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Examining the Spillover Effects of Ethanol Prices on the Import Demand for Corn

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Introduction

- The U.S. has produced ethanol mainly from corn to achieve energy security and environmental sustainability (Elobeid and Hart, 2007). The U.S. Bioenergy Statistics reported that the total annual production of ethanol increased to about 16 billion gallons 2018, accounting for over 90% of biofuel consumption.

- Recent studies emphasize that ethanol policy may influence the international crop and livestock markets. Since the U.S. is the largest corn exporter, a change in domestic corn prices caused by ethanol policy has a potential for changing international corn prices (Valero-Gil and Valero, 2008; Dyer and Taylor, 2011).

- If corn-importing countries are weak to a change in international corn prices, ethanol policy may change the countries' decisions about corn imports, ultimately affecting crop and livestock prices in the countries.

- Given that ethanol policy is associated with international corn prices, this study examines the international spillover effects of ethanol prices on the import demand for corn with a focus on the case of South Korea.

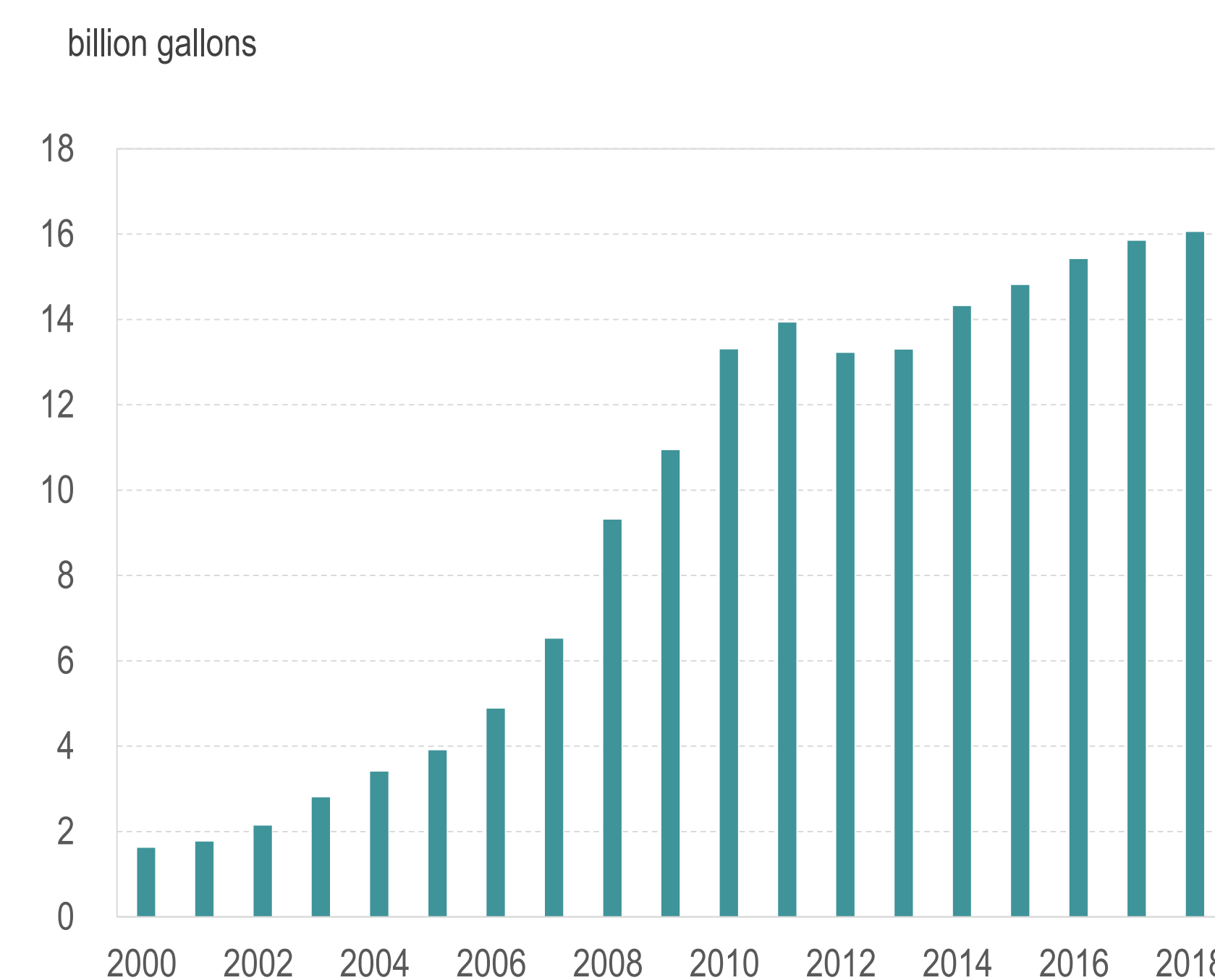
Data

- Quarterly data for corn imports are collected mainly from the Trade Statistics of the Korea Customs Service, which includes the quantities and prices of corn imported from the U.S., Brazil, and the rest of world. The data for ethanol prices are also obtained from the U.S. Bioenergy Statistics.

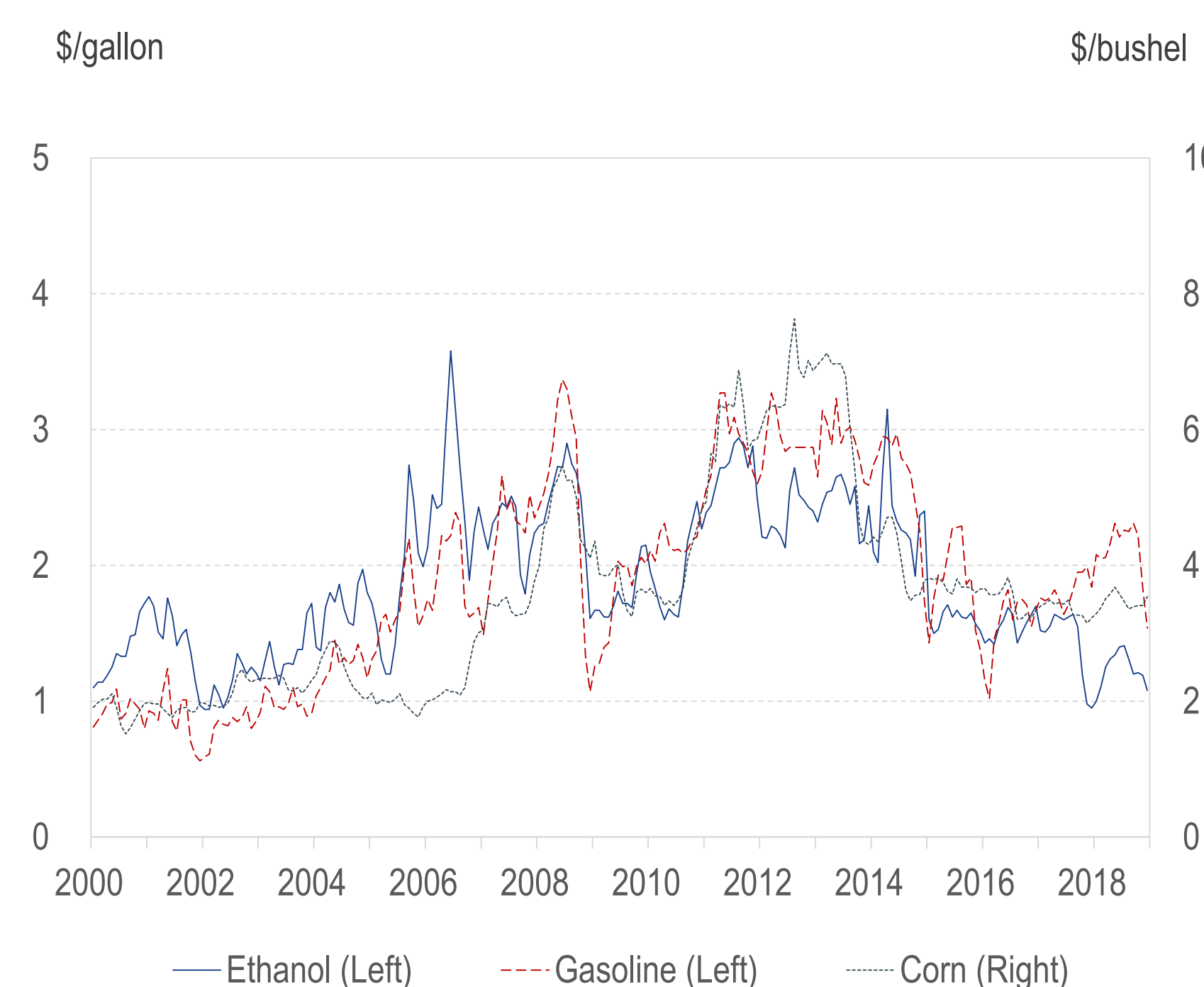
- The data cover the period between the third quarter of 2000 and the second quarter of 2018.

