Product Characteristics Affecting Consumers' Fresh Beef Cut Purchasing Decisions in the United States, Japan, and Australia

Glade R. Erikson, Thomas I. Wahl, Raymond A. Jussaume, and Hongqi Shi

The effects of product and economic characteristics on consumers who purchase six cuts of fresh beef (blocks/parts, steak, thinly sliced, diced, chopped, and ground) in urban areas of the United States, Japan, and Australia will be examined in this paper. Certain product characteristics (such as product freshness and display case cleanliness) were important to consumers of beef in all three countries while other product characteristics (such as price considerations for ground beef consumers) were important for consumers of different beef cuts in all three countries. Some product characteristics varied in importance across consumers from different countries and consumers of different beef cuts.

As Kerr et al. (1994) noted, "The first step in understanding any market must be the identification of those product characteristics that are desired by consumers." Product characteristics that are valued in one region may or may not be valued as highly elsewhere. In an increasingly global market, learning which product characteristics are important to consumers in specific countries is becoming increasingly important to successful marketing strategies.

Japan is the largest market for U.S. agricultural exports and is the largest importer of beef from the United States in terms of value (U.S. Department of Agriculture, 1998). Japan is also an important importer of Australian beef. Understanding the characteristics of beef that are important to Japanese consumers will facilitate continued beef exports to Japan for both the United States and Australia by helping exporters to supply and promote products with the characteristics that are valued by Japanese consumers.

Some researchers have examined product characteristics that are important to beef consumers. Menkhaus et al. (1993) found that—for beef consumers in the United States—cholesterol, calorie content, artificial ingredients, convenience, store display, and the cost of beef affect consumer perceptions of beef quality. Others, such as Capps and Schmitz (1991), have found health issues to be important attributes for beef consumers. A 1984

Glade R. Erikson and Thomas I. Wahl are graduate research assistant and associate professor, respectively, in the Department of Agricultural Economics, and Raymond A. Jussaume is an associate professor in the Department of Rural Sociology, Washington State University, Pullman, WA. Hongqi Shi is an econometrician at American Express, Phoenix, AZ.

U.S. Meat Export Federation survey reported that Japanese meat consumers' purchasing decisions were influenced by beef freshness (40 percent of consumers surveyed), price (18 percent), product safety (11 percent), and cleanliness (7 percent) (Kerr et al., 1994; Hayes, 1990).

Research on beef cuts in the United States includes studies by Namken et al. (1994) and Capps et al. (1994) who examined the seasonalities in U.S. demand for different cuts of beef. Also, Capps and Nayga (1990) estimated demand equations for several beef cuts (brisket, chuck, ground beef, loin, rib, and round), using data from stores in Houston, Texas.

There has been little work done to compare the importance of beef cut characteristics to consumers in different countries. However, some researchers have noted that cultural reasons, based on the attributes of the cut, exist for the preference of one cut of meat over another. For example, Kerr et al. (1994), and Comeau, Mittelhammer, and Wahl (1996) suggest that Japanese prefer beef that shows relatively less blood (that is, thinly sliced beef instead of roasts or steaks) because of cultural and religious beliefs.

This paper examines the importance of beef cut characteristics to U.S., Australian, and Japanese consumers. By doing so, the importance of beef cut attributes can be compared among the three countries. The comparisons of particular interest are those between the beef-exporting countries of Australia and the United States and the beef-importing country of Japan. Comparing the product attributes that are important to consumers in Japan and the exporting countries will allow beef marketers to identify similarities and differences in

country-specific preferences for product attributes. This paper is intended to "identify those product characteristics" that are desired by consumers and, by so doing, to increase the understanding of not only the domestic markets for the United States and Australia but also an important export market, Japan.

Methods and Data

The framework for this study is analogous to a hedonic price model. In this case, however, product characteristics, instead of prices, are used to predict quantities of goods consumed. Also, quantities of goods consumed are proxied by categorical data. Consumer preferences, health concerns, and demographics are also included in the models. Logit models are then used to estimate the 18 equations (six cuts of fresh beef for three countries).

