



Korea's Demand for U.S. Beef

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Abstract

This paper uses a price-adjusted index of demand to estimate the change in Korean consumers' demand for U.S. beef from 2003 through 2011. The paper provides an overview of Korea's consumption, production, and imports of beef over this period, which included Korea's ban on imports of U.S. beef following discovery of bovine spongiform encephalopathy (BSE) in the U.S. cattle herd in December 2003, the signing of the U.S.-Korea Beef Protocol in April 2008, and the subsequent recovery of U.S. beef imports. The paper also includes background information on BSE and Korean consumers' perceptions of the safety of U.S. beef. Korean demand for U.S. beef is estimated to have increased substantially since 2009 (the first full year after signing of the Beef Protocol), but in 2011 remained well below the level observed in 2003.

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INTRODUCTION

In 2003, Korea was the second-largest export market for U.S. beef, after Japan.² In December 2003, a dairy cow in Washington State was discovered to have bovine spongiform encephalopathy (BSE), and in response many countries, including Korea, closed their markets to U.S. beef. Since the discovery of BSE, U.S. beef producers and regulators have put in place a series of measures designed to control the risk of BSE, and in 2008 an agreement to reopen Korea's market to U.S. beef, the U.S.-Korea Beef Protocol, was reached. Since then, Korea's imports of U.S. beef have resumed, but at a much lower volume. This paper will examine Korean consumers' demand for U.S. beef, compared to demand in 2003, and since 2009, the first full year after imports resumed. This will help determine the extent to which improved access to the Korean market would be expected to lead to greater exports of U.S. beef.

Since 2003, changes have occurred in the Korean beef market that have led to a decline in Korean consumers' demand for U.S. beef. There have been changes in Korea's domestic production of beef and pork, as well as changes in the volume and composition of Korea's beef imports from other sources, particularly Australia. Additionally, the discovery of BSE in the U.S. cattle herd and errors made in U.S. beef shipments to Korea have reportedly undermined Korean consumers' perceptions of the safety of U.S. beef. (See box 1 for a description of BSE.)

The goal of this paper is to estimate changes in Korean consumers' demand for U.S. beef relative to a base year of 2003 and since 2009, the first full year after trade was resumed. A price-adjusted index of demand will be used to estimate Korean consumer's demand for U.S. beef through 2011. A price-adjusted index of demand compares the actual quantity purchased (in this case, imported) to the quantity that would be expected had there been no change in demand. The index will control for changes in population, price, and inflation. The paper will also identify possible causes for the changes in demand.

KOREA'S MARKET FOR BEEF

Domestic Production

The closure of the Korean market to U.S. beef in 2004 led to higher beef prices in Korea, which stimulated domestic Korean cattle and beef production (table 1). Cattle numbers and beef production increased more than 50 percent in 2003–11. Domestic beef production as a share of total beef supply (self-sufficiency ratio) reached a high of 45 percent in 2009, but dropped slightly in 2010 and 2011 as imports expanded rapidly with the reopening of the Korean market to U.S. beef in 2008.³

² Korea was the third-largest export market by volume, after Japan and Mexico. USDA, Foreign Agricultural Service (FAS), Production, Supply, and Distribution (PS&D) database.

³ USDA, FAS, PS&D database.

Box 1 BSE in the U.S. Cattle Herd

There have been a total of four cases of BSE in the U.S. cattle herd. The first case, identified in December 2003, occurred in a Canadian-born dairy cow. The three subsequent cases were found in cattle born in the United States. The second case occurred in a Texas cow that was initially tested in November 2004, and confirmed in June 2005. The third case occurred in a cow in Alabama that was initially tested in February 2006 and confirmed in March 2006. The latest case occurred in a California cow tested and confirmed in April 2012.¹ Unlike the December 2003 case, the discovery of subsequent cases of BSE has not resulted in wide-spread closures of export markets for U.S. beef. In response to the most recent case, which is the only U.S. case of BSE since Korea's imports of U.S. beef resumed in 2008, Korean officials have not banned imports of U.S. beef, but have increased the inspection rate.²

BSE is a fatal neurological disease that is caused by an abnormal protein called a prion. BSE is one of a family of transmissible spongiform encephalopathies (TSEs) that includes scrapie in sheep, chronic wasting disease in elk and deer, and Creutzfeldt-Jakob disease (CJD) in humans. The incubation period between infection and the onset of symptoms is typically three to six years. The only way to confirm the presence of BSE is through testing of a portion of the brain (the obex) after death.

