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# **Evaluation of the impacts of the Korea-US FTA on the Beef Markets in Korea and the United States: Focusing on the Market Power and Competitiveness among Beef**

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# Evaluation of the impacts of the Korea-US FTA on the Beef Markets in Korea and the United States: Focusing on the Market Power and Competitiveness among Beef



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## Introduction

Currently Korea is one of the top ranked countries that import beef from the United States. The amount of beef imported by Korea within total US beef export is 20%.

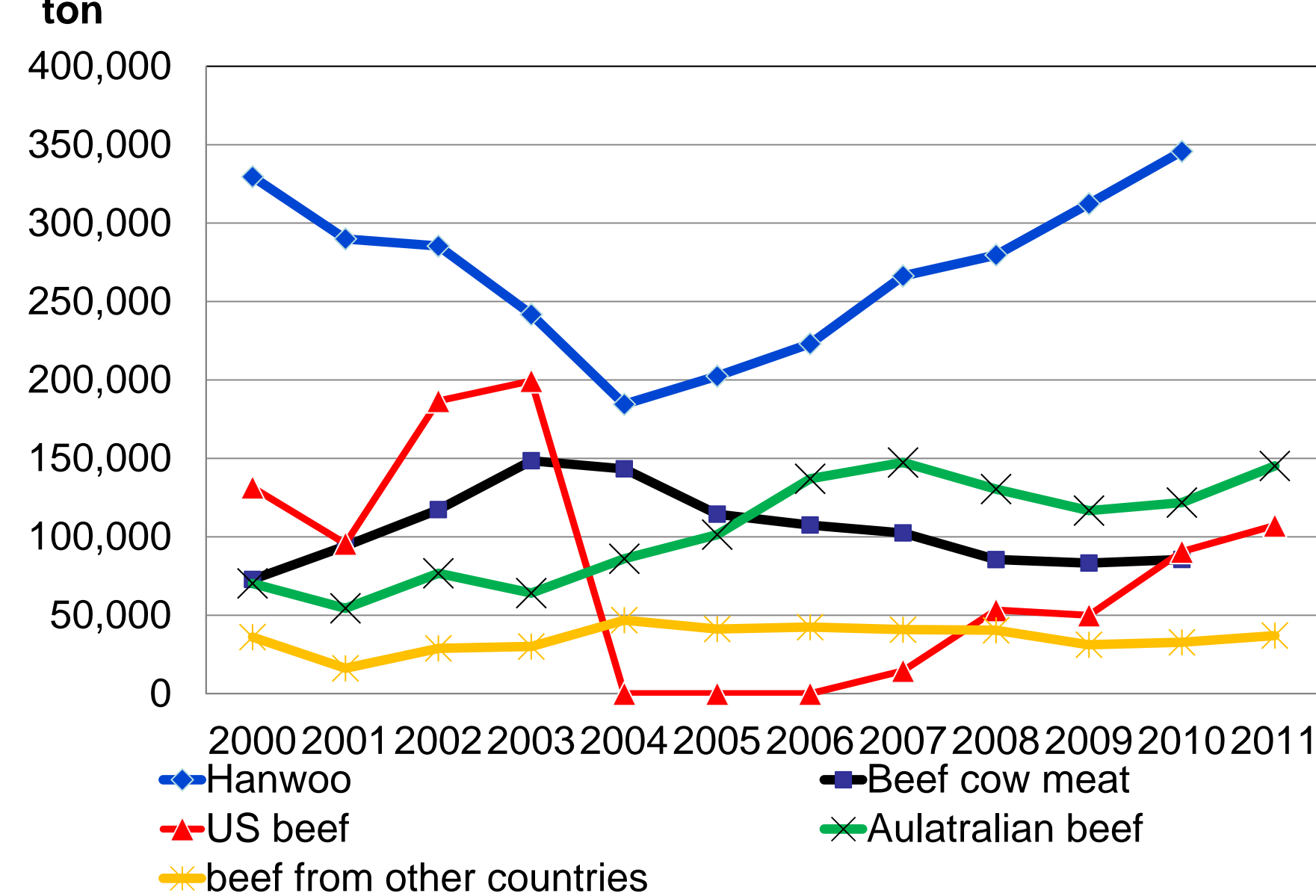
Australia, Canada and New Zealand are exporting beef to Korean market. The market share of the beef imported from these countries within the total imported beef in Korea is about 60% and remaining 40% is imported from the United States.