Data for this study were obtained from the Consumer Survey of Animal Product Consumption and Lifestyle in the United States, Japan, and Australia (Nagano et al., 1995). The surveys were conducted as a result of a joint project—sponsored by Nihon University in Japan—between Washington State University, Nihon University, and Queensland University in Australia. The sample sizes were 1,217, 1,232, and 1,149, respectively, for the United States, Japan, and Australia. The surveys were completed in two metropolitan areas in each country (respectively, Seattle and Kansas City; Osaka and Tokyo; and Brisbane and Adelaide). While the samples were not drawn for the populations of each country and thus cannot be used to describe the attitudes of all classes of consumers in the country, they can be said to provide information on the cultural orientation of each nation as drawn from major metropolitan areas of each country. It is on this basis that consumers' attitudes in each country are examined.

In the United States, the surveys were mailed to 2,800 (1,400 in each city) consumers randomly selected from phone listings. Follow-up mailings were also sent. The completion rate (ratio of number of returned surveys to number of potential eligible respondents) was 49.8 percent (56.8 percent in Seattle and 43.3 percent in Kansas City).

In Japan and Australia, postal surveys were also sent to a random sample of residents listed in the telephone directory. Again, two mailings were sent. The sample sizes and response rates were 2,121 and 1,901 for Tokyo (28.1 percent) and Osaka (33.5

percent), respectively, and 2,000 for Brisbane (30.0 percent) and Adelaide (27.5 percent).

The dependent variables were dichotomous responses for the purchase of various beef cuts, with "one" indicating that the consumer normally purchased the product in question and "zero" indicating that he or she did not. Specifically, survey respondents were asked, "Which type of meat cuts do you normally purchase? Please mark an 'X' in the appropriate space." Six general cuts of fresh beef (block/parts, steak, thinly sliced, cubed (diced), chopped, and ground) are examined in this paper.

In constructing international surveys, it is often difficult to decide which items to include since each country is unique in some respects. The beef cut categories were chosen in order to represent those cuts of beef that are consumed in one or more of the countries but were defined in a way that was intended to be as meaningful as possible for each country. For example, in this survey, since thinly sliced beef is an important category of beef for Japanese consumers, it was included in the survey for all countries.

Of course, consumers in each country can and do define product categories differently. For example, Japanese consumers likely define "thinly sliced beef" as beef that will be boiled, either as shabu-shabu or as sukiyika, while U.S. consumers may consider "thinly sliced beef" to be a deli meat. Thus, interpretations of results must be made with each context in mind.

The independent variables were consumers' responses toward product attributes, retail service, and other considerations related to fresh beef. These response variables were measured on an ordinal scale, indicating the degree of importance perceived by consumers. The responses were coded: 1) doesn't matter; 2) slightly matters; 3) somewhat important\very important; and 4) extremely important. Independent variables included: 1) production date/expiration date; 2) price; 3) knowledge of where the meat was produced; 4) blood in package (presence of purge); 5) package size; 6) arrangement of product in the display case; 7) selection of cuts; 8) cleanliness of the display case; 9) services provided by the butcher; 10) butcher's recommendation; and 11) preferences of household members.

A variable was included to assess the impact of consumers' cholesterol consciousness on the

purchase decision. Cholesterol consciousness was measured by the extent to which the respondents agreed with the statement, "Low cholesterol is essential for good health." The responses were coded: 1) strongly disagree; 2) disagree; 3) neither; 4) agree; and 5) strongly agree.

In addition, demographic variables on household size and income were included in the model to assess how these factors influence purchase decisions. The household income variable was the midpoint of the survey income categories expressed in 1993 U.S. dollars. The mean was used for missing observations on all explanatory variables.

Results

A descriptive analysis of the independent variables allows some comparisons about consumer purchasing behavior for beef products between each of the three countries. The mean and standard deviation for each independent variable is reported in Table 1 for each country.

The first 11 items in Table 1 were ranked using the same system. Of these 11, on average, consumers in all three countries valued display case cleanliness and expiration date as the two most important considerations when buying fresh beef. The selection of cuts was the third most important consideration for U.S. and Australian consumers when buying fresh beef. Beef cut selection was the fourth most important consideration for Japanese consumers. The third most important consideration for Japanese consumers was household member preferences. Preferences of household members was ranked relatively lower by U.S. and Australian consumers.