	Mean	Std. dev.	Min.	Max.
Quantity (1000 tons)				
U.S.	1232.39	673.47	5.78	2549.04
Brazil	368.87	483.61	0.05	1864.10
ROW	639.29	441.98	6.62	1668.09
Price (\$/ton)				
U.S.	276.42	114.01	143.68	784.41
Brazil	256.75	68.99	153.83	439.73
ROW	255.69	58.90	157.71	369.70
Import Share				
U.S.	0.56	0.30	0.01	0.99
Brazil	0.16	0.20	0.00	0.70
ROW	0.28	0.19	0.00	0.84

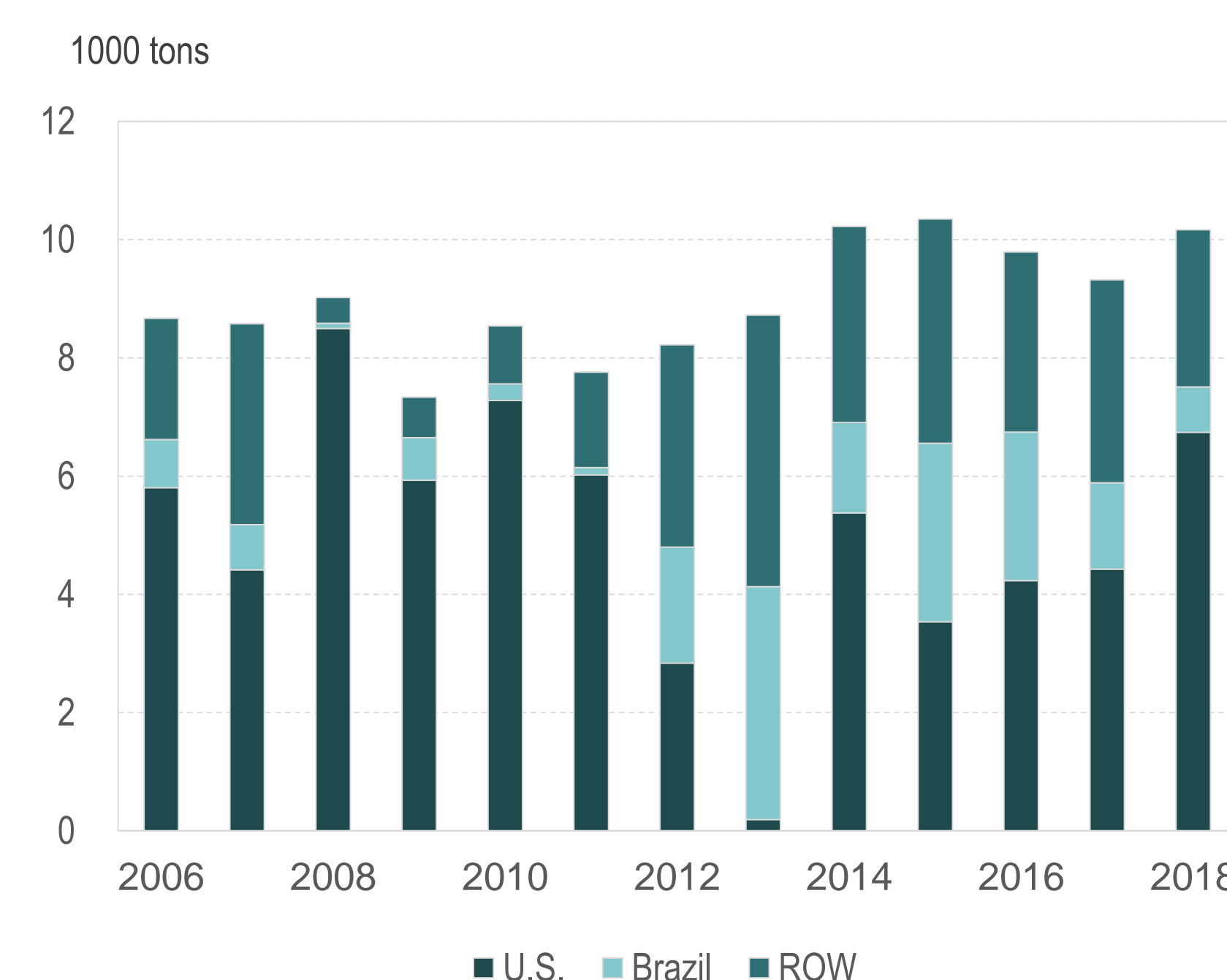
Ethanol Production



Corn, Ethanol, and Gasoline Prices



South Korea's Corn Imports



Methodology

- Differential Import Allocation Model (Seale et al., 1992)

$$w_{it} d \ln q_{it} = \theta_i d \ln Q + \sum_{j=1} \pi_{ij} d \ln p_{jt} + \varepsilon_{it}$$

- Divisia Elasticities

$$\varepsilon_i = \frac{\theta_i}{\bar{w}_{it}}$$

- Import Price Elasticities

$$\eta_{ij} = \frac{\pi_{ij}}{\bar{w}_{it}}$$

Divisia and Import Price Elasticities

- Estimation Results

	SUR Estimates	GMM Estimates
<i>Divisia Elasticities</i>		
U.S.	-0.235 (0.284)	-0.271 (0.348)
Brazil	5.887*** (0.989)	5.956*** (1.040)
ROW	0.701 (0.455)	0.732 (0.503)
<i>Own-Price Elasticities</i>		
U.S.	-1.116*** (0.301)	-2.372*** (0.860)
Brazil	-3.814*** (1.357)	-5.030*** (1.754)
ROW	-0.737 (0.750)	-1.384 (1.178)
<i>Cross-Price Elasticities</i>		
U.S. – Brazil	0.910*** (0.266)	1.545*** (0.533)
U.S. – ROW	0.206 (0.240)	0.828 (0.619)
Brazil – U.S.	3.201*** (0.934)	5.431*** (1.873)
Brazil – ROW	0.613 (1.142)	-0.401 (1.330)
ROW – U.S.	0.399 (0.466)	1.605 (1.199)
ROW – Brazil.	0.338 (0.630)	-0.221 (0.733)

Note. Standard errors are in parentheses.
*** Denotes statistical significance at 1% level.

Results and Conclusions

- To account for endogeneity of the U.S. corn price, the U.S. ethanol price is used as an instrumental variable so that the differential import allocation model is estimated using the generalized method of moments with homogeneity and symmetry imposed (Hansen, 1982).

- In the estimation results, the Divisia elasticities show that South Korea tends to increase the corn import from Brazil when the total import volume rises.

- The own-price elasticities indicate that the import demand for corn is elastic. The endogeneity of corn prices makes the import demand more elastic, implying that the effects of corn import prices tend to reduce the import volume further due to the linkage between corn and ethanol prices.

- The cross-price elasticities indicate that there is a substitutable relationship between the U.S. and Brazil, showing that a change in ethanol prices induces South Korea to substitute the corn import from Brazil for that from the U.S. further.

- The findings provide empirical evidence that ethanol policy may cause unintended consequences internationally. Since the U.S. ethanol price is associated with the import price of corn, it will affect directly South Korea's allocation decisions about corn imports, which may eventually influence livestock producers' decisions for feed grains.

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