Increase in the US beef import by Korea will be greater if the 40% tariff levied on the US beef is reduced and eliminated due to the FTA that Korea and United States formed. There have been several studies for assessing the impacts of the Korea-US FTA on the agricultural sectors in Korea or the United States. However, just very few attempts were made to evaluate the single sectorial impact of Korea-US FTA on the beef industry in Korea or the United States. Moreover, assessments of the impacts of the FTA on the beef industry in the existing researches do not form a consensus (USTR, 2001; Lee et al., 2005; Choi et al., 2006; Han et al., 2007; Choi, 2009). Main reason for the very different results is a failure of constructing an analytical model by reflecting close relationship between beef markets in Korea and the United States.

This research is motivated by the importance of beef industries in Korea and the United States. This research develops a simulation model that enables us to evaluate the impacts of the Korea-US FTA on the beef industries in Korea as well as the United States.

In the simulation model, the competitiveness among Hanwoo which is the highest quality of beef produced in Korea, beef cow meat which is relatively lower quality beef produced in Korea, Australian beef and US beef is reflected via cross price elasticities. In addition, the market power by importers is included in the simulation model.

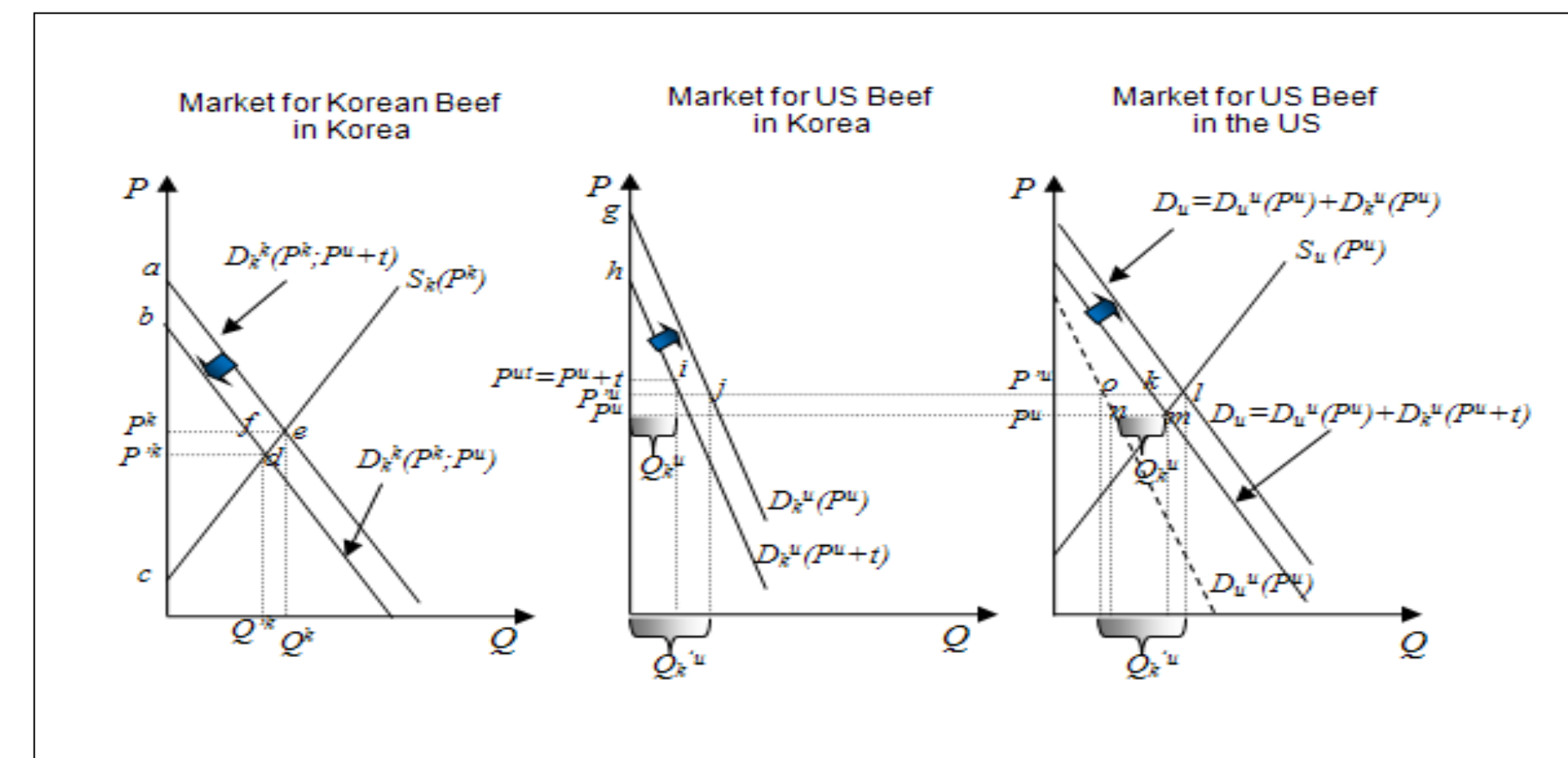
### [ Beef Consumption in Korea ]