The least important consideration for U.S. and Australian consumers was knowing where the meat was produced. In Japan, butcher services and the recommendation of butchers were the least important considerations for consumers when buying fresh beef.

The significant t values for the estimated coefficients of the 21 models are summarized in Table 2. Estimated coefficients, statistically different from zero at the 5 percent or 10 percent significance level, are indicated by ++, – –, and +, –, respectively.

The elasticities and marginal effects of the explanatory variables are presented in Tables 3–5 for significant variables. The elasticities and marginal effects were included to show the magnitude of the effect of the independent variables on the dependent variables. For example, in Table 3, the marginal

effect shows that increasing the importance of freshness (date of expiration) by one unit increases the probability that a person normally purchases steak by 6.27 percent. The elasticity column shows that a 1 percent increase in the importance of freshness increases the probability that a person normally consumes steak by 0.33 percent. Also shown in Tables 3, 4, and 5 are the percentages of consumers who normally purchase different cuts of beef. Note that ground beef and steak were the most popular cuts in the United States and Australia while thinly sliced beef was the most popular cut in Japan. The discussion of results will concentrate on these three cuts.

For consumers who normally purchase steak, there are several comparative results of interest. First, as consumers' income increased, the log odds ratio increased for all three countries. This can be interpreted as meaning that consumers with higher incomes were more likely to purchase steak. This result is consistent with intuition and holds for all three countries.

Next, steak consumers in the United States and Australia were similar in that, as the importance of product freshness (expiration date) and selection of cuts increased, they were more likely to normally purchase steak. For Japanese steak consumers, production date and cut selection were insignificant. Australian and Japanese steak consumers were similar in that, as household size increased and preferences of household members became more important, they were more likely to purchase steak.

Australian consumers were increasingly likely to purchase steak as they became less cholesterol-conscious. American consumers were more likely to purchase steak as blood in the package became less of an issue. Neither of these results were significant in the other two countries.

Ground beef consumers shared several similarities between countries. First, price was an important consideration for ground beef consumers in all three countries. Also, as household size increased, consumers were more likely to purchase ground beef in all three countries. Again, these results seem consistent with intuition if ground beef is considered a "low quality" cut in all three countries.

Consumers in Australia and the United States both were more likely to purchase ground beef as knowledge of where the meat is produced became less important. Origin of beef was not significant for Japanese ground beef consumers.

Table 1. Descriptive Statistics from Consumer Attitude Survey in the United States, Japan, and Australia. [a]

Item	Independent Variable	United States			Japan			Australia		
		Average	Rank	Std. Dev.	Average	Rank	Std. Dev.	Average	Rank	Std. Dev.
1	Production/expiration date	3.35	2	0.69	3.72	1	0.53	3.56	2	0.85
2	Price	2.77	7	0.69	3.27	5	0.65	2.82	7	0.96
3	Knowledge of where meat was produced	2.27	11	0.92	2.87	7	0.74	2.28	11	1.12
4	Blood in package	2.98	3	0.83	3.25	6	0.70	2.96	6	1.08
5	Package size	2.78	5	0.69	2.85	8	0.83	2.53	8	1.06
6	Arrangement of product in case	2.30	10	0.88	2.76	9	0.80	2.30	10	1.07
7	Selection of cuts	2.98	3	0.54	3.29	4	0.63	3.22	3	0.87
8	Cleanliness of display case	3.39	1	0.68	3.70	2	0.49	3.72	1	0.67
9	Butcher service	2.69	8	0.84	2.75	10	0.76	3.08	4	0.99
10	Butcher recommendation	2.42	9	0.91	2.48	11	0.77	2.53	8	1.04
11	Preferences of household members	2.78	5	0.85	3.33	3	0.66	3.00	5	1.13
12	Low cholesterol is essential for good health	3.18		1.10	3.29		1.27	4.01		0.79
13	Household size	2.63		1.35	3.40		1.37	2.97		1.33
14	Income	4.33		1.79	6.85		3.47	2.54		1.30

[a] Items 1-11 are considerations that mattered when the consumer bought fresh beef.

