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Japanese Consumers' Valuation of U.S. Beef and Pork Products after the Beef Trade Ban

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Analysis of survey data indicates that Japanese consumers discount their willingness to pay for U.S. beef and pork relative to that of domestic products, but that the discounts have declined from 2006 to 2009. The discounts for U.S. products were greater than those imported from other countries in 2006, but the 2009 discounts were statistically indistinguishable across origins. Our findings also suggest than Japan is a receptive market for meat produced with GM-free feed and for meat products meeting full organic standards.

Key words: beef, choice experiment, county of origin, Japan, organic, pork, U.S. exports

Introduction

Country-of-origin labeling (COOL) transforms a credence attribute into an observable search attribute, much like price and brand. COOL allows consumers to form images associated with products from various countries analogous to brand images. Observable attributes and their perceptions serve as decisive factors until consumers have developed opinions about intrinsic product attributes, such as flavor, based on repeated experience.

Japan has required COOL for all fresh foods since 2000. In 2005, the United States was the country of origin for 26.4% of Japanese imported food, which makes up nearly a third of its entire food supply. Japan is a major overseas market for U.S. agricultural products, particularly meat. Before the December 2003 discovery of BSE (bovine spongiform encephalopathy) in the United States, it was the largest destination of U.S. beef exports, which totaled $1.4 billion in 2003 and accounted for 28% of annual beef supply in Japan. During a two-year disruption of U.S. beef exports to Japan, new trade terms were negotiated, most critically allowing only beef from cattle under the age of 20 months. Trade was resumed in December 2005, only to be terminated again after 5 weeks due to an apparently neglectful violation of the new terms. Trade reopened for good in July 2006 and has continued to the present.

The trade ban disrupted the Japanese red meat market, and prospects of U.S. red meat exports to Japan remain uncertain in the near term. During the beef trade ban, the U.S. share of imported beef in Japan was picked up by Australia. In 2008, Australia still accounted for 78% of imported volume, compared to 11.8% for the United States. U.S. beef generated $383 million, less than a third of its 2003 level. Japan consumed 3.4% more pork during 2004 and 2005 than the preceding years, but since 2006 annual disappearance of pork has returned to the pre-ban level. Nonetheless, U.S. pork has steadily increased sales in Japan from $784 million in 2003 to $1.5 billion in 2008 (U.S. Meat Export Federation, 2010). Its expansion in volume share of imports from 32.6% to 41.2% coincides

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with the decline in the Danish share from 29.3% to 19.6% (Agriculture and Livestock Industries Corporation, 2011).

Another trend during the beef trade ban was an expansion in the production of specialty livestock products, such as those certified organic or produced with no added growth hormones, particularly in the United States. From 2003 to 2008 production of certified organic beef cattle and hogs and pigs increased 133% and 54%, respectively (U.S. Department of Agriculture, Economic Research Service, 2011). While certified organic animals must be raised without any hormones and antibiotics, this statistic does not include animals classified as "natural," which may also have been raised without hormones or antibiotics. Japan has seen a growth in the so-called "natural food" market. While its organic market is nascent compared to European or U.S. markets–equaling only 5.6% of the U.S. market in 2009 (Willer and Kilcher, 2011)–Japan is projected to be the largest organic market in Asia (Kuhlmann and Everett-Jones, 2006). Japanese consumers have generally been wary to accept genetically modified (GM) food products (McCluskey et al., 2003). They are also sensitive to having a large share of foods supplied from overseas and appear concerned about farming practices in exporting countries such as the United States (Peterson and Yoshida, 2004). However, Japanese preferences for these livestock products are yet to be studied in depth.

To gain insight on marketing opportunities and challenges for U.S. meat products in Japan following the beef trade ban, this paper examines how Japanese consumers value beef and pork products of various countries of origin. Specifically, we estimate consumer values of U.S. beef and pork relative to products from other origins in two time periods: immediately after the trade ban had been lifted and three years later. We then explore whether livestock product attributes such as hormone-free, fed with feed free of GM organisms, or certified organic could be marketable in Japan, by estimating consumer values for these attributes under exposure to varying amounts of information. Consumers' choices given additional product information will help assess their current perceptions about these production attributes.

Surveys were conducted in late 2006 and in 2009. In the surveys, choice experiments were included to obtain willingness-to-pay estimates for beef and pork of various countries of origin. Choice experiments in versions of the 2009 survey considered production process attributes such as organic and hormone-free. Responses to these new choice tasks were used to estimate consumer values for these production process attributes. We find that U.S. beef and pork products were generally more discounted than other imported products in Japan, but relative discounts had declined from 2006 to 2009. Our findings also suggest a receptive market for organic meat products in Japan and an opportunity for marketing meat products using GM-free feed.

Previous Literature

COOL has been a topic of multiple studies over the last decade. Some studies have focused on food safety issues and the effect on U.S. producers' and consumers' welfare (Brester, Marsh, and Atwood, 2004; Lusk and Anderson, 2004; Lusk et al., 2006). Other studies examined consumer preferences and obtained willingness-to-pay (WTP) estimates for products of various countries of origin, typically using survey instruments as reviewed below. Preferences for domestic products over imported products have been documented for consumers from various parts of the world in multi-country comparisons (Bernués, Olaizola, and Corcoran, 2003; Dransfield et al., 2005; Ehmke, Lusk, and Tyner, 2008) and in single country studies (Alfnes and Rickertsen, 2003; Loureiro and Umberger, 2003, 2007; Alfnes, 2004; Peterson and Yoshida, 2004; Beriain, Sánchez, and Carr, 2009; Chung, Boyer, and Han, 2009). In the context of beef, Norwegians (Alfnes and Rickertsen, 2003; Alfnes, 2004), Spaniards (Beriain, Sánchez, and Carr, 2009), and Koreans (Chung, Boyer, and Han, 2009) preferred their own products over U.S. products, but urban consumers in the United Kingdom, Germany, and France were on average indifferent regarding domestic beef versus hormone-free beef from the United States (Tonsor et al., 2005). While there are several theories about the role of country image on product purchases (see Skaggs et al., 1996, for review), ethnocentrism, a tendency to view the world from the perspective of one's own group, has been attributed to the preference for domestic products (Shimp and Sharma, 1987).

Estimated values for country-of-origin (COO) information have varied across studies. Mørkbak, Christensen, and Gyrd-Hansen (2008), in their review of 35 stated preference studies valuing food safety attributes in meat, ascribed the differences to products used in valuation, selection bias, and ambiguity in the perception of attributes. They called for additional studies to examine the impact of additional information about attributes on consumer assessment. Consistent with the halo theory, consumers seemingly view COOL as collective indicators of quality, including intrinsic attributes and food safety assurance (Beriain, Sánchez, and Carr, 2009; Loureiro and Umberger, 2003, 2007).

Estimated consumer values have also been found to be dependent on the attributes included in the assessments. In a general marketing context, Verlegh and Steenkamp (1999) noted that larger COO effects were found in studies that examined COO in isolation, compared to cases where COO was assessed along with other quality indicators. Gao and Schroeder (2009) varied the number of attributes in a choice experiment study to examine the impact of additional attributes in the choice set on consumer assessment of beef attributes. One of the attributes indicated that the product was "U.S. certified," which was expected to signal multiple dimensions of product quality. Indeed, they found that WTP estimation depended on the attributes included in the valuation exercise, and the WTP for cue attributes such as COO tended to be affected more than single-faceted attributes. In their study, however, the rank of attributes based on WTP was not affected by presenting additional attributes.

