake, and meal results are summarized in Table 4. In the soybean meal market, the U.S. share of global exports is slightly more than 20%. Increased competition from Argentina, Brazil, and the European Community (EC), primarily Spain and Portugal, have steadily eroded the U.S. share since the late 1970s. The U.S. share of global soybean oil exports is similar to that for soybean meal. Argentina, Brazil, and the EC are again the main competitors.

The country effect and exchange rate coefficient for Canada and West

Germany were significant when using both the nominal and real exchange rate measures. The joint F-tests for the country effects and exchange rate coefficients were significantly different from zero when the nominal exchange rates were used in the estimation. In the specification using real exchange rates, only the F-test for the exchange rate coefficients was significant.

The evidence in support of price discrimination for soybean oil, cake, and meal was mixed. The significant coefficients on country effects for Canada and West Germany indicate that the United States may have exercised market power in these countries. The findings should be interpreted with caution, however, because the coefficients for the other four countries were not significant. The results for the soybean meal market reflect the availability of substitutes that exist in the meal market. The availability of substitutes can restraint countries (or firms) from exercising market power.

The strongest evidence to support price discrimination occurred for the wheat market, presented in Table 5. Since the analysis includes the period in which the EEP was implemented, equation (5) was modified to account for this policy intervention. The EEP program was established in response to export subsidies by the European Economic Community. Under the program, targeted countries are eligible for subsidized wheat exports. Among the targeted countries included in this study are the People's Republic of China, the Soviet Union, Egypt and the Philippines. A dummy variable was set equal to one for all periods and countries during which the EEP was in effect and zero otherwise.

The results indicate that five of the country effects and three of the exchange rate coefficients were significant in the regression using the nominal exchange rate. All country effects and four of the exchange rate coefficients were significant when real exchange rates were used. The F-tests of $\forall \beta_i=0$ and $\forall \lambda_i=0$ were strongly rejected, thus rejecting the hypothesis of perfectly competitive market structure in the wheat market.

In both regressions the coefficients isolating the EEP effect were negative and highly significant. This result indicates that the EEP had a significant negative impact on the unit value of wheat to the targeted countries. The impact of targeted export subsidies such as the EEP for the world wheat market was examined in more details by Seitzinger and Paarlberg using a Nash bargaining model linked to a spatial price equilibrium model.

Wheat export behavior by the United States is not consistent with complete pass-through of exchange rates changes to importers. The evidence supports the model of imperfect competition with price discrimination across destination markets. Pick and Skully confirmed that significant premiums and discounts in United States wheat exports to different countries exist, even after accounting for class differences and the Export Enhancement Program. Further empirical work should investigate if significant country effects reflect quality differences among wheat exports.[2]

Model Extensions

While Knetter's model proposes a distinction between a competitive and imperfectly competitive market structure, large buyers may behave as monopsonists. Carter and Schmitz and Love and Murniningtyas have suggested such behavior in the international wheat market. An importer's influence on its purchase prices may depend on its relative market share.

To examine the impact of monopsony power in international wheat trade, a term which measures the import share of each country from the United States

(r_{it}) was added to equation (5). This coefficient was added to capture the possibility that large importers are able to capture monopsony rent. Thus, if a country can exercise monopsony power and obtain a lower price, the coefficient on the import share would be negative and significant.

Table 6 presents the estimated share coefficients in the wheat market using both real and nominal exchange rate measures in equation (5). The share coefficients for the People's Republic of China were negative and significant in both regressions. The Soviet Union's share coefficient was negative and significant when using the real exchange rate measure. Since both China and the Soviet Union are the largest importers of wheat, these results suggest some exercise of monopsony power. The estimates for Japan did not yield a significant share coefficient. Thus, the conclusions by Carter and Schmitz and Love and Murninigtyas, which suggested that Japan exerts monopsony power in the international wheat market, were not supported by this analysis.