Coded as:
1 doesn't matter
2 slightly matters
3 somewhat important/very important
4 extremely important

Item 12 is the extent to which the respondents agreed with the statement, "Low cholesterol is essential for good health."

Coded as:
1 strongly disagree
2 disagree
3 neither
4 agree
5 strongly disagree

Item 13 is household size.

Item 14 is the midpoint of categories of household income in 10,000 1993 U.S. dollars.

Table 2. Summary of t-values for Product Characteristics That Affect Consumers' Beef Cut Purchasing Decisions in the United States, Japan, and Australia.[a]

Independent Variables	Blocks/Parts			Steak			Thinly Sliced			Diced			Chopped			Ground (Minced)		
	U.S.	Japan	Aust.	U.S.	Japan	Aust.	U.S.	Japan	Aust.	U.S.	Japan	Aust.	U.S.	Japan	Aust.	U.S.	Japan	Aust.
Production/expiration date				++		+	++	++			++				+	++		++
Price						+					++			++		++	++	++
Knowledge of where meat was produced		++														– –		– –
Blood in package (presence of purge)	– –			– –														
Package size		–	–			–		++	+			++						+
Arrangement of product in case			–															
Selection of cuts		++	++			++		++	+			– –						+
Cleanliness of display case										++		++						+
Butcher service							– –							–				
Butcher recommendation					++		++	+				++			++			
Preferences of household members						+								– –			–	
Low cholesterol is essential for good health			– –			– –		++	++		–			–				
Household size		++		++	+	++		++	++		++		++	++	+	++	++	++
Income			–	++	++	++		++	– –		++			+			++	
Likelihood ratio D.F. =14	18.5	24.6	35.9	99.9	45.9	88.8	27.5	62.3	32.5	37.6	47.5	38.2	17.0	46.1	21.8	75.9	54.3	75.3

[a] blanks = not significant at the 5 percent or 10 percent level.
++ t value >1.96
– – t value < -1.96
+ 1.645 < t value < 1.96
– -1.645 > t value > -1.96

Table 3. Marginal Effects and Elasticities of Product Characteristics That Affect Beef Cut Consumers in the United States.

Independent Variables	Blocks/Parts		Steak		Thinly Sliced		Diced		Chopped		Ground (minced)	
	Marginal Effect	Elasticity	Marginal Effect	Elasticity	Marginal Effect	Elasticity	Marginal Effect	Elasticity	Marginal Effect	Elasticity	Marginal Effect	Elasticity
Production/expiration date			0.0627	0.33	0.0425	1.17					0.0619	0.25
Price											0.0712	0.24
Knowledge of where meat was produced											-0.0481	-0.13
Blood in package (presence of purge)			-0.0586	-0.27	-0.0265	-0.65						
Package size												
Arrangement of product in case												
Selection of cuts			0.0921	0.43								
Cleanliness of display case							0.0546	1.27				
Butcher service					-0.0464	-1.02						
Butcher recommendation					0.0363	0.72					0.0392	0.12
Preferences of household members												
Low cholesterol is essential for good health												
Household size			0.0483	0.33			0.0238	0.43	0.0171	0.53	0.0253	0.08
Income							-0.0126	-0.37				
Number of survey respondents who normally bought certain cut	262		766		150		180		104		934	
Percent of survey respondents who normally bought certain cut	21.53		62.94		12.33		14.79		8.55		76.75	

Table 4. Marginal Effects and Elasticities of Product Characteristics That Affect Beef Cut Consumers in Japan.

