

DISSERTATION

WHAT IS QUALITY?

THE PROPENSITY OF FOREIGN CUSTOMERS OF U.S. PORK TO PAY FOR
PORK QUALITY ATTRIBUTES IN SELECT EXPORT MARKETS.

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ABSTRACT

WHAT IS QUALITY?

THE PROPENSITY OF FOREIGN CUSTOMERS OF U.S. PORK TO PAY FOR PORK QUALITY ATTRIBUTES IN SELECT EXPORT MARKETS.

The objectives of this research were to: 1) Document the various factors that foreign customers of U.S. pork whole muscle cuts, pork variety meats and offal products, and processed pork products use to describe “quality,” as well as identify quality attributes that are unique to individual countries. 2) Estimate the willingness of foreign customers of U.S. pork to pay for quality attributes. 3) Establish a ranking of the specified quality attributes. Research teams conducted interviews over two-week time periods in the countries of Hong Kong/China, Japan, Mexico, and Russia.

In Hong Kong/China, a total of 83 interviews were conducted in the cities of Beijing, Guangzhou, and Hong Kong over a two-week period during December 2009. In Japan, 48 interviews were conducted in the city of Tokyo over a two-week period during November 2009 and at Foodex Japan during March 2010. In Mexico, 70 interviews were conducted over a two-week period during September and October 2009 in the cities of Monterrey and Mexico City. Lastly, in Russia, 54 interviews were conducted in Moscow at Prodexpo, the largest food and beverage tradeshow in Russia and Eastern Europe, during February 2009, and over a one-week period during April 2010 in the cities of Kaliningrad, Moscow, and St. Petersburg. Overall, it is believed that the approximate

volume of U.S. pork exports accounted for in each country by our interviews was between 40 and 50% for Hong Kong/China and Mexico and between 60 and 70% for Japan and Russia. Companies targeted for participation were those that, in the past three years, had imported pork directly from a foreign country or had used imported pork in their operations but did not import the product themselves. At no time, were “end consumers” interviewed; this study focused entirely on “customers” of U.S. pork.

In order to determine the willingness of foreign customers of U.S. pork to pay premiums for pork quality attributes, it was necessary to first establish what they understand “quality” to mean as it relates to imported pork products. To accomplish this task, “quality” was divided into seven attributes: (i) Food Safety, (ii) Customer Service, (iii) Product Eating Quality (referred to, hereafter, as Eating Quality), (iv) Product Specifications Desirability and Conformity (referred to, hereafter, as Product Specifications), (v) Product Packaging and Condition upon Receiving (referred to, hereafter, as Product Packaging), (vi) Visual Characteristics of Product (referred to, hereafter, as Visual Characteristics), and (vii) Production History.

Food Safety was the single most important quality attribute to Japan. The primary opportunities for improving Customer Service were improving service after the sale and/or customer relations, fulfilling contract requirements, and improving responses to complaints and questions. Good flavor/taste was the most common response for Eating Quality, which suggests the need for continued development of products with flavor profiles that are well-suited for each market. The primary opportunities for improving Product Specifications were consistent product size, consistent product weight, and reducing the level of external fat on some cuts. Improving box strength and integrity was

the primary opportunity for improving Product Packaging. The primary opportunities for improving Visual Characteristics were to improve lean color quality and lean color consistency. For Production History, nearly 60% of companies in Hong Kong/China stated “brand” and/or “reputation” as being important.

To satisfy objective 2, interviewed companies were asked to list the characteristics or attributes that are “required” in order for them to consider purchasing imported pork products. Their responses were categorized within the seven specified quality attributes. They were then asked if they would purchase the imported pork products, at a price discount, if the attributes they “require” could not be guaranteed. Once the discount questions were completed, the questions concerning remaining quality attributes were asked (as “premium” questions) to ascertain whether or not any, or all, of the specified attributes are of great enough importance to merit a premium if they could be guaranteed. Japan had a significantly greater probability of requiring Food Safety than the other countries. Customer Service was the only attribute, common to all product types, with a significant probability for which companies would be willing to pay a premium. In three of the four countries, with the exception of companies in Mexico, Eating Quality had the highest likelihood of being a “required” quality for processed products. Overall, Hong Kong/China had low expectations or “requirements” for purchasing pork but had consistently higher probabilities of paying premiums as well as higher premium values than the other countries. Thus, Hong Kong/China could hold more profit potential than previously considered. Mexico had the lowest expectations or “requirements,” with the exception of Visual Characteristics, for purchasing pork and

some of the lowest probabilities of paying premiums, telling us that Mexico is the most price sensitive market.

Finally, a Best-Worst scaling task was employed to establish an objective ranking of the specified quality attributes. The scaling task showed that, on average, Food Safety was the most important quality attribute across all countries with the exception of Russia, which believed Product Specifications to be most important, albeit, just slightly.

Averaging across countries, Food Safety was twice as important and Eating Quality and Product Specifications were one-and-a-half times more important than Production History. Based on the extensive amount of information and knowledge gained from this study, the results should be of tremendous benefit to the U.S. pork industry as it continues to grow its export potential.

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DEDICATION

First, I have to begin by thanking my parents, Ray and Leona. Both of you have always shown tremendous resiliency and perseverance, but especially over the past year, which gave me the strength and determination to continue when I felt like giving up. You are my inspiration! I am very proud to have grown up on our family farm and I am very proud of everything the two of you have accomplished as a team. I am grateful for everything the farm taught me about life, responsibility, and love. All of my successes can be traced back to the farm and to both of you.

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EXECUTIVE SUMMARY

WHAT IS QUALITY? THE PROPENSITY OF FOREIGN CUSTOMERS OF U.S. PORK TO PAY FOR PORK QUALITY ATTRIBUTES IN SELECT EXPORT MARKETS.

The objectives of this research were to: 1) Document the various factors that foreign customers of U.S. pork whole muscle cuts, pork variety meats and offal products, and processed pork products use to describe “quality,” as well as identify quality attributes that are unique to individual countries. 2) Estimate the willingness of foreign customers of U.S. pork to pay for specified quality attributes. 3) Establish a ranking of the specified quality attributes.

Research teams conducted interviews over two-week time periods in Hong Kong/China, Japan, Mexico, and Russia. The four markets were selected for this study based on current and forecasted values of imported U.S. pork and pork variety meats. Combined, they represented 70% of the total value and 71% of the total volume of U.S. pork and pork variety meat exports in 2008 and 2009.

By design, USMEF foreign office staff was instructed to recruit companies that had purchased imported pork in the past three years. If a company had not purchased imported pork in the past three years, for example, purchasing only domestic pork, their results were excluded from the study. Once this condition was satisfied, targeted companies were identified and recruited according to two distinct customer profiles: primary customers and marketing chain customers. Primary customers were defined as

companies that have imported some proportion of their pork directly from foreign producers (i.e., direct from packers). Primary customers included importer/distributors, meat traders, meat processors, wholesalers, large-chain retail and foodservice operations, etc. Marketing chain customers were defined as “indirect purchasers” of imported pork. There were companies that had used imported pork in their operations, but that did not import the product themselves. Examples of marketing chain customers included retail, grocery store and foodservice managers, smaller or independent retail stores and supermarkets, independent restaurants, chefs, intermediary distributors, etc. It was likely that several of the interviewed marketing chain customers purchased imported pork from companies identified and interviewed as primary customers. In all interviews, it was central that we interviewed the individual or individuals within the company that made actual purchasing decisions because, in order to accurately answer the WTP questions, it was critical that the company representatives were familiar with current pork prices. At no time were “end consumers” recruited or interviewed; this study focused entirely on “customers” of U.S. pork.

In Hong Kong/China, a total of 83 interviews were conducted in the cities of Beijing, Guangzhou, and Hong Kong over a two-week period during December 2009. In Japan, 48 interviews were conducted in the city of Tokyo over a two-week period during November 2009 and at Foodex Japan, Asia’s largest food and beverage trade show, during March 2010. In Mexico, 70 interviews were conducted over a two-week period during September and October 2009 in the cities of Monterrey and Mexico City. The research team in Mexico City, besides conducting interviews in the city and surrounding area, also completed interviews at Abastur, the largest food and beverage trade show for

the HRI sector in Latin America. Lastly, in Russia, 54 interviews were conducted in Moscow at Prodexpo, the largest food and beverage tradeshow in Russia and Eastern Europe, during February 2009, and over a one-week period during April 2010 in the cities of Kaliningrad, Moscow, and St. Petersburg. Overall, it is believed that the approximate volume of U.S. pork exports accounted for in each country by our interviews was between 40 and 50% for Hong Kong/China and Mexico and between 60 and 70% for Japan and Russia.

U.S. pork was purchased by all interviewed companies in Mexico; by all but one company in Japan, which they said was because of price; by all but three companies in Hong Kong/China, which they attributed to a lack of knowledge or familiarity with U.S. pork; and, by all but six companies in Russia, which one attributed to price and five said was because they did not possess tariff rate quota for U.S. pork. Other pork producing countries in direct competition with U.S. pork included Canada in all four countries and Denmark in all countries except Mexico. Hong Kong/China was the most diversified purchasing area because of the free-trade zone represented by Hong Kong. Brazilian pork was purchased by roughly 51 and 76% of the interviewed companies in Hong Kong/China and Russia, respectively, slightly edging out Canada for second place in these markets. Approximately 83 and 85% of the interviewed companies in Russia and Hong Kong/China, respectively, believed U.S. pork to have a favorable image in their countries; whereas, 92 and 99% of the interviewed companies in Japan and Mexico, respectively, considered this to be true.

In order to determine the willingness of foreign customers of U.S. pork to pay premiums for pork quality attributes, it was necessary to first establish what they

understand “quality” to mean as it relates to imported pork products. To accomplish this task, “quality” was divided into seven attributes: (1) Food Safety, (2) Customer Service, (3) Product Eating Quality (referred to, hereafter, as Eating Quality), (4) Product Specifications Desirability and Conformity (referred to, hereafter, as Product Specifications), (5) Product Packaging and Condition upon Receiving (referred to, hereafter, as Product Packaging), (6) Visual Characteristics of Product (referred to, hereafter, as Visual Characteristics), and (7) Production History.

“Quality” Defined

Food Safety: Around 38% of interviewed companies in Hong Kong/China and Mexico, as well as 27% of those interviewed in Russia, explained that “not getting sick from eating pork” was an important food safety concern, which was mentioned 2 to 3 times more often in these countries than it was in Japan. Further, 26, 19, and 32% of interviewed companies in Hong Kong/China, Mexico, and Russia, respectively, listed the ability of imported pork products to pass Customs inspection without food safety-related issues considerably more often than companies in Japan (2.6%). The mentioned disparities between Japan and the other countries may be partially related to the high degree of confidence that Japanese companies have in the safety of U.S. pork, the stability of our trading relationship with Japan relative to other countries, and the tendency of the other countries to impose unscientific food safety-related requirements on imported meat products, most notably Hong Kong/China and Russia. Additional notable differences between Japan and the other countries was Japan’s general interest or concern in traceability and/or production history information, in chemical residue levels, in the quality of feed ingredients, and in the presence of physical hazards, specifically bone

chips. However, Mexico was almost as equally concerned about microbiological contamination as Japan (33.9 versus 41.0%, respectively), and was more concerned about the hygiene and cleanliness of production and slaughter processes (37.3 versus 30.8%, respectively). These findings suggested that the technical knowledge level of companies in Mexico relative to Food Safety has increased, which should give the U.S. a competitive advantage in this market. Overall, Food Safety comments from Mexico appeared to support the long-term educational strategy implemented by the industry in Mexico, which has been designed to guide and develop their technical understanding of food safety. The same level of technical understanding was not evident in Food Safety responses offered by companies in Hong Kong/China and Russia. With that said, there may be opportunities to implement similar educational strategies in both Hong Kong/China and Russia.

Customer Service: Responses for this category that were common across all countries and that were provided in the highest aggregate numbers were service after the sale and/or good customer relations, fulfilled contract requirements, and responses to complaints and/or questions. Fulfilled contract requirements generally referred to foreign companies fulfilling their obligations for product specifications, packaging, price, and date of delivery as stipulated in the original sales contract. Nearly 41% of interviewed companies in Mexico listed service after the sale and/or good customer relations as an important part of Customer Service, which they described to mean that their suppliers should have a genuine interest and knowledge of their customers' companies, and provide follow-up on their success with the purchased products. Further, nearly one-quarter of those interviewed in Mexico said the ability to negotiate purchase prices (as

opposed to being presented with a set price) and the ability to negotiate contracts of different lengths were important to them. While interviewed companies in Japan expressed interest in receiving all microbiological test results, even if the results are negative. On-time delivery was mentioned by 46, 49, and 57% of interviewed companies in Hong Kong/China, Mexico, and Russia, respectively, which could be partially related to shipping delays at their borders as a consequence, again, of their governments using food safety concerns as unscientific requirements. Exactly half of interviewed companies in Russia explained that correct documentation and no documentation errors were important to them. Finally, 41% of those interviewed in Japan expressed interest in receiving listings of available products and/or information on new products, demonstrating Japan's appetite for new and exciting products like U.S. pork back ribs.

Product Eating Quality: Good flavor/taste was the most common response to define Eating Quality, followed by tenderness, juiciness, and good smell and/or no off-smells. Close behind these responses were comments that actually reflected Visual Characteristics, such as lean color and freshness. "Freshness" (a succinct meaning for what this term was used to describe was not always clear) was mentioned by 20% of those interviewed in Hong Kong/China and Mexico and by 16% of those interviewed in Russia, but by only 5% in Japan. The popularity of "freshness" as a factor of Eating Quality may be due to the still large presence of wet markets in every country except Japan, and consumer preferences in these countries for purchasing fresh or, at minimum, "fresh-looking" pork products. Overall, there appeared to be a close association of Visual Characteristics with overall Eating Quality.

Product Specifications Desirability and Conformity: The majority of comments from all four countries focused on correct and/or consistent product size and weight to characterize this quality attribute. In addition, nearly one-third of interviewed companies in each country made reference to products having too much external fat as well. Likewise, roughly 30% of interviewed companies in Mexico and Russia described this attribute as meaning that it is important to receive the correct product; e.g., if fresh/chilled product is ordered, then the company should not receive frozen product. Comments regarding Product Packaging were offered by 26 and 20% of interviewed companies in Hong Kong/China and Mexico, respectively, to describe Product Specifications. Further, 15 and 22% of companies in Japan and Mexico, respectively, made comments that related more to Visual Characteristics (e.g., color and overall appearance) than to Product Specifications.

Product Packaging and Condition upon Receiving: Box strength/integrity was the most commonly identified term used to define this quality attribute. Eighteen percent of interviewed companies in Hong Kong/China and Japan, as well as 27% of those interviewed in Russia said correct box size was important. Pork importers and users in Hong Kong/China and Russia described correct box size as boxes that are appropriate to the size of the contents in order to minimize free space in the box, thereby, limiting the possibility of the box being crushed. Customers in Japan explained that boxes appropriate to the size of the contents would alleviate the cumbersome task of handling product in over-sized boxes, as well as act as an effective means for controlling box weight. In addition, all countries expressed desire for standardized box sizes for U.S. pork products. The justification was that it would be much easier to organize pallets,

which were made up of product from different companies, for further distribution if all boxes were the same shape and size. Clean and attractive packaging, such as use of “white”-colored boxes and attractive printing and logos on boxes, was important to interviewees in all countries, especially those in Russia. Around 10% of interviewed companies in Hong Kong/China and Japan expressed a preference for product in which the content of the box was packed in a neat and organized manner. Unique to customers in Mexico, with a 24% response rate, was a concern for maintaining cold-chain integrity, which is understandable given their in-country difficulties of keeping the cold-chain intact, their strong preference for purchasing fresh/chilled product, and their association of Visual Characteristics with the safety and quality of pork. Finally, concerns associated with product labeling were mentioned by over 25% of interviewed companies in Hong Kong/China and Mexico and by over 15% of interviewed companies in Japan and Russia. Examples of labeling concerns included having the product name, weight, and production date correspond to the information on the export certificates, having the labels affixed to the box in the correct location and in the correct orientation, as well as not having problems with the label peeling off the box.

Visual Characteristics of Product: The vast majority of interview responses associated with this attribute concentrated on ideal lean color, making it the single most important component of Visual Quality. In fact, almost 92% of those interviewed in Mexico made a direct reference to lean color, 12% higher than the next closest country (Hong Kong/China), and more than three-times higher than any other listed Visual Quality attribute in Mexico. Ideal lean color was defined as lean that is not too pale in color or that appears “washed out,” lean that is not too dark, or lean that does not express

noticeably different shades of color within the same muscle or across muscles (e.g., hams). Nearly 20 and 25% of those interviewed in Hong Kong/China and Mexico, respectively, listed smell and/or off-odors within the Visual Characteristic category as important.

Production History: Product traceability, which was generally described as the ability to trace back product to its origin in the event of a recall, and whole-life history of product were two of the most common responses across all countries. While pork importers and users in all countries expressed at least some interest in receiving information on production practices and/or feeding programs, interviewees in Japan clearly were most concerned with this characteristic, with nearly 62% mentioning it or referring specifically to information on the quality of the feed ingredients. Specific to interviews in Mexico regarding Production History was their association of food safety controls, control of the cold-chain, information on production and slaughter dates, and storage life with this attribute. Perhaps most surprising was that 60% of interviewed companies in Hong Kong/China that said company brand and/or the reputation of that company in China was important to them and their customers in reference to Production History. Nearly 40% of those interviewed in Russia said that Production History was not important, and that the health/veterinary certificate included all of the background information necessary—a sharp contrast to comments provided in Japan. In addition, animal welfare, environmentally responsible and/or sustainable production practices, “free range” pork, and “natural” and/or “organic” pork received very little to no mention during interviews in all countries.

Willingness-to-Pay Results and Calculated Premium Values

Analyzing “required” quality attributes for whole muscle cuts across all countries, Product Specifications and Visual Characteristics had greater probabilities of being required than other quality attributes (as previously defined). Customer Service had the lowest probability of being required for whole muscle cuts. With respect to variety meats and offal products across all countries, Eating Quality had a significantly lower probability of being required than the other quality attributes; whereas, for processed products, Eating Quality had the highest probability of being a requirement for purchase. With regard to “guaranteed” or “premium” attributes, the only attribute, common to all product types, with a significant probability for which companies would be willing to pay a premium was Customer Service.

Companies in Japan expressed higher probabilities of requiring Food Safety for whole muscle cuts and processed products than any other country. For variety meats, Japanese companies had a greater likelihood of requiring Product Specifications than companies in both Hong Kong/China and Russia. In addition, Japanese companies had an equal probability to Mexican companies of requiring Visual Characteristics for whole muscle cuts; but interviewees in Mexico had a greater probability of requiring Visual Characteristics than those in Hong Kong/China and Russia.

