

World Markets of Vertically Differentiated Agricultural Commodities: A Case of Soybean Markets

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Problem Identification

World agricultural commodity trade flows have dramatically changed in the last decade. On the production side, major agricultural commodity producing countries such as the U.S., Brazil, and China started and expanded the production of genetically modified (GM) crops. On the consumption side, the world demand for agricultural commodities has been increasing significantly, mostly due to higher income in developing countries and world population growth.

Market power may exist in the world markets of agricultural commodities due to high market concentration, and/or state trading behaviors. The existence and degree of the market power have important implications for world agricultural producers, consumers, and governments.

Numerous studies have examined and measured the degree of market power in agricultural commodity and food product markets. But interaction between two vertically differentiated goods: traditional non-GM commodities vs. GM commodities, was taken into account in few studies.

Failing to include interaction between two vertically differentiated goods can result in incorrect measures of exporters' and importers' market power in world agricultural commodity markets and misleading policy and welfare implications.

This study fills this gap by explicitly including the interaction between non-GM soybeans and GM soybeans in an analysis on the market power of exporters and importers in world soybean markets.

Objectives

- Develop a conceptual model, which extends the Goldberg and Knetter (1999) approach: The interaction between non-GM soybeans and GM soybeans is taken into account in the world demand and supply functions of the two goods.
- Conduct an empirical estimation based on the conceptual model.
- Compare results based on new approach and those with previous methods.

Methodology

Extends Goldberg and Knetter (1999) approach: Interaction between non-GM and GM soybeans is taken into account in world demand and supply functions of the two goods

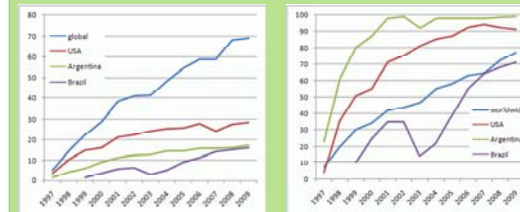
- Specify residual demand and supply functions with interaction between non-GM and GM soybeans
- Obtain residual demand and supply elasticities for non-GM and GM soybeans
- Measure market power of exporters and importers
- Repeat step 1-3 in a framework without interaction of non-GM and GM soybeans
- Compare two sets of elasticities results and find out effects of failing to include interaction of non-GM /GM soybeans

U.S.–Japan residual demand/supply models with interaction between non-GM/GM soybeans are:

$$\begin{cases} \ln P_{JP}^{NGM} = \lambda_{JP} + \eta_{JP}^{US} \ln RD_{JP}^{US} + \alpha_1 \ln P_{JP}^{GM} + \alpha_2 \ln DPI_{JP} + \beta_1 \ln IM^{CH} \\ \quad + \beta_2 \ln IM^{CA} + \beta_3 BP_{JP} + \epsilon_{JP} \quad (1) \\ \ln P_{US}^{NGM} = \lambda_{US} + \eta_{US}^J \ln RS_{US}^J + \gamma_1 \ln P_{US}^{GM} + \gamma_2 \ln DPI_{US} + \delta_1 \ln EX^{CH} \\ \quad + \delta_2 \ln EX^{EU} + \delta_3 \ln EX^{ME} + \delta_4 \ln STK_{US} + \epsilon_{US} \quad (2) \end{cases}$$

(1)	The inverse Japanese residual import demand from U.S. with interaction b/w non-GM/GM soybeans	BP_{JP}	the GM food biotechnological policy in Japan
(2)	The inverse U.S. residual supply for the Japanese market with interaction b/w non-GM/GM soybeans	P_{US}^{NGM}	U.S. non-GM soybean export price to Japan (\$/MT)
		RS_{US}^J	U.S. residual non-GM soybean supply for Japan (MT)
		P_{US}^{GM}	U.S. GM soybean export price to Japan (\$/MT)
	P_{JP}^{NGM}	DPI_{JP}	U.S. disposable personal income (\$)
	RD_{JP}^{US}	EX^j	U.S. non-GM soybean exports to country j ($j = \text{China, EU, Mexico}$) (MT)
	P_{JP}^{GM}	STK_{US}	the U.S. beginning non-GM soybean stocks (MT)
	DPI_{JP}	ϵ	the error term
	IM^i		Japanese non-GM soybean imports from country i ($i = \text{China, Canada}$) (MT)

Global GM Soybean Cultivation Acreage in million hectares GM soybean share in the total soybean acreage of a country



References

GMO Compass, figures <http://www.gmo-compass.org/eng/home/> Goldberg, Pinelopi K., and Michael M. Knetter, "Measuring the Intensity of Competition in Export Markets," Journal of International Economics 47 (February 1999), 27-60.

Estimation Results

Estimated Results for US-Japan Non-GM Soybean Imports

	With Interaction Term		Without Interaction Term	
	RD Model	RS Model	RD Model	RS Model
Intercept	-4.985** (1.598)	-7.672*** (2.653)	78.780*** (8.501)	-12.526 (7.815)
RD	-0.075** (0.032)		-0.219** (0.092)	
INCJP	0.448*** (0.144)		-6.231*** (0.736)	
IMPOTH	-0.001 (0.013)		0.229*** (0.074)	
PIMPGM	0.971*** (0.034)			
RS		0.077* (0.041)		0.041** (0.205)
INCUS		1.661*** (0.576)		2.505*** (0.944)
EXPOTH		0.015* (0.009)		-0.097 (0.065)
STKUS		-0.213* (0.123)		-0.218* (0.128)
PEXPGM		1.053*** (0.041)		
R-square	0.973	0.977	0.937	0.939
DW-Stat	1.754	1.733	1.695	1.763

Note:

- *** Refers to significance at 1% level
- ** Refers to significance at 5% level
- * Refers to significance at 10% level

Conclusions and Discussions

Model with Interaction

- The profit margin of the U.S. non-GM soybean exporters is 7.5%.
- The profit margin of the Japanese non-GM soybean importers is 7.7%.
- This indicates exporters and importers margins are similar, and importers margin is higher and exporters margin is lower when the interaction is taken into account.

Model without Interaction

- The profit margin of the U.S. non-GM soybean exporters is 21.9%.
- The profit margin of the Japanese non-GM soybean importers is 4.1%.
- Without interaction term, exporters margin is 5 times larger than importers margin.

This study shows that the model without interaction between GM/non-GM soybeans overestimates U.S. exporters margins and underestimates Japanese importers margins in the non-GM soybean markets. After taking the interaction into account, our new approach shows that U.S. exporters and Japanese importers have similar market power in non-GM soybean trade. Therefore, this study finds that Japanese importers are not just price takers but they have almost the same bargaining power as the exporters in the determination of non-GM soybean prices.



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