Independent Variables	Blocks/Parts		Steak		Thinly Sliced		Diced		Chopped		Ground (minced)	
	Marginal Effect	Elasticity	Marginal Effect	Elasticity	Marginal Effect	Elasticity	Marginal Effect	Elasticity	Marginal Effect	Elasticity	Marginal Effect	Elasticity
Production/expiration date					0.0708	0.35	0.0677	0.96				
Price							0.0447	0.56	0.0692	0.81	0.0532	0.40
Knowledge of where meat was produced	0.0361	0.57										
Blood in package (presence of purge)					0.0512	0.22	0.0547	0.60				
Package size	-0.0250	-0.39										
Arrangement of product in case												
Selection of cuts	0.0422	0.76			0.0574	0.25						
Cleanliness of display case												
Butcher service					0.0352	0.12			-0.0380	-0.37		
Butcher recommendation			0.0550	0.39								
Preferences of household members									-0.0490	-0.58	-0.0394	-0.30
Low cholesterol is essential for good health	0.0209	0.39					-0.0177	-0.22	-0.0194	-0.23		
Household size			0.0206	0.15	0.0225	0.10	0.0232	0.30	0.0307	0.37	0.0415	0.32
Income			0.0179	0.26	0.0148	0.14	0.0104	0.27	0.0074	0.18	0.0131	0.21
Number of survey respondents who normally bought certain cut	227		584		882		328		350		539	
Percent of survey respondents who normally bought certain cut	18.43		47.40		71.59		26.62		28.41		43.75	

Table 5. Marginal Effects and Elasticities of Product Characteristics That Affect Beef Cut Consumers in Australia.

Independent Variables	Blocks/Parts		Steak		Thinly Sliced		Diced		Chopped		Ground (minced)	
	Marginal Effect	Elasticity	Marginal Effect	Elasticity	Marginal Effect	Elasticity	Marginal Effect	Elasticity	Marginal Effect	Elasticity	Marginal Effect	Elasticity
Production/expiration date			0.0341	0.15					0.0206	1.77		
Price			0.0293	0.11							0.0394	0.18
Knowledge of where meat was produced											-0.0437	-0.16
Blood in package (presence of purge)												
Package size	-0.0228	-0.27	-0.0298	-0.10	0.0243	0.31	0.0248	0.43			0.0280	0.11
Arrangement of product in case	-0.0248	-0.27										
Selection of cuts	0.0431	0.65	0.0796	0.33	0.0296	0.49	-0.0305	-0.68			0.0393	0.20
Cleanliness of display case							0.0596	1.53			0.0557	0.33
Butcher service												
Butcher recommendation							0.0540	0.94	0.0243	1.49		
Preferences of household members			0.0259	0.10								
Low cholesterol is essential for good health			-0.0483	-0.25	0.0320	0.65						
Household size	-0.0480	-0.91	0.0226	0.09	0.0266	0.40			0.0082	0.59	0.0589	0.28
Income	-0.0200	-0.24	0.0348	0.11	-0.0188	-0.24						
Number of survey respondents who normally bought certain cut	247		847		228		169		48		711	
Percent of survey respondents who normally bought certain cut	21.50		73.72		19.84		14.71		4.18		61.88	

Some interesting differences existed between countries. For example, as income increased, Japanese consumers were more likely to consume ground beef. However, income was not significant for U.S. and Australian consumers. These results may illustrate the cultural differences between the three countries, that is, beef is more likely to be viewed as an everyday food for U.S. and Australian consumers.

For consumers who normally purchased thinly sliced beef, there were no product attributes that were significant in all three countries. There were some similarities between pairs of countries, however. Product freshness (expiration date) and butcher recommendations were important to thinly sliced beef consumers in both the United States and Japan. Also, the importance of cut selection and household size increased the likelihood that consumers in Japan and Australia normally purchased thinly sliced beef. There were several differences between sliced beef consumers in the three countries. For example, consumers were more likely to purchase thinly sliced beef as blood in the meat package became more important in Japan and less important in the United States. Also, income was related to sliced beef consumption negatively in Australia but positively in Japan.

The results on the other types of meat (blocks/parts, diced, and chopped) can be similarly interpreted. Again, for each of the meat cuts, some attributes were similarly important for consumers across countries while others were not.

Summary and Conclusions

In general, the descriptive analysis indicated that consumers in Australia, Japan, and the United States ranked similar attributes of fresh beef purchases as most important. Cleanliness of the display case and production/expiration date were the most important of the 11 product attributes when buying fresh beef in all three countries. These results indicate common concerns of consumers across the three countries toward freshness and health issues. While the results are perhaps expected, they reemphasize the logistical challenges of getting fresh imported beef to Japan in a timely fashion and the importance of getting beef distributed through quality retail chains.