With regard to WTP premiums for attributes of “guaranteed” quality, for whole muscle cuts, companies in Hong Kong/China were more likely to pay a premium for Food Safety than Japanese companies. Notably, the probability of Japanese companies requiring Food Safety was nearly twice as high as the calculated probability of paying a premium for Food Safety. Also, companies in Hong Kong/China and Japan were significantly more likely to pay premiums for Customer Service than those in Mexico. In

general, foreign customers of U.S. pork do not require Customer Service as a condition for purchase, evident by the very low probabilities, but the odds of paying a premium for such service were considerably higher. For Eating Quality, companies in Hong Kong/China were significantly more likely to pay a premium for guaranteed Eating Quality than companies in the other countries. The odds of requiring Product Specifications (i.e., conformity) were consistent across all countries, with companies in Hong Kong/China twice as likely as those in Mexico to pay a premium for this attribute. Overall, Product Specifications for whole muscle cuts was “required” in all four countries. Mexican companies had the lowest expectations for all quality attributes, except Visual Characteristics where it was regarded as a requirement for purchase. Finally, companies in Hong Kong/China had expressed a 63% probability of paying a premium for Production History, which they described previously as the “brand” or reputation of the “brand” in their region. Companies in Hong Kong/China were more than twice as likely to pay a premium for Production History as those in Japan.

For variety meats and offal products, companies in Hong Kong/China and Japan expressed significantly higher odds of paying premiums for Food Safety than those in Mexico or Russia. Mexican companies expressed a significantly lower probability of paying a premium for Customer Service than companies in the other countries. Interestingly, the attribute of Eating Quality was unlikely to be a “required” trait, which was not entirely unexpected given the fact that variety meats and offal products are considered to be low-value, commodity items. However, companies in Hong Kong/China were more likely to pay a premium for Eating Quality than those in the other countries. Japanese companies expressed the highest odds of requiring Product

Specifications. Russian companies were one of the most likely to require Product Packaging and one of the least likely to pay a premium for it, which indicates that Russian companies hold Product Packaging as a requirement for purchase. Conversely, companies in Hong Kong/China were easily the most likely to pay a premium for Product Packaging.

For processed products, Japanese companies were most likely to require Food Safety and least likely to pay a premium for this attribute; when it comes to Food Safety for processed products, Japanese companies have little tolerance for issues with this trait. More specifically, Japanese customers will not tolerate finding bone chips in their processed products. Further, customers in other countries do not require Food Safety but are willing to pay extra for this assurance. Companies in Hong Kong/China were more likely to pay a premium for Visual Characteristics than those in the other countries. Although Product Specifications was generally the attribute least likely to generate WTP estimates, it generated the highest average WTP premium values. Further, generalizing WTP premium values by product type, variety meats would generate the lowest average premium values, whole muscle cuts were intermediary, and processed products would generate the highest average premium values.

Numerous research reviews have found that studies which use “hypothetical” WTP, like that used in our study, which simply “asks” about WTP rather than requires actual expenditure, can sometimes overestimate “actual” WTP values by as much as 2 to 3-times. Some research studies have even found “hypothetical” WTP estimates to be as much as 4 to 6-times greater than “actual” WTP values. Thus, as a point of

consideration, the calculated WTP premium values reported in this study could be reduced to reveal more accurate WTP values in practice.

Overall, importers and users of pork in Hong Kong/China had low expectations for nearly every quality attribute, but, consistently, expressed some of the highest probabilities for paying premiums for attributes and the highest premium values. Based on these results, there is tremendous potential for adding a significant amount of value to U.S. pork products in the Hong Kong/China market. In contrast, importers and users of pork in Mexico had the lowest expectations for every attribute, except Visual Characteristics, and also were least likely to pay premiums for attributes of “guaranteed” quality, suggesting that—of the four—Mexico is the most price-sensitive market.

Ranking of Quality Attributes

The BW scaling task showed that, on average, Food Safety was the most important quality attribute across importers and users of pork in all countries with the exception of those in Russia, which believed Product Specifications to be more important, albeit just slightly. The order of importance for quality attributes after Food Safety was, on average, Product Specifications, Eating Quality, Product Packaging, Visual Characteristics, and Customer Service, respectively. Overall, Production History was the least important quality attribute to importers and users of pork except to those in Japan which ranked Customer Service, Product Packaging, and Visual Characteristics lower than Production History. Differences among attributes in importance were not significant, but the values provided a useful ranking. Further, although Food Safety was mentioned considerably more often than, say, Production History as being the most

important quality attribute, a few companies still selected Production History, which minimized the observed differences in importance among quality attributes.

Areas of Opportunity for Consideration by the U.S. Pork Industry

Based on the extensive amount of detailed information collected during this study, a list of opportunities was compiled for consideration by the U.S. pork industry as it continues to grow its export potential.

- The technical knowledge level of companies in Mexico is increasing, which should give the U.S. a competitive advantage in this market.
- Food Safety comments from Mexico appeared to support the long-term educational strategy implemented by the industry in Mexico, which has been designed to guide and develop their technical understanding of food safety. There may be opportunities to implement similar, long-term educational strategies in Hong Kong/China and Russia to help promote sales of U.S. pork in these countries.
- Food Safety was the single most important quality attribute to companies in Japan. Specifically, Japanese companies defined Food Safety as product traceability, production history, results from microbiological testing, and the absence of physical hazards, especially bone chips in processed products.
- Customer Service was the only attribute, common to all product types, with a significant probability for which companies would be willing to pay a premium.
- The primary opportunities for improving Customer Service were improving service after the sale and/or customer relations, fulfilling contract requirements, and improving responses to complaints and questions.

- On-time delivery was mentioned by roughly 50% of the companies in Hong Kong/China, Mexico, and Russia, suggesting a possible area for improvement and an opportunity for adding value by capitalizing on service.
- Over 40% of those interviewed in Japan expressed interest in receiving listings of available products and/or information on new products.
- In three of the four countries (all except Mexico) Eating Quality had the highest likelihood of being a “required” quality attribute for processed products.
- Good flavor/taste was the most common response for Eating Quality, which suggests the need for continued development of products with flavor profiles that are well-suited for each market.
- The primary opportunities for improving Product Specifications were consistent product size, consistent product weight, and reduced levels of external fat on some cuts.
- Improving box strength and integrity was the primary opportunity for improving Product Packaging.
- Standardizing box shape and size could reap benefits that would benefit the entire U.S. pork industry.
- Clean and attractive packaging, such as use of “white”-colored boxes and attractive printing and logos on the boxes, was important to customers in all countries, especially those in Russia.
- Interviewed companies in Hong Kong/China and Japan expressed a preference for product in which the content of the box was packed in a neat and organized manner that allowed the contents to maintain their shape during shipment and distribution.

- The primary opportunities for improving Visual Characteristics were to improve lean color quality and lean color consistency.
- Lean color was the most important Visual Characteristic to companies in Mexico.
- Lean color and/or visual appearance were associated with Food Safety, Eating Quality, Product Specifications, and Product Packaging. Thus, lean color and/or visual appearance is, perhaps, more related to perceptions of overall product quality and safety than previously thought.
- Nearly 62% of companies in Japan referenced production practices and feeding programs, and specifically, the quality of feed ingredients, as important Production History information.
- Nearly 60% of companies in Hong Kong/China stated “brand” and/or “reputation” as being important, suggesting opportunities for the U.S. to use its “brand power” to increase market share in this region.
- Overall, pork importers and users in Hong Kong/China had comparatively low expectations or “requirements” of quality traits for purchasing pork, but were consistently more likely to pay premiums—and larger amounts—than the other countries. Thus, Hong Kong/China could hold more profit potential than previously considered.
- Mexican pork importers and users had the lowest expectations or “requirements” for quality, with the exception of Visual Characteristics, and were least likely to pay premiums, suggesting that Mexico is the most price sensitive market of the four evaluated.

- Pork cuts imported by Russia that do not appear to be manufactured by the U.S. present an opportunity for the U.S. pork industry, particularly if trade barriers for fresh pork can be overcome.

LITERATURE REVIEW

The U.S. pork industry has previously funded research that addressed export markets and pork demand drivers. The 1994 International Pork Quality Audit (IPQA) was conducted by Morgan et al. (1995) at Colorado State University. The purpose of the 1994 IPQA was to identify the competitive advantages that the U.S. pork industry had in relation to other foreign competitors so that the U.S. pork industry could better understand the needs of their customers, increase market share in countries where U.S. pork was traded, as well as identify and pursue relationships with new markets. The 1994 IPQA served to establish specific areas in which U.S. pork excelled, including: (1) high confidence in the U.S. food safety system, (2) competitive price of U.S. pork, (3) excellent palatability, especially tenderness, (4) positive image of the U.S., and (5) ability for importers to purchase individual cuts in large volumes. With respect to pork sensory traits, the U.S. was ranked first, followed by Denmark and Taiwan, respectively.

However, many aspects of international trade have changed significantly since 1994, including increased vertical integration of the U.S. pork industry, increased competitiveness of the pork industries in other countries, the newfound “value” of pork variety meats and offal products, as well as the changing dynamics of the international marketplace. Furthermore, it is not known if all or any of the U.S. advantages identified in the 1994 IPQA still exist today. Likewise, several deficiencies identified for U.S. pork in 1994 may still have merit today. Morgan et al. (1995) concluded that the “top five

concerns” about the quality of U.S. pork were: (1) color, firmness, water-holding capacity, and pale, soft, exudative (PSE) lean muscle, (2) lack of customer service, (3) abscesses/bruises/foreign material contamination, (4) excessive seam fat, and (5) cut sizes that were too large.

Vonada et al. (2001) collected data in retail stores in Seoul and Pusan, South Korea to quantitatively determine the merchandizing characteristics used at retail for U.S. pork subprimals. The study concluded that no quality attributes of U.S. pork “exceeded” the expectations of Korean retailers (Vonada et al., 2001). However, U.S. pork did exceed the expectations of Korean traders/wholesalers with respect to marbling, tenderness, juiciness, flavor, and overall eating satisfaction, as well as with respect to the low level of foreign material contamination. The study demonstrated that emphasis on, and importance of, different quality attributes varied according to the sector being evaluated. Microbiological analyses of retail pork samples collected in South Korea suggested that U.S. pork is greater than or, at a minimum, equal to, the microbiological quality of Korean or Danish pork (Vonada et al., 2001). However, Vonada et al. (2001) explained that both U.S. and Danish pork sold at substantially lower retail prices in South Korean stores than domestic Korean pork, and that U.S. pork captured only 2.6% of the total pork display case area in South Korea (pork, in total, only accounted for 27.8% of total meat retail case frontage).

In 2002, personnel representing Colorado State University and the U.S. Department of Agriculture-Agricultural Marketing Service (USDA-AMS), along with a private consultant conducted a study for the National Pork Board entitled “Competitive Disparities for U.S. Pork in Export Markets” (Smith et al., 2002). The study was

conducted to benchmark pork production in Brazil, Canada, Denmark, and the U.S.; the marketing strengths and weaknesses of each country; and, to identify supply chain efficiencies within each country that contributed to strong pork export programs. At the time that the study was conducted, Denmark was the largest volume exporter of pork in the world, followed by Canada, the U.S., and Brazil, respectively. Brazil was considered to be an up-and-coming competitor for challenging established market share in major pork export markets. Smith et al. (2002) provided an opportunity for the U.S. pork industry to consider several potential strategies for improving pork exports, which were explored at a strategy workshop in 2003 and led to the implementation of new policies that dramatically increased U.S. focus on international trade and significantly improved the volume and value of U.S. pork exports (Smith et al., 2002; Belk et al., 2006).

Since 1994, the U.S. has evolved from a net importer of pork to become the largest exporter of pork and pork variety meats in the world. Several factors have facilitated the massive increase in volume, and value, of U.S. pork exports, including successful marketing strategies in established and new markets; animal disease outbreaks in other countries, which have limited their domestic pork production, thus creating a deficiency within that country as well as reducing the volume of product available for export; improved logistics and supply chain coordination for moving fresh/chilled and frozen pork worldwide; increasing world incomes, most notably in Latin American, Asian, and Association of Southeast Asian Nations (ASEAN) countries; and, conscientious attention by U.S. companies to the export customer. Other factors that have served to bolster U.S. pork exports in recent years include a depreciating U.S. dollar (relative to other global currencies), as well as weather problems and natural disasters in

some regions of the world. With the exception of this past year, the U.S. has achieved double and even triple-digit increases in pork export volumes every year since 1994. In the years immediately following the research by Vonada et al. (2001) and Smith et al. (2002), exports of U.S. pork products worldwide dramatically increased from 726,000 mt (\$1.5 billion) in 2002 to over one million mt (\$2.2 billion) in 2004, exceeding 2 million mt in 2008 with a total value of \$4.88 billion (USMEF, 2010a). On a per hog basis, 2008 export value equated to \$42.30 for every hog slaughtered in the U.S., but this value dropped to \$38.44 in 2009 as exports were moderated by H1N1 influenza-related market access restrictions, especially in China and Russia, by large domestic pork supplies in several key markets, including Japan and China, and by the negative impacts of the global economic crisis. U.S. pork and variety meat exports in 2009 were valued at \$4.33 billion with volume totaling 1.866 million mt, which exceeded 2007 volume by 43% but was 9% less than the record year of 2008. From January 2010 to April 2010, the U.S. pork industry exported 468,793 mt of pork products valued at \$1.1 billion; an increase of 527% in volume and 554% in value over exports in January through April 1994 (USMEF, 2010b).

The increasing importance of export markets to the U.S. pork industry, as well as the value of exports to the U.S. economy, requires continuation of the progress established by Morgan et al. (1995), Vonada et al. (2001), and Smith et al. (2002) in order to consciously adapt to the ever-changing opportunities and challenges facing U.S. pork exports. However, a common limitation of these studies was the limited amount of emphasis placed on ascertaining, using objective measures, the importance of specified quality attributes when deciding to purchase imported pork. Therefore, it is necessary

that the U.S. pork industry understand how foreign customers define “quality” as it relates to the products and services of U.S. pork in order to stay abreast of changes and emerging trends in the international marketplace. The information gained from this study will be invaluable in ensuring continued success of U.S. pork in important export markets.

In order to understand the meaning of “quality” as much as is reasonably possible, an indicator of customer preference must be identified and implemented in a systematic fashion. One such method commonly used in economic market analyses is an estimate of customer willingness-to-pay (WTP) for attributes of goods and services (i.e., for quality attributes of imported pork). A second method, called Best-Worst (BW) scaling (sometimes referred to as maximum-difference scaling), utilizes a ratio scale to measure differences in the importance of various attributes (i.e., to measure the relative importance that customers or “users” of U.S. pork place on specified quality attributes related to imported pork).

Willingness-to-pay studies are a structured survey technique within the Contingent Valuation (CV) method of economic analysis (Loomis et al., 1997). As it relates to the CV method, the question format utilized in this study is referred to as dichotomous choice. In dichotomous choice experiments, respondents are asked whether or not they would pay a given dollar amount, which varies randomly from respondent to respondent, for a good or service, and then from this, the maximum WTP value that the population would pay is determined (Hanemann, 1984).

The CV method was actually developed with the explicit intention of putting a “value” to environmental or social goods that cannot easily be sold to consumers, such as

beautification of the local landscape, the intrinsic value of National parks to society, etc. (Carson and Hanemann, 2005). Further, according to Carson and Hanemann (2005), the CV method has even been applied in the U.S. for conducting assessments of the costs and benefits of major new government regulations and the reauthorization of existing ones, and by the Organization for Economic and Cooperative Development (OECD) for measuring the economic impact of pollution. Since then, the CV method has found its way into a much broader range of applications and has been used successfully in agricultural economics research for objectives such as evaluating consumer perceptions of “sustainably produced” food labels (Tonsor and Shupp, 2009) and measuring “food values” (Lusk and Briggeman, 2009).

Best-Worst scaling was originally introduced by Finn and Louviere (1992) as a means for avoiding the shortfalls common to survey research. Since then, BW scaling has been integrated into everything from business marketing research to measuring overall life values (Lee et al., 2007) to investigating ethical beliefs across countries (Auger et al., 2007) to, very recently, measuring food values (Lusk and Briggeman, 2009). As explained by Finn and Louviere (1992), “BW scaling models the cognitive process by which respondents repeatedly choose the two objects in varying sets of three or more objects that they feel exhibit the largest perceptual difference on an underlying continuum of interest.” In other words, the respondent chooses one attribute as most important and one attribute as least important in order to maximize their utility or “benefit” relative to the objects identified in the set. In research results reported here, the underlying continuum of interest is “degree of importance” and the objects are “quality attributes of imported pork” (Table 1).

Best-worst scaling enjoys several advantages over other frequently used rating-based methods such as hedonic scales (e.g., scale of 1 to 5, with 1 being “most important” and 5 being “least important”). First, Finn and Louviere (1992) explained that interpreting ratings data for new or emerging concerns may be difficult if there is no context with which to base the results. Second, BW scaling exploits human nature and our “propensity to identify and respond more consistently to extreme options” (Marley and Louviere, 2005). Thus, it is easier to select the two extremes than it is to rank a list of choices. Third, most rating-based methods do not require respondents to make choices or trade-offs for degrees of importance between objects. For example, an interviewed company could indicate that all of the quality attributes are important, which would hinder our ability to adequately discriminate the data and establish priorities. Like Lusk and Briggeman (2009) explained, “By having people choose the best and worst options, people are forced to decide which issues are more or less important, and unlike rating scales, there is only one way for people to respond to the question (with a choice).” Fourth, and perhaps most important, as it relates to the complexities of this study, BW scaling allows “us to compare issues and people across countries in a way that minimizes differences due to scale use and/or cultural response orientations” (Auger et al., 2007). In other words, the “degree of importance” of selecting a value of 2 (i.e., important) on the aforementioned hedonic scale for interviewed companies in Japan could be a 1 (i.e., most important) for interviewed companies in another country, and vice versa. Best-worst scaling minimizes these scalar differences.

RESEARCH OBJECTIVES

The objectives of this research were to:

1. Document the various factors that foreign customers of U.S. pork whole muscle cuts, pork variety meats and offal products, and processed pork products use to describe the specified quality attributes identified in Table 1, as well as identify quality attributes that are unique to individual countries.
2. Estimate the willingness of foreign customers of U.S. pork to pay for specified quality attributes.
3. Establish a ranking of the specified quality attributes.

MATERIALS AND METHODS

STUDY DESIGN

USMEF foreign office staff was instructed to recruit companies that had purchased imported pork in the past three years (results are shown in Table 2). If a company had not purchased imported pork in the past three years, for example, purchasing only domestic pork, their results were excluded from the study. Once this condition was met, targeted companies were characterized according to two distinct customer profiles: primary customers and marketing chain customers. Primary customers were companies that had imported pork directly from foreign producers (i.e., packers) in the past three years. Primary customers included importer/distributors, meat traders, meat processors, wholesalers, large-chain retail and foodservice operations, etc. Marketing chain customers were what we considered “indirect purchasers” of imported pork. These were companies that had used imported pork in their business operations in the past three years but had not imported it themselves. Examples of marketing chain customers included retail and foodservice managers, smaller or independent retail stores and supermarkets, independent restaurants, chefs, intermediary distributors, etc. It was very likely that a number of the interviewed marketing chain customers have purchased imported pork from companies that we identified, and interviewed, as primary customers. In all interviews, it was central that we interviewed the individual or individuals within the company that make the actual purchasing decisions because, in order to accurately answer the WTP questions, it was critical that the company representatives were familiar

with current pork prices. At no time were “end consumers” recruited or interviewed; this study focused entirely on “customers.”

INTERVIEW INSTRUMENT

A computer-assisted personal interview was developed using commercial survey software [PASW Data Collection 5.6, SPSS, Inc. (an IBM Company), Chicago, IL] to produce the interview instrument used in the study. The survey software was required to handle the dynamic routing structure of the interview instrument and to administer the WTP and BW scaling methodologies. The interview instrument was developed in consultation with USMEF-Denver and their foreign offices.