Demographic and psychographic factors, such as trust, can help explain some variation in consumer values of meat attributes, including COO. Angulo and Gil (2007) conceptualized links among consumers' confidence in food safety, perceived risk for beef, and WTP for labeled beef as a signal of reduction in perceived risk and empirically estimated their model using phone interview responses from Spanish consumers. They found that education and trust in information sources affected confidence in food safety, which in turn, affected perceived risks associated with beef. Perception of beef safety was a main determinant of respondents' WTP for certified beef, along with income, level of beef consumption, and the average price paid for beef. Tonsor et al. (2005) found European consumers' valuation of domestic beef and hormone-free U.S. beef varied systematically by gender, education, and income. Chung, Boyer, and Han (2009) included travel experience to countries that export beef to Korea as proxies for trust levels consumers may have for those countries as interaction terms with beef attributes, but none of these travel experience variables were statistically significant. They only found that older consumers, consumers who shopped at upscale stores, and full-time homemakers were more sensitive to COO and were willing to pay more for Korean beef.

How COO is valued by consumers relative to other attributes is a relevant question for the meat industry and policy makers. Mørkbak, Christensen, and Gyrd-Hansen (2008) categorized meat attributes into three groups by WTP estimates from studies in their review; origin was grouped in the middle group with organic and general food safety, while avoiding added hormones and GM products were listed in the group with the highest WTP. Consistent with their ranking, Tonsor et al. (2005) found that European consumers valued beef from animals that were not given hormones or antibiotics and were not fed GM grains more than domestic beef, Loureiro and Umberger (2007) found that U.S. consumers valued food safety assurance more than COOL, and Ehmke, Lusk, and Tyner (2008) found that COO was not as important to students in China, France, Niger, and the United States as the use of GM and pesticide. However, COO mattered much more to Korean consumers than the use of GM feed and antibiotics (Chung, Boyer, and Han, 2009).

A few studies have examined the preferences of Japanese consumers for COO. A choice experiment conducted by Peterson and Yoshida (2004) found strongly negative perceptions of imported rice varieties among Japanese consumers. While consumer values were significantly discounted by uncertainty about flavor and safety, flavor was the major factor for U.S. rice in particular. Kim, Suwunnamek, and Toyoda (2008) studied Japanese consumer preferences for organic labeling varying in countries of origin and sources of quality assurance. The study found that Japanese consumers were willing to pay a premium for organic products that were domestic as opposed to organic imported products, illustrating that origin still mattered in the presence of an organic label. They found no differences in premiums among import origins considered, including the United States, Australia, and Canada. The study also found that the source of quality assurance was important; Japanese consumers preferred the mandatory government label over voluntary source verification by consumer organizations, independent agencies, and retailers. Our study focuses on estimating values of COO for beef and pork products from a national sample of consumers in Japan. In addition to the origin of production, the attributes of the meats valued include different labels indicating production processes: organic, GM-free feed, and hormone-free. We examine the impacts of demographic and psychographic characteristics on estimated values.

Methods

Survey Instrument

The survey was designed with a choice experiment, which is useful for estimating marginal values associated with individual attributes, along with questions on perceptions about product labels and production practices, trust of public and private entities in ensuring quality food products, and demographics. After pre-testing, it was administered to Japanese consumers in November 2006 and June 2009 via the Internet through a reputable research firm that was asked to provide a nationwide sample of about 300 households for each administration. The samples were age- and gender-stratified to match the general population. For both 2006 and 2009 surveys, there were beef and pork versions. The meat products used for valuation were specified as typical cuts of "beef for Korean barbeque or *sukiyaki*" and "pork for stir-fry," respectively.

The 2006 survey and sub-version 1 of the 2009 survey included choice tasks with COO and price as only attributes. The COO attribute levels were specified as Japan, U.S., and a third country, which was Australia for beef and Denmark for pork. During the study period, Australian beef accounted for about 44% to 51% of the Japanese beef supply, and Danish pork accounted for about 10% of the Japanese pork supply (Agriculture and Livestock Industries Corporation, 2011). Three price levels were specified in yen per 100 grams, and distinct ranges were used for each product-origin combination. The prices were initially set based on national average retail prices and from reviews of grocery store advertisements at the time of the survey. The ranges were then adjusted based on pre-test results to ensure that the responses were balanced across price levels.[1]

Sub-versions 2 and 3 of the 2009 survey included choice tasks that asked respondents to consider production processes of meats in addition to COO and price.[2] The production process for beef was represented as an attribute with four levels: "hormone-free," "GM-free feed," "organic" (implying products are both hormone- and GM-free), and "no label." The process attribute for pork had the same levels, except "hormone-free" was excluded because hormones are not commonly administered in pork production. The selection of these attributes would enable comparisons of Japanese preferences to those of consumers in other parts of the world. Our focus on the use of hormones and GM-free feed is consistent with Lusk, Roosen, and Fox (2003) on European and U.S. consumers' preferences. The use of hormones is a main difference in mainstream livestock management practices in Japan and the United States. The use of antibiotics in animal feed is another

[1] In the 2006 survey, the midpoint of the price ranges for Japanese, U.S., and Australian beef were set at 432 yen, 267 yen, and 367 yen per 100 grams, respectively, with endpoints 125 yen above and below the midpoints. Ranges for pork prices were 137 $\pm$ 30 yen for Japanese pork and 132 $\pm$ 30 yen for U.S. and Danish pork. In the 2009 survey, beef price ranges were centered at 362, 167, and 187 yen for Japanese, U.S., and Australian beef, respectively (endpoints of $\pm$ 85 yen); pork prices were centered at 167 yen for Japanese pork and 122 yen for U.S. and Danish pork (endpoints of $\pm$ 25 yen).

[2] In these versions, the price ranges for beef from Japan, the US, and Australia were centered at 432, 187, and 227 yen per 100 grams, respectively (endpoints of $\pm$ 95 yen). The price ranges for pork from Japan, the United States, and Denmark were centered at 172, 132, and 132 yen per 100 grams, respectively (endpoints of $\pm$ 25 yen).

commonly acknowledged concern among consumers, but Lusk, Fox, and McIlvain (1999) found it to be of less concern than the use of hormones. Moreover, it is typically labeled jointly with the use of hormones in the United States and thus is examined jointly (Tonsor et al., 2005). As such, it was not considered in this study as a distinct attribute.

Sub-version 3 included brief statements explaining these production practices immediately before the choice tasks to examine how additional information, if any, would impact consumer values. The translated information statements appear in Appendix A. Values estimated from sub-version 2, which did not include these statements, would represent what consumers infer from labels alone based on their current states of knowledge. These values can be compared to those from sub-version 3, where information implied by labels would be less ambiguous to respondents.