The primary source of infection for BSE is believed to be feed contaminated with prions from an infected animal.³ Prions have been found in the central nervous system (brain and spinal cord) and the distal ileum of infected animals, with lower concentrations found in the tonsils and eyes. The primary method to prevent spread of the disease is the removal of tissues that could potentially contain the infective agent, to ensure that these tissues do not enter the human food chain and are not used to produce feed for animals that could then become infected. Tissues that could potentially contain the infective agent are known as specified risk materials (SRMs). The definition of SRMs varies by country.⁴ The vast majority of BSE cases have been in cattle over 30 months of age, and the infective agent has never been found in skeletal muscle meat. When imports of U.S. beef resumed, Korea allowed only imports of boneless beef from cattle no more than 30 months of age.

¹ USDA, Animal and Plant Health Inspection Service (APHIS), "History of BSE in the United States," http://www.aphis.usda.gov/animal_health/animal_diseases/bse/history.shtml, accessed September 18, 2012; USDA, "Statement by USDA Chief Veterinary Officer John Clifford Regarding a Detection of Bovine Spongiform Encephalopathy (BSE) in the United States," April 24, 2012.

² Yonhap News Agency, "S. Korea to Keep Tightened Quarantine Checks on U.S. Beef," May 11, 2012.

³ USDA, APHIS, "About BSE," http://www.aphis.usda.gov/animal_health/animal_diseases/bse/index.shtml. There are several different strains of BSE. The first case of BSE in the United States was of the typical or classic strain of BSE, the strain originally found in the UK, and that has been linked to variant CJD in humans. The three subsequent U.S. BSE cases were found to be atypical strains of BSE (L-type and H-type). Some research suggests that these atypical BSE cases may occur sporadically in older cattle, and may not be linked to consumption of infected feed. (U.S. Centers for Disease Control and Prevention, "About BSE," <http://www.cdc.gov/ncidod/dvrd/bse/>, accessed September 18, 2012.)

⁴ In the United States, SRMs are defined as the brain, skull, eyes, trigeminal ganglia, spinal cord, vertebral column (excluding the vertebrae of the tail, the transverse processes of the thoracic and lumbar vertebrae, and the wings of the sacrum) and dorsal root ganglia of cattle over 30 months of age, plus the tonsils and distal ileum from cattle of all ages.

TABLE 1 Korea's production, supply, and distribution of beef, 2003–11 (carcass weight equivalent)

Attribute	2003	2004	2005	2006	2007	2008	2009	2010	2011
Beginning stocks (1,000 mt)	40	61	1	3	5	10	15	47	49
Production (1,000 mt)	182	186	195	200	219	246	267	247	280
Imports (1,000 mt)	457	224	250	298	308	295	315	366	431
Exports (1,000 mt)	0	0	0	0	0	0	4	2	3
Total supply (1,000 mt)	679	471	446	501	531	551	597	660	760
Consumption (1,000 mt)	618	470	443	496	522	536	546	609	677
Self-sufficiency ratio (percent)	27	39	44	40	41	45	45	37	37
Per capita consumption (kg)	12.97	9.82	9.23	10.31	10.82	11.08	11.26	12.5	13.9

Source: USDA, FAS, Production, Supply, and Distribution database, accessed June 13, 2012.

Further increases in Korea's cattle herd are not expected for several reasons. U.S. beef has recaptured a significant share of Korea's beef market since the market was reopened in 2008. Also, Korean domestic regulations enacted in the aftermath of the recent outbreak of foot and mouth disease (FMD), discussed below, have increased costs for Korean cattle producers. As a result, cattle demand has fallen and cattle prices in Korea have begun to decline. Korea's beef production is expected to increase in the short-run, as farmers decrease cattle inventories.⁴ In the first four months of 2012, cattle slaughter in Korea was 35 percent above the corresponding level of 2011. Slaughter of heifers and cows was up 63 percent.⁵

Imports

In 2003, Korea's imports of beef reached a record high, and imports accounted for 73 percent of supply. The United States, which had been a large and growing supplier of beef to Korea, supplied about two-thirds of Korea's beef imports in 2003. Australia was second with approximately 20 percent of imports.

Following the ban on imports of U.S. beef, Korea's imports of beef from Australia more than doubled in volume between 2003 and 2005. Korean buyers were initially unable to find sufficient supplies of grain-fed beef, which is preferred in many Korean dishes. Australia produces primarily grass-fed beef, and it took time for producers in Australia to increase the supply of grain-fed beef. Also, Koreans prefer a limited number of cuts, and producers in Australia typically provided only full sets or half-sets.⁶ As a result, imports from Australia did not fully replace the loss of imports from the United States, and overall Korean beef imports fell by 47 percent in value and 52 percent in volume between 2003 and 2004. Since then, Korea's global beef imports have gradually increased, but have not reached the volume of imports observed in 2003 (table 2).