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## Conceptual Framework

[ Effects of Korea-US FTA on the beef markets in Korea and United States ]



\* This is a simplified model that only includes Korean and US beef but well illustrates the expected changes in the prices and quantities of beef in two countries.

Korean beef supply is  $S_k P^k$  where  $P^k$  is the price of Korean beef, US beef supply is  $S_u P^u$  where  $P_u$  is the price of US beef, Korean consumers' demand for Korean beef with no FTA is  $D_k^k(P^k; P^u + t)$  where  $t$  is the tariff levied on the US beef when it is imported, Korean consumers' demand for Korean beef with FTA (after tariff removal) is  $D_k^k(P^k; P^u)$  Korean consumers' demand for US beef with and without FTA are  $D_k^u(P^u + t)$  and  $D_k^u(P^u)$ , US consumers' demand for US beef is  $D_u^u(P^u)$ , aggregated demand for US beef without FTA is  $D_u^u(P^u) + D_k^u(P^u)$ , and aggregated demand for US beef with FTA is  $D_u^u(P^u) + D_k^u(P^u)$ .

Without FTA, Korean consumers have to pay imported price plus levied tariff, in order to purchase the US beef. Thus the amount of imported beef is  $Q_k^u$  at which purchasing price  $P^u + t$  and demand curve  $D_k^u(P^u + t)$ , intersect.

Tariff removal incurred by the FTA will expand the demand curve of Korean consumers up to  $D_k^u(P^u)$ , since they will face lower purchasing price (i.e., just  $P^u$ , not  $P^u + t$ ) for the US beef. This will in turn expand aggregated demand for US beef up to  $D_k^u(P^u) + D_u^u(P^u)$ . Thus FTA will lead to the rise in the price of US beef from  $P^u + t$  to  $P^u$ , the decrease in the purchasing price of US beef in the Korean market from  $P^u + t$  to  $P^u$  and the increase in the imports of US beef in Korean market from  $Q_k^u$  to  $Q_k^u$ . However, the fall in the price of US beef will result in the shift the demand curve for Korean beef down from  $D_k^k(P^k; P^u + t)$  to  $D_k^k(P^k; P^u)$ , thus the price of Korean pork will decrease from  $P^k$  to  $P^k$ .

Hence the overall change in the surplus of Korean consumers is  $\Delta CS_k = \int_{P^k}^{P^k} D_k^k(P^k; P^u) dP^k - \int_{P^k}^{P^k} D_k^k(P^k; P^u + t) dP^k$ . Beef producer will gain whereas beef consumers will lose in the United States, due to the FTA. In the right graph, the change in the surplus of US producers is measured by  $\Delta PS_u = \int_{P^u}^{P^u} D_u^u(P^u) dP^u$  and the change in the surplus of US consumers is measured by  $\Delta CS_u = \int_{P^u}^{P^u} D_u^u(P^u) dP^u$ , thus overall surplus(welfare) gain in the United States is  $\Delta CS_u + \Delta PS_u$ .