Choice scenarios were generated based on orthogonality and balance using the "%mktex" macro and the "%choiceff" macro in SAS 9.1. Each survey contained six choice scenarios with each task consisting of three alternatives plus an opt-out of choosing none of the products. An inclusion of an opt-out alternative is debatable, but its inclusion better mimics the actual shopping experience (Adamowicz, Louviere, and Swait, 1998). Moreover, an explicit comparison between two choice experiment designs with and without the opt-out alternative showed no differences in terms of choices, respondents choosing or not choosing the opt-out alternatives, and marginal WTP (Carlsson, Frykblom, and Lagerkvist, 2007). The D-efficiency measures ranged from 95.20 to 99.07.

Random Parameter Logit Models

Multinomial logit models are used to analyze responses from discrete consumer choices of similar products with distinct combinations of attributes. However, it is expected that consumer preferences are heterogeneous. A random parameter logit (RPL) model allows for heterogeneous preferences with unrestricted substitution patterns and is flexible enough to approximate any random utility model (McFadden and Train, 2000).

The utility that individual i derives from choosing alternative j is assumed to consist of components that are observable and unobservable:

$$U_{ij} = V(\boldsymbol{X}_{ij};\boldsymbol{\beta}_i) + \varepsilon_{ij}, \tag{1}$$

where V represents the observable component that depends on attributes of the alternatives and individual characteristics, $\boldsymbol{X}_{ij}$, and the parameter vector $\boldsymbol{\beta}_i$, while ε_{ij} represents the unobservable, random component. In an RPL, the random component in equation (1) is assumed to be independently and identically distributed (*iid*) extreme value type I, and the parameters $\boldsymbol{\beta}$ are allowed to vary across individuals with density $f(\boldsymbol{\beta})$. Choice probabilities are integrals of standard logit probabilities over the parameter densities (Train, 2003); assuming that the utility is linear in $\boldsymbol{\beta}$, they can be written as:

$$P_{ij}(\boldsymbol{\theta}) = \int \left(\frac{e^{\boldsymbol{X}_{ij}\boldsymbol{\beta}_i}}{\sum_{k=0}^{J} e^{\boldsymbol{X}_{ik}\boldsymbol{\beta}_i}} \right) f(\boldsymbol{\beta}|\boldsymbol{\theta})d\boldsymbol{\beta}, \tag{2}$$

where $\boldsymbol{\theta}$ is the vector of parameters that define $f(\boldsymbol{\beta})$. Assuming V_{ij} is linear in parameters, the model with only price and COO attributes takes the form of:

$$V_{ij} = \beta_{1i}price_j + \beta_{2i}JP_j + \beta_{3i}US_j + \beta_{4i}TCO_j, \tag{3}$$

where TCO (third country of origin) equaled AU for the beef and DE for the pork models, respectively, and JP, US, AU, and DE are dummy variables representing Japanese, U.S., Australian, and Danish origins. In our case, alternative-specific constants are equal to the coefficients on COO attributes. For the choice tasks with production process attributes, the observable component of utility can be written out as:

$$V_{ij} = \beta_{1i}price_j + \beta_{2i}JP_j + \beta_{3i}US_j + \beta_{4i}TCO_j + \beta_{5i}org_j + \beta_{6i}NGMfeed_j + \beta_{7i}hfree_j, \tag{4}$$

where *org* (organic), *NGMfeed* (GM-free feed), and *hfree* (hormone-free) are binary variables representing different levels of the production process attribute, and observations for *hfree* were all zeros for the pork model. In both models, the utility level when a non-buy option is chosen was normalized to zero.

If individual characteristics can be used to segment consumers by their preferences, conditional means of parameters should depend on individual characteristics. Thus, individual-specific parameters were specified as:

$$\beta_{li} = \beta_l + \boldsymbol{\delta}_l' \boldsymbol{z}_i + \sigma_l \upsilon_i, \quad l = 2, 3, 4 \text{ in (3) or } 2, 3, ..., 7 \text{ in (4)}, \tag{5}$$

where β_l is the population mean of the coefficient on the lth attribute, $\boldsymbol{\delta}$ and σ are parameters, $\boldsymbol{z}_i$ is a vector of observed individual characteristics, and υ_i is an *iid* error term with a standard normal distribution. Following convention, the price coefficient was specified as fixed across individuals to simplify the computation of implicit values. All non-price attribute parameters were specified as normal, with conditional means as functions of selected respondent characteristics.

The impact of additional information provided in sub-version 3 was examined by including a binary variable representing the individual's exposure to the additional information by interacting it with all attribute variables. To make the model tractable, coefficients on these interaction terms were specified as fixed. The statistical significance of the parameter vector on the interaction terms would imply the impact of additional information.

Each RPL was estimated by simulating distributions using 100 draws from Halton method using NLOGIT 4.0 (Greene, 2007, p. N17-63). Individual specific parameters were estimated, based on choices they made and individual-specific variation of the error component (Greene, 2007, p. N17-37). Individual-specific WTP estimates for meat attributes were computed from individual-specific, attribute parameters and fixed, price and information parameters. Each WTP estimate of attributes was calculated as the negative ratio between the attribute and price parameters. Denoting the parameters of the interaction terms with γ, WTP estimates for attribute l with additional information would be calculated as:

$$WTP_l = -\frac{\beta_l + \gamma_l}{\beta_1 + \gamma_1} \tag{6}$$

where the subscript 1 references parameters on price.

Results

Survey Response Summary Statistics

Descriptive statistics for survey responses can be found in table 1. For each variable, the statistical equivalence of sub-sample averages based on pair-wise t-tests at the 5% level is denoted by shared lettered superscripts. For example, mean values for *AGE* in the 2006 and 2009 beef and pork samples were all statistically equivalent with each other at the 5% level; the same held true for *GENDER*, except the 2009 beef sample had proportionally more female respondents than the 2009 pork sample. Sample demographics were mostly similar between years for each commodity.

Despite the stratified sampling, the sample was younger than the Japanese adult population, averaging around 51 years of age. This is because the oldest age strata used by the survey company was 40 and older, as proportionally fewer older people were accessible via the Internet. About half of the respondents were female and about half had a baccalaureate or higher degree. The sample average household income was comparable to the 2006 median household income in Japan of 4.58 million yen (Ministry of Health, Labour, and Welfare, 2007). The population density of the respondent's home municipality was much higher than the 2006 Japanese national average of 1,032.8 people per square kilometer (computed from data available from UUB), suggesting that the

Table 1. Variable Definitions and Summary Statistics

		Beef		Pork	
		2006 n = 313	2009 n = 312	2006 n = 310	2009 n = 315
Variable	Definition	Mean (Std. Dev.)	Mean (Std. Dev.)	Mean (Std. Dev.)	Mean (Std. Dev.)
AGE		42.97^{a}	44.48^{a}	43.02^{a}	44.99^{a}
		(13.43)	(13.25)	(13.38)	(13.46)
COMEATS	Concerned whether meats are from	$3.82^{a,b}$	$3.83^{a,b}$	3.95^{a}	3.73^{b}
	foreign origin (1 = not at all, ..., 5 = extremely)	(1.22)	(1.14)	(1.10)	(1.18)
GENDER	1 = female	$0.55^{a,b}$	0.57^{a}	$0.53^{a,b}$	0.48^{b}
		(0.50)	(0.50)	(0.50)	(0.50)
EDUC	1 = baccalaureate or higher	0.53^{a}	$0.48^{a,b}$	0.51^{a}	0.43^{b}
		(0.50)	(0.50)	(0.50)	(0.50)
INC	Annual gross household income	460.53^{a}	449.51^{a}	455.48^{a}	433.49^{a}
	(10,000 yen)	(313.48)	(324.00)	(332.57)	(326.36)
MEAT	Frequency of fresh meat purchases	$2.49^{a,b}$	2.54^{a}	2.39^{b}	2.58^{a}
	(1 = daily, 2 = 2-3 times per week, 3 = once a week, 4 = 1-2 times a month, 5 = less than once a month)	(0.78)	(0.80)	(0.78)	(0.80)
POPDENS	Population density of the residing	46.91^{a}	43.52^{a}	42.49^{a}	46.80^{a}
	municipality (100 people per square kilometer)	(47.00)	(47.77)	(46.72)	(47.47)