⁴ USDA, FAS, *Korea: Livestock and Products Semiannual*, March 6, 2012, 4-6.

⁵ The BeefSite, "High Korean Cattle Slaughter Continues," June 13, 2012.

⁶ ABARE Research Report, Korean beef market, 2009, 36. Selling in "full sets" or "half-sets" forces buyers to purchase a wider range of cuts, including some less-desirable ones, rather than the specific cuts most preferred.

TABLE 2 Korea's imports, by leading suppliers, 2003–11

Partner	2003	2004	2005	2006	2007	2008	2009	2010	2011
Million dollars									
Australia	197.4	355.3	539.7	693.7	761.6	679.9	482.3	633.9	849.3
United States	886.6	103.2	4.0	0.0	94.0	197.1	285.5	421.6	653.0
New Zealand	71.7	138.7	178.6	163.5	161.9	155.9	88.7	120.4	156.8
Mexico	(^a)	2.2	11.8	21.5	19.0	17.7	5.3	9.2	18.4
ROW	21.1	0.9	0.9	0.3	0.6	0.3	0.1	0.4	0.4
World	1,176.9	600.3	735.0	879.0	1,037.1	1,050.9	862.0	1,185.6	1,678.0
Metric tons									
Australia	78,018	99,066	139,798	180,386	179,942	151,918	144,306	155,406	170,111
United States	248,645	27,790	760	8	14,112	32,446	61,527	92,649	128,445
New Zealand	28,962	47,735	51,829	49,038	44,891	42,718	36,250	38,945	39,427
Mexico	(^a)	852	3,585	6,791	5,366	5,201	2,678	4,452	5,929
ROW	8,318	500	379	115	291	103	37	87	128
World	363,943	175,943	196,351	236,338	244,602	232,386	244,798	291,539	344,040
Average unit value (<i>dollars per kg</i>)									
Australia	2.53	3.59	3.86	3.85	4.23	4.48	3.34	4.08	4.99
United States	3.57	3.71	5.25	3.80	6.66	6.07	4.64	4.55	5.08
New Zealand	2.48	2.90	3.45	3.33	3.61	3.65	2.45	3.09	3.98
Mexico	NA	2.59	3.29	3.16	3.54	3.41	1.98	2.07	3.11
ROW	2.53	1.75	2.38	2.95	1.92	2.52	3.53	4.75	3.30
World	3.23	3.41	3.74	3.72	4.24	4.52	3.52	4.07	4.88

Source: Global Trade Atlas, accessed June 13, 2012.

(a) Less than \$50,000 or 500 kg.

Australia has been the largest source of Korea's beef imports in every year since 2004. The volume of imports from Australia has declined slightly since 2006, but in 2011 Korea's beef imports from Australia were four times the value and nearly twice the volume observed in 2003. Australian producers now supply more of the specific cuts favored by Korean consumers. Producers in Australia have increased the share of beef that is grain-fed to approximately 28 percent in 2007 and 31 percent in 2011.⁷ The changes in the composition of imports coupled with the "clean and safe image" of Australian beef likely improved the competitive position of Australian beef⁸ in the Korean market and resulted in less demand for U.S. beef.

Beginning in early 2008, several bilateral agreements have been instrumental in reopening the Korean market to U.S. beef.

- **The 2008 Beef Protocol:** On April 18, 2008, U.S. and Korean negotiators reached agreement to reopen the Korean market to U.S. beef. The new Beef Protocol provided for Korean imports of boneless and bone-in beef from the United States from cattle less than 30 months of age. Additionally, in an addendum to the Protocol, the Korean government agreed to open the Korean market to U.S. beef from cattle of any age

⁷ ABARE Research Report, *Korean Beef Market*, 2009, 1, 36; Australian Lot Feeders' Association, "Grain Fed Cattle Numbers Rebound Slightly," February 20, 2012; USDA, FAS, PS&D database, accessed June 13, 2012.

⁸ ABARE Research Report, *Korean Beef Market*, 2009, 2.

once the United States announced its enhanced feed ban. Notice of the U.S. enhanced feed ban was published one week after the signing of the Beef Protocol, on April 25, 2008.⁹ Announcement of the Beef Protocol and the enhanced feed ban were followed by widespread public protests in Korea due to concerns about the safety of U.S. beef.¹⁰ Box 2 describes Korean consumers' perceptions of the safety of U.S. beef.