DEMOGRAPHIC QUESTIONS

Each interview began with questions that would delineate basic demographics to provide insight into the companies, to establish rapport, and to enable classification of the companies according to predetermined categories.

QUALITY ATTRIBUTES

To determine the willingness of foreign customers of U.S. pork to pay premiums for pork quality attributes, it was necessary to first establish what they understand “quality” to mean as it relates to imported pork products. To accomplish this task, “quality” was divided into seven attributes: (1) Food Safety, (2) Customer Service, (3) Product Eating Quality (referred hereafter simply as Eating Quality), (4) Product Specifications Desirability and Conformity (referred to hereafter as simply Product Specifications), (5) Product packaging and Condition upon Receiving (referred hereafter

as simply Product Packaging), (6) Visual Characteristics of Product (referred hereafter as simply Visual Characteristics), and (7) Production History.

Company representatives were not provided definitions for each quality attribute because we did not want to unintentionally alter their responses. For example, our definition of “food safety” could be very different from the descriptions provided by interviewed company representatives, as well as very different across sectors and, certainly, across countries. It was our intention to gather their “top-of-mind” responses when they explained the meaning of each quality attribute.

ECONOMIC FACTORS

Before the WTP questions were initiated, respondents were first asked to list the economic factors that were taken into consideration when they purchased imported pork products. The rationale for asking this question was to draw out important economic factors so that their responses to the WTP questions focused on “quality” issues. So, in other words, when asked “What must pork whole muscle cuts have in order for you to purchase them,” their attention should have been to responses like Food Safety, Product Packaging, Product Specifications, etc., and not on price or exchange rate.

WILLINGNESS-TO-PAY (WTP) ESTIMATES

To initiate the WTP questions, company representatives were asked, “What specific characteristics or attributes are “required” in order for your company to purchase imported pork whole muscle cuts/pork variety meats and offal products/processed pork products?” The researchers administering the interviews then categorized the interviewees’ responses within the seven specified quality attributes identified in Table 1. For example, if a company answered that the degree of external fat thickness was central

in their decision to purchase or not purchase imported pork whole muscle cuts, their response was recorded under Product Specifications, as we considered this a specification and conformity defect. If the company answered with “quality,” they were asked to be more explicit and to define quality.

Once it was established which quality attributes were “required” for purchase, company representatives were asked if they would be willing to purchase the product at a discounted value (X%) if the quality attribute(s) they had identified previously could not be guaranteed. The discount value (i.e., X) was a randomly generated value between 0 and 100 produced by the software package and the respondents answer was recorded. This question was then asked a second time with a new value that was contingent on how the first question was answered. For example, if the company said “no” to a 40% discount, the second discount value was some random number between 41 and 100. However, if the company said “yes” to a 40% discount, the second discount value was some random number between 0 and 39. The discount questions were repeated for each quality attribute that was identified as being “required” before a purchase would be made. The rationale behind the discount questions was to test whether or not the “required” quality attributes were absolute requirements for purchasing imported pork products or simply preferences. If a company was willing to purchase imported pork products at a discount for quality attributes which they had just identified as “required,” then as much as they may demand quality, they are still highly sensitive to price.

Once discount questions were completed for each “required” quality attribute, company representatives were asked to assess whether or not they would pay a premium for the remaining quality attributes; in other words, if the company would be willing to

pay a premium of a randomly selected amount if the attributes could be guaranteed. Thus, if two of the seven quality attributes were identified as “required,” that left five quality attributes for which they were asked the questions regarding premiums. For example, if Customer Service was not identified as being “required,” then the company representative was asked if they would be willing to pay a Y% “premium” to purchase the same product if the customer service that they received from their suppliers could be guaranteed to satisfy their expectations. The premium value (i.e., Y) was again a randomly generated number between 0 and 100. If the representative answered “no” to a 20% premium, the second value generated to elicit a response was some random number between 0 and 19. If they answered “yes,” the second value was some random number between 21 and 100.

BEST-WORST (BW) SCALING

A Best-Worst (BW) scaling task was designed to measure the importance of the seven quality attributes identified in Table 1. According to Louviere and Islam (2008), “one can treat each attribute as having two levels (present/absent), and use a fraction of a 2^k design to construct sets (k = number of attributes).” In the present study, an orthogonal fraction of the 2^7 was used to make eight sets of questions to which each interviewee was asked to respond with a “best/worst” rating. Seven sets contained three quality attributes to be assessed, while the eighth set contained all seven quality attributes to be assessed. Each respondent received all eight sets and was required to select one attribute as most important and one attribute as least important in each of these sets.

DATA COLLECTION TRIPS

In cooperation with USMEF, research teams consisting of one interviewer and one recorder for each team conducted interviews over two-week time periods in the countries of Hong Kong/China, Japan, Mexico, and Russia. These countries were selected for evaluation in this study based on current and forecasted values of imported U.S. pork and pork variety meats. Combined, the four international markets represented 70% of the total value and 71% of the total volume of U.S. pork and pork variety meat exports in 2008 and 2009 (USMEF, 2010a). In-country translation was provided by USMEF personnel whenever possible, and in instances when this was not possible, trained translators were hired.

COMPLETED INTERVIEWS

For Hong Kong/China, a total of 83 interviews were conducted in the cities of Beijing, Guangzhou, and Hong Kong over a two-week period in December 2009. In order to accomplish the enormous task of collecting a representative sample of the major Chinese destinations for U.S. pork, three research teams were utilized. The teams consisted of four CSU personnel, one representative from USDA-AMS, and one representative from USMEF-Denver. For Japan, 48 interviews were conducted in the city of Tokyo over a two-week period in November 2009 and at Foodex Japan, Asia's largest food and beverage trade show, in March 2010. For Mexico, 70 interviews were conducted over a two-week period in September and October 2009 in the cities of Monterrey and Mexico City. The research team in Mexico City, besides conducting interviews in the city and surrounding areas, also attended Abastur, the largest food and beverage trade show for the HRI sector in Latin America. Lastly, for Russia, 54

interviews were conducted in Moscow at Prodexpo, the largest food and beverage tradeshow in Russia and Eastern Europe, in February 2009, and over a one-week period in April 2010 in the cities of Kaliningrad, Moscow, and St. Petersburg.

Conducting interviews at tradeshow presented a unique set of challenges and opportunities. Interview were frequently required to be conducted at a brisk pace because of time constraints, which sometimes limited the ability to establish thorough and in-depth discussions of the various interview topics; however, it did enable a large number of interviews without travel and that captured a very business-wise and geographically diverse sample of customers of U.S. pork.

Overall, the approximate volume of U.S. pork exports that was accounted for in each country by conducting the number of our interviews and companies to which the questions were administered was between 40 and 50% for Hong Kong/China and Mexico and between 60 and 70% for Japan and Russia.

COUNTRY PROFILES

HONG KONG/CHINA

In 2008, Hong Kong/China was the largest growth market for U.S. pork and pork variety meat exports, where total export volumes reached nearly 400,000 mt and were valued at almost \$690 million (USMEF, 2010a). In 2009, U.S. pork and pork variety meat exports to the Hong Kong/China region were 258,708 mt, down 35% from the record-breaking levels of 2008. Still, demand for U.S. pork in 2009 in this region was solid, with U.S. pork representing an estimated 19% of the total imported pork market, and exports of U.S. pork reached the second highest annual volume since China opened

its market. Pork imports into the region moderated in 2009 due to greater domestic supplies and China's ban on imports of U.S. pork due to the H1N1 influenza. The vast majority of U.S. pork (90 to 95%) exported to Hong Kong/China is distributed to the hotel, restaurant, and institution (HRI) sector, which has a strong demand for high-quality table cuts (USMEF, 2010b). In addition, the demand for U.S. pork in China's processing sector, while relatively undeveloped, appears to be growing in competitiveness (USMEF, 2010b). Record-breaking exports of U.S. pork to China in 2008 were partially driven by preparation for catering events associated with the 2008 Beijing Olympics, as well as by rising personal incomes and reduced domestic production (~10%) attributed to swine disease outbreaks, weather, and natural disasters. U.S. pork exports to Hong Kong/China faced several challenges in 2009, but still exceeded 2007 volumes by 53%, indicating that the market will likely continue to gradually increase volumes of imported pork. However, certain issues such as ractopamine use, pathogen testing, and residue levels remain, presenting new challenges for U.S. exporters.

JAPAN

Japan ranks number one as an export market for U.S. pork on a value basis. In 2009, U.S. pork and pork variety meat exports to Japan totaled 421,360 mt valued at \$1.54 billion, accounting for 35% of total U.S. pork and pork variety meat export value (USMEF, 2010a). Additionally, U.S. market share, as a percent of all pork products imported into Japan, reached a new high of 46%; however, this position is being challenged by Mexico, Canada, Chile, and other countries that wish to establish a presence in this lucrative market (USMEF, 2010b). U.S. pork is extremely competitive in Japan in terms of price and quality, and is constantly improving its image. To address

Japan's import duty system which penalizes lower-cost cuts, USMEF has aggressively promoted higher-value U.S. pork cuts, such as back ribs, spare ribs and tenderloin. To continue building a positive image, U.S. pork is promoted as a regular item on the menus of top international hotels, used for private brands by some group companies including convenience stores and delis, and most major retailers sell U.S. pork with steadily expanding shelf space following the introduction of more products and cuts. Moreover, U.S. chilled products are increasing penetration into the retail, foodservice and even processing sectors. A strong presence for U.S. pork in the processing sector remains critical for the growth in exports to Japan.

MEXICO

According to USMEF (2010a), Mexico was the most important export market, on a volume basis, for U.S. pork and pork variety meat exports in 2009, where exports increased 27% to 503,503 mt and were valued at \$762 million. The U.S. enjoyed record-breaking exports to Mexico in 2009 despite the global economic downturn and the H1N1 influenza virus, which both negatively impacted the meat trade in Mexico. U.S. exports continue to increase even as Mexican hog slaughter numbers increase and domestic pork prices become more competitive (relative to U.S. pork prices). Furthermore, Mexico is shifting towards a more vertically integrated pork industry, which should improve the production, quality, and consistency of domestic pork, and create stiffer competition for U.S. pork (USMEF, 2010b). However, new opportunities for U.S. pork are still being discovered, especially as growth in demand outpaces growth in Mexico's domestic production. According to USMEF (2010b), many medium-sized, fast-growing processors are not aware of the quality attributes of U.S. pork. In addition, Mexican

consumers are gradually transitioning away from wet markets to retail chains and regional supermarkets, and there is significant potential for the U.S. pork industry to supply these growing sectors.

RUSSIA

In 2009, Russia was the second largest pork importer in the world, trailing only Japan. Exports of U.S. pork and pork variety meats to Russia set a new record in 2008, totaling 217,767 mt valued at \$476 million. In 2009, U.S. pork and pork variety meat exports to Russia dropped 36% to 139,387 mt that were worth \$289.3 million, which represented a 19% market share of total imported pork in this market. According to USMEF (2010b), the U.S. was the third largest supplier for Russia's imported pork market, and the U.S. is well-positioned to further realize the potential of this emerging market. Numerous factors support this argument including the well-deserved reputation of U.S. pork in the processing and retail sectors, a booming retail sector, increasing consumer purchasing power, and a growing number of up-scale establishments that serve high-quality food (USMEF, 2010b). However, the long-term stability of this market is difficult to ascertain as Russia is aggressively working to increase its domestic pork production and is willing to use regulatory tools to deal with issues such as pathogen testing and maximum residue levels as well as tariff rate quotas and prohibitive over-quota duties to limit imports of foreign pork.

STATISTICAL ANALYSIS

The PROC GLIMMIX procedure of SAS (Version 9.2, SAS Institute Inc., Cary, NC) was used to calculate the probability that interviewed companies were willing to

purchase imported pork products at a discount when quality attributes—for which they had indicated previously as “required”—were instead not necessarily provided. In addition, the same procedure was utilized to calculate the probabilities for companies to pay a premium for imported pork products possessing quality attributes that were “guaranteed.” The class statement included country and quality attribute. The model statement was the number of interviewed companies that were not willing-to-purchase products at the offered discount levels over the number of interview observations, or the number of interviewed companies that were willing-to-pay a premium at one of the offered premium levels over the number of interview observations.

The PROC LIFEREG procedure of SAS was used to generate the WTP estimates. The dependent variables were the bounds or limits of the discount/premium values randomly generated by the software program, and the independent variables included the four interviewed countries, three product types (i.e., pork whole muscle cuts, pork variety meats and offal products, and processed pork products), and the seven specified quality attributes.

The PROC QLIM procedure of SAS was used to elicit the shares of preference for the BW scaling task. The dependent variable was the ordered combination of the chosen quality attributes and the independent variables were the seven quality attributes.

RESULTS AND DISCUSSION

DEMOGRAPHIC RESULTS

U.S. pork was purchased by all interviewed companies in Mexico (Table 3); by all but one company in Japan, which—for that company—was because of price; by all but three companies in Hong Kong/China, which—for those companies—was attributed to a lack of knowledge or familiarity with U.S. pork; and, by all but six companies in Russia, which—for those companies—one attributed to price and five attributed to not possessing tariff rate quota for U.S. pork. Other pork producing countries in competition with U.S. pork included Canada in all four countries and Denmark in all interviewed countries except Mexico (Table 3). Overall, Hong Kong/China was the most diversified purchasing area, which was expected given the free-trade zone represented by Hong Kong. Interestingly, only 28% of the interviewed companies in Hong Kong reported purchasing Chinese pork. Brazilian pork was purchased by roughly 51 and 76% of the interviewed companies in Hong Kong/China and Russia, respectively, slightly edging out Canada for second place in these markets (Table 3).

Numerous respondents said that Brazilian pork is popular in Russia because of their carcass fabrication styles that yield bone-in and boneless collars and shoulders, which is the same fabrication style used in Europe; Russian consumers are more familiar with European cuts than U.S. butts and picnics. Additionally, the Russian government considers Brazil to be a developing country, which gives their exports, including pork, a

15% discount in import duties compared to products from developed countries like Canada, the U.S., and Western Europe.

The percentage of U.S. pork purchased expressed as a proportion of total pork purchases (including purchases of domestic pork) during the past three years was approximately 45, 46, and 35% for companies in Hong Kong/China, Japan, and Russia, respectively (Table 4). Mexico was considerably higher at 81%. However, data were collected in Mexico before this question was modified to include consideration of domestic pork purchases. After collecting data in Mexico, it was determined to be more informative to understand what proportion of total interviewee business relied on U.S. pork. Hence, the percentages of U.S. pork used by Mexican companies may or may not be misleading as numerous companies use only U.S. pork in their operations.

Approximately 76% of the interviewed companies in Russia had purchased some imported pork directly from foreign countries in the past three years (Table 5). Of those companies, 34 (roughly 83%) had purchased directly from U.S. packers and processors. Likewise, 96 and 98% of the interviewed companies in Hong Kong/China and Mexico, respectively, which had purchased directly from foreign companies, had purchased directly from the U.S. Only 35% of the interviewed companies in Japan had purchased directly from U.S. companies, which may have resulted as a consequence of the variable levy system and the difficulties that smaller companies have in complying with Japanese import regulations.

Interviewed companies in all four markets that had purchased directly from the U.S. in the past three years generally classified themselves as importers/distributors (Table 6). Other important sectors for all four markets were retail buyer and intermediary

distributors; roughly one-quarter of these companies in all but Mexico (considerably lower at 9%) classified themselves as wholesale buyers (Table 6). Further, nearly 30% of the companies in Japan and Russia that had purchased directly from the U.S. were meat traders, and over 50% of the companies in Mexico and almost 30% of the companies in Russia were meat processors (Table 6). It should be noted, however, that the different categories were not exclusive, meaning that it was possible for the same company to be represented in multiple categories depending on diversity of company operations and the operations of their direct customers.

For interviewed companies that did not report purchasing imported pork directly from any country in the past three years, involvement in foodservice, and specifically, restaurants, was the most popular category in Hong Kong/China, Japan, and Mexico; whereas in Russia, meat processing and intermediary distribution were considerably more popular (Table 7). Overall, approximately 68, 48, 71, and 32% of the interviewed companies in Hong Kong/China, Japan, Mexico, and Russia, respectively, had sold pork directly to end consumers in the past three years via foodservice, retail or company-owned meat shops, or other outlets such as on-line stores.

Approximately 83 and 85% of the interviewed companies in Russia and Hong Kong/China, respectively, believed U.S. pork to have a favorable image in their countries; whereas, 92 and 99% of the interviewed companies in Japan and Mexico, respectively, said U.S. pork had a favorable image (Table 8). In Japan, 91% of interviewed company representatives said that image was an important factor in their decision to purchase U.S. pork (Table 8). Image was considerably less important to interviewed companies in Russia (59%), which was primarily due to limitations imposed

upon them by the type and amount of tariff rate quota allocated to their company, as well as to interviewed companies in Mexico (67%), which was due to their close geographical proximity to the U.S. and their dependency on stable supplies of inexpensive imported pork. Of the interviewed companies that had not purchased U.S. pork in the past three years, image would have been an important factor to the single company in Japan and for two of the three companies in Hong Kong/China, but important to only one of the six companies in Russia, which was more related to limitations associated with the tariff rate quota system than anything else.

TYPES OF IMPORTED PORK PRODUCTS

PORK WHOLE MUSCLE CUTS

Roughly 22, 85, 80, and 19% of the interviewed companies in Hong Kong/China, Japan, Mexico, and Russia, respectively, had purchased fresh/chilled pork whole muscle cuts in the past three years (Table 9). Loin products, and specifically bone-in and boneless loins, as well as tenderloins, were the most common fresh/chilled pork whole muscle cuts purchased by companies in Hong Kong/China, Japan, and Russia; whereas, bone-in hams were more popular to Mexican companies (Table 9). In addition to the popularity of fresh/chilled boneless loins and tenderloins in Japan, over two-thirds of companies had also purchased skinless and single-rib bellies, cellar trimmed (CT) butts, and boneless picnics (Table 9). It should be noted that U.S. processors were not eligible to export fresh/chilled pork cuts to Russia at the time that this study was conducted because of trade restrictions related to trichinae, so responses indicating that Russian

companies purchased such items likely referred to purchases from European countries and Brazil.

For frozen pork whole muscle cuts, there was considerably more parity in types of products purchased by companies in Hong Kong/China and Mexico (Table 10). For Japanese companies, skinless and single-rib bellies, as well as boneless loins and tenderloins, were the most popular frozen pork whole muscle cuts. In Russia, almost twice as many companies purchased bone-in and boneless hams than the next closest country. Pork whole muscle cuts not offered by U.S. companies but apparently purchased from suppliers in other countries are listed in Table 11 and Table 12. Roughly 7 and 17% of the interviewed companies in Mexico purchased 3-piece hams and portion-cut pork loins, respectively (Table 11). For Russia, nearly one-third of the companies that purchased fresh/chilled pork whole muscle cuts in the past three years had purchased boneless collar and carcass sides (Table 12). Whereas for frozen pork whole muscle cuts, 60% had purchased boneless collar, 40% had purchased boneless shoulder, 29% had purchased 80%-lean or higher trimmings, 15% had purchased carcass sides, and 14% had purchased belly sheet-ribs (Table 12). The numbers for these products could be higher than reported because, while interviewed company representatives were shown lists of products produced by the U.S., the products listed here were recalled from memory or without the assistance of a list, so it is possible that companies which do import these products did not say so. Overall, these additional muscle items offered an opportunity for the U.S., particularly if trichinae-related trade barriers for fresh/chilled pork are overcome. Notably, in Mexico, more interviewed companies had purchased fresh/chilled (n = 56) than frozen (n = 48) pork whole muscle cuts (Figure 1).