Notes: For each row, the means that share the lettered superscripts are statistically equivalent at the 5% level.

sample included proportionally more people from urban areas than the population. Implications of such sample features on our findings would depend on what impacts age and population density have on estimated attribute values. If an attribute is favored more by older respondents, for example, our mean estimates would underestimate the population mean.

Two additional variables were included to examine impacts of some attitudinal differences. A 5-point scale variable represented levels of concern about purchasing meat from foreign countries (*COMEATS*), and an ordinal variable measured how frequently respondents purchased fresh meats (*MEAT*), which may signal familiarity with meat products or account for impacts of budget constraint on marginal utility. While we did not expect any differences in responses by meat versions, results from the pair-wise t-test results suggest otherwise. There were no statistical differences in the concern towards imported meat and frequency of fresh meat purchases among the beef survey respondents in 2006 and 2009, while the 2009 pork survey respondents were less concerned about imported meat and purchased fresh meat less frequently than the 2006 pork survey respondents.

Discounts for U.S. Products in 2006 and 2009

Table 2 summarizes individual WTP estimates based on the RPL model using equation (3) for meat products of various COO from the 2006 and 2009 (sub-version 1) choice tasks. The parameter means were specified as functions of demographic variables (*GENDER*, *AGE*, *EDUC*, *INC*, and *POPDENS*), the frequency of household purchase of fresh meat and poultry (*MEAT*), and the concern for the origin of fresh meat products (*COMEATS*), as defined in table 1. Complete estimation results are found in the appendix.

Previous studies have found that values of individual attributes in a choice experiment could be estimated consistently with non-hypothetical values (Lusk and Schroeder, 2004), and that goods familiar to consumers such as grocery items may suffer little from hypothetical bias (Peterson,

Table 2. Simulated Willingness to Pay for Beef and Pork Products by Origin in 2006 and 2009

	Beef			
	2006 n=313		2009 n=103	
Country	yen/100 grams	% discount from Japanese product	yen/100 grams	% discount from Japanese product
Japan	567.15		433.74	
	(135.50)		(603.66)	
US	66.25	83.77%^{a,f}	155.46	39.31%^{a,b,c,d,e,f}
	(216.29)	(45.83%)	(205.23)	(414.00%)
Australia	417.74	21.44%^{d,f}	376.18	19.58%^{a,b,c,d,e,f}
	(111.24)	(29.23%)	(160.77)	(604.08%)

	Pork			
	2006 n=310		2009 n=105	
Country	yen/100 grams	% discount from Japanese product	yen/100 grams	% discount from Japanese product
Japan	184.61		189.27	
	(28.23)		(97.84)	
US	113.81	36.44%^{b,f}	137.90	2.61%^{e,f}
	(30.00)	(21.11%)	(40.97)	(59.77%)
Denmark	126.31	29.74%^{c,f}	140.93	2.85%^{e,f}
	(24.72)	(18.49%)	(41.57)	(56.40%)

Notes: Numbers in parentheses are standard deviations of individual-specific willingness-to-pay estimates. The "%discount numbers" that share the lettered superscripts are statistically equivalent at the 5% level.

Bernard, and Fox, 2008). Indeed, our estimates were comparable to the national average retail prices, which were about 403 (648) and 356 (658) yen per 100 grams for domestic beef (*wagyu* beef) in November 2006 and June 2009, respectively (Agriculture and Livestock Industries Corporation, 2011).[3] Corresponding information has not been available for U.S. beef since 2004, but the national average retail price for Australian beef had declined from 248 yen in 2006 to 235 yen in 2009. Average national retail prices for domestic (imported) pork in November 2006 and June 2009 were 246 (172) and 252 (159) yen per 100 grams in nominal terms, respectively. For reference, the 2005-based fresh meat price index over this period rose slightly from 101.0 to 104.4 (Japanese Ministry of Internal Affairs and Communications, Statistics Bureau, 2010).

For each subject, an estimated percentage discount was computed for imported products by subtracting the subject's WTP estimate for U.S. or the third country's products from her WTP for domestic products and dividing by the WTP for domestic products. Discounts for imported products relative to domestic products are consistent with the previous literature on preferences for domestic products. Percentage discounts were tested for equivalence in means between import origins, meat products, and survey years, using pair-wise t-tests. Results are indicated by lettered superscripts (i.e., if two entries share the same superscript, then a pairwise t-test of mean equivalence cannot be rejected). Standard deviations for the percentage discounts from the 2009 beef survey were so large for both U.S. and Australian products that no statistical difference can be established between these two means and other means. Thus, all percentage discounts share the superscript f. Ignoring the superscript f allows us to make some useful observations.

For example, the 83.8% mean discount for U.S. beef in 2006 was statistically different from the 21.4% mean discount for Australian beef in 2006 at the 5% level. Similarly, in 2006, the average discount for U.S. pork was greater than the average discount for Danish pork. But, in 2009, the

[3] *Wagyu* refers to the beef from purebred animals belonging to a native breed of cattle in Japan. *Wagyu* beef commands a higher price than overall domestic beef, which mainly consists of beef from dairy breeds, a byproduct of the dairy industry (Peterson and Chen, 2005).

average discounts for U.S. and Danish pork are statistically equivalent. Second, imported U.S. beef was subject to greater discounts on average than U.S. pork, regardless of survey years considered. This is consistent with previous studies, which found beef attributes to be of greater value than pork attributes (Carlsson, Frykblom, and Lagerkvist, 2005; Hobbs et al., 2005).

Moreover, U.S. products were subject to greater discounts on average than Australian or Danish products for both beef and pork in 2006, but the difference diminished in 2009. The 2006 results are comparable to the findings by Kim, Suwunnamek, and Toyoda (2008) that Japanese consumers held lower implicit values for U.S. products relative to Canadian or Australian products. Chung, Boyer, and Han (2009) also estimated U.S. products to have slightly lower valuations among Korean consumers than products from other countries including Australia, New Zealand, and Canada. The fact that U.S. pork was valued similarly to Danish pork in 2009 implies an image problem for the U.S. industry. For typical products sold in grocery stores, U.S. pork is imported as chilled, unlike Danish pork, which is primarily frozen. Thus, in most taste tests, Danish pork product is rated below U.S. products (Yoshioka, 2006).