- **Private sector initiative:** Because of consumer concerns, U.S. exporters and Korean importers agreed to a separate “transitional private sector initiative” published by the Korean government as an addendum to the Beef Protocol. The private sector initiative restricted Korea’s imports of U.S. beef to beef from cattle less than 30 months of age “until Korean consumer confidence in U.S. beef improves.” Currently, U.S. beef exports to Korea must be from establishments participating in the USDA Agricultural Marketing Service (AMS) Quality Systems Assessment (QSA) program that verifies that the beef being certified is from cattle less than 30 months of age. Other conditions of the initiative include the requirement that beef not be sourced from cattle imported from Canada for immediate slaughter in the United States.¹¹
- **The KORUS FTA:** The U.S.-Korea Free Trade Agreement (KORUS) was approved by the U.S. Congress on October 12, 2011 and ratified by the Korean National Assembly on November 22, 2011. It entered into force on March 15, 2012.¹² In May 2011, the United States Trade Representative announced that after KORUS enters into force, he intends to consult with Korea under the terms of the Beef Protocol to regain access for U.S. beef from cattle of any age. KORUS provides for the reduction and eventual elimination of tariffs on Korea’s imports of U.S. beef, but does not directly address the Beef Protocol or the private sector initiative.

⁹ A ban on cattle feed containing meat and bone meal derived from cattle is considered to be an important control step in preventing the risk of infection from BSE. The 1997 U.S. feed ban prohibited the use of most proteins derived from mammals in the feed of all ruminants. Because of the possibility of cross-contamination, the 2008 enhanced feed ban prohibited the use of “certain cattle origin materials” in the feed of any ruminant.

¹⁰ Clemens, “U.S. Beef Faces Challenges in Korea,” *Iowa Ag Review*, Center for Agricultural and Rural Development, Winter 2009, 5.

¹¹ United States Trade Representative, letter from Susan Schwab (USTR) and Edward T. Schafer (Secretary of Agriculture) to Minister Jong Hoon Kim and Minister Woon Chun Chung, June 25, 2008.

¹² Office of the United States Trade Representative, “*U.S.-Korea* Free Trade Agreement.”

Box 2 Consumer Perceptions of Safety

The discovery of BSE in the U.S. cattle herd has negatively impacted Korean consumers' perceptions of U.S. beef. In addition to the BSE cases themselves, Korean public perception has been influenced by the discovery of bones in several shipments of U.S. beef to Korea, including a vertebral column (considered at the time to be a specified risk material or SRM by Korea) in a shipment of U.S. beef in 2007.

In a survey conducted by the Korea Rural Economic Institute following the December 2003 ban on imports of U.S. beef, 87.4 percent of survey respondents indicated they were concerned about the safety of U.S. beef and only 4.2 percent said it was safe. Respondents also expressed little confidence in Korea's country-of-origin labeling system (COOL). A majority of respondents were concerned about the safety of imports from Australia, and one-third were concerned about the safety of Korea's domestic Hanwoo beef.¹

Later surveys show that Korean consumers' concerns over the safety of U.S. beef continued, and were reflected in beef sales. In August 2007 when part of a vertebral column was found in a shipment of U.S. beef, U.S. beef imports were suspended for three weeks. Publicity over consumer concerns depressed demand for U.S. beef and retail sales of U.S. beef in Korea declined in August and September, relative to July.² In October 2007, another shipment of U.S. beef to Korea was found to contain part of a vertebral column. In reaction, all U.S. beef exports to Korea were suspended.

At the time the Beef Protocol was negotiated (April 2008), Korean consumers reportedly considered the risk of BSE in U.S. beef to be very high. In a May 2008 survey on U.S. beef food safety risks, 78 percent of Korean respondents agreed with the statement that "U.S. beef is not safe."³ More than one year after the private sector agreement that allowed U.S. beef back into the Korean market, few consumers were willing to purchase U.S. beef. In a survey conducted in December 2009, only 21.7 percent of Korean respondents reported plans to purchase U.S. beef, and only 22.1 percent reported having purchased U.S. beef in the past.⁴

¹ USDA, FAS, *Korea: Livestock and Products Semiannual 2004*, February 5, 2004, 3.

² USDA, FAS, *Korea: Livestock and Products Semiannual 2008*, February 29, 2008, 9–11.

³ U.S. industry representative, Korean market briefing for Commission staff, Seoul, Korea, June 4, 2008.

⁴ USDA, FAS, *Korea: Livestock and Products Semiannual*, March 2, 2011, 7.