PORK VARIETY MEATS AND OFFAL PRODUCTS

Companies in Hong Kong/China were the most diverse buyers of imported fresh/chilled pork variety meats (Table 13). Two companies in Japan and seven companies in Mexico had purchased fresh/chilled jowls in the past three years; while the other popular fresh/chilled variety meats and offal products purchased by companies in Mexico were skins and whole heads. For frozen pork variety meats and offal products, companies in Hong Kong/China, Japan, and Mexico were more diverse buyers than those in Russia (Table 14). Variety meats not offered by U.S. companies but which apparently were purchased in the past three years from other countries are presented in Table 15. Again, these were items that were not believed to be offered by the U.S. as export items, according to the list of exported items provided by USMEF, at the time this study was conducted, thus representing potential opportunities for exporting U.S. companies.

For Hong Kong/China specifically, 24 companies had purchased small and/or large intestines in the past three years, of which 14 (58%) had purchased intestines for human consumption only (Figure 2). Surprisingly, only two companies had purchased intestines for manufacture into casings and six companies had purchased intestines for both consumption and casing manufacture (Figure 2). Initially, it was believed that almost all pork intestines were used for casings.

IMPORTANT ECONOMIC FACTORS

Before initiating the WTP questions, respondents were asked what economic factors were important to them before they decided to purchase imported pork products. Not surprisingly, purchase price was the most commonly provided answer in all countries (Table 16). However, companies in Russia said price 15 to 20% less often than

companies in the other three countries. Russia's lower response rate for purchase price was compensated by their notable concern for credit terms and tariff rate quota, which reflected access to U.S. supply (Table 16).

“QUALITY” DEFINED

FOOD SAFETY

Overall, there were numerous notable distinctions across countries with regard to general understanding of Food Safety. “Not getting sick from eating pork,” which we classified under *USDA inspection and/or guarantee of the product's wholesomeness and safety* as the USDA is the regulatory agency responsible for ensuring the safety and integrity of the U.S. meat supply, was important to interviewed companies in Hong Kong/China (39.4%), Mexico (37.3%), and Russia (27.3%; Table 17). The wholesomeness and safety of imported pork products was 2 to 3-times more important to Hong Kong/China, Mexico, and Russia than it was to Japan. Likewise, *in-country government inspection*, which is the ability of imported pork products to pass inspection without food safety-related issues, was vastly more important to Hong Kong/China (25.8%), Mexico (18.6%) and Russia (31.8%) than it was to Japan (2.6%; Table 17). These disparities may have been related to the high degree of confidence that Japanese companies have in the safety of U.S. pork, the stability of the U.S.'s trading relationship with Japan relative to the other countries, and the tendency of the other countries, most notably Hong Kong/China and Russia, to use food safety-related issues as trade barriers. Other notable differences between Japan and the other countries was Japan's interest in *traceability and/or production history* (43.6%), *no chemical residues* (38.5%), *quality of*

feed ingredients and/or no feed additives (23.1%), and *no physical hazards* (41.0%), specifically bone chips (Table 17). One company explained that Japanese consumers have such a low tolerance for physical hazards that a single bad eating experience, such as finding a bone chip in pork sausage, could be enough to cause that consumer to switch brands or to stop buying that product all together.

Mexico was similarly concerned as Japan about microbiological contamination (33.9 versus 41.0%, respectively) and more concerned about the hygiene and cleanliness of production and slaughter processes (37.3 versus 30.8%, respectively). These findings suggest that the technical knowledge level of companies in Mexico relative to Food Safety has increased, which should give the U.S. a competitive advantage in this market. Overall, Food Safety comments from Mexico appeared to support the long-term educational strategy implemented by the industry in Mexico, which has been designed to guide and develop their technical understanding of food safety. The same level of technical understanding was not evident in the Food Safety responses from companies in Hong Kong/China and Russia. There may be opportunities to implement similar strategies in both Hong Kong/China and Russia to help promote sales of U.S. pork in these countries.

Finally, what was not mentioned in interviews was almost as interesting as what was. No respondents made reference to concerns over cloning or irradiation of foods, suggesting that these markets are either unaware of these technologies or complacent with the possibility of their use. Additional research is needed to delineate whether or not such technologies are acceptable in export markets.

CUSTOMER SERVICE

Responses common across all countries relating to Customer Service, provided in the highest aggregate numbers, were *service after the sale and/or good customer relations* and *fulfill contract requirements*, followed closely by *response to complaints* and *response to questions* (Table 18). *Service after the sale and/or good customer relations* was important to 40.7% of interviewed companies in Mexico, which they described as their suppliers having a genuine interest in, and knowledge of, their companies, as well as suppliers following-up on their company's success with the purchased products. Further, 22.0% of interviewed companies in Mexico said that the ability to negotiate purchase prices (as opposed to being presented with a set price) as well as the ability to negotiate contracts of different lengths of time was important to them. Interviewed companies in Japan expressed interest in receiving all microbiological test results, even if the results were negative, which were classified under *response to questions*. *Fulfilling contract requirements* were defined as foreign companies fulfilling requirements for products specifications, packaging, price, and date of delivery as stipulated in the original sales contract. *On-time delivery* was mentioned by 45.5, 49.2, and 56.8% of interviewed companies in Hong Kong/China, Mexico, and Russia, respectively (Table 18), which could be partially related to shipping delays at their borders as a consequence, again, of their governments using food safety concerns as barriers to trade. Exactly half of interviewed companies in Russia explained that *correct documentation and/or no errors* were important to them. Also, unique to Russian companies, was at an 11.4% response rate that *credit and/or payment terms* was a part of customer service and 13.6% said *updates on orders (i.e., delays)* were important.

For interviewed companies in Hong Kong/China, *promotional material* (21.2%), *technical information* (18.2%), *consistent product quality* (19.7%), *consistent supply of product* (19.7%), and *negotiate price/stable price/price information/long-term contracts* (18.2%) were related to Customer Service (Table 18). Additionally, 22.0 and 33.3% of those interviewed in Mexico and Japan, respectively, identified *correct and/or flexible product specifications* as good customer service. Finally, 41.0% of those interviewed in Japan expressed interest in *listings of offered products and/or information on new products* (Table 18), demonstrating Japan's appetite for new and exciting products like U.S. pork back ribs.

PRODUCT EATING QUALITY

Good flavor/taste was the most common response describing what is important to Eating Quality, followed by *tenderness, juiciness, and good smell and/or no off-smells* (Table 19). *Good visual appearance and/or color* were close behind, indicating the close association of visual characteristics in their overall eating experience, especially for Mexico (33.9%). *Texture and/or firmness* was important to companies in Hong Kong/China (18.2%), Japan (28.2%), and Mexico (23.7%) but not to companies in Russia (2.3%; Table 19), which might be due to the large number of further-processors that were interviewed in Russia. Additionally, *freshness* was important to customers in Hong Kong/China (19.7%), Mexico (20.3%) and Russia (15.9%) but of little importance to companies in Japan (5.1%; Table 19). The popularity of *freshness* as a factor of Eating Quality may have been partially related to the still large presence of wet markets in each country (except Japan) and lingering consumer preferences for purchasing "fresh" or, at minimum, "fresh-looking" pork products. Finally, *not "enhanced"* was important to

interviewed companies in Hong Kong/China (12.1%), which again, was probably directly related to wet markets and the absence of regulatory controls in such markets. Overall, there appears to be a close association of Visual Characteristics with Eating Quality.

PRODUCT SPECIFICATIONS DESIRABILITY AND CONFORMITY

The majority of comments from all four countries relating to specifications for products focused on *correct product size* and *correct product weight*, as well as on *consistent product size* and *consistent product weight* (Table 20). Further, nearly one-third of interviewed companies in each country said *correct amount of external fat* was important. *Good yield* was mentioned less often, but many companies likely considered yield and external fat thickness to be one and the same, because the fatter the product, the more fat that will have to be trimmed, thereby, reducing that product's yield. Vonada et al. (2000) found that South Korean customers preferred Boston butts of mid-weight (3.82 kg) with moderate or higher USDA marbling scores, and moderate amounts of seam fat. *Correct product* was reported by 16.7, 27.1, and 31.8% of interviewed companies in Hong Kong/China, Mexico, and Russia, respectively (Table 20), which was described, for example, as an issues with having ordered fresh/chilled product and actually receiving from the supplier frozen product instead, or receiving a few boxes of back fat in a shipment of hearts. Comments on Product Packaging were offered by 25.8 and 20.3% of interviewed companies in Hong Kong/China and Mexico, respectively. Further, 15.4 and 22.0% of companies in Japan and Mexico, respectively, made comments that more closely related to Visual Characteristics (e.g., color and overall appearance) rather than Product Specifications (Table 20). Finally, 15.3% of interviewed companies in Mexico said *control of cold-chain* was related to specifications, while 13.6% of interviewed

companies in Russia identified *labeling (including production date)* as important in this category of quality factors (Table 20).

PRODUCT PACKAGING AND CONDITION UPON RECEIVING

Box strength/integrity (i.e., flattened/crushed boxes) was the most common response provided across all countries (Table 21). Hong Kong/China and Russia described *correct box size* as using boxes that are appropriate to the size of the contents in order to minimize free space in the box, thereby, limiting the possibility of the box being crushed. Japan explained that using boxes appropriate to the size of the contents would alleviate the cumbersome task of handling product in over-sized boxes, as well as effectively help in controlling box weight. In addition, all countries expressed desire for standardized box sizes. The justification was that it would be much easier to organize pallets for further distribution, which are sometimes made up of product from different companies, if all boxes were the same shape and size. In addition, *clean and/or attractive packaging*, such as use of “white”-colored boxes and attractive printing and logos, were important to all countries, particularly to companies in Russia (Table 21). Standardized box sizes and use of white boxes were two examples of opportunities for the U.S. pork industry to add value to their packaging. Also, 9.1 and 10.3% of interviewed companies in Hong Kong/China and Japan, respectively, said that *product placed in box neatly and/or layered packaging* was important to them. Something as simple as organizing the contents of the box may be enough to command a premium in these markets. This assertion agrees with the data reported by Vonada et al. (2000), which found that South Korean customers had a strong preference for round-shaped Boston butt slices and square-shaped belly slices. Vonada et al. (2000) indicated the need for packaging and

boxing that allowed these products to maintain their shape during shipment to, and distribution in, South Korea.

Unique to Mexico, with a 23.7% response rate, was their concern over *control of cold-chain*, which could be partially related to their in-country difficulties of keeping the cold-chain intact; their strong preference for purchasing fresh/chilled product; and, their association of visual characteristics with the safety and quality of pork. *No leaking bags* and *prefer vacuum packaging* were important across all countries, while 15.2 and 38.6% of those interviewed in Hong Kong/China and Russia, respectively, *prefer individual wrap packaging (IWP)* (Table 21). In general, these companies were referring to difficulties that they have experienced trying to un-wrap vacuum packaged frozen product when the packaging is trapped in the folds of the frozen product. This also was sometimes identified as a problem with IWP, but less so than with vacuum packaging. Customers would prefer that products be frozen or at least blast-chilled before packaging to alleviate this problem. Russia also expressed a preference for poly-lined boxes over wax-lined boxes (15.9%) that was not observed in the other countries (Table 21). Finally, *labeling (no mislabeling)* was important to 28.8 and 25.4% of interviewed companies in Hong Kong/China and Mexico, respectively, and to over 17.9 and 15.9% of those interviewed in Japan and Russia, respectively (Table 21). Examples of labeling concerns included having the product name, weight, and production date correspond to the information on the export certificate, having the labels affixed to the box in the correct location and in the correct orientation, as well as not having problems with the label peeling off the box.

VISUAL CHARACTERISTICS

The majority of interview responses relating to Visual Characteristics concentrated on *ideal lean color*, making it the single most important component of visual quality (Table 22). In fact, almost 91.5% of those interviewed in Mexico made a direct reference to lean color, approximately 11% higher than Hong Kong/China, the next closest country, and more than three-times higher than any other listed visual quality factor identified in Mexico (Table 22). Companies said that *ideal lean color* was lean that is not too pale in color or that does not appear “washed out,” lean that is not too dark, or lean that does not express noticeably different shades of color within the same muscle or across muscles (e.g., hams). Wright et al. (2005) found that “high” quality pork loin chops, besides having more desirable marbling, juiciness and shear force characteristics, also had more desirable “darker” lean color than lower quality pork chops. Topel et al. (1976) and Person et al. (2005) found that consumers discriminated against pale color chops and against hams manufactured with greater amounts of pale, soft, and exudative raw materials, respectively, at the point of purchase. Likewise, Brewer and McKeith (1999) reported that consumers very clearly discriminated against pork they perceived to be “very light pink.” Wright et al. (2005) concluded that 12.5% of the pork loins at retail classified as “low quality” and that retail pork in the U.S. was quite variable with regard to quality and palatability traits.

Freshness was mentioned in relation to Visual Characteristics about one-third to one-half as often by companies in Mexico than it was in other countries, which could be due to Mexico’s association of freshness with Eating Quality (Table 22). *Good marbling and/or juiciness* was associated with Visual Characteristics twice as often by companies

in Japan as it was in any other country, which was to be expected given their penchant for high-quality, highly-marbled meat products. *Correct external fat thickness and/or yield* and *correct fat-to-lean ratio*, classified as similar in meaning more reflective of a Product Specifications attribute, was mentioned by 18.2 and 19.7%, respectively, of companies in Hong Kong/China; *correct external fat thickness and/or yield* was mentioned by 33.3% of interviewed Japanese companies (Table 22). Likewise, *no scarring on product surfaces (i.e., no knife cuts)*, another response that should have been perhaps considered as a Product Specification attribute, was important to a number of companies in all countries. Interestingly, 18.2 and 23.7% of interviewed companies in Hong Kong/China and Mexico, respectively, associated *no smell and/or off-odors* with Visual Characteristics, a response that would be more related to Eating Quality than to Visual Characteristics.

PRODUCTION HISTORY

Product traceability, which was generally described as the ability to trace back product to its origin in the event of a recall, and *whole-life history of product* were two of the most common responses across all countries (Table 23). While all countries expressed at least some interest in receiving *information on production practices and/or feeding programs*, customers in Japan expressed the greatest interest (61.5%), referring specifically, to information on the quality of feed ingredients (Table 23). Specific to Mexican companies was their association of *product safety (including processing controls)*, *control of cold-chain*, and *production/slaughter date and/or storage life* with Production History (Table 23). Perhaps most surprising was that 59.1% of interviewed companies in Hong Kong/China that said *brand and/or reputation of company or*

individual establishment in that market was important to them. There may be opportunities for the U.S. pork industry to establish a stronger presence in this market based on the strength of company brands and reputations. Vonada et al. (2000) found that packages of sliced Boston butts and bellies which displayed the U.S. Pork seal was the most preferred marketing concept, higher than even the Korean Pork marketing concept utilized in the study. Finally, 38.6% of those interviewed in Russia said that production history was not important (Table 23), explaining that the health/veterinary certificate included all of the background information necessary—a sharp contrast to comments provided in Japan.

In general, specific references to *animal identification and traceability* was very limited across all countries, which may have been due to associating *product traceability* and *whole-life history of product* with animal identification (although never mentioned explicitly), or that *animal identification and traceability* was simply not important to companies and, by extension, consumers in Hong Kong/China, Mexico and Russia. Japan, on the other hand, was more difficult to explain and, perhaps like the former reason given, most accurately can be described as believing that *animal identification and traceability* to be under the umbrella of *product traceability*. Likewise, *animal welfare*, *environmentally responsible and/or sustainable production practices*, “*free range*” pork, and “*natural*” and/or “*organic*” pork were not associated with Production History attributes in any of the countries included in this study (Table 23).

WILLINGNESS-TO-PAY RESULTS AND CALCULATED PREMIUM VALUES

The probabilities of an interviewed company that had declined to purchase imported pork products at the two discount values provided are shown in Table 24. If a

company answered “no/no” to both discount values, they would not compromise on their “required” quality attributes. The major limitation of this assumption is the possibility that some of these companies would purchase these products if the discount was, say, 80, 90, or 100%. However, discounts of such magnitude are unrealistic, and for the purposes of this study, the double-bounded discount assumption satisfied our need of testing their resolve for “required” quality attributes. When companies declined to purchase the discounted products, they almost exclusively referred to their hard-earned reputations as fair and honest companies and to their commitment to providing quality products to their customers. Interviewees reported often that any above-normal profit they derived from purchasing inferior products would cost them significantly more in lost business when their customers switched suppliers. Overall, Product Specifications was the most popular “required” quality attribute, followed, in no specific order, by Food Safety, Eating Quality, Product Packaging, and Visual Characteristics (Table 24).

To take the analysis a step further, a generalized linear mixed model was utilized to calculate the probabilities of interviewed companies adhering to “required” quality attributes. Although sometimes limited by the lack of differences between attributes, the calculated probabilities, in essence, provide generalized rankings of the quality attributes that are “required” for companies to purchase imported pork products (Table 25).

Similar to the assumption made in the discount questions about a “no/no” response to purchasing product at a discount, if an interviewed company said “no/no” to both premium values, it was assumed that the company was unwilling to pay a premium of any kind. While the design theoretically limited responses to a conclusion that the potential premium that a company might be willing to pay was somewhere between 0%

and the lowest value asked, say, 10%, answers to the questions still satisfied the needs of the study. It might be helpful in future studies, after a response of “no/no” is received for either a discount or premium question, to ask a follow-up yes or no question of whether or not the respondent company would be willing to accept the product as a discount/willing to pay a premium to purchase the product, and, if so, what size of discount/premium would they be willing to accept/pay. Asking the follow-up question would largely alleviate the need to make the assumption of “no” with a “no/no” response to both questions and would lend itself to generating more accurate WTP premiums.

RESULTS ACROSS ALL COUNTRIES

For whole muscle cuts across all countries, Product Specifications and Visual Characteristics were more likely to be required than the other quality attributes (Table 25). Customer Service, on the other hand, had the lowest probability of being “required” for whole muscle cuts. For variety meats and offal products across all countries, Eating Quality was least likely to be a “required” trait (Table 25). However, no further distinctions for variety meats could be made. For processed products, Eating Quality was most likely to be a requirement for purchase, as shown in Table 25. Cells in Table 25 with double dashes (--) indicate that one or more of the countries had zero observations for that specific quality attribute, which prevented us from calculating a probability for that attribute. With regard to “guaranteed” or “premium” attributes above those “required” characteristics identified, the only attribute with a significant probability that companies would be willing to pay a premium, common to all product types, was Customer Service (Table 26).

RESULTS BY COUNTRY

For whole muscle cuts by country (Table 27): (1) Japan had a significantly higher probability of requiring Food Safety than the other countries. (2) Mexico had a similar probability as Japan of requiring Visual Characteristics, but a significantly higher probability of requiring Visual Characteristics than Hong Kong/China or Russia. (3) Russia had a significantly lower probability of requiring Production History than Hong Kong/China and Japan. The attribute of highest average probability of being required across all countries was Product Specifications, while Customer Service was the attribute with the lowest average probability of being a “required” trait (Table 27).