The Values of Alternative Production Process Attributes

Now we turn to exploring the demand for alternative production process attributes for meats among Japanese consumers. Using the responses from sub-versions 2 and 3 of the 2009 survey, the impact of additional information provided in sub-version 3 was examined first. Initially, likelihood ratio tests found the full model with information terms on all attributes to be statistically equivalent to the restricted model with no information terms. But, coefficients on information terms of production process attributes were individually statistically significant. As these production processes are unfamiliar to Japanese consumers relative to COO or price, a model with information terms on production process attributes alone was estimated, which was preferred over the previous specifications based on likelihood function values and Akaike Information Criteria for both meats. The final model estimates are presented in table 3.

All fixed coefficients, except for the information term for hormone-free attribute, were statistically significant at the 1% level. None of the random coefficients on beef attributes were statistically significant, while all COO and organic coefficients in the pork model were significant. Statistically significant standard deviations on all random coefficients in both models suggest strong heterogeneity among preferences. Particularly for beef, the individual characteristics specified to account for heterogeneity in parameter means accounted for a relatively small share of overall preference variation.

Heterogeneity-in-mean parameters indicate that female respondents, on average, derived higher utility from beef of all origins and from U.S. and Danish pork, but valued organic labels on beef less than their male counterparts (*GENDER*). Younger respondents valued pork products of all origins and U.S. beef more than older respondents, but older respondents valued organic labels on beef more (*AGE*). Those with higher education valued U.S. beef less and organic labels on beef more than others (*EDUC*). Income had positive impacts on the means of the coefficients on the Japanese origin and GM-free attributes in the beef model (*INC*). People who lived in more rural areas valued Japanese beef more than their urban counterparts (*POPDENS*). Respondents who shopped for fresh meats more frequently did not derive as much utility from Japanese pork as those who shopped less frequently (*MEAT*). Lastly, those who were concerned about the origin of meats placed higher values on Japanese pork and hormone-free beef products (*COMEATS*).

Our results show that consumer values vary systematically by demographic and other individual characteristics. In particular, valuation towards COO and organic attributes varied by gender, age, and education. The impacts of age and educational attainment on preferences towards U.S. beef are consistent with our regression analysis above. Given our sample bias towards younger individuals, our mean WTP estimates for organic products may be underestimated,

Table 3. Random Parameter Logit Model Estimates with Country-of-Origin and Production Process Attributes

	Beef		Pork	
Variables/Statistics	**Coefficient**	**Std. Error**	**Coefficient**	**Std. Error**
JP (random)	0.70	2.26	7.82***	2.21
Standard deviation	4.39***	0.48	5.11***	0.64
Heterogeneity-in-mean				
GENDER	1.33**	0.61	0.71	0.74
AGE	0.04	0.03	−0.08***	0.02
EDUC	−0.37	0.64	0.07	0.65
INC	0.00**	0.00	0.00	0.00
POPDENS	−0.01*	0.01	0.00	0.01
MEAT	−0.98***	0.38	−0.64*	0.35
COMEATS	0.37	0.30	1.30***	0.40
US (random)	0.67	1.73	11.52***	1.40
Standard deviation	1.87***	0.30	1.71***	0.22
Heterogeneity-in-mean				
GENDER	1.62***	0.55	1.08**	0.45
AGE	−0.03*	0.02	−0.06***	0.02
EDUC	−0.86*	0.52	−0.34	0.42
INC	0.00	0.00	0.00	0.00
POPDENS	0.00	0.01	0.00	0.00
MEAT	0.27	0.30	−0.47*	0.25
COMEATS	−0.11	0.26	−0.71***	0.20
AU/DE (random)	1.25	1.42	9.55***	1.36
Standard deviation	1.39***	0.19	1.66***	0.24
Heterogeneity-in-mean				
GENDER	1.56***	0.47	1.11***	0.42
AGE	−0.02	0.02	−0.04**	0.01
EDUC	−0.48	0.44	−0.37	0.41
INC	0.00	0.00	0.00	0.00
POPDENS	−0.01	0.00	0.00	0.00
MEAT	0.11	0.26	−0.01	0.24
COMEATS	0.14	0.20	−0.85***	0.20
Organic (random)	−1.83	1.20	1.77**	0.90
Standard deviation	0.51**	0.23	1.27***	0.19
Heterogeneity-in-mean				
GENDER	−0.73*	0.39	−0.48	0.33
AGE	0.04***	0.01	0.00	0.01
EDUC	0.83**	0.38	0.20	0.32
INC	0.00	0.00	0.00	0.00
POPDENS	0.00	0.00	0.00	0.00
MEAT	−0.01	0.23	−0.27	0.18
COMEATS	0.08	0.16	−0.18	0.12

(continued on next page. . .)

Table 3. – continued from previous page

	Beef		Pork	
Variables/Statistics	**Coefficient**	**Std. Error**	**Coefficient**	**Std. Error**
GM-Free Feed (random)	−0.31	1.31	−0.35	1.12
Standard deviation	0.73***	0.26	1.70***	0.28
Heterogeneity-in-mean				
GENDER	−0.70	0.44	−0.12	0.41
AGE	−0.02	0.02	0.03**	0.01
EDUC	0.23	0.42	0.81**	0.40
INC	0.00*	0.00	0.00	0.00
POPDENS	−0.01	0.00	0.00	0.00
MEAT	−0.24	0.25	−0.28	0.22
COMEATS	0.26	0.18	−0.42***	0.16
Hormone-Free (random)	−2.38	1.49		
Standard deviation	1.36***	0.20		
Heterogeneity-in-mean				
GENDER	−0.77	0.48		
AGE	−0.01	0.02		
EDUC	0.22	0.46		
INC	0.00	0.00		
POPDENS	0.00	0.00		
MEAT	0.13	0.27		
COMEATS	0.47**	0.21		
Price (fixed)	−0.01***	0.00	−0.04***	0.00
Organic × *Info* (fixed)	0.92***	0.29	0.83***	0.30
GM-Free Feed × *Info* (fixed)	0.79**	0.35	1.40***	0.38
Hormone-Free × *Info* (fixed)	0.43	0.34		
Number of observations	1,254		1,260	
Log likelihood function	-1208.00		-1183.58	
McFadden Pseudo R-squared	0.31		0.322	
Akaike Information Criterion	2.02		1.955	

Notes: Single, double, and triple asterisks (*, **, ***) represent significance at the 10%, 5%, and 1% level.

while those for pork from the origins considered here and for U.S. beef may be overestimated. Our sample also consisted of proportionally more individuals from urban areas than the general population. The population density impacted the mean of the Japanese beef coefficient at the 10% level, suggesting that the value of Japanese beef may be underestimated.

Statistics of individual-specific WTPs are summarized in table 4.[4] For example, mean WTP for Japanese beef was 415.2 yen per 100 grams with standard deviation of 525.1 yen. The distribution appears to be skewed to the right, with a median (360 yen) below the mean. Slightly more than a quarter of simulated values were negative.

[4] Values for production process attributes with additional information were computed according to equation (6), where the numerator, the individual-specific coefficient for the production process plus the fixed interaction coefficient, was divided by the fixed price coefficient.