The Resumption of Imports from the United States

Following the reopening of the Korean market to U.S. beef in 2008, imports from the United States increased significantly. In 2011, Korea's U.S. beef imports reached 74 percent of the value, but only 56 percent of the volume, of Korea's U.S. beef imports in 2003. In 2011, Korea's U.S. beef imports accounted for approximately 22 percent of Korea's beef consumption. In comparison, imports from Australia, the largest supplier of Korea's beef imports in 2011, accounted for approximately 29 percent of consumption.

The increase in imports of U.S. beef after 2008 has been due to both a decline in prices relative to other sources of beef and marketing campaigns designed to promote U.S. beef in Korea. In 2003, the average unit value (AUV) of Korea's U.S. beef imports was 41 percent higher than the AUV of imports from Australia, reflecting the Korean preference for grain-fed beef. The AUV of U.S. imports has been higher than that for imports from Australia in every subsequent year except 2006, when Korea's imports of U.S. beef totaled only 8 tons. In 2010, the AUV of U.S. imports was 12 percent higher than that of Australian imports, and in 2011, the AUV of U.S. imports was only 2 percent higher (table 2). The premium for U.S. beef has declined substantially, and the decline in U.S. prices relative to those for Australian beef has likely been responsible for some of the 2010 and 2011 gains in U.S. market share.

Since 2008, U.S. beef exporters and the U.S. Meat Exporter's Federation (USMEF) have carried out a series of promotions intended to raise Korean consumers' awareness of and confidence in U.S. beef. In 2010, the USMEF "Trust" campaign was reportedly successful in allaying some Korean consumers' concerns about U.S. beef. Surveys conducted in December 2009 and February 2011 found that the share of consumers planning to purchase U.S. beef increased from 21.7 percent of those surveyed in December 2009 to 39.3 percent of those surveyed in February 2011.¹³ A survey in January 2012 found that the share of consumers surveyed who had purchased U.S. beef more than doubled since December 2009, from 22.1 percent of those surveyed in December 2009 to 52.3 percent in January 2012.¹⁴

MEASURING DEMAND

A demand index can be used to estimate changes in demand over time. One method that has been used to measure changes in demand for beef, pork, and chicken over time is the quantity-adjusted index of demand.¹⁵ The quantity-adjusted index of demand controls for changes in population and inflation. For a given level of consumption and given an estimate of the own-price demand elasticity, the actual price in any given period is compared to the price that theoretically would have been associated with that level of consumption had there been no changes in

¹³ USDA, FAS, *Korea: Livestock and Products Semiannual*, March 2, 2011, 7.

¹⁴ USDA, FAS, *Korea: Livestock and Products Semiannual*, March 6, 2012, 6.

¹⁵ Purcell, *Measures of Changes in Demand for Beef, Pork, and Chicken, 1975-1998*, 1998. The index controls for changes in the price of the good and in population.

demand from the base period ($P_{D=D_0}$). Calculations use inflation-adjusted prices and per capita consumption. The index is the ratio of the actual price to $P_{D=D_0}$ multiplied by 100.

An alternative to a quantity-adjusted index of demand is a price-adjusted index of demand. At a prevailing price and given an estimate of the own-price demand elasticity, actual consumption in any given period is compared to the level of consumption that theoretically would have been associated with that price had there been no changes in demand from the base period ($Q_{D=D_0}$). Calculations use inflation-adjusted prices and per-capita consumption. The index is the ratio of the actual quantity to $Q_{D=D_0}$ multiplied by 100. A graphical representation of the use of a price-adjusted index of demand is presented in the Appendix, Figure A1.

As Korean beef purchasers are assumed to have little influence on the price of U.S. beef, a price-adjusted index of demand is used in this analysis. Korean consumers' demand for U.S. beef relative to demand in a base year is estimated from the quantity imported in a given year at the average unit value of imports. The price-adjusted index of demand is calculated below.

Korea's Demand for U.S. Beef Since 2003

To calculate the price-adjusted index of demand for U.S. beef, the following data are required: (1) the real change in U.S. beef prices in Korea, (2) Korea's per capita consumption of U.S. beef, and (3) the elasticity of demand. The real change in U.S. beef prices in Korea is approximated by the change in the nominal AUV of Korea's U.S. beef imports, divided by the change in Korea's consumer price index.¹⁶ Korea's per-capita consumption of U.S. beef is approximated by the volume of imports, divided by the population.¹⁷ Several studies have estimated the Korean demand for U.S. beef, and estimates of the demand elasticity can be drawn from this literature. These estimates vary, but generally range between approximately -0.7 and 0.9.¹⁸ A demand elasticity of -0.7 was used to construct table 3.¹⁹ (The Appendix presents a comparison of the price-adjusted demand index for U.S. beef at own-price elasticities of -0.5 and -0.9.)