For variety meats (Table 28): (1) The probability of customers in Japan requiring Product Specifications was significantly higher than customers in both Hong Kong/China and Russia. (2) Russia companies had a significantly higher probability of requiring Product Packaging than Hong Kong/China. The top three “required” attributes based on the highest average probabilities across all countries were Product Specifications, Visual Characteristics, and Food Safety, followed closely by Product Packaging (Table 28). Customer Service had the lowest probability of being required, with Japan and Russia recording no observations of requiring this trait before purchasing product (Table 28).

For processed products (Table 29), companies in Japan had a 0.579 probability of requiring Food Safety, which was significantly greater than the calculated probabilities for Hong Kong/China and Mexico. Russia had no recorded observations for a company saying that Food Safety was “required” before they would purchase. No other differences for processed products were detected across countries. Numerically, Eating Quality had the highest average probability of being “required” across all countries,

followed by Product Specifications, Product Packaging, Visual Characteristics, and Production History (Table 29).

The probability of a quality attribute being “required” should be inversely related to the probability of paying a “premium” for that same attribute. For example, for whole muscle cuts in Japan, the probability of a company requiring Food Safety before agreeing to purchase a product was nearly twice as high as the calculated probability for those same companies of paying a premium for Food Safety (Table 27).

The calculated probabilities that foreign customers would be willing-to-pay premiums for “guaranteed” quality attributes associated with whole muscle cuts are shown in Table 27. The results indicate that: (1) Companies in Hong Kong/China had a significantly higher probability of paying a premium for Food Safety than those in Japan. (2) Companies in Hong Kong/China and Japan had significantly higher probabilities of paying premiums for Customer Service than those in Mexico (Table 27). In general, foreign customers did not indicate that they required Customer Service as a condition for purchase, evident by the very low probabilities, but companies expressed considerably higher odds of paying a premium for this service. (3) Companies in Hong Kong/China had significantly higher probabilities of paying premiums for Eating Quality, Product Specifications, and Visual Characteristics than those in Mexico. Overall, Product Specifications were “required” in all four countries. (4) Companies in Hong Kong/China had a significantly greater probability of paying a premium for Production History (0.625) than those in any other country (Table 27), which they had described earlier as the “brand” or reputation of the “brand” in their region. Companies in Hong Kong/China were more than twice as likely to pay a premium for Production History as those in

Japan. Mexico had the lowest “requirements” for all quality attributes except Visual Characteristics, where it was regarded as a “must have” (0.508).

For variety meats and offal products (Table 28): (1) Companies in Hong Kong/China and Japan had significantly higher probabilities of paying premiums for Food Safety than those in Mexico or Russia. (2) Companies in Mexico had the lowest probability of paying a premium for Customer Service than those in any other country. (3) Companies in Hong Kong/China had a greater probability of paying a premium for Eating Quality than those in any other country. (4) Companies in Hong Kong/China had a significantly higher probability of paying a premium for Product Packaging than those in Russia, which suggested that companies in Russia hold Product Packaging as a requirement for purchase. (5) Companies in Hong Kong/China had a greater probability of paying a premium for Visual Characteristics than those in Japan or Mexico. (6) Companies in Hong Kong/China had a greater probability of paying a premium for Production history than those in any other country.

For processed products (Table 29): (1) Companies in Japan had a significantly lower probability of paying a premium for Food Safety than those in any other country. Additionally, companies in Japan had the highest probability of requiring Food Safety, which tells us that when it comes to Food Safety for processed products, Japanese companies have little tolerance for these issues. More specifically, Japanese customers will not tolerate finding bone chips in their processed products. Further, customers in other countries do not require Food Safety but appear to be willing to pay extra for this assurance. (2) Companies in Hong Kong/China had a greater probability of paying a premium for Visual Characteristics than those in any other country.

Product Specifications “requirements” generally elicited the lowest probabilities for WTP but generated the highest WTP premium values. Generalizing premium values that companies would be willing to pay by product type, variety meats would return the lowest premium values, whole muscle cuts would return intermediate values, and processed products would be expected to return the greatest values. Variety meats generally are considered to be high-volume, low-margin products, whereas the value-added and convenience factors of processed products have the potential to return greater profits. Accordingly, results indicated that companies are willing to pay higher premiums to acquire processed products that meet their specific needs than the premiums they are willing to pay for whole muscle cuts and for variety meats and offal products.

However, numerous research reviews have found that studies which use “hypothetical” WTP, like what was used in this study, can overestimate “actual” WTP values by as much as 2 to 3-times (List and Gallet, 2001; Loomis et al., 1997). Results from some scientific studies have found “hypothetical” WTP estimates to be as much as 4 to 6-times greater than “actual” WTP values (Champ et al., 1995; Foster et al., 1997). Thus, as a point of consideration, the calculated WTP premium values reported in this study could be reduced to reveal more accurate WTP values in practice.

Overall, companies in Hong Kong/China had low expectations for nearly every quality attribute but, consistently, had some of the highest probabilities of paying premiums for products as well as the highest premium values. Based on these results, there could be potential for adding greater value to U.S. pork products destined for the Hong Kong/China market. In contrast, companies in Mexico had the lowest requirements for every attribute, except Visual Characteristics, and had some of the lowest

probabilities of paying premiums for attributes of “guaranteed” quality, indicating that Mexico is the most price sensitive market.

Please see the Appendix for additional results by country by product type.

RANKING OF SPECIFIED QUALITY ATTRIBUTES (BEST-WORST SCALING)

The relative importance of the seven quality attributes to companies in and across all countries as estimated by the multinomial logit model are shown in Table 30. The importance of each attribute was estimated relative to Production History because it was the least important quality attribute in each country except Japan, which ranked Customer Service significantly lower than Production History (Table 30). Food Safety was selected as the most important quality attribute in each country except Russia, which ranked Product Specifications higher (Table 30). The order of intermediary attributes, on average, was Product Specifications, Eating Quality, Product Packaging, Visual Characteristics, and Customer Service, respectively (Table 30). For Hong Kong/China and Japan, the quality attributes of most importance (i.e., Food Safety, Eating Quality, and Product Specifications, respectively) were ranked in the same order.

According to Lusk and Briggeman (2009), “One of the difficulties in evaluating the importance of each value that results from the [multinomial logit model] is that the estimates themselves have no natural interpretation.” In other words, the multinomial logit model estimates can only provide a relative ranking of the quality attributes. This shortcoming was remedied by calculating shares of preference for each quality attribute as explained by Lusk and Briggeman (2009).

On average, 20% of customers in each country rated Food Safety as the most important quality attribute (Figure 3). Food Safety was twice as important and Eating

Quality and Product Specifications were one-and-a-half times more important than Production History (Table 30). By country, Food Safety was roughly twice as important as Production History in all countries except Japan. Interestingly, 17.4% of customers in Russia believed that Product Specifications was the most important quality attribute; albeit, just slightly higher than 16.5% that chose Food Safety (Figure 3). Furthermore, in Russia, Product Specifications was twice as important and Product Packaging more than one-and-three-quarter times more important than Production History (Table 30).

Overall, the calculated values provide a ranking of importance. Further, although Food Safety was mentioned considerably more often than, say, Production History as being the most important quality attribute, a few companies still selected Production History, which minimized the observed differences between attributes.

CONCLUSION: POTENTIAL OPPORTUNITIES FOR THE U.S. PORK INDUSTRY

Based on the extensive amount of detailed information collected during this study, a list of opportunities was compiled for consideration by the U.S. pork industry as it continues to grow its export potential.

- The technical knowledge level of companies in Mexico is increasing and that they are becoming more informed about the safety of U.S. pork, which should give the U.S. a competitive advantage in this market.
- The Food Safety comments from Mexico speak volumes about the long-term educational strategies implemented by U.S.-based red meat trade associations in Mexico, which is guiding, and developing, their technical understanding of food safety. There may be opportunities to implement similar, long-term educational strategies in Hong Kong/China and Russia to increase the technical understanding of our customers in these growing markets.
- Food Safety was the single most important quality attribute to companies in Japan. Specifically, Japanese companies defined Food Safety as product traceability, production history, results from microbiological testing, and the absence of physical hazards, especially bone chips in processed products.
- Customer Service was the only attribute, common to all product types, with a significant probability for which companies would be willing to pay a premium.

- The primary opportunities for improving Customer Service were improving service after the sale and/or customer relations, fulfilling contract requirements, and improving responses to complaints and questions.
- On-time delivery was mentioned by roughly 50% of the companies in Hong Kong/China, Mexico, and Russia, suggesting a possible area for improvement and an opportunity for adding value by capitalizing on service.
- Over 40% of those interviewed in Japan expressed interest in receiving listings of available products and/or information on new products.
- In three of the four countries (all except Mexico) Eating Quality had the highest likelihood of being a “required” quality attribute for processed products.
- Good flavor/taste was the most common response for Eating Quality, which suggests the need for continued development of products with flavor profiles that are well-suited for each market.
- The primary opportunities for improving Product Specifications were consistent product size, consistent product weight, and reduced levels of external fat on some cuts.
- Improving box strength and integrity was the primary opportunity for improving Product Packaging.
- Standardizing box shape and size could reap benefits that would benefit the entire U.S. pork industry.
- Clean and attractive packaging, such as use of “white”-colored boxes and attractive printing and logos on the boxes, was important to customers in all countries, especially those in Russia.

- Interviewed companies in Hong Kong/China and Japan expressed a preference for product in which the content of the box was packed in a neat and organized manner that allowed the contents to maintain their shape during shipment and distribution.
- The primary opportunities for improving Visual Characteristics were to improve lean color quality and lean color consistency.
- Lean color was the most important Visual Characteristic to companies in Mexico.
- Lean color and/or visual appearance were associated with Food Safety, Eating Quality, Product Specifications, and Product Packaging. Thus, lean color and/or visual appearance is, perhaps, more related to overall perceptions of product quality and safety than previously thought.
- Nearly 62% of companies in Japan referenced production practices and feeding programs, and specifically, the quality of feed ingredients, as important Production History information.
- Nearly 60% of companies in Hong Kong/China stated “brand” and/or “reputation” as being important, suggesting opportunities for the U.S. to use its “brand power” to increase market share in this region.
- Overall, pork importers and users in Hong Kong/China had comparatively low expectations or “requirements” of quality traits for purchasing pork, but were consistently more likely to pay premiums—and larger amounts—than the other countries. Thus, Hong Kong/China could hold more profit potential than previously considered.

- Mexican pork importers and users had the lowest expectations or “requirements” for quality, with the exception of Visual Characteristics, and were least likely to pay premiums, suggesting that Mexico is the most price sensitive market of the four evaluated.
- Pork cuts imported by Russia that do not appear to be manufactured by the U.S. present an opportunity for the U.S. pork industry, particularly if trade barriers for fresh pork can be overcome.

TABLES

Table 1. List of specified quality attributes.

Quality attribute
Food safety
Customer service
Product eating quality
Product specification desirability and conformity
Product packaging and condition upon receiving
Visual characteristics of product
Production history

Table 2. Types of imported proteins purchased by interviewed companies in the past three years.

	Hong Kong/ China	Japan	Mexico	Russia
n =	83 (%)	48 (%)	70 (%)	54 (%)
Pork	83 (100.0)	48 (100.0)	70 (100.0)	54 (100.0)
Beef	77 (92.8)	43 (89.6)	62 (88.6)	49 (90.7)
Chicken	60 (72.3)	39 (81.3)	36 (51.4)	39 (72.2)
Fish	29 (34.9)	2 (4.2)	11 (15.7)	12 (22.2)
Lamb	39 (47.0)	15 (31.3)	27 (38.6)	15 (27.8)
Seafood	38 (45.8)	2 (4.2)	5 (7.1)	3 (5.6)
Turkey	18 (21.7)	5 (10.4)	21 (30.0)	11 (20.4)
Veal	13 (15.7)	1 (2.1)	13 (18.6)	4 (7.4)
Goose	5 (6.0)	0	0	0
Goat	2 (2.4)	0	0	0
Horse	1 (1.2)	7 (14.6)	1 (1.4)	8 (14.8)
Duck	11 (13.3)	5 (10.4)	6 (8.6)	4 (7.4)
Mutton	2 (2.4)	7 (14.6)	0	11 (20.4)
Rabbit	1 (1.2)	0	1 (1.4)	8 (14.8)
Wild boar	1 (1.2)	0	1 (1.4)	0
Alligator	1 (1.2)	2 (4.2)	0	0
Venison	0	1 (2.1)	3 (4.3)	1 (1.9)
Others	4 (4.8)	3 (6.3)	1 (1.4)	1 (1.9)

Table 3. Countries-of-origin of imported pork products purchased by interviewed companies in the past three years.

	Hong Kong/ China	Japan	Mexico	Russia
n =	83 (%)	48 (%)	70 (%)	54 (%)
U.S.	80 (96.4)	47 (97.9)	70 (100.0)	48 (88.9)
Australia	8 (9.6)	4 (8.3)	1 (1.4)	4 (7.4)
Brazil	42 (50.6)	2 (4.2)	0	41 (75.9)
Canada	39 (47.0)	34 (70.8)	32 (45.7)	40 (74.1)
Chile	9 (10.8)	15 (31.3)	6 (8.6)	5 (9.3)
China	23 (27.7)	5 (10.4)	0	0
Denmark	22 (26.5)	30 (62.5)	2 (2.9)	31 (57.4)
Germany	20 (24.1)	1 (2.1)	0	33 (61.1)
Holland (The Netherlands)	17 (20.5)	0	0	15 (27.8)
Mexico	1 (1.2)	25 (52.1)	0	0
Spain	16 (19.3)	15 (31.3)	0	27 (50.0)
Thailand	8 (9.6)	0	0	0
Vietnam	2 (2.4)	0	0	0
France	16 (19.3)	10 (20.8)	0	22 (40.7)
Belgium	4 (4.8)	1 (2.1)	0	22 (40.7)
United Kingdom	7 (8.4)	0	0	0
Argentina	6 (7.2)	0	0	4 (7.4)
Japan	6 (7.2)	0	0	0
Italy	5 (6.0)	3 (6.3)	0	4 (7.4)
Uruguay	2 (2.4)	0	0	4 (7.4)
Ireland	2 (2.4)	1 (2.1)	0	9 (16.7)
New Zealand	3 (3.6)	0	1 (1.4)	0
Hungary	2 (2.4)	8 (16.7)	0	2 (3.7)
Poland	0	5 (10.4)	0	8 (14.8)
Sweden	1 (1.2)	0	0	5 (9.3)
Finland	0	0	0	9 (16.7)
Paraguay	0	0	0	4 (7.4)
Austria	0	1 (2.1)	0	4 (7.4)
Spain	0	0	0	2 (3.7)
Estonia	0	0	0	2 (3.7)
Portugal	0	0	0	2 (3.7)
Panama	1 (1.2)	0	0	0
Costa Rica	1 (1.2)	0	0	0
Singapore	1 (1.2)	0	0	0
Norway	1 (1.2)	0	0	0
Indonesia	1 (1.2)	0	0	0
Taiwan	0	1 (2.1)	0	0

Table 4. U.S. pork as a percent of total (i.e., domestic and imported) pork purchases made in the past three years.

	Hong Kong/ China (%)	Japan (%)	Mexico (%)	Russia (%)
U.S. pork as a percent of total pork purchases ¹	44.5	45.8	81.3	35.3

¹ Question was modified to include purchases of domestic pork in addition to purchases of imported pork after the Mexico data collection trip was completed.

Table 5. Number of interviewed companies that have purchased imported pork products direct from foreign and U.S. companies (i.e., packers/processors) in the past three years.

	Hong Kong/ China	Japan	Mexico	Russia
n =	83 (%)	48 (%)	70 (%)	54 (%)
Import pork directly from foreign companies	51 (61.4)	17 (35.4)	46 (65.7)	41 (75.9)
Import pork directly from U.S. companies	49 (59.0)	14 (29.2)	45 (64.3)	34 (63.0)

Table 6. Categorization of the interviewed companies that have imported pork directly from foreign companies (i.e., directly from packers/processors) in the past three years.¹

	Hong Kong/ China	Japan	Mexico	Russia
n =	51 (%)	17 (%)	46 (%)	41 (%)
Foodservice buyer	9 (17.6)	1 (5.9)	0	1 (2.4)
Importer/distributor	43 (84.3)	13 (76.5)	33 (71.7)	31 (75.6)
Intermediary distributor	8 (15.7)	3 (17.6)	11 (23.9)	6 (14.6)
Meat processor	10 (19.6)	2 (11.8)	25 (54.3)	12 (29.3)
Meat trader	8 (15.7)	5 (29.4)	3 (6.5)	12 (29.3)
Retail buyer	12 (23.5)	5 (29.4)	13 (28.3)	8 (19.5)
Wholesale buyer	13 (25.5)	4 (23.5)	4 (8.7)	11 (26.8)
Broker	0	0	3 (6.5)	0
Casing processor	1 (2.0)	0	0	0
Catering	0	1 (5.9)	0	0
Slaughter operation	0	0	0	1 (2.4)
Cold storage	0	0	0	2 (4.9)

¹ The different categories are not exclusive. It is possible for same company (i.e., interview) to be represented in multiple categories.

Table 7. Categorization of interviewed companies that in the past three years used imported pork in their operations but did not import directly themselves.¹

	Hong Kong/ China	Japan	Mexico	Russia
n =	83 (%)	48 (%)	70 (%)	54 (%)
Foodservice	73 (88.0)	36 (75.0)	60 (85.7)	32 (59.3)
Hotel	52 (62.7)	21 (43.8)	39 (55.7)	21 (38.9)
Restaurant	68 (81.9)	34 (70.8)	51 (72.9)	30 (55.6)
Institution	27 (32.5)	19 (39.6)	31 (44.3)	14 (25.9)
Meat Processing	41 (49.4)	29 (60.4)	47 (67.1)	44 (81.5)
Retail	54 (65.1)	35 (72.9)	50 (71.4)	32 (59.3)
Intermediary distribution	51 (61.4)	33 (68.8)	42 (60.0)	43 (79.6)

¹ The different categories are not exclusive. It is possible for same company (i.e., interview) to be represented in multiple categories.

Table 8. Number of interviewed companies who view the image of U.S. pork as favorable and the importance of image in purchasing decisions.¹

	Hong Kong/ China (%)	Japan (%)	Mexico (%)	Russia (%)
Favorable image of U.S. pork	67/79 (84.8)	43/47 (91.5)	66/67 (98.5)	43/52 (82.7)
Image is an important factor in their company's decision to purchase U.S. pork ²	57/76 (75.0)	42/46 (91.3)	45/67 (67.2)	27/46 (58.7)
If their company were to purchase U.S. pork, image would be an important factor in their company's decision? ³	2/3 (66.7)	1/1 (100.0)	0	1/6 (16.7)

¹ Due to time constraints in some interviews it was necessary to skip these questions.

² Question was asked to individuals who companies had purchased U.S. pork in the past 3 years.

³ Question was asked to individuals whose companies had not purchased U.S. pork in the past 3 years.

Table 9. Fresh/chilled pork whole muscle cuts purchased by interviewed companies in the past three years.