Table 4. Individual-Specific Willingness to Pay for Country of Origin and Other Production Attributes (yen/100 grams)

	Beef (n = 209)				Pork (n = 210)			
Attributes	Mean	Std. Dev.	Median	Share <0	Mean	Std. Dev.	Median	Share <0
Japan	415.18	525.08	359.97	27.2%	188.13	115.28	182.98	1.0%
US	−16.93	216.38	−45.60	56.3%	142.50	49.26	144.74	0.0%
Australia/Denmark	228.06	161.26	244.95	8.7%	140.46	43.86	140.67	0.0%
Organic	58.59	99.09	58.94	26.2%	11.61	21.97	11.88	27.5%
w/ addtl. info.	175.98	99.09	176.33	2.9%	32.74	21.97	33.01	7.2%
GM-Free Feed	−90.18	89.21	−75.17	85.4%	−25.18	34.69	−25.69	74.9%
w/ addtl. info.	10.97	89.21	25.97	42.7%	10.29	34.69	9.78	37.2%
Hormone-Free	−73.19	143.33	−69.14	69.4%				
w/ addtl. info.	−18.82	143.33	−14.78	53.4%				

The average WTP for U.S. beef was negative (-16.9 yen per 100 grams), with its distribution skewed to the right with a median (-45.6 yen) much further below the mean and 43.7% of individual values above zero. The WTP for Australian beef averaged 228.1 yen per 100 grams and was estimated with the smallest standard deviation, resulting in the smallest percentage of negative values among COO attributes. In contrast, estimated individual values for pork origins were nearly all positive, averaging 188.1 yen per 100 grams for Japanese pork, 142.5 yen for U.S. pork and 140.5 yen for Danish pork. Noticeably, WTPs for beef attributes had much more variability than those for pork attributes, as expected from the estimation results. The results suggest that not only mean attribute values but standard deviations of attribute values are product dependent, which was not the case in Carlsson, Frykblom, and Lagerkvist (2005). If attributable to BSE, we would expect to see higher variability in 2006 estimates compared to 2009 estimates in table 2. Thus, this high variability could be something unique to Japanese preferences for beef at the time of the study.

Comparing the WTP estimates in table 4 to the 2009 estimates without production process attributes in table 2, mean WTP estimates were lower for beef of all origins when controlling for production attributes, particularly for import origins, but the ranking across origins stayed the same. This is consistent with Gao and Schroeder's finding that COO values decreased with additional attributes included in the choice set. But, pork estimates were not subject to the same effect. At this point, we can only speculate, but pork products may be relatively standardized across countries, at least in the minds of Japanese consumers. Also, quality cues associated with COO in pork could have been relatively independent of the production process attributes considered.

Of the production process attributes considered, respondents were willing to pay on average 58.6 yen per 100 grams more for beef with an organic label. With an explanation of organic meat products, the average increased to 176.0 yen, and the share of negative values decreased from 26% to 3%. An organic label on pork products was valued at 11.6 yen on average, which increased to 32.7 yen with additional information. The impact of additional information was similar for both meats, increasing the value approximately threefold. The organic label yielded proportionally greater value for beef than for pork. Using 500 yen and 250 yen as rough estimates of market prices for domestic beef and pork products, average organic premiums ranged from 11.7% (labels only) to

35.2% (with information) for beef and from 4.6% (labels only) to 13.1% (with information) for pork. Our estimates for organic premiums on beef are higher than the 7% premium estimated by Kim, Suwunnamek, and Toyoda (2008) but are comparable to those reviewed by Mørkbak, Christensen, and Gyrd-Hansen (2008), which ranged from 15% to 75% for multiple products, including beef and pork. Thus, our estimates for organic premiums for pork are on the low end of existing estimates. Perhaps Japanese consumers are content with the quality of currently available pork products and feel no need to seek out alternative quality assurances.

The average values for "GM-free feed" labels were negative but with comparable standard deviations not statistically different from zero. Labels alone generated mostly negative values (85% for beef and 75% for pork), but an explanation of the labels shifted the WTP distributions to the right and reduced these percentages to 43% and 37%, respectively. A similar effect was observed for the WTP of "hormone-free" beef but to a smaller degree, which follows the information term for "hormone-free" being statistically insignificant (table 3).

Results from labels alone suggest that the organic label has established recognition among Japanese consumers as an indication of desirable quality, but the features that are embedded in organic labels (i.e., feed being GM-free and hormone-free) were not separately recognized or valued as much. Thus, the current state of knowledge about GM-free feed and hormone-free products in Japan is likely not high. Basic explanation of production processes implied by labels shifted consumers' WTP to the right for organic and GM-free attributes, shedding light on how much Japanese consumers are willing to pay for these attributes with a better understanding. Comparing consumer values for COO and other production process attributes suggest that Japanese consumers value COO much more than the other production processes considered. This is consistent with the findings of Chung, Boyer, and Han (2009) that Korean consumers valued domestic beef over imported beef by an amount twice as large as the premium they placed on beef fed with GM-free feed.

Conclusions

The overall value of U.S. agricultural products is increasingly dependent on international consumers' perceptions of the products' quality relative to products from other origins. During the last decade, COOL has been mandated for an increasing number of export commodities (General Accounting Office, 2003). Currently, exports generate approximately a third of the value generated by U.S. agriculture (computed from numbers reported by U.S. Department of Agriculture, Economic Research Service, 2010), and the role of exports in maintaining agricultural revenues is expected to become more important as productivity growth in U.S. agriculture is expected to outpace domestic demand. This paper examined consumer values for beef and pork originating from the United States and other countries in the Japanese market after the 2003-2006 beef trade ban.

Consistent with previous studies, we found that Japanese consumers heavily discount U.S. beef and pork products relative to the prices they are willing to pay for domestic meats. However, the relative discount declined from 2006 to 2009. The relative discounts for U.S. products were greater than the discounts for products from other import sources in 2006, which is also consistent with previous findings, but our 2009 results found no statistical difference across sources. For the U.S. pork industry, this may be considered a troubling finding, as there are established quality differences between U.S. and Danish pork.

U.S. beef was discounted relatively more than U.S. pork, which is consistent with other studies that have found beef attribute values to be greater than those of pork. In this particular case, it could also be explained by the recent trade dispute surrounding BSE. Prominent in our findings is the fact that heterogeneity in preferences for beef was much greater than for pork, and greater heterogeneity was found in 2009 than in 2006. Consumer values were found to vary systematically by demographics and other individual characteristics to a limited degree. Additional research is needed to gain further understanding of the heterogeneity in preferences, particularly to identify the sources of heterogeneity. Further efforts to attribute heterogeneity in preferences to individual characteristics may be fruitful and could generate useful information for the industry.

Our results also suggest opportunities for value-added meat marketing in Japan. Results suggest that organic is a recognized attribute for which most Japanese consumers are willing to pay a premium, particularly with a basic explanation about organic meat products. Compared to Europe or the United States, markets for meat attributes embedded in organics, such as hormone-free, seem yet to be developed. However, our findings suggest some potential for developing meat products from animals using GM-free feed with appropriate provision of information.

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References

Adamowicz, W., J. Louviere, and J. Swait. "An Introduction to Attribute-Based State Choice Methods." 1998. Prepared by Advanis Inc. for the National Oceanic and Atmospheric Administration, U.S. Department of Commerce. January 1998. Available online at http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.119.6910&rep=rep1&type=pdf.