¹⁶ Data on Korea's consumer price index are from the IMF, "International Financial Statistics," <http://elibrary-data.imf.org/>.

¹⁷ Consumer price index and population data were obtained from the International Monetary Fund statistical database.

¹⁸ Henneberry and Hwang, "Meat Demand in South Korea," April 2007, 56; Lee and Kennedy, "Effects of Price and Quality Differences in Source Differentiated Beef," April 2009, 246. Henneberry and Hwang found that the price elasticity of demand for U.S. beef in Korea was -0.904. Lee and Kennedy found that the price elasticity of demand for U.S. beef in Korea was -0.7217.

¹⁹ Estimates of the own-price demand elasticity for U.S. beef in Korea vary and the calculated price index could be sensitive to changes in this estimate.

TABLE 3 Price-adjusted index of Korea's demand for U.S. beef relative to 2003, $E_d = -0.7$

Year	Quantity of U.S. beef imports (mt)	Per capita consumption (kg)	Deflated AUV (won/kg)	Consumption at $Q_{D=D_0}$ (kg)	Index
2003	248,645	5.272	4,523	5.272	100.0
2004	27,790	0.587	4,372	5.396	10.9
2005	760	0.016	5,373	4.579	0.3
2006	8	0.000	3,548	6.068	0.0
2007	14,112	0.294	5,904	4.144	7.1
2008	32,446	0.674	6,098	3.986	16.9
2009	61,527	1.273	5,254	4.675	27.2
2010	92,649	1.910	4,530	5.265	36.3
2011	128,445	2.629	4,665	5.156	51.0

A demand index with 2003 as the baseline period provides an estimate of how much Korean demand for U.S. beef has recovered since the high-water mark of Korea's U.S. beef imports. The inflation adjusted AUV of Korea's 2011 imports of U.S. beef was 3.1 percent higher than in 2003. Therefore, other factors being equal, the increase in price, operating through the demand elasticity, would be expected to lead to a very small decrease in the consumption of U.S. beef. If the demand for U.S. beef in Korea in 2011 had been equal to that observed in 2003, Korea's per-capita consumption of U.S. beef in 2011 would have been 5.156 kg, compared to consumption in 2003 of 5.272 kg. In fact, per capita consumption was 2.629 kg. The estimated demand index in 2011, relative to 2003 was 51.0.

Sample Calculation:

Percent change in real price of U.S. beef 2003–11 = $(4665-4523)/(4523) = 3.1\%$

Expected change in per-capita consumption = $3.1\% * -0.7 = -2.2\%$

Expected per-capita consumption $Q_{D=D_0} = (1.0 - 0.022) * 5.272 = 5.156$

Actual per-capita 2011 consumption of U.S. beef = 2.629 kg

Index = $(2.629 / 5.156) * 100 = 51.0$

Therefore, Korean consumers' demand for U.S. beef in 2011 was far short of demand in 2003, approximately 49 percent lower. Use of an alternate demand elasticity does not lead to a large change in this index. As shown in the Appendix, use of an estimated demand elasticity of -0.5 or 0.9 leads to an estimated demand index of 50.7 or 51.3, respectively.

Demand in 2010 and 2011 Relative to 2009

Comparing changes in price and consumption to a fixed base period understates changes in later periods if there has been a substantial decline in consumption.²⁰ For instance, Korea's imports of U.S. beef in 2010 were roughly 50 percent higher than in 2009, the first full year after the signing of the Beef Protocol and the subsequent private sector agreement. However, this change was equivalent to only 12 percent of 2003 consumption. It is therefore also useful to estimate demand changes on an annual basis, using 2009 as the base period. A demand index relative to 2009 provides a measure of changes in demand since the resumption of trade.

2010

Since the resumption of imports in mid-2008, U.S. producers and organizations have heavily promoted health and flavor aspects of U.S. beef in the Korean market. This promotion would be expected to increase Korean consumers' demand for U.S. beef and contribute to a higher value for the demand index. The AUV of Korea's imports of U.S. beef also declined in 2010, on an absolute basis and relative to the AUV of imports from Australia, even though Korea's consumer price index increased in 2010. This decline in price would also be expected to lead to an increase in Korean consumers' consumption of U.S. beef. Given the increased promotion and decline in price, an increase in import volume is attributable to both relatively lower prices for U.S. beef, and an increase in demand.

Given the estimated demand elasticity of -0.7 and the observed 13.8 percent decline in the inflation-adjusted AUV of Korea's U.S. beef imports 2009–10, we would expect per-capita consumption to have increased by 9.7 percent between 2009 and 2010 to 1.396 kg, if there were no change in demand. In fact, Korean per-capita consumption of U.S. beef in 2010 was an estimated 1.910 kg. This yields an index value of 136.8.