	Hong Kong/ China	Japan	Mexico	Russia
n =	18 (%)	40 (%)	56 (%)	10 (%)
Belly				
Skin-on	6 (33.3)	16 (40.0)	2 (3.6)	0
Skinless	6 (33.3)	27 (67.5)	8 (14.3)	0
Single-rib	5 (27.8)	30 (75.0)	3 (5.4)	1 (10.0)
Butt				
Semi-boneless	5 (27.8)	15 (37.5)	10 (17.9)	0
Boneless	7 (38.9)	22 (55.0)	17 (30.4)	3 (30.0)
Cellar trimmed (CT)	6 (33.3)	27 (67.5)	0	0
Ham				
Bone-in	4 (22.2)	5 (12.5)	44 (78.6)	2 (20.0)
Boneless	7 (38.9)	18 (45.0)	17 (30.4)	5 (50.0)
Loin				
Back ribs	3 (16.7)	24 (60.0)	8 (14.3)	1 (10.0)
Bone-in	13 (72.2)	13 (32.5)	14 (25.0)	5 (50.0)
Boneless	16 (88.9)	32 (80.0)	8 (14.3)	6 (60.0)
Spare ribs	6 (33.3)	25 (62.5)	6 (10.7)	3 (30.0)
Tenderloin	10 (55.6)	36 (90.0)	10 (17.9)	3 (30.0)
Picnic				
Bone-in	3 (16.7)	6 (15.0)	12 (21.4)	0
Boneless	4 (22.2)	28 (70.0)	27 (48.2)	3 (30.0)
Cushion	3 (16.7)	13 (32.5)	1 (1.8)	1 (10.0)
Shanks	5 (27.8)	9 (22.5)	6 (10.7)	0
Lean trimmings				
42%	0	4 (10.0)	2 (3.6)	0
72%	1 (5.6)	4 (10.0)	4 (7.1)	0

Table 10. Frozen pork whole muscle cuts purchased by interviewed companies in the past three years.

	Hong Kong/ China	Japan	Mexico	Russia
n =	79 (%)	40 (%)	48 (%)	52 (%)
Belly				
Skin-on	31 (39.2)	15 (37.5)	5 (10.4)	15 (28.8)
Skinless	29 (36.7)	27 (67.5)	9 (18.8)	17 (32.7)
Single-rib	22 (27.8)	23 (57.5)	2 (4.2)	20 (38.5)
Butt				
Semi-boneless	23 (29.1)	8 (20.0)	6 (12.5)	5 (9.6)
Boneless	37 (46.8)	19 (47.5)	12 (25.0)	28 (53.8)
Cellar trimmed (CT)	45 (57.0)	22 (55.0)	1 (2.1)	7 (13.5)
Ham				
Bone-in	25 (31.6)	6 (15.0)	19 (39.6)	38 (73.1)
Boneless	28 (35.4)	18 (45.0)	14 (29.2)	43 (82.7)
Loin				
Back ribs	46 (58.2)	21 (52.5)	11 (22.9)	11 (21.2)
Bone-in	51 (64.6)	8 (20.0)	11 (22.9)	27 (51.9)
Boneless	43 (54.4)	29 (72.5)	5 (10.4)	41 (78.8)
Spare ribs	39 (49.4)	14 (35.0)	6 (12.5)	11 (21.2)
Tenderloin	30 (38.0)	26 (65.0)	7 (14.6)	20 (38.5)
Picnic				
Bone-in	20 (25.3)	6 (15.0)	7 (14.6)	5 (9.6)
Boneless	28 (35.4)	25 (62.5)	17 (35.4)	37 (71.2)
Cushion	18 (22.8)	19 (47.5)	0	22 (42.3)
Shanks	16 (20.3)	8 (20.0)	10 (20.8)	11 (21.2)
Lean trimmings				
42%	9 (11.4)	2 (5.0)	3 (6.3)	7 (13.5)
72%	16 (20.3)	5 (12.5)	9 (18.8)	30 (57.7)

Table 11. Pork whole muscle cuts not offered by the U.S. but purchased from other countries by interviewed companies in Hong Kong/China, Japan, and Mexico in the past three years.

Hong Kong/China	Fresh/chilled		Frozen	
	(n = 18)	(%)	(n = 79)	(%)
Suckling pig	1	(5.6)	0	
Boneless butt CT shoulder	0		1	(1.3)
St. Louis style spareribs	0		1	(1.3)
Portion control pork chops	0		1	(1.3)
Knuckle	0		1	(1.3)
Riblets	0		2	(2.5)
Ham cushion	0		1	(1.3)
Center cut (CC) loin	0		1	(1.3)
Short rib	0		1	(1.3)
Brisket rib	0		1	(1.3)
Carcass (no head)	0		1	(1.3)
Full leg bone-in	0		1	(1.3)
Japan	(n = 40)		(n = 40)	
Belly – sheet-rib	1	(2.5)	1	(2.5)
Sirloin	1	(2.5)	0	
Center cut (CC) loin	1	(2.5)	2	(5.0)
Middle muscle (MM) loin	1	(2.5)	2	(5.0)
Portion cut pork loins	1	(2.5)	1	(2.5)
Mexico	(n = 56)		(n = 48)	
Riblets	1	(1.8)	1	(2.1)
Sirloin	1	(1.8)	0	
3-piece ham	4	(7.1)	0	
5-piece ham	1	(1.8)	0	
Ham with shank	0		1	(2.1)
Picnic shredded	0		1	(2.1)
Portion cut pork loins	1	(1.8)	8	(16.7)
Lean trimmings				
60%	0		1	(2.1)
80%	0		1	(2.1)
90%	1	(1.8)	1	(2.1)
Inner shank	0		1	(2.1)

Table 12. Pork whole muscle cuts not offered by the U.S. but purchased from other countries by interviewed companies in Russia in the past three years.

	Fresh/chilled		Frozen	
	(n = 10)	(%)	(n = 52)	(%)
Bone-in collar	0		4	(7.7)
Boneless collar	3	(30.0)	31	(59.6)
Bone-in shoulder	0		3	(5.8)
Boneless shoulder	1	(10.0)	21	(40.4)
Carcass side	3	(30.0)	8	(15.4)
Bone-in leg	0		1	(1.9)
Boneless leg	1	(10.0)	1	(1.9)
Sirloin	0		1	(1.9)
Center cut (CC) loin	0		3	(5.8)
Boneless blade meat	0		2	(3.8)
Skin-on boneless pork middle	0		3	(5.8)
Belly				
Bone-in	0		1	(1.9)
Sheet-ribs	0		7	(13.5)
Skin-on single- rib	0		4	(7.7)
Boneless ham cap	0		1	(1.9)
UDE picnic (shoulder)	0		1	(1.9)
Skin-on boneless ham	0		1	(1.9)
Boneless shank	0		1	(1.9)
Lean trimmings				
75%	0		6	(11.5)
80%	0		10	(19.2)
85%	0		3	(5.8)
90%	0		2	(3.8)
95%	0		1	(1.9)
Boneless assortment of pork	1	(10.0)	1	(1.9)

Table 13. Fresh/chilled pork variety meats and offal products purchased by interviewed companies in the past three years.

	Hong Kong/ China	Japan	Mexico	Russia
n =	5 (%)	2 (%)	8 (%)	0 (%)
Brisket bones	1 (20.0)	0	0	0
Diaphragm (skirt) meat	0	0	1 (12.5)	0
Fat				
Back	0	0	2 (25.0)	0
Mixed or leaf	2 (40.0)	0	0	0
Feet				
Front	1 (20.0)	0	0	0
Back	1 (20.0)	0	0	0
Hearts	1 (20.0)	0	0	0
Intestine				
Large	1 (20.0)	0	0	0
Jowls	0	2 (100.0)	7 (87.5)	0
Kidneys	1 (20.0)	0	0	0
Livers	2 (40.0)	0	0	0
Salivary glands	0	0	1 (12.5)	0
Skins	1 (20.0)	0	4 (50.0)	0
Stomachs/maws	1 (20.0)	0	0	0
Tails	1 (20.0)	0	0	0
Tendons	1 (20.0)	0	0	0
Tongues	2 (40.0)	0	0	0
Whole heads	0	0	3 (37.5)	0

Table 14. Frozen pork variety meats and offal products purchased by interviewed companies in the past three years.

	Hong Kong/ China	Japan	Mexico	Russia
n =	60 (%)	27 (%)	41 (%)	37 (%)
Bladders	11 (18.3)	0	1 (2.4)	0
Brains	2 (3.3)	1 (3.7)	11 (26.8)	1 (2.7)
Brisket bones	35 (58.3)	1 (3.7)	13 (31.7)	3 (8.1)
Diaphragm (skirt) meat	9 (15.0)	13 (48.1)	1 (2.4)	3 (8.1)
Ears	31 (51.7)	1 (3.7)	4 (9.8)	3 (8.1)
Esophagus (wezand)	5 (8.3)	1 (3.7)	1 (2.4)	0
Face mask/face plate	29 (48.3)	1 (3.7)	9 (22.0)	0
Fat				
Back	19 (31.7)	19 (70.4)	8 (19.5)	23 (62.2)
Mixed or leaf	14 (23.3)	2 (7.4)	1 (2.4)	8 (21.6)
Feet				
Front	43 (71.7)	2 (7.4)	29 (70.7)	9 (24.3)
Back	39 (65.0)	2 (7.4)	17 (41.5)	13 (35.1)
Femur bones	18 (30.0)	15 (55.6)	0	0
Hearts	26 (43.3)	2 (7.4)	6 (14.6)	30 (81.1)
Hocks	21 (35.0)	0	3 (7.3)	2 (5.4)
Intestine				
Large	22 (36.7)	6 (22.2)	1 (2.4)	0
Small	15 (25.0)	8 (29.6)	1 (2.4)	0
Jowls	22 (36.7)	7 (25.9)	24 (58.5)	11 (29.7)
Kidneys	24 (40.0)	1 (3.7)	1 (2.4)	10 (27.0)
Lips	11 (18.3)	0	2 (4.9)	0
Livers	14 (23.3)	3 (11.1)	1 (2.4)	27 (73.0)
Neck bones	32 (53.3)	1 (3.7)	4 (9.8)	1 (2.7)
Pizzles	7 (11.7)	2 (7.4)	0	0
Rectums/bungs	11 (18.3)	13 (48.1)	0	0
Salivary glands	2 (3.3)	0	15 (36.6)	0
Skins	22 (36.7)	1 (3.7)	17 (41.5)	17 (45.9)
Snouts	26 (43.3)	1 (3.7)	11 (26.8)	0
Spleens/melts	2 (3.3)	2 (7.4)	0	0
Stomachs/maws	36 (60.0)	4 (14.8)	18 (43.9)	0
Tails	26 (43.3)	1 (3.7)	1 (2.4)	6 (16.2)
Tendons	35 (58.3)	21 (77.8)	12 (29.3)	30 (81.1)
Tongues	7 (11.7)	1 (3.7)	0	0
Trachea	8 (13.3)	3 (11.1)	7 (17.1)	0
Tunic	25 (41.7)	1 (3.7)	12 (29.3)	0
Uterus	27 (45.0)	3 (11.1)	6 (14.6)	21 (56.8)
Whole heads	5 (8.3)	0	0	8 (21.6)

Table 15. Pork variety meats and offal products not offered from the U.S. but purchased from other countries by interviewed companies (n) in the past three years.

Hong Kong/China	Fresh/chilled		Frozen	
	(n = 5)	(%)	(n = 60)	(%)
Aorta	0		2	(3.3)
Back bone	0		1	(1.7)
Ear flap	0		1	(1.7)
Humerus	0		1	(1.7)
Lacone (feet and hock)	0		1	(1.7)
Roof of mouth (upper pallet)	0		1	(1.7)
Soft bones	0		2	(3.3)
Testicles	0		1	(1.7)
Japan	(n = 2)		(n = 27)	
Hanging tender	1	(50.0)	4	(13.7)
Tongue trimmings	1	(50.0)	4	(13.7)
Mexico	(n = 8)		(n = 41)	
Skin of belly (muscle)	1	(12.5)	2	(5.9)
Russia	(n = 0)		(n = 37)	
Cheek meat	0		15	(40.5)
Cubed fat	0		1	(2.7)
Head meat	0		3	(8.1)
Lungs	0		2	(5.4)
Rib bones	0		2	(5.4)
Soft bones	0		3	(8.1)
Temple meat	0		3	(8.1)

Table 16. Economic or financial conditions that determine whether or not interviewed companies purchase imported pork.

Economic condition	Hong Kong/ China	Japan	Mexico	Russia
n =	82 (%)	47 (%)	70 (%)	54 (%)
Purchase price	61 (74.4)	33 (70.2)	50 (71.4)	30 (55.6)
Exchange rate	16 (19.5)	18 (38.3)	38 (54.3)	23 (42.6)
Access to containers	0	0	0	1 (1.9)
Access to insurance	0	0	1 (1.4)	0
Credit terms	0	0	3 (4.3)	21 (38.9)
Duties and tariffs	7 (8.5)	3 (6.4)	1 (1.4)	4 (7.4)
Import license	0	0	1 (1.4)	0
Inspection fees	1 (1.2)	0	2 (2.9)	0
Logistics	0	1 (2.1)	2 (2.9)	6 (11.1)
Risk of importing product (import clearance)	1 (1.2)	0	1 (1.4)	1 (1.9)
Seasonal changes in demand	15 (18.3)	3 (6.4)	0	6 (11.1)
Tariff rate quota	0	0	0	21 (38.9)
Transaction fees	1 (1.2)	0	1 (1.4)	0
Transportation costs	1 (1.2)	0	5 (7.1)	3 (5.6)
Value added tax (VAT)	1 (1.2)	0	0	1 (1.9)
Variable levy (Japan only)	0	3 (6.4)	0	0

Table 17. Categorized responses from interviewed companies for explaining what “food safety” means to their company as it relates to all pork products.

Response	Hong Kong/ China	Japan	Mexico	Russia
n =	66 (%)	39 (%)	59 (%)	44 (%)
No antibiotic residues	3 (4.5)	8 (20.5)	2 (3.4)	9 (20.5)
In-country government inspection	17 (25.8)	1 (2.6)	11 (18.6)	14 (31.8)
Quality of feed ingredients and/or no feed additives	6 (9.1)	9 (23.1)	0	2 (4.5)
No ractopamine	3 (4.5)	0	0	0
No growth promotants	0	0	1 (1.7)	0
HACCP	6 (9.1)	2 (5.1)	11 (18.6)	1 (2.3)
Disease-free hogs	6 (9.1)	3 (7.7)	7 (11.9)	3 (6.8)
No hormone residues	1 (1.5)	2 (5.1)	0	0
No microbiological contamination	7 (10.6)	16 (41.0)	20 (33.9)	8 (18.2)
Pathogen reduction treatments	0	0	1 (1.7)	0
No chemical residues	5 (7.6)	15 (38.5)	0	0
No physical hazards	9 (13.6)	16 (41.0)	5 (8.5)	0
Hygiene/cleanliness of production and slaughter processes	14 (21.2)	12 (30.8)	22 (37.3)	7 (15.9)
USDA inspection and/or guarantee of the product’s wholesomeness and safety	26 (39.4)	5 (12.8)	22 (37.3)	12 (27.3)
Health/veterinary certificates	20 (30.3)	0	1 (1.7)	20 (45.5)
Company history and/or brand	4 (6.1)	1 (2.6)	1 (1.7)	0
Control of cold-chain	17 (25.8)	4 (10.3)	19 (32.2)	12 (27.3)
Acceptable visual appearance	5 (7.6)	2 (5.1)	7 (11.9)	6 (13.6)
No preservatives	3 (4.5)	0	0	0
Traceability and/or production history	3 (4.5)	17 (43.6)	10 (16.9)	0
Organic and/or natural production practices	3 (4.5)	0	0	0
Packaging and/or storage life	8 (12.1)	3 (7.7)	13 (22.0)	11 (25.0)
Information on product origin	3 (4.5)	0	0	1 (2.3)
Relationship with suppliers	0	3 (7.7)	1 (1.7)	0

Table 18. Categorized responses from interviewed companies for explaining what “customer service” means to their company as it relates to all pork products.

Response	Hong Kong/ China	Japan	Mexico	Russia
n =	66 (%)	39 (%)	59 (%)	44 (%)
Correct documentation and/or no errors	9 (13.6)	1 (2.6)	2 (3.4)	22 (50.0)
Fulfilling contract requirements	17 (25.8)	7 (17.9)	17 (28.8)	11 (25.0)
Marketing and sales assistance	10 (15.2)	4 (10.3)	9 (15.3)	3 (6.8)
On-time delivery	30 (45.5)	5 (12.8)	29 (49.2)	25 (56.8)
Promotional material	14 (21.2)	3 (7.7)	3 (5.1)	3 (6.8)
Response to complaints	21 (31.8)	8 (20.5)	13 (22.0)	7 (15.9)
Response to questions	13 (19.7)	10 (25.6)	8 (13.6)	8 (18.2)
Technical expertise	2 (3.0)	0	1 (1.7)	0
Technical information	12 (18.2)	1 (2.6)	6 (10.2)	1 (2.3)
Service after the sale and/or good customer relations	18 (27.3)	7 (17.9)	24 (40.7)	14 (31.8)
Correct and/or flexible product specifications	9 (13.6)	13 (33.3)	13 (22.0)	4 (9.1)
Consistent product quality	13 (19.7)	4 (10.3)	7 (11.9)	2 (4.5)
Consistent supply of product	13 (19.7)	6 (15.4)	5 (8.5)	3 (6.8)
Negotiate price/stable price/pricing information/long-term contracts	12 (18.2)	6 (15.4)	13 (22.0)	5 (11.4)
Well-established company and/or good reputation in market	3 (4.5)	1 (2.6)	2 (3.4)	1 (2.3)
Provide samples or photos of products	2 (3.0)	0	1 (1.7)	1 (2.3)
Listings of offered products and/or information on new products	7 (10.6)	16 (41.0)	6 (10.2)	2 (4.5)
State specifications of offered products	2 (3.0)	0	0	0
Assured food safety	4 (6.1)	3 (7.7)	3 (5.1)	0
Updates on orders (i.e., delays)	4 (6.1)	4 (10.3)	1 (1.7)	6 (13.6)
Control of cold-chain	3 (4.5)	0	5 (8.5)	4 (9.1)
Credit and/or payment terms	0	0	0	5 (11.4)

Table 19. Categorized responses from interviewed companies for explaining what “product eating quality” means to their company as it relates to all pork products.