## Equilibrium model

[ Market for Hanwoo ]

- $P_h^{kh,f} = f(Q_h^k)$ : inverse supply for Hanwoo
- $P_h^{kh} = f(Q_h^k; P_y^{ky}, P_u^{ku}, P_a^{ka})$ : inverse demand for Hanwoo
- $P_h^{kh} = P_h^{kh,f} + M_h^{kh}$ : relationship between the producer and consumer prices of Hanwoo

[ Market for beef cow meat ]

- $P_y^{ky,f} = f(Q_y^k)$ : inverse supply of cow meat produced in Korea
- $P_y^{ky} = f(Q_y^k; P_h^{kh}, P_u^{ku}, P_a^{ka})$ : inverse demand of cow meat produced in Korea
- $P_y^{ky} = P_y^{ky,f} + M_y^{ky}$ : relationship between the producer and consumer prices of cow meat

[ Market for Australian beef ]

- $P_a^{ka} = f(Q_a^k; P_h^{kh}, P_u^{ku}, P_y^{ky})$ : Korean consumers' inverse demand for Australian beef
- $P_a^{ka} = P_a^{ka} + t_a^k + c_a^k$ : inverse supply for Australian beef

[ Market for US beef ]

- $P_u^{ku} = f(Q_u^k; P_h^{kh}, P_a^{ka}, P_y^{ky})$ : inverse demand of US beef by Korean consumers
- $P_u^{uu} = f(Q_u^o)$ : inverse demand of US beef by US consumers
- $P_u^{ou} = f(Q_u^o)$ : inverse demand of US beef by the consumers in other countries
- $P_u^{uu,f} = f(Q_u^o)$ : inverse supply for US beef
- $Q_u^u + Q_u^k + Q_u^o = Q_u$ : market clearing condition for US beef
- $\frac{Q_u^k}{Q_u} P_u^{ku} - t_u^k - c_u^k + \frac{Q_u^o}{Q_u} (P_u^{uu} - M_u^{uu}) = P_u^{uu,f}$ : relationship between producer price and consumer prices for US beef
- $P_u^{ku} = -Q_u^k [1 + \frac{\partial P_u^{ku}}{\partial P_h^{kh}} \frac{\partial P_h^{kh}}{\partial P_u^{ku}} + \frac{\partial P_u^{ku}}{\partial P_a^{ka}} \frac{\partial P_a^{ka}}{\partial P_u^{ku}} + \frac{\partial P_u^{ku}}{\partial P_y^{ky}} \frac{\partial P_y^{ky}}{\partial P_u^{ku}} + \frac{\partial P_u^{ku}}{\partial P_u^{ou}} \frac{\partial P_u^{ou}}{\partial P_u^{ku}}] \frac{\partial P_u^{ku}}{\partial Q_u^k} \theta_u^k + t_u^k + c_u^k + P_u^{uu,f}$ : supply relation for US beef to Korean market
- $P_u^{ou} = P_u^{ou} + t_u^o + c_u^o$ : relationship between the consumer prices of US beef in the US and other countries' market

Across the equations (1) to (16), variable P and Q indicate price and quantity. The subscript in the price variable denotes types of beef (thus, h is Hanwoo, y is beef cow meat, a is Australian beef and u is US beef), the first superscript in the price variable denotes the destination market (thus, k implies Korean market, u implies US market and o indicates the other markets to which US beef is exported) and the second superscript in the price variable denotes the demand on which the beef of interest is influencing.