Annual Demand Index Change 2009–10:

Percent change in real price of U.S. beef 2009–10 = $(4530-5254)/(5254) = -13.8\%$
 Expected change in per-capita consumption = $-13.8\% \times -0.7 = 9.7\%$
 Expected per-capita consumption $Q_{D=D_0} = (1.0 + 0.097) \times 1.273 = 1.396$
 Actual per-capita 2010 consumption of U.S. beef = 1.910 kg
 Index = $(1.910 / 1.396) \times 100 = 136.8$

²⁰ Purcell, *Measures of Changes in Demand for Beef, Pork, and Chicken, 1975-1998*, 2008; Marsh, "Impacts of Declining U.S. Retail Beef Demand on Farm-Level Beef Prices and Production," November 2003, 903.

2011

In 2011, the AUV of imported U.S. beef increased slightly more than the Korean consumer price index. The higher price, all else being equal, would be expected to lead to a lower volume of imports. Therefore the increase in 2011 was attributable to increased demand. One of the most significant factors that likely led to a continued increase in imports was an outbreak of foot and mouth disease (FMD) in Korea. The outbreak affected more swine than cattle, but would be expected to increase demand for imported beef as a substitute for domestic pork. Promotions of U.S. beef continued in 2011, which would also be expected to increase demand for U.S. beef.

In late November 2010, an outbreak of FMD was confirmed in Andong, North Gyeongsang, Korea. The widespread outbreaks of FMD led to culling of over 150,000 cattle and over 3 million swine in an effort to stop the spread of the disease.²¹ Korea also initiated widespread vaccination of livestock.²² On March 24, 2011, Korea lowered its FMD alert status, and on March 25 declared that the outbreak was over.²³

The 150,000 cattle culled were a small fraction of the nearly 3 million head of cattle in Korea, and Korea's domestic beef production increased in 2011.²⁴ However, approximately one-third of Korea's swine were culled in the effort to control the outbreaks of FMD, and Korea's production of pork is not expected to recover to 2010 levels until 2014. Korea is a major consumer of pork, and in recent years, Koreans have consumed more than twice as much pork as beef.²⁵ As a competing product, beef demand would be expected to increase in response to the decline in pork production.²⁶

Marketing efforts to promote U.S. beef have continued. The USDA awarded an additional \$1 million to USMEF for U.S. beef promotion in Korea in fiscal year 2011, and USMEF has begun the second phase of its Trust campaign. USMEF plans to spend an additional \$10 million over the next 5 years on initiatives to expand Korea's consumption of U.S. beef.²⁷ An estimated 65 percent of Korea's imports of U.S. beef is used by the restaurant sector, and the current phase of the Trust campaign includes advertisements in restaurant trade magazines, as well as ads targeting

²¹ USDA, FAS, *Korea: Livestock and Products Semiannual*, March 2, 2011, 2.

²² The Korean government announced the first vaccinations for cattle in areas surrounding FMD outbreaks in December 2010, and expanded the vaccination effort to swine on January 6, 2011.

²³ There has not been a reported outbreak since February 26, 2011. Yonhap News Agency, "S. Korea Lowers Foot-and-mouth Alert Level," March 24, 2011; Joongang Daily, "With FMD Over, New Precautions Unveiled by Gov't," March 25, 2011.

²⁴ USDA, FAS, *Korea: Livestock and Products Annual*, September 2, 2011, 12; USDA, FAS, PS&D database, accessed June 13, 2012.

²⁵ USDA, FAS, PS&D database; USDA, FAS, *Livestock and Poultry: World Markets and Trade*, April 2011, 9.

²⁶ USDA, FAS, *Korea: Livestock and Products Semiannual*, March 2, 2011, 10; USDA, FAS, *Korea: Livestock and Products Annual*, September 2, 2011, 10.

²⁷ U.S. Meat Export Federation (USMEF), "USMEF Announces Expanded South Korea Initiative," May 4, 2011.

consumers.²⁸ The continued promotion is expected to have a positive impact on Korean consumers' attitudes and perceptions of U.S. beef, following the success of past promotions.

Although the AUV of Korea's imports of U.S. beef increased slightly more rapidly than consumer prices in 2011, consumption increased over 2010 to an estimated 2.629 kg per capita, more than twice that of 2009. The demand index relative to 2009 was 191.5.

Conclusion

There has been a substantial decline in Korean consumers' demand for U.S. beef since 2003. Since 2003, Korea's domestic beef production has increased substantially, and producers in Australia now supply more grain-fed beef and more of the specific cuts in greatest demand by Korean consumers. The decline in demand is likely attributable to both increased availability of substitute products and a shift in consumer preference away from U.S. beef.