The least important of the 11 product attributes were similar for U.S. and Australian consumers (knowing where the meat was produced and

arrangement of product in a display case). For Japan, the least important considerations were butcher's service and recommendations. The origin of beef was relatively more important to Japanese consumers. This perhaps reflects the preference for domestic beef by Japanese consumers (Kerr et al., 1994). Again, this reiterates an opportunity for beef exporters to change the perceptions of the Japanese consumer by supplying beef of quality comparable to Japanese domestic beef and by informing consumers about the quality of imported beef.

It is not surprising that income was important for consumers who normally purchased steak. However, this gives additional evidence that beef marketers should target higher income consumers for steak promotion in all three countries. Household numbers and preferences were important for Japanese steak consumers. This may be a reflection of the younger generation's comparatively greater preference for beef (Kerr et al., 1994) and indicates that steak promotions could be aimed at larger families in Japan.

Larger households could be targeted for ground beef promotion in all three countries. Also, since price is an important characteristic in all three countries, ground beef promotion could focus on price issues. Since the study also indicates that income positively affected the likelihood that consumers normally purchased ground beef, ground beef promotion in Japan could also target higher income families.

Thinly sliced beef was the most popular beef cut in Japan. It seems that marketers should be particularly concerned with the freshness of beef destined to be sliced, the package appearance, and a quality retailer that can provide a wide selection of cuts and appropriate recommendations. Also, income and household size positively affected consumers who normally consumed thinly sliced beef, suggesting that promotion of thinly sliced beef could be aimed at consumers with higher income and larger families in Japan.

References

Capps Jr., O., and R.M. Nayga, Jr. 1990. "Effect of Length of Time on Measured Demand Elasticities: The Problem Revisited." *Canadian Journal of Agricultural Economics.* 38: 499–512.

Capps Jr., O., and J.D. Schmitz. 1991. "A Recognition of Health and Nutrition Factors in Food Demand Analysis." *Western Journal of Agricultural Economics.* 16(1): 21–35.

Capps Jr., O., D.E. Farris, P.J. Byrne, J.C. Namken, and C.D. Lambert. 1994. "Determinants of Wholesale Beef-Cut Prices." *Journal of Agricultural and Applied Economics.* 26(1): 183–199.

Comeau, A, R.C. Mittelhammer, and T.I. Wahl. 1996. "Assessing the Effectiveness of MPP Meat Advertising and Promotion in the Japanese Market." R.B. 96-20, National Institute for Commodity Promotion Research and Evaluation, Cornell University, Ithaca New York.

Hayes, D.J. (ed.) 1990. *Meat Marketing in Japan: A Guide for U.S. Meat Exporting Companies.* Des Moines and Ames, Iowa: Midwest Agribusiness Trade and Research Center.

Kerr, W.A., K.K. Kline, J.E. Hobbs, and M. Kagatsume. 1994. *Marketing Beef in Japan.* New York: Food Products Press.

Menkhaus, D.J., D.P.M. Colin, G.D. Whipple, and R.A. Field. 1992. "The Effects of Perceived Product Attributes on the Perception of Beef." *Agribusiness: An International Journal.* 9(1):57–63.

Nagano, M., A. Baba, S. Takaku, S. Kobauashi, S. Koizumi, R.A. Jussaume, P. Riethmuller, and J. Morison. 1995. "Consumer Consciousness of Animal Products in Japan, the U.S. and Australia." Poster Presentation at the WAAP/FAO International Symposium on Supply of Livestock Products to Rapidly Expanding Urban Population, Seoul National University, Seoul, Korea, May 19.

Namken, J.C, D.E. Farris, and O. Capps, Jr. 1994. "The Demand for Wholesale Beef Cuts by Season and Trend." *Journal of Food Distribution Research.* 25(2):47–60.

USDA (U.S. Department of Agriculture). 1998. *U.S. Agricultural Trade Update.* ERS, USDA, Jan. 23.