The variable  $P_h^{kh,f}$  indicates producer price of Hanwoo,  $Q_h^k$  is the quantity of Hanwoo,  $M_h^{kh}$  is the difference between the producer and consumer prices thus indicates the unit marketing margin for Hanwoo,  $P_y^{ky,f}$  is the producer price of cow meat,  $Q_y^k$  is the quantity of cow meat,  $M_y^{ky}$  is the unit marketing margin for cow meat,  $t_a^k$  is the tariff levied by Korea on the Australian beef,  $c_a^k$  is the unit cost for importing Australian beef from Australia to Korea,  $t_u^k$  is the tariff levied by Korea on US beef,  $c_u^k$  is the unit cost for importing US beef from the United States to Korea,  $P_u^{uu,f}$  is the producer price of US beef,  $Q_u$  is the total quantity of US beef,  $Q_u^k$  is the quantity of US beef sold in the US market,  $Q_u^o$  is the quantity of US beef sold in other markets. The variable  $t_u^o$  is the tariff levied on US beef,  $c_u^o$  is the unit cost for exporting US beef from the United States to other countries.

In equation (15),  $\theta_u^k$  is the conjectural elasticity that indicates the percentage change in total quantity supplied in the market in reaction to an 1 percentage change in the quantity supplied by importer  $i$  ( $\theta_u^k = \frac{\partial Q_u^k}{\partial Q_u^i} = \theta_u^k$ ). In the above equation system, endogenous variables

are  $P_h^{kh}, P_y^{ky}, P_a^{ka}, P_u^{ku}, P_u^{ou}, P_u^{ou}, P_h^{kh}, P_y^{ky}, P_a^{ka}, P_u^{ku}, P_u^{ou}, Q_h^k, Q_y^k, Q_a^k, Q_u^k, Q_u^o, Q_u$  and  $Q_u$ . Since number of equations and endogenous variables are the same as 16, this system is able to yield solutions.

## Simulation results of impacts of the Korea-US FTA

Equations (1) to (16) were converted into log-differential forms that compose the simulation model. The price elasticities of demand as well as supply and the cross price elasticities between different beefs in the prior studies were applied to the simulation model.

[ Simulation results ]

	With no market power by importers ( $\theta_h^k = 0$ )	With oligopoly power by importers ( $\theta_h^k = 0.5$ )	With monopoly (cartel) power by importers ( $\theta_h^k = 1$ )
change in Hanwoo price at consumer level	-11.24%	-6.98%	-5.07%
change in cow meat price at consumer level	-15.97%	-9.92%	-7.20%
change in US beef price in Korean Market	-45.15%	-28.05%	-20.35%
change in Australian beef price in Korea	0.00%	0.00%	0.00%
change in Hanwoo price at producer level	-20.58%	-12.79%	-9.28%
change in beef cow meat price at producer level	-29.25%	-18.17%	-13.18%
change in US beef price at producer level in the US	0.14%	0.14%	0.15%
change in the US beef price at consumer level in the US	0.60%	0.29%	0.14%
change in the US beef price exported to other countries	0.63%	0.30%	0.15%
change in equilibrium quantity of Hanwoo	-9.03%	-5.61%	-4.07%
change in equilibrium quantity of beef cow meat	-12.83%	-7.97%	-5.78%
change in equilibrium quantity of US beef in Korean market	35.68%	22.17%	16.08%
change in equilibrium quantity of Australian beef in Korean market	-41.86%	-26.01%	-18.87%
change in equilibrium quantity of US beef in the US market	-0.36%	-0.17%	-0.09%
change in total quantity of US beef	0.13%	0.13%	0.13%
change in equilibrium quantity of US beef in other countries	-0.52%	-0.25%	-0.13%

➤ The effects of tariff reduction due to Korea-US FTA under market power by importers are simulated to be smaller than those under no market power by importers. If beef importers exercise market power, they would absorb the decrease in the procuring cost due to tariff reduction as an additional profits without lowering the selling prices. Thus, impacts of the FTA will become smaller as the degree of market power by importers increases.

➤ Korea-US FTA will lead to relatively big impacts on beef markets in Korea (especially on beef cow markets). Total values of production for Hanwoo and beef cow are simulated to decrease by 30% ~ 14% and 42% ~ 19%, respectively. However, it will bring about little impacts on beef industry in the United States (beef price will be raised by 0.60% ~ 0.14% in the United States), although export to Korea will increase by 36%~16%.

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