Response	Hong Kong/ China	Japan	Mexico	Russia
n =	66 (%)	39 (%)	59 (%)	44 (%)
No connective tissue	0	0	0	1 (2.3)
Good flavor/taste	40 (60.6)	22 (56.4)	39 (66.1)	19 (43.2)
Juiciness	22 (33.3)	10 (25.6)	16 (27.1)	5 (11.4)
Tenderness	37 (56.1)	20 (51.3)	27 (45.8)	13 (29.5)
No off-flavors	0	2 (5.1)	1 (1.7)	0
Good smell and/or no off-smells	11 (16.7)	15 (38.5)	9 (15.3)	11 (25.0)
Marbling	3 (4.5)	5 (12.8)	3 (5.1)	0
Correct fat-to-lean ratio	3 (4.5)	0	1 (1.7)	3 (6.8)
Not too much external fat	2 (3.0)	1 (2.6)	4 (6.8)	0
Leaner is better (i.e., no marbling)	5 (7.6)	1 (2.6)	6 (10.2)	2 (4.5)
Texture and/or firmness	12 (18.2)	11 (28.2)	14 (23.7)	1 (2.3)
Freshness	13 (19.7)	2 (5.1)	12 (20.3)	7 (15.9)
Good feed ingredients	2 (3.0)	0	0	0
Correct product specifications	7 (10.6)	0	5 (8.5)	2 (4.5)
Good packaging	1 (1.5)	0	3 (5.1)	0
Good visual appearance and/or color	10 (15.2)	7 (17.9)	20 (33.9)	9 (20.5)
Not too much cook-loss	0	2 (5.1)	0	0
Consistent quality	3 (4.5)	0	2 (3.4)	3 (6.8)
Control of cold-chain	2 (3.0)	0	1 (1.7)	0
Hygiene standards and/or safety of product	3 (4.5)	1 (2.6)	4 (6.8)	1 (2.3)
Not "enhanced"	8 (12.1)	0	4 (6.8)	2 (4.5)
Production and/or slaughter processes	3 (4.5)	0	2 (3.4)	1 (2.3)
Origin of product	1 (1.5)	0	0	0
Production/slaughter date and/or storage life	2 (3.0)	0	1 (1.7)	0

Table 20. Categorized responses from interviewed companies for explaining what “product specification desirability and conformity” means to their company as it relates to all pork products.

Response	Hong Kong/ China	Japan	Mexico	Russia
n =	66 (%)	39 (%)	59 (%)	44 (%)
Correct product size	27 (40.9)	17 (43.6)	23 (39.0)	11 (25.0)
Correct product weight	14 (21.2)	7 (17.9)	19 (32.2)	5 (11.4)
Consistent product size	23 (34.8)	15 (38.5)	16 (27.1)	9 (20.5)
Consistent product weight	12 (18.2)	7 (17.9)	17 (28.8)	7 (15.9)
Consistent supply of product	3 (4.5)	1 (2.6)	3 (5.1)	1 (2.3)
Correct product	11 (16.7)	4 (10.3)	16 (27.1)	14 (31.8)
Correct amount of external fat	21 (31.8)	12 (30.8)	20 (33.9)	13 (29.5)
Good yield	15 (22.7)	7 (17.9)	10 (16.9)	5 (11.4)
Marbling and/or juiciness	0	2 (5.1)	3 (5.1)	7 (15.9)
Packaging	17 (25.8)	2 (5.1)	12 (20.3)	5 (11.4)
Good visual appearance and/or color	7 (10.6)	6 (15.4)	13 (22.0)	4 (9.1)
Accurate and/or consistent cutting/specifications	11 (16.7)	7 (17.9)	11 (18.6)	14 (31.8)
Grade	3 (4.5)	0	0	0
Origin of product	4 (6.1)	0	1 (1.7)	0
No pale, soft, exudative (PSE) pork	0	0	2 (3.4)	0
Freshness	1 (1.5)	1 (2.6)	2 (3.4)	0
Samples and/or pictures of product	1 (1.5)	0	1 (1.7)	3 (6.8)
Ready for sale out of the package	1 (1.5)	2 (5.1)	0	1 (2.3)
Clean and/or no foreign matter	2 (3.0)	4 (10.3)	4 (6.8)	1 (2.3)
Correct water content	3 (4.5)	0	1 (1.7)	0
Control of cold-chain	2 (3.0)	0	9 (15.3)	1 (2.3)
Good feeding program	1 (1.5)	0	1 (1.7)	0
Labeling (including production date)	5 (7.6)	0	2 (3.4)	6 (13.6)
Brand	1 (1.5)	0	0	0
Minimally processed and/or not injected	1 (1.5)	0	2 (3.4)	0
Products should conform to that country's specifications	1 (1.5)	0	0	2 (4.5)

Table 21. Categorized responses from interviewed companies for explaining what “product packaging and condition upon receiving” means to their company as it relates to all pork products.

Response	Hong Kong/ China		Japan		Mexico		Russia	
n =	66 (%)	39 (%)	59 (%)	44 (%)				
Correct box size	12 (18.2)	7 (17.9)	7 (11.9)	12 (27.3)				
Box strength/integrity (i.e., flattened/crushed boxes)	25 (37.9)	19 (48.7)	28 (47.5)	17 (38.6)				
Correct box weight	11 (16.7)	2 (5.1)	7 (11.9)	11 (25.0)				
Control of cold-chain	6 (9.1)	3 (7.7)	14 (23.7)	0				
Combo strength/integrity	0	1 (2.6)	16 (27.1)	0				
Correct combo weight	0	0	4 (6.8)	0				
No freezer burn	5 (7.6)	2 (5.1)	1 (1.7)	1 (2.3)				
No frosting	2 (3.0)	1 (2.6)	2 (3.4)	4 (9.1)				
No leaking bags	19 (28.8)	15 (38.5)	18 (30.5)	5 (11.4)				
Labeling (no mislabeling)	19 (28.8)	7 (17.9)	15 (25.4)	7 (15.9)				
Pallet quality	0	0	4 (6.8)	0				
Minimal purge/drip loss	1 (1.5)	3 (7.7)	4 (6.8)	4 (9.1)				
Slaughter and/or production date	1 (1.5)	1 (2.6)	0	5 (11.4)				
Storage life and/or expiration date	2 (3.0)	2 (5.1)	9 (15.3)	6 (13.6)				
Prefer vacuum packaging	21 (31.8)	14 (35.9)	12 (20.3)	19 (43.2)				
Well-frozen	8 (12.1)	0	4 (6.8)	3 (6.8)				
Prefer individual wrap packaging (IWP)	10 (15.2)	0	0	17 (38.6)				
Product placed in box neatly and/or layered packaging	6 (9.1)	4 (10.3)	0	3 (6.8)				
Freshness	2 (3.0)	1 (2.6)	1 (1.7)	0				
Good visual appearance and/or color	1 (1.5)	0	0	1 (2.3)				
Correct bag size for product	2 (3.0)	1 (2.6)	0	0				
Clean and/or attractive packaging	8 (12.1)	4 (10.3)	9 (15.3)	13 (29.5)				
Strong packaging	9 (13.6)	1 (2.6)	3 (5.1)	1 (2.3)				
Clear/transparent packaging	3 (4.5)	0	0	2 (4.5)				
List number and/or standardize number of pieces per box/combo	2 (3.0)	3 (7.7)	1 (1.7)	2 (4.5)				
Box partitions used	2 (3.0)	2 (5.1)	0	0				
Labels provide metric values	2 (3.0)	0	0	0				
Bilingual box labels	3 (4.5)	0	0	0				
Poly-lined boxes (instead of wax-lined boxes)	1 (1.5)	0	1 (1.7)	7 (15.9)				

Table 22. Categorized responses from interviewed companies for explaining what “visual characteristics of product” means to their company as it relates to all pork products.

Response	Hong Kong/ China		Japan		Mexico		Russia	
	n =	66 (%)	39 (%)	59 (%)	44 (%)			
No abscesses	0		0		1 (1.7)	0		
No blood splash	4 (6.1)		2 (5.1)		3 (5.1)	1 (2.3)		
No bruising	2 (3.0)		2 (5.1)		3 (5.1)	4 (9.1)		
No dark, firm, dry (DFD) pork	0		4 (10.3)		0	0		
Ideal fat color	9 (13.6)		14 (35.9)		4 (6.8)	9 (20.5)		
Ideal fat texture and/or firmness	1 (1.5)		2 (5.1)		1 (1.7)	2 (4.5)		
Freshness	25 (37.9)		9 (23.1)		7 (11.9)	9 (20.5)		
Ideal lean color	53 (80.3)		29 (74.4)		54 (91.5)	33 (75.0)		
Ideal lean texture and/or firmness	5 (7.6)		5 (12.8)		8 (13.6)	4 (9.1)		
Good marbling and/or juiciness	5 (7.6)		6 (15.4)		2 (3.4)	3 (6.8)		
No pale, soft, exudative (PSE) pork	0		4 (10.3)		2 (3.4)	0		
Correct pH	0		0		3 (5.1)	0		
Ideal variety meat color	4 (6.1)		3 (7.7)		0	2 (4.5)		
Low water content and/or purge/drip loss	0		0		0	0		
Correct external fat thickness and/or yield	12 (18.2)		13 (33.3)		4 (6.8)	10 (22.7)		
Correct fat-to-lean ratio	13 (19.7)		5 (12.8)		17 (28.8)	5 (11.4)		
Consistent product size and/or weight	0		2 (5.1)		1 (1.7)	2 (4.5)		
No smell and/or off-odors	12 (18.2)		5 (12.8)		14 (23.7)	5 (11.4)		
No scarring on product surfaces (i.e., no knife cuts)	8 (12.1)		3 (7.7)		10 (16.9)	6 (13.6)		
No foreign material and/or clean product surface	3 (4.5)		0		0	2 (4.5)		
Well-frozen	10 (15.2)		2 (5.1)		1 (1.7)	3 (6.8)		
Attractive, clean, and/or transparent packaging	5 (7.6)		0		2 (3.4)	2 (4.5)		
Labeling (including production date)	11 (16.7)		3 (7.7)		2 (3.4)	3 (6.8)		
Origin of product and/or company brand	1 (1.5)		0		2 (3.4)	0		
Control of cold-chain and/or no frosting	1 (1.5)		0		1 (1.7)	0		
Maintain proper shape after freezing	1 (1.5)		0		4 (6.8)	6 (13.6)		
No freezer burn	4 (6.1)		2 (5.1)		0	5 (11.4)		
No leaking bags	3 (4.5)		0		2 (3.4)	2 (4.5)		

Table 23. Categorized responses from interviewed companies for explaining what “production history” means to their company as it relates to all pork products.

Response	Hong Kong/ China	Japan	Mexico	Russia
n =	66 (%)	39 (%)	59 (%)	44 (%)
Animal identification and traceability	3 (4.5)	1 (2.6)	4 (6.8)	1 (2.3)
Animal welfare	2 (3.0)	0	0	1 (2.3)
Environmentally responsible and/or sustainable production practices	2 (3.0)	0	0	1 (2.3)
“Free range” pork	2 (3.0)	0	0	0
“Natural” and/or "organic" pork	3 (4.5)	0	0	0
Product traceability	10 (15.2)	17 (43.6)	29 (49.2)	9 (20.5)
No ractopamine use	0	0	0	0
Whole-life history of product	14 (21.2)	14 (35.9)	9 (15.3)	12 (27.3)
Information on production practices and/or feeding programs	10 (15.2)	24 (61.5)	22 (37.3)	10 (22.7)
Product safety (including processing controls)	6 (9.1)	3 (7.7)	14 (23.7)	3 (6.8)
Origin of product	9 (13.6)	0	5 (8.5)	3 (6.8)
Brand and/or reputation of company or individual establishment in that market	39 (59.1)	2 (5.1)	8 (13.6)	6 (13.6)
Training of in-plant staff	2 (3.0)	0	1 (1.7)	0
Control of cold-chain	0	2 (5.1)	7 (11.9)	0
Consistent specifications and/or product quality	7 (10.6)	0	5 (8.5)	2 (4.5)
Production capacity and/or supply	8 (12.1)	1 (2.6)	1 (1.7)	0
History of customer service/relations	3 (4.5)	0	1 (1.7)	0
Production/slaughter date and/or storage life	6 (9.1)	2 (5.1)	11 (18.6)	1 (2.3)
Not important	4 (6.1)	1 (2.6)	3 (5.1)	17 (38.6)

Table 24. Probabilities of interviewed companies that declined to purchase imported pork products at a discounted price for quality attributes that they had indicated previously as being “required” for purchase.

Country	Product type	Food safety	Customer service	Product eating quality	Product specifications desirability and conformity	Product packaging and condition upon receiving	Visual characteristics of product	Production history
Hong Kong/China	Whole muscle cuts	0.792 (19/24) ¹	0.286 (2/7)	0.600 (15/25)	0.519 (28/54)	0.400 (12/30)	0.553 (21/38)	0.567 (17/30)
	Variety meats	0.929 (13/14)	0.333 (1/3)	0.571 (4/7)	0.292 (14/48)	0.304 (7/23)	0.577 (15/26)	0.700 (7/10)
	Processed products	0.889 (8/9)	0.600 (3/5)	0.818 (18/22)	0.619 (13/21)	0.529 (9/17)	0.571 (4/7)	0.615 (8/13)
Japan	Whole muscle cuts	0.917 (22/24)	1.000 (1/1)	0.500 (12/20)	0.531 (17/32)	0.857 (6/7)	0.762 (16/21)	0.688 (11/16)
	Variety meats	0.917 (11/12)	0.000 (0/0)	0.500 (3/6)	0.750 (12/16)	0.714 (5/7)	0.692 (9/13)	0.750 (3/4)
	Processed products	0.957 (22/23)	1.000 (1/1)	0.840 (21/25)	0.643 (9/14)	0.875 (7/8)	0.857 (6/7)	0.714 (5/7)
Mexico	Whole muscle cuts	0.786 (11/14)	0.545 (6/11)	0.750 (12/16)	0.521 (25/48)	0.739 (17/23)	0.805 (33/41)	0.800 (8/10)
	Variety meats	0.889 (8/9)	0.333 (4/12)	0.600 (3/5)	0.591 (13/22)	0.556 (10/18)	0.619 (13/21)	0.667 (2/3)
	Processed products	0.500 (1/2)	0.000 (0/1)	0.750 (6/8)	0.533 (8/15)	0.750 (9/12)	0.625 (5/8)	0.000 (0/1)
Russia	Whole muscle cuts	0.917 (11/12)	0.333 (3/9)	0.600 (6/10)	0.474 (18/38)	0.500 (15/30)	0.545 (6/11)	0.500 (3/6)
	Variety meats	0.857 (6/7)	0.000 (0/1)	0.667 (2/3)	0.389 (7/18)	0.417 (10/24)	0.556 (5/9)	0.000 (0/4)
	Processed products	0.000 (0/0)	1.000 (1/1)	1.000 (4/4)	0.500 (1/2)	0.667 (2/3)	1.000 (1/1)	0.500 (1/2)

¹ Numbers in parentheses () are the number of companies that declined discounts out of the total number of companies that “required” that attribute.

Table 25. Calculated probabilities of the specified quality attributes identified as being "required" before companies across all countries would consider purchasing imported pork products.

Product	Food safety	Customer service	Product eating quality	Product specification desirability and conformity	Product packaging and condition upon receiving	Visual characteristics of product	Production history
Whole muscle cuts	0.261 ^{bc} (0.030) ¹	0.041 ^e (0.014)	0.181 ^d (0.026)	0.361 ^a (0.031)	0.199 ^{cd} (0.027)	0.288 ^{ab} (0.033)	0.141 ^d (0.025)
Variety meats and offal products	0.247 ^a (0.037)	None	0.078 ^b (0.022)	0.303 ^a (0.039)	0.209 ^a (0.034)	0.262 ^a (0.038)	None
Processed products	None	None	0.472 ^a (0.068)	0.256 ^b (0.061)	0.269 ^b (0.055)	0.152 ^b (0.045)	None

¹ Numbers in parentheses () are standard errors.

^{a, b, c, d, e} Means within a row with different superscripts differ ($p = 0.05$).

Table 26. Calculated probabilities across all countries of the willingness-to-pay of companies to pay a premium for imported pork products possessing attributes of “guaranteed” quality.

Country	Food safety	Customer service	Product eating quality	Product specification desirability and conformity	Product packaging and condition upon receiving	Visual characteristics of product	Production history
Whole muscle cuts	0.355 ^b (0.032) ¹	0.473 ^a (0.034)	0.368 ^b (0.032)	0.233 ^d (0.028)	0.258 ^{cd} (0.031)	0.224 ^d (0.029)	0.340 ^{bc} (0.033)
Variety meats and offal products	0.387 ^a (0.043)	0.385 ^a (0.043)	0.376 ^a (0.043)	0.173 ^c (0.032)	0.231 ^{bc} (0.037)	0.221 ^{bc} (0.038)	0.298 ^{ab} (0.041)
Processed products	0.581 ^a (0.078)	0.467 ^{ab} (0.066)	0.285 ^b (0.065)	0.318 ^b (0.059)	None	0.404 ^{ab} (0.065)	0.395 ^{ab} (0.063)

¹ Numbers in parentheses () are standard errors.

^{a, b, c, d} Means within a row with different superscripts differ ($p = 0.05$).

Table 27. Probabilities of attributes being “required” before companies would consider purchasing imported pork whole muscle cuts as well as the probabilities and average values [%] of paying premiums for these attributes.

Country		Food safety	Customer service	Product eating quality	Product specification desirability and conformity	Product packaging and condition upon receiving	Visual characteristics of product	Production history
Hong Kong/ China	Required	0.238 ^{ab, z}	0.025 ^{c, z}	0.188 ^{b, z}	0.354 ^{a, z}	0.150 ^{b, z}	0.266 ^{ab, y}	0.213 ^{b, y}
	Premium	0.463 ^{bc, y}	0.675 ^{a, x}	0.525 ^{ab, y}	0.317 ^{c, y}	0.375 ^{bc, y}	0.329 ^{c, y}	0.625 ^{a, y}
	Value	[17.1%]	[15.0%]	[16.9%]	[18.2%]	[13.2%]	[14.2%]	[13.5%]
Japan	Required	0.478 ^{a, y}	0.022 ^{d, z}	0.261 ^{bc, z}	0.370 ^{ab, z}	0.130 ^{cd, z}	0.348 ^{ab, xy}	0.239 ^{bc, y}
	Premium	0.261 ^{b, z}	0.522 ^{a, xy}	0.304 ^{b, z}	0.217 ^{b, yz}	0.283 ^{b, y}	0.217 ^{b, yz}	0.304 ^{b, z}
	Value	[10.9%]	[8.8%]	[10.8%]	[12.1%]	[7.0%]	[8.0%]	[7.4%]
Mexico	Required	0.164 ^{cd, z}	0.090 ^{d, z}	0.179 ^{cd, z}	0.368 ^{ab, z}	0.258 ^{bc, z}	0.508 ^{a, x}	0.121 ^{cd, yz}
	Premium	0.403 ^{a, yz}	0.299 ^{ab, z}	0.269 ^{ab, z}	0.162 ^{bc, z}	0.318 ^{a, y}	0.092 ^{c, z}	0.288 ^{ab, z}
	Value	[11.5%]	[9.4%]	[11.3%]	[12.6%]	[7.6%]	[8.6%]	[7.9%]
Russia	Required	0.216 ^{ab, z}	0.057 ^{c, z}	0.118 ^{bc, z}	0.353 ^{a, z}	0.294 ^{a, z}	0.118 ^{bc, z}	0.058 ^{c, z}
	Premium	0.308 ^{ab, yz}	0.404 ^{a, yz}	0.392 ^{a, yz}	0.255 ^{abc, yz}	0.118 ^{c, z}	0.333 ^{ab, y}	0.192 ^{bc, z}
	Value	[11.0%]	[8.9%]	[10.9%]	[12.2%]	[7.1%]	[8.1%]	[7.5%]

^{a, b, c} Means within a row with different superscripts differ ($p = 0.05$).

^{x, y, z} Means within a column with different superscripts differ ($p = 0.05$).