Additional support for these findings was provided by Blandford who estimated market share model for wheat and corn. Based on the results, the importing countries are ranked according to a criteria which reflects favorable conditions for the United States in each of the markets. The wheat export markets of the Soviet Union and the PRC ranked almost last (exceeding only the EEC wheat market) compared to the other markets considered.

Conclusions

The competitive structure of agricultural exports from the United States is examined using a model of exporter behavior based on pricing decisions across destination markets. Market power in international agricultural trade is revealed in the adjustment patterns of export prices in response to currency movements. A pooled cross-section, time-series regression model is specified and econometric tests are presented to distinguish between a competitive market and two models of imperfect competition.

The results reject the hypothesis that the export pricing decisions by U.S. firms are consistent with price discrimination across destination markets for cotton, corn, and soybeans. The results are ambiguous for the soybean oil, cake, and meal markets, indicating potential price discrimination against Canada and West Germany.

The strongest evidence against the competitive market structure is obtained for international trade in wheat. A share variable accounts for the impact of large importers of wheat from the United States. The share coefficients are negative and significant for the PRC and the Soviet Union, the two largest importers. As their import shares from the United States increase, these countries obtain lower prices for their imports.

A reviewer has suggested that price discrimination may occur in the margins between CIF and FOB prices. Large multinational exporting firms dominate the market for chartering and shipping services and may exercise market power by influencing the margins. However, Binkley and Harrer noted that the structure of the shipping industry ensures that freight rates remain flexible and do not deviate significantly from the costs of shipping. This lend support for the model of pricing to market developed here based on prices which are exclusive of loading or transportation costs. However, an important research topic is to formally develop tests for price discrimination based on the margins between CIF and FOB prices.

This research highlights the link between industrial organization models and export pricing decisions in international agricultural trade. Future work might examine the relationship between exchange rate adjustments and pricing to market in specific industries, focussing on market concentration within an industry and alternative sources of supply. The extent of pricing to market across different commodities and in different countries should also be investigated.

References

Alaouze, C.M., A.S. Watson, and N.H. Sturgess. "Oligopoly Pricing in the World Wheat Market." American Journal of Agricultural Economics 60(1978):173-85.

Binkley, J.K. and B. Harrer. "Major Determinants of Ocean Freight Rates for Grains: An Econometric Analysis." American Journal of Agricultural Economics, 63(1981):47-58.

Blandford, D. "Market Share Models and the Elasticity of Demand for U.S. Agricultural Exports." In C.A. Carter and W.H. Gardiner eds., Elasticities in International Agricultural Trade, Westview Press, 1988.

Carter, C. and A. Schmitz. "Import Tariffs and Price Formation in the World Wheat Market." American Journal of Agricultural Economics 61(1979):517-22.

Dornbusch, R. "Exchange Rates and Prices." American Economic Review 77(1987):93-106.

Farnsworth, H.C. "International Wheat Agreements and Problems." Quarterly Journal of Economics 66(1956):217-248.

Feinberg, R.M. "The Interaction of Foreign Exchange and Market Power Effects on German Domestic Prices." The Journal of Industrial Economics 35(1986):61-70.

Karp, L.S., and A.F. McCalla. "Dynamic Games and International Trade: An Application to the World Corn Market." American Journal of Agricultural Economics 65(1983):641-56.

Knetter, M.M. "Price Discrimination by U.S. and German Exporters." American Economic Review 79(1989):198-210.

Kolstad, C.D., and A.E. Burris. "Imperfectly Competitive Equilibria in

International Commodity Markets." American Journal of Agricultural Economics 68(1986):25-36.

Krugman, P. "Pricing to Market When the Exchange Rate Changes." In S.W. Arndt and J.D. Richardson eds., Real-Financial Linkages Among Open Economies, Cambridge: MIT Press, 1987.

Love, A.H., and E. Murniningtyas. "Japanese Wheat Imports: A Test of Market Power." Paper presented at the Annual AAEA Meeting, Baton Rouge, Louisiana. August 1989.