Agriculture and Livestock Industries Corporation. "Livestock and Livestock Products: Statistical Data." 2011. Available online at http://lin.alic.go.jp/alic/statis/dome/data2/e_nstatis.htm.

Alfnes, F. "Stated Preferences for Imported and Hormone-Treated Beef: Application of a Mixed Logit Model." *European Review of Agricultural Economics* 31(2004):19–37.

Alfnes, F. and K. Rickertsen. "European Consumers' Willingness to Pay for U.S. Beef in Experimental Auction Markets." *American Journal of Agricultural Economics* 85(2003):396–405.

Angulo, A. M. and J. M. Gil. "Risk Perception and Consumer Willingness to Pay for Certified Beef in Spain." *Food Quality and Preference* 18(2007):1106–1117.

Beriain, M. J., M. Sánchez, and T. R. Carr. "A Comparison of Consumer Sensory Acceptance, Purchase Intention, and Willingness to Pay for High Quality United States and Spanish Beef under Different Information Scenarios." *Journal of Animal Science* 87(2009):3392–3402.

Bernués, A., A. Olaizola, and K. Corcoran. "Extrinsic attributes of red meat as indicators of Quality in Europe: An Application for Market Segmentation." *Food Quality and Preference* 14(2003):265–276.

Brester, G. W., J. M. Marsh, and J. A. Atwood. "Distributional Impacts of Country-of-Origin Labeling in the U.S. Meat Industry." *Journal of Agricultural and Resource Economics* 29(2004):206–227.

Carlsson, F., P. Frykblom, and C. J. Lagerkvist. "Consumer Preferences for Food Product Quality Attributes from Swedish Agriculture." *Ambio* 34(2005):366–370.

———. "Consumer Willingness to Pay for Farm Animal Welfare: Mobile Abattoirs versus Transportation to Slaughter." *European Review of Agricultural Economics* 34(2007):321–344.

Chung, C., T. Boyer, and S. Han. "Valuing Quality Attributes and Country of Origin in the Korean Beef Market." *Journal of Agricultural Economics* 60(2009):682–698.

Dransfield, E., T. M. Ngapo, N. A. Nielsen, L. Bredahl, P. O. Sjödén, M. Magnusson, M. M. Campo, and G. R. Nute. "Consumer Choice and Suggested Price for Pork as Influenced by its Appearance, Taste and Information Concerning Country of Origin and Organic Pig Production." *Meat Science* 69(2005):61–70.

Ehmke, M. D., J. L. Lusk, and W. Tyner. "Measuring the Relative Importance of Preferences for Country of Origin in China, France, Niger, and the United States." *Agricultural Economics* 38(2008):277–285.

Gao, Z. and T. C. Schroeder. "Effects of Label Information on Consumer Willingness-to-Pay for Food Attributes." *American Journal of Agricultural Economics* 91(2009):795–809.

General Accounting Office. "Country-of-Origin Labeling: Opportunities for USDA and Industry to Implement Challenging Aspects of the New Law." 2003. Report to Congressional Requesters GAO-03-780. Available online at http://www.gao.gov/new.items/d03780.pdf.

Greene, W. H. *NLOGIT Version 4.0: Reference Guide*. Plainview, NY: Econometric Software, Inc., 2007.

Hobbs, J. E., D. L. Dickinson, D. V. Bailey, and M. Haghiri. "Traceability in the Canadian Red Meat Sector: Do Consumers Care?" *Canadian Journal of Agricultural Economics* 53(2005):47–65.

Japanese Ministry of Internal Affairs and Communications, Statistics Bureau. "Consumer Price Index." 2010. Available online at http://www.stat.go.jp/english/data/cpi/index.htm.

Kim, R., O. Suwunnamek, and T. Toyoda. "Consumer Attitude towards Organic Labeling Schemes in Japan." *Journal of International Food & Agribusiness Marketing* 20(2008):55–71.

Kuhlmann, H. and J. Everett-Jones. "The Organic Food Market in Japan." *Australian Organic Journal* Autumn(2006):20–21.

Loureiro, M. L. and W. J. Umberger. "Estimating Consumer Willingness to Pay for Country-of-Origin Labeling." *Journal of Agricultural and Resource Economics* 28(2003):287–301.

———. "A Choice Experiment Model for Beef: What US Consumer Responses Tell Us about Relative Preferences for Food Safety, Country-of-Origin Labeling and Traceability." *Food Policy* 32(2007):496–514.

Lusk, J. L. and J. D. Anderson. "Effects of Country-of-Origin Labeling on Meat Producers and Consumers." *Journal of Agricultural and Resource Economics* 29(2004):185–205.

Lusk, J. L., J. Brown, T. Mark, I. Proseku, R. Thompson, and J. Welsh. "Consumer Behavior, Public Policy, and Country-of-Origin Labeling." *Review of Agricultural Economics* 28(2006):284–292.

Lusk, J. L., J. A. Fox, and C. L. McIlvain. "Consumer Acceptance of Irradiated Meat." *Food Technology* 53(1999):56–59.

Lusk, J. L., J. Roosen, and J. Fox. "Demand for Beef from Cattle Administered Growth Hormones or Fed Genetically Modified Corn: A Comparison of Consumers in France, Germany, the United Kingdom, and the United States." *American Journal of Agricultural Economics* 85(2003):16–29.

Lusk, J. L. and T. C. Schroeder. "Are Choice Experiments Incentive Compatible? A Test with Quality Differentiated Beef Steaks." *American Journal of Agricultural Economics* 86(2004):467–482.

McCluskey, J. J., K. M. Grimsrud, H. Ouchi, and T. I. Wahl. "Consumer Response to Genetically Modified Food Products in Japan." *Agricultural and Resource Economics Review* 32(2003):222–231.

McFadden, D. and K. Train. "Mixed MNL Models for Discrete Response." *Journal of Applied Econometrics* 15(2000):447–470.

Ministry of Health, Labour, and Welfare. "Graphical Review of Japanese Households: Income, Savings." 2007. Available online at http://www.mhlw.go.jp/english/database/db-hss/dl/hs091216b.pdf.

Mørkbak, M. R., T. Christensen, and D. Gyrd-Hansen. "Valuation of Food Safety in Meat: A Review of Stated Preference Studies." *Food Economics - Acta Agriculturae Scandinavica* 5(2008):63–74.

Peterson, H., J. Bernard, and J. Fox. "Calibrating Hypothetical Values: Estimating the US Brand Value in a COOL-Mandated Export Market." In *Selected Paper at the Western Agricultural Economics Association annual meeting,* Big Sky, MT, 2008.

Peterson, H. H. and Y. J. Chen. "The Impact of BSE on Japanese Retail Meat Demand." *Agribusiness* 21(2005):313–323.

Peterson, H. H. and K. Yoshida. "Perceptions of Quality and Willingness-to-Pay for Imported Rice in Japan." *Journal of Agricultural and Applied Economics* 36(2004):123–142.

Shimp, T. A. and S. Sharma. "Consumer Ethnocentrism: Construction and Validation of the CETSCALE." *Journal of Marketing Research* 24(1987):280–289.