Although Korea's demand for U.S. beef in 2011 remains well below the 2003 level, demand has increased significantly since 2009. There have not been substantial changes in the availability of Korean domestic beef and Australian grain-fed beef as substitute products since 2009, but there have been reported improvements in consumer attitudes towards U.S. beef. The increase in Korean consumers' demand for U.S. beef is likely due to these changes in consumer perceptions. Given the structural changes that have taken place in Australia's beef production, as well as Korea's increased domestic production, demand for U.S. beef may not reach the high reached in 2003 in the near future, but continued promotions that improve consumer perceptions of the quality and safety of U.S. beef are expected to increase demand further.

²⁸ USMEF, "USMEF Announces Phase 2 of U.S. Beef 'Trust' Campaign in South Korea."

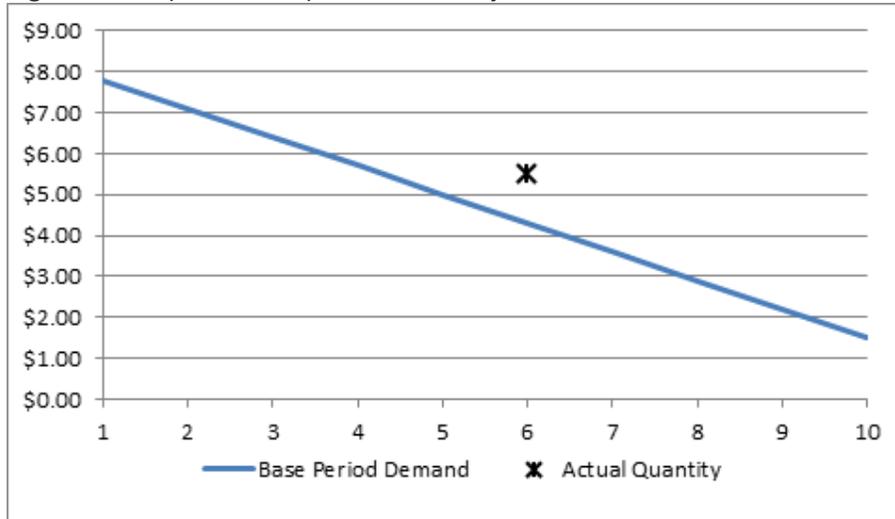
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APPENDIX

Figure A1 Graphical Example of a Price-Adjusted Index of Demand



Given the estimated demand curve represented by “Base Period Demand,” the demand index is calculated as the actual quantity consumed in a given period divided by the quantity that would have been consumed at that price assuming there were no changes in demand from the base period, multiplied by 100. In this example, the demand index is equal to $(6 / 4.65) * 100 = 129$.

The estimated demand elasticity has an impact on the calculated demand index. The following tables present Korean consumers’ calculated indices of demand using alternative estimates of the demand elasticity, relative to demand in 2003 and 2009.

Table A1 Price-adjusted index of Korea’s demand for U.S. beef compared to 2003, $E_d = -0.5$ and $E_d = -0.9$

Year	Quantity (mt)	Per capita consumption (kg)	Deflated AUV (won per kg)	$E_d = -0.5$		$E_d = -0.9$	
				$Q_{D=D_0}$	Index	$Q_{D=D_0}$	Index
2003	248,645	5.272	4,523				
2004	27,790	0.587	4,372	5.360	10.9	5.431	10.8
2005	760	0.016	5,373	4.777	0.3	4.381	0.4
2006	8	0.000	3,545	5.842	0.0	6.298	0.0
2007	14,112	0.294	5,904	4.467	6.6	3.824	7.7
2008	32,446	0.674	6,098	4.354	15.5	3.619	18.6
2009	61,527	1.273	5,254	4.846	26.3	4.505	28.3
2010	92,649	1.910	4,530	5.268	36.3	5.265	36.3
2011	128,445	2.629	4,665	5.190	50.7	5.123	51.3

Table A2 Price-adjusted index of Korea's demand for U.S. beef compared to 2009, $E_d = -0.5$ and $E_d = -0.9$

Year	Quantity (mt)	Per capita consumption (kg)	Deflated AUV (won per kg)	$E_d = -0.5$		$E_d = -0.9$	
				$Q_{D=D_0}$	Index	$Q_{D=D_0}$	Index
2009	61,527	1.273	5,254				
2010	92,649	1.910	4,530	1.361	140.3	1.131	133.5
2011	128,445	2.629	4,665	1.344	195.5	1.402	187.6