McCalla, A.F. "A Duopoly Model of World Wheat Pricing." Journal of Farm Economics 48(1966):711-27.

Mendelsohn, C. "Approaches to International Trade Under Nonprice Competition." Journal of Farm Economics 39(1957):1724-31.

Mitchell, D.O. and R.C. Duncan. "Market Behavior of Grains Exporters." The World Bank Research Observer, 2 (1987):3-21.

Paarlberg, P.L. and P.C. Abbott. "Oligopolistic Behavior by Public Agencies in International Trade: The World Wheat Market." American Journal of Agricultural Economics 68(1986):528-542.

Pick, D.H. and D. Skully. "The Price Structure of the U.S. Wheat Export Market." USDA, ERS, Unpublished Manuscript, 1989.

Sarris, A.H. and J. Freebairn. "Endogenous Price Policies and International Wheat Prices." American Journal of Agricultural Economics 65(1983):214-224.

Seitzinger, A.H. and P.L. Paarlberg. "A Simulation Model of the U.S. Export Enhancement Program for Wheat." American Journal of Agricultural Economics, 72(1990):95-103.

Veeman, M.M. "Hedonic Price Functions for Wheat in the World Market:

Implications for Canadian Wheat Export Strategy." Canadian Journal of Agricultural Economics 35(1987):535-552.

Williams, G.W. and Thompson, R.L. "The South American Soybean Industry: Its Growth and Future Prospects." Quarterly Journal of International Agriculture 23(1984):264-280.

Wilson, W.W. "Differentiation and Implicit Prices in Export Wheat Markets." Western Journal of Agricultural Economics, 14(1989):67-77.

Footnotes

[1] Although these exchange rates are not determined in the free market, they are adjusted by the respective governments to reflect economic conditions. For the Soviet Union, it is often argued that the price of gold or the trade balance should be used as a proxy to the exchange rate. However, the exchange rate for the Soviet Union is monitored and changed on a monthly basis and is a reasonable proxy for an exchange rate which reflects economic conditions in the Soviet Union. Both exchange rate coefficients for the Soviet Union and the People's Republic of China in the wheat equation were not significant.

[2] See Veeman and Wilson for the effects of different quality characteristics on the international wheat prices.

Table 1. Country Effects and Exchange Rate Coefficients for Cotton

Destination	Nominal Exchange Rate λ	Nominal Exchange Rate ß	Real Exchange Rate λ	Real Exchange Rate ß
Canada	-0.249	0.706	-0.293*	1.004
	(-1.540)	(1.392)	(-1.670)	(1.324)
Germany	-0.068	-0.038	-0.213	0.084
	(-0.391)	(-0.227)	(-1.149)	(0.555)
Hong Kong	-0.282	0.028	-0.528	0.143
	(-0.847)	(0.170)	(-1.042)	(0.524)
Indonesia	-0.500	0.062	-0.924	0.120
	(-0.936)	(0.825)	(-1.264)	(1.123)
Italy	0.425	-0.084	-3.112*	0.418*
	(0.499)	(-0.727)	(-2.254)	(2.124)
S. Korea	-1.221	0.163	-2.782*	0.397
	(-1.151)	(1.028)	(-1.682)	(1.582)
Philippines	-0.239	0.009	-0.502	0.109
	(-1.093)	(0.124)	(-0.981)	(0.495)
Portugal	0.472	-0.117*	-0.482	0.093
	(1.450)	(-1.799)	(-0.597)	(0.487)
Spain	0.162	-0.073	0.211	-0.097
	(0.316)	(-0.703)	(0.293)	(-0.628)
Taiwan	-0.678	0.130	-1.436	0.324
	(-0.721)	(0.499)	(-1.135)	(0.945)
Thailand	-0.128	-0.004	-0.186	0.001
	(-0.840)	(-0.092)	(-1.174)	(0.029)
U. Kingdom		0.076		0.149
		(0.446)		(0.755)
	R^2=0.50		R^2=0.50	
	F_{ER}=0.86		F_{ER}=0.86	
	F_{CN}=1.11		F_{CN}=0.99	

Note: Values in parentheses are t-values. Asterisks denote t-values significant at the 10% level. F_{ER} is the F-value for testing whether $\forall \beta_i=0$. F_{CN} is the F-value for testing whether $\forall \lambda_i=0$.