Skaggs, R., C. Falk, J. Almonte, and M. Cárdenas. "Product-Country Images and International Food Marketing: Relationships and Research Needs." *Agribusiness* 12(1996):593–600.

Tonsor, G. T., T. C. Schroeder, J. A. Fox, and A. Biere. "European Preferences for Beef Steak Attributes." *Journal of Agricultural and Resource Economics* 30(2005):367–380.

Train, K. *Discrete Choice Methods with Simulation*. Cambridge, UK: Cambridge University Press, 2003.

U.S. Department of Agriculture, Economic Research Service. "Agricultural Baseline Projections: U.S. Agricultural Sector Measures, 2010-2019." 2010. Available online at http://www.ers.usda.gov/ Briefing/Baseline/agsector.htm.

———. "Organic Production Data Sets." 2011. Available online at http://www.ers.usda.gov/ Data/Organic/.

U.S. Meat Export Federation. "Export Statistics." 2010. Available online at http://www.usmef.org/ TradeLibrary/Statistics.asp.

UUB. "Population Density Ranking of Municipalities: As of June 1 2009." 2010. Available online at http://rnk.uub.jp/rnk/rnk.cgi?T=cktv&S=m&B=2009/06/01.

Verlegh, P. W. J. and J. B. E. M. Steenkamp. "A Review and Meta-Analysis of Country-of-Origin Research." *Journal of Economic Psychology* 20(1999):521–546.

Willer, H. and L. Kilcher. "The Countries with the Largest Domestic Markets for Organic Food 2009." In *The World of Organic Agriculture. Statistics and Emerging Trends,* Bonn: FiBL, 2011.

Yoshioka, Y. "E-mail message to author." 2006. November 7.

Appendix: Translated Information Provided to Survey Respondents in Sub-Version 3

In the following the phrase "beef" in italics was replaced with "pork" in the pork version. Other phrases in italics did not appear in the pork version.

> There is a variety of ways to make *beef* products. You may have seen labels at the storefront such as "organic", "*hormone-free*" or "GM-free feed" (GM is an abbreviation for "genetically modified").
>
> Please read the following statements regarding the beef production processes:
>
> - *Hormones promote growth and can be administered to livestock to shorten the feeding period. There are both natural and synthetic hormones, but no scientific evidence suggests that consuming hormones harms human health. Currently, the use of hormones is prohibited in Japan, and regarding meat imports, the use is regulated by the allowable residue level. When no additional hormones are administered, meat products can be labeled as being "hormone-free."*
> - Except for meat products with labels that state "Have not used genetically modified crops (GM-free)" or "organic", livestock is fed feed that include some genetically modified crops. To date, no scientific evidence suggests genetically modified crops included in livestock feed harms human health.
> - Organic *beef* products are produced and processed using feed free of genetically modified crops and without any antibiotics or nonorganic preservatives except salt and water. In addition, livestock is required regular access to outdoors. This organic standard is virtually universal worldwide.

Table A1. Random Parameter Logit Model Estimates with Country-of-Origin Attributes

	Beef			
	2006		2009	
	Coeff.	Std. Error	Coeff.	Std. Error
JP (random)	6.559***	1.205	−11.218**	4.386
Standard deviation	2.615***	0.225	5.474***	1.008
Heterogeneity-in-mean				
GENDER	0.306	0.416	−0.865	1.142
AGE	0.015	0.014	0.170***	0.043
EDUC	0.252	0.405	1.003	1.020
INC	0.001	0.001	0.000	0.001
POPDENS	0.002	0.004	−0.005	0.009
MEAT	−0.591**	0.245	0.407	0.624
COMEATS	1.044***	0.174	1.832***	0.648
US (random)	7.114***	2.342	4.847***	1.794
Standard deviation	4.281***	0.409	2.045***	0.455
Heterogeneity-in-mean				
GENDER	0.257	0.657	0.118	0.671
AGE	−0.025	0.025	−0.014	0.026
EDUC	−0.740	0.678	0.797	0.643
INC	0.001	0.001	0.000	0.001
POPDENS	0.002	0.006	−0.002	0.006
MEAT	0.714	0.470	0.309	0.424
COMEATS	−1.866***	0.286	−1.052***	0.285
AU (random)	9.114***	1.152	1.435	1.664
Standard deviation	2.496***	0.217	1.641***	0.318
Heterogeneity-in-mean				
GENDER	0.868**	0.401	−0.275	0.579
AGE	−0.033**	0.015	0.041*	0.024
EDUC	−0.286	0.396	0.732	0.594
INC	0.001	0.001	0.000	0.001
POPDENS	−.878	0.004	0.009*	0.005
MEAT	0.316	0.243	0.659*	0.393
COMEATS	−0.339**	0.153	−0.566**	0.251
Price (fixed)	−0.019***	0.001	−0.009***	0.001
Number of observations	1,878		618	
Log likelihood function	-1457.87		-506.3844	
McFadden Pseudo R-squared	0.440		0.409	
Akaike Information Criterion	1.582		1.729	

Notes: Single, double, and triple asterisks (*, **, ***) represent significance at the 10%, 5%, and 1% level.

Table A2. Random Parameter Logit Model Estimates with Country-of-Origin Attributes

	Pork			
	2006		2009	
	Coeff.	**Std. Error**	**Coeff.**	**Std. Error**
JP (random)	15.999***	1.548	6.613**	2.743
Standard deviation	2.963***	0.233	5.773***	0.933
Heterogeneity-in-mean				
GENDER	0.592	0.449	−0.237	1.278
AGE	0.014	0.018	−0.042	0.042
EDUC	0.125	0.432	0.825	1.273
INC	0.000	0.001	0.002	0.001
POPDENS	0.000	0.005	−0.020*	0.012
MEAT	−0.747***	0.249	0.411	0.640
COMEATS	0.359*	0.190	1.124*	0.600
US (random)	19.247***	1.757	11.338***	2.380
Standard deviation	2.825***	0.274	2.558***	0.511
Heterogeneity-in-mean				
GENDER	0.385	0.525	−1.250	0.892
AGE	−0.070***	0.021	−0.026	0.025
EDUC	−0.105	0.497	1.598*	0.847
INC	0.001	0.001	0.001	0.001
POPDENS	0.000	0.005	0.001	0.008
MEAT	−0.400	0.318	−0.696	0.531
COMEATS	−1.360***	0.232	−0.456	0.327
DE (random)	15.419***	1.419	5.565**	2.196
Standard deviation	2.562***	0.276	2.027***	0.317
Heterogeneity-in-mean				
GENDER	1.311***	0.453	−0.211	1.044
AGE	−0.058***	0.017	0.015	0.026
EDUC	0.440	0.434	1.238	0.867
INC	0.000	0.001	0.003*	0.001
POPDENS	−0.002	0.004	0.005	0.009
MEAT	−0.371	0.262	0.197	0.509
COMEATS	−0.372**	0.178	−0.264	0.328
Price (fixed)	−0.091***	0.004	−0.052***	0.005
Number of observations	1,860		630	
Log likelihood function	-1311.86		-531.8341	
McFadden Pseudo R-squared	0.491		0.391	
Akaike Information Criterion	1.441		1.777	

Notes: Single, double, and triple asterisks (*, **, ***) represent significance at the 10%, 5%, and 1% level.