Table 2. Country Effects and Exchange Rate Coefficients for Corn

Destination	Nominal Exchange Rate λ	Nominal Exchange Rate ß	Real Exchange Rate λ	Real Exchange Rate ß
Belgium	0.012	-0.031	-0.003	-0.014
	(0.054)	(-0.537)	(-0.024)	(-0.453)
Japan	-0.229	0.034	-0.029	0.005
	(-0.687)	(0.545)	(-0.072)	(0.073)
S. Korea	0.242	-0.045	0.237	-0.037
	(0.528)	(-0.651)	(0.324)	(-0.331)
Mexico	0.107*	-0.021*	0.254	-0.059
	(1.680)	(-2.464)	(1.109)	(-0.920)
Netherlands	0.046	-0.086	0.023	-0.006
	(0.540)	(-1.149)	(0.266)	(-0.089)
Portugal	0.054	-0.030	-0.279	0.060
	(0.382)	(-1.063)	(-0.772)	(0.708)
USSR	-0.026	-0.106	0.019	-0.094
	(-0.487)	(-1.084)	(0.318)	(-0.952)
Spain	-0.024	-0.012	-0.112	0.018
	(-0.106)	(-0.262)	(-0.344)	(0.263)
Taiwan	-0.508	0.140	-0.293	0.093
	(-1.207)	(1.208)	(-0.515)	(0.602)
U. Kingdom		0.068		-0.324
		(0.909)		(-0.214)
	R^2=0.86		R^2=0.85	
	F_{ER}=1.18		F_{ER}=0.31	
	F_{CN}=0.95		F_{CN}=0.31	

Note: Values in parentheses are t-values. Asterisks denote t-values significant at the 10% level. F_{ER} is the F-value for testing whether $\forall ß_i=0$. F_{CN} is the F-value for testing whether $\forall \lambda_i=0$.

Table 3. Country Effects and Exchange Rate Coefficients for Soybeans

	Nominal Exchange Rate		Real Exchange Rate	
Destination	λ	ß	λ	ß
Belgium	-0.199	0.052	-0.066	0.017
	(-0.962)	(0.934)	(-0.715)	(0.659)
Germany	0.019	0.008	0.020	-0.002
	(1.137)	(0.100)	(1.166)	(-0.031)
Italy	-0.008	-0.027	0.001	-0.041
	(-0.126)	(-0.556)	(0.009)	(-0.529)
Japan	0.199	-0.013	0.289	-0.015
	(0.568)	(-0.253)	(0.538)	(-0.240)
U. Kingdom	0.068	-0.090	0.081	-0.096
	(0.244)	(-1.407)	(0.234)	(-1.303)
S. Korea	-0.033	0.002	-0.041	-0.098
	(-0.877)	(0.667)	(-0.890)	(-0.974)
Mexico	0.022	-0.001	0.652	-0.026
	(1.133)	(-0.315)	(0.992)	(-0.466)
Netherlands	0.159*	-0.160*	0.154*	-0.145*
	(2.602)	(-2.439)	(2.417)	(-2.247)
Spain	0.148	-0.029	0.107	0.003
	(0.744)	(-0.686)	(0.563)	(0.690)
Taiwan		0.002		0.002
		(0.458)		(0.485)
	R^2=0.85		R^2=0.85	
	F_{ER}=0.99		F_{ER}=0.78	
	F_{CN}=1.26		F_{CN}=1.01	

Note: Values in parentheses are t-values. Asterisks denote t-values significant at the 10% level. F_{ER} is the F-value for testing whether $\forall \beta_i=0$. F_{CN} is the F-value for testing whether $\forall \lambda_i=0$.

Table 4. Country Effects and Exchange Rate Coefficients for Soybean Meal

Destination	Nominal Exchange Rate λ	Nominal Exchange Rate ß	Real Exchange Rate λ	Real Exchange Rate ß
Canada	-0.306*	0.599*	-0.342*	1.117*
	(-2.789)	(1.687)	(-2.072)	(2.094)
Germany	-0.364*	0.234*	-0.310*	0.164
	(-2.699)	(1.819)	(-1.798)	(1.473)
Italy	0.572	-0.109	1.202	-0.203
	(0.987)	(-1.330)	(1.218)	(-1.449)
Mexico	-0.133	0.016	-0.425	0.109
	(-1.329)	(1.138)	(-1.196)	(1.090)
Netherlands	-0.223	0.033	-0.184	-0.007
	(-1.620)	(0.282)	(-1.043)	(-0.066)
Venezuela		-0.047		-0.050
		(-0.979)		(-0.560)

	Nominal Exchange Rate	Real Exchange Rate
	R^2=0.57	R^2=0.57
	F_{ER}=2.13*	F_{ER}=1.93*
	F_{CN}=2.68*	F_{CN}=1.78

Note: Values in parentheses are t-values. Asterisks denote t-values significant at the 10% level. F_{ER} is the F-value for testing whether $\forall ß_i=0$. F_{CN} is the F-value for testing whether $\forall \lambda_i=0$.

Table 5. Country Effects and Exchange Rate Coefficients for Wheat

	Nominal Exchange Rate		Real Exchange Rate	
Destination	λ	β	λ	β
China	0.187*	-0.017	0.874*	-0.011
	(2.562)	(-0.494)	(4.525)	(-0.334)
Egypt	0.198*	-0.024	0.791*	-0.018*
	(2.459)	(-0.335)	(4.189)	(-3.879)
Japan	0.088	0.033	0.885*	0.013
	(0.274)	(0.569)	(2.345)	(0.206)
S. Korea	0.918*	-0.107*	1.928*	-0.157*
	(2.397)	(-1.827)	(3.164)	(-1.710)
Venezuela	0.237*	0.067*	0.777*	0.165*
	(2.831)	(2.404)	(3.792)	(3.327)
USSR	0.247*	-0.036	0.934*	-0.024
	(3.358)	(-0.395)	(4.823)	(-0.266)
Taiwan	0.618	-0.089	1.305*	-0.088
	(1.604)	(-0.844)	(2.708)	(-0.697)
Philippines		0.138*		0.472*
		(4.910)		(5.345)
EEP	-0.213*		-0.237*	
	(-9.317)		(-10.981)	
	R^2=0.90		R^2=0.90	
	F_{ER}=5.02*		F_{ER}=6.746*	
	F_{CN}=2.71*		F_{CN}=5.406*	

Note: Values in parentheses are t-values. Asterisks denote t-values significant at the 10% level. F_{ER} is the F-value for testing whether $\forall \beta_i=0$. F_{CN} is the F-value for testing whether $\forall \lambda_i=0$. EEP represents the coefficient measuring the effect of the EEP.

Table 6. Market Share Coefficients in the Wheat Market

Destination	Nominal Exchange Rate	Real Exchange Rate
China	-0.560*	-0.454*
	(-2.431)	(-2.148)
Egypt	-0.225	-0.673
	(-0.458)	(-1.314)
Japan	-0.334	-0.443
	(-0.665)	(-0.809)
S. Korea	-0.229	-0.629
	(-0.266)	(-0.708)
Philippines	0.220	0.305
	(0.135)	(0.174)
USSR	-0.240	-0.358*
	(-1.325)	(-1.962)
Taiwan	2.360	2.060
	(1.461)	(1.198)
Venezuela	0.115	-1.303
	(0.063)	(-0.665)
	R^2=0.87	R^2=0.86

Note: Values in parentheses are t-values. Asterisks denote t-values significant at the 10% level.