Table 28. Probabilities of attributes being “required” before companies would consider purchasing imported pork variety meats and offal products as well as the probabilities and average values [%] of paying premiums for these attributes.

Country		Food safety	Customer service	Product eating quality	Product specification desirability and conformity	Product packaging and condition upon receiving	Visual characteristics of product	Production history
Hong Kong/ China	Required	0.210 ^{a, z}	0.016 ^{b, z}	0.065 ^{b, z}	0.226 ^{a, z}	0.113 ^{ab, z}	0.242 ^{a, z}	0.113 ^{ab, z}
	Premium	0.516 ^{abc, y}	0.484 ^{abc, y}	0.613 ^{a, y}	0.145 ^{d, z}	0.371 ^{c, y}	0.436 ^{bc, y}	0.581 ^{ab, y}
	Value	[15.3%]	[13.2%]	[15.2%]	[16.5%]	[11.4%]	[12.4%]	[11.8%]
Japan	Required	0.407 ^{ab, z}	None	0.111 ^{c, z}	0.444 ^{a, y}	0.185 ^{bc, yz}	0.333 ^{abc, z}	0.111 ^{c, z}
	Premium	0.556 ^{a, y}	0.482 ^{ab, y}	0.296 ^{abc, z}	0.148 ^{c, z}	0.259 ^{bc, yz}	0.148 ^{c, z}	0.259 ^{bc, z}
	Value	[9.2%]	[7.1%]	[9.0%]	[10.3%]	[5.3%]	[6.3%]	[5.6%]
Mexico	Required	0.211 ^{abc, z}	0.105 ^{bc, z}	0.079 ^{c, z}	0.342 ^{a, yz}	0.263 ^{ab, yz}	0.342 ^{a, z}	0.054 ^{c, z}
	Premium	0.290 ^{a, z}	0.158 ^{a, z}	0.237 ^{a, z}	0.158 ^{a, z}	0.211 ^{a, yz}	0.105 ^{a, z}	0.162 ^{a, z}
	Value	[9.7%]	[7.6%]	[9.6%]	[10.9%]	[5.9%]	[6.8%]	[6.2%]
Russia	Required	0.194 ^{ab, z}	None	0.065 ^{b, z}	0.226 ^{ab, z}	0.323 ^{a, y}	0.161 ^{ab, z}	None
	Premium	0.226 ^{bc, z}	0.484 ^{a, y}	0.387 ^{ab, z}	0.258 ^{abc, z}	0.129 ^{c, z}	0.290 ^{abc, yz}	0.258 ^{abc, z}
	Value	[9.3%]	[7.1%]	[9.1%]	[10.4%]	[5.4%]	[6.4%]	[5.7%]

^{a, b, c, d} Means within a row with different superscripts differ ($p = 0.05$).

^{x, y, z} Means within a column with different superscripts differ ($p = 0.05$).

Table 29. Probabilities of attributes being “required” before companies would consider purchasing imported processed pork products as well as the probabilities and average values [%] of paying premiums for these attributes.

Country		Food safety	Customer service	Product eating quality	Product specification desirability and conformity	Product packaging and condition upon receiving	Visual characteristics of product	Production history
Hong Kong/ China	Required	0.200 ^{bc, z}	0.075 ^{c, z}	0.450 ^{a, z}	0.325 ^{ab, z}	0.225 ^{bc, z}	0.100 ^{c, z}	0.200 ^{bc, z}
	Premium	0.650 ^{a, y}	0.550 ^{ab, z}	0.375 ^{b, z}	0.425 ^{b, z}	0.475 ^{ab, z}	0.675 ^{a, y}	0.350 ^{b, z}
	Value	[19.9%]	[17.7%]	[19.7%]	[21.0%]	[16.0%]	[16.9%]	[16.3%]
Japan	Required	0.579 ^{a, y}	0.026 ^{c, z}	0.553 ^{a, z}	0.237 ^{b, z}	0.184 ^{bc, z}	0.158 ^{bc, z}	0.132 ^{bc, z}
	Premium	0.211 ^{b, z}	0.553 ^{a, z}	0.211 ^{b, z}	0.290 ^{b, z}	0.395 ^{ab, z}	0.342 ^{ab, z}	0.421 ^{ab, z}
	Value	[13.7%]	[11.6%]	[13.6%]	[14.9%]	[9.8%]	[10.8%]	[10.2%]
Mexico	Required	0.040 ^{b, z}	None	0.240 ^{ab, z}	0.320 ^{a, z}	0.360 ^{a, z}	0.200 ^{ab, z}	None
	Premium	0.600 ^{a, y}	0.440 ^{ab, z}	0.440 ^{ab, z}	0.240 ^{b, z}	0.280 ^{b, z}	0.280 ^{b, z}	0.480 ^{ab, z}
	Value	[14.3%]	[12.1%]	[14.1%]	[15.4%]	[10.4%]	[11.3%]	[10.7%]
Russia	Required	None	0.167 ^{a, z}	0.667 ^{a, z}	0.167 ^{a, z}	0.333 ^{a, z}	0.167 ^{a, z}	0.167 ^{a, z}
	Premium	0.833 ^{a, y}	0.333 ^{ab, z}	0.167 ^{b, z}	0.333 ^{ab, z}	0.000	0.333 ^{ab, z}	0.333 ^{ab, z}
	Value	[13.8%]	[11.7%]	[13.7%]	[15.0%]	None	[10.9%]	[10.2%]

^{a, b} Means within a row with different superscripts differ ($p = 0.05$).

^{y, z} Means within a column with different superscripts differ ($p = 0.05$).

Table 30. Relative importance of specified quality attributes.

Quality attribute	Multinomial logit model estimates					Shares of preference (%)				
	Hong Kong/China	Japan	Mexico	Russia	All Countries ¹	Hong Kong/China	Japan	Mexico	Russia	All countries
Food safety	0.755* ² (0.061) ³	0.557* (0.080)	0.644* (0.065)	0.624* (0.075)	0.656* (0.034)	20.2	21.9	19.9	16.5	19.6
Customer service	0.152* (0.060)	-0.184* (0.079)	0.171* (0.065)	0.326* (0.074)	0.131* (0.034)	11.0	10.4	12.4	12.2	11.6
Product eating quality	0.630* (0.061)	0.266* (0.079)	0.226* (0.065)	0.524* (0.075)	0.425* (0.034)	17.8	16.3	13.1	14.9	15.6
Product specification desirability and conformity	0.512* (0.060)	0.238* (0.079)	0.437* (0.065)	0.678* (0.075)	0.474* (0.034)	15.8	15.9	16.2	17.4	16.3
Product packaging and condition upon receiving	0.379* (0.060)	-0.105 (0.079)	0.245* (0.065)	0.591* (0.075)	0.296* (0.034)	13.9	11.3	13.3	16.0	13.7
Visual characteristics of product	0.214* (0.060)	-0.074 (0.079)	0.340* (0.065)	0.471* (0.074)	0.249* (0.034)	11.8	11.6	14.7	14.1	13.0
Production history	0.000	0.000	0.000	0.000	0.000	9.5	12.5	10.4	8.8	10.2

¹Data was pooled from all countries and analyzed.

²One asterisk (*) implies that the mean importance of the quality attribute within country (column) is statistically different from production history at $p = 0.05$ level.

³Numbers in parentheses () are standard errors.

FIGURES

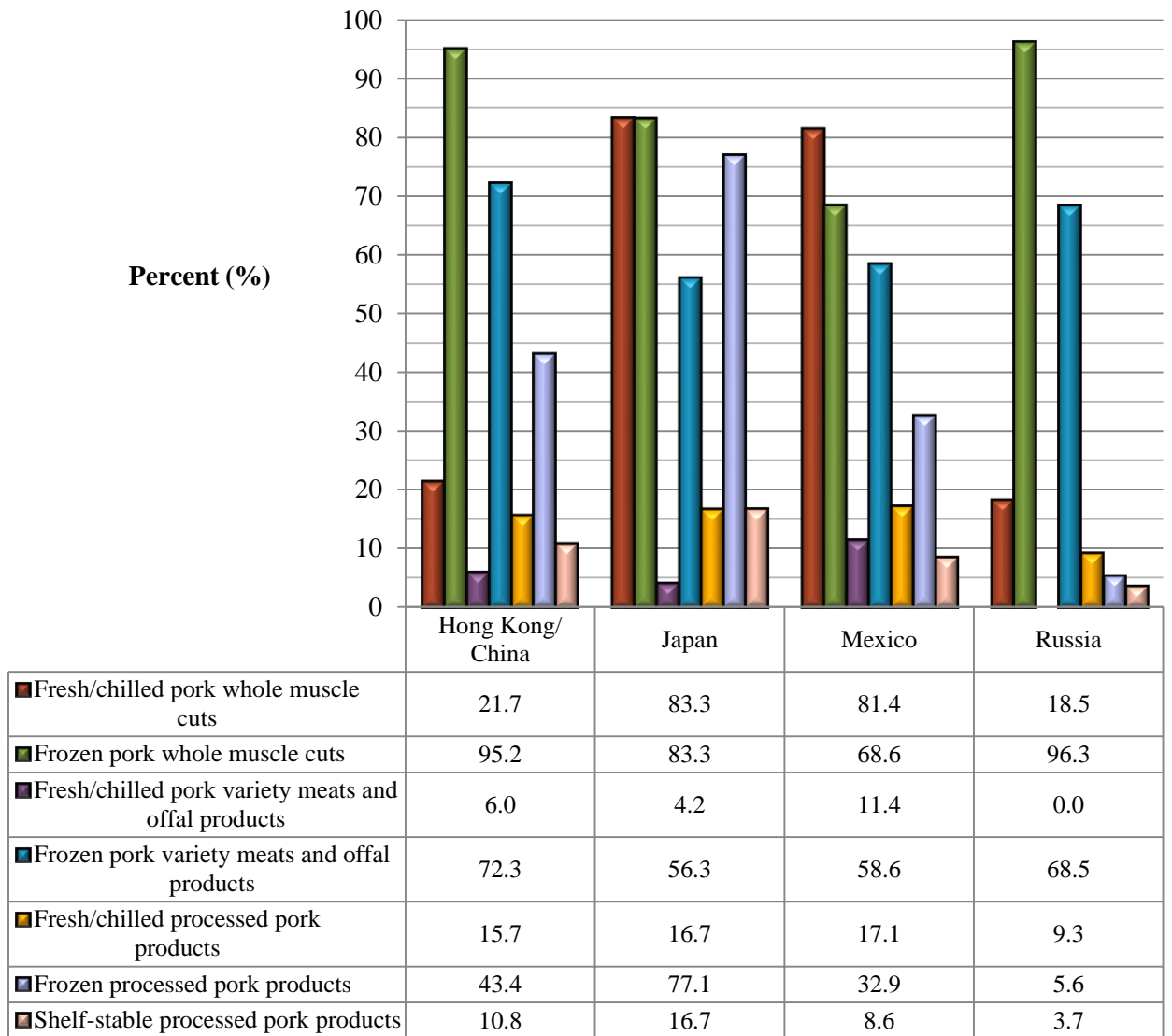


Figure 1. Types of imported pork products (%) purchased by interviewed companies in the past 3 years.

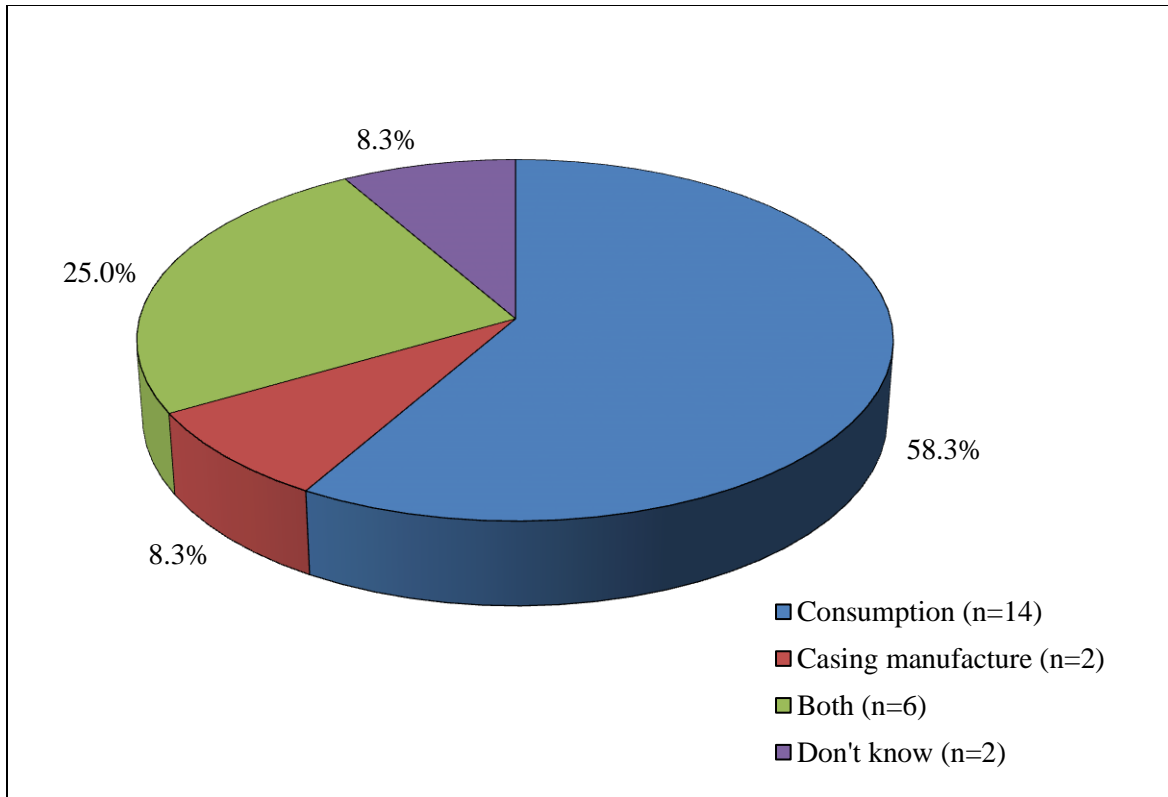


Figure 2. Intended uses for pork large and small intestines imported by Hong Kong/China (n = 24).

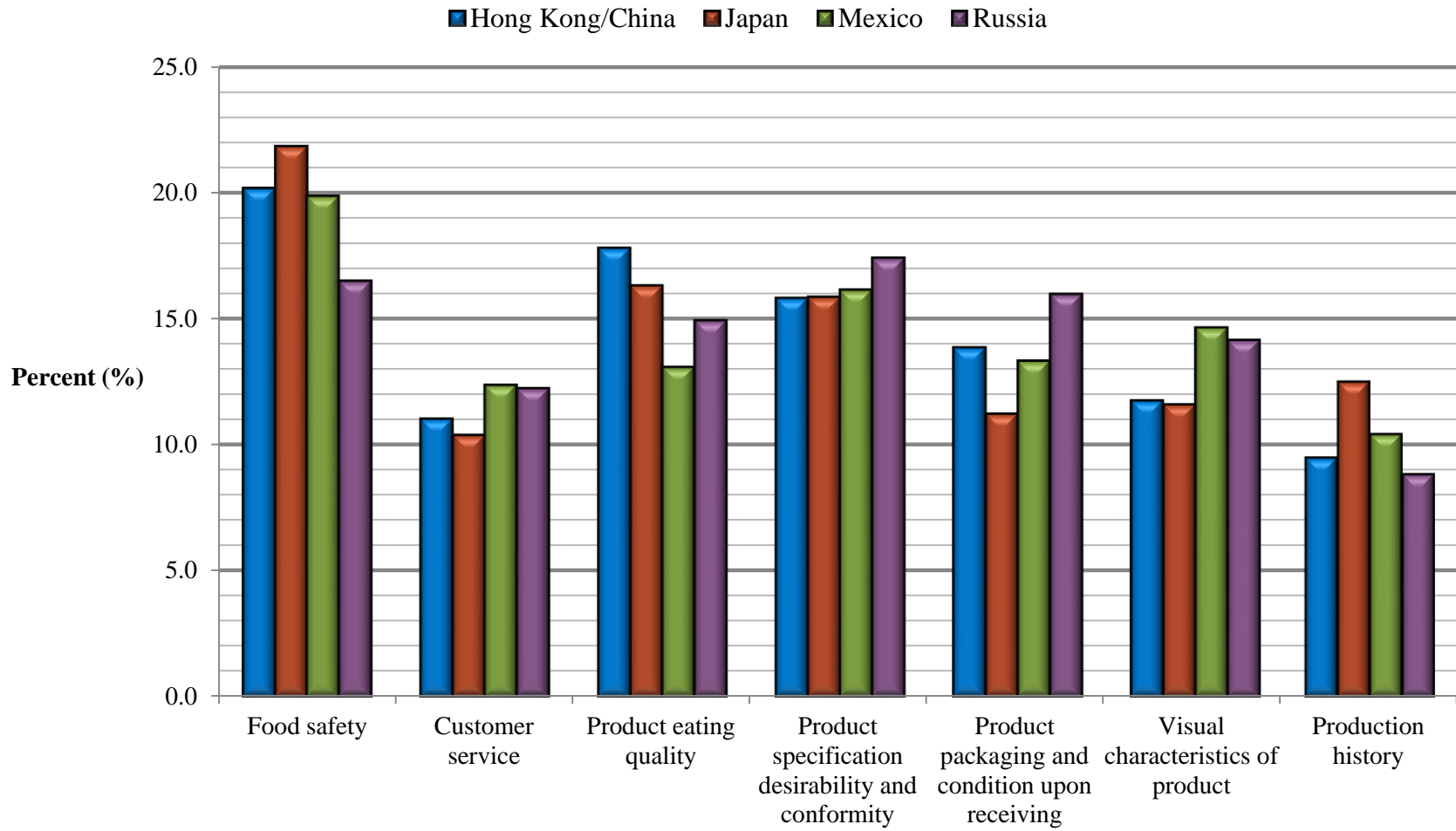


Figure 3. Shares of preference for specified quality attributes by individual and all countries.

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APPENDIX

RESULTS BY COUNTRY BY PRODUCT TYPE

Hong Kong/China

Whole Muscle Cuts (Table 27).

Required. (1) Probability of requiring Product Specifications > Customer Service, Eating Quality, Product Packaging, and Production History. (2) Probabilities of requiring Eating Quality, Product Packaging, and Production History > Customer Service.

Premium. (1) Probabilities of paying premiums for Customer Service and Production History > Food Safety, Product Specifications, Product Packaging, and Visual Characteristics. (2) Probability of paying a premium for Eating Quality > Product Specifications and Visual Characteristics. The calculated WTP premiums for Customer Service, Eating Quality, and Production History were 15.0, 16.9, and 13.5%, respectively.

Variety Meats and Offal Products (Table 28).

Required. Probabilities of requiring Food Safety, Product Specifications, and Visual Characteristics > Customer Service and Eating Quality.

Premium. (1) Probability of paying a premium for Eating Quality > Product Specifications, Product Packaging, and Visual Characteristics. (2) Probability of paying a premium for Production History > Product Specifications and Product Packaging. (3) Probability of paying a premium for Product Packaging > Product Specifications. The

calculated WTP premiums for Food Safety, Customer Service, Eating Quality, and Production History were 15.3, 13.2, 15.2, and 11.8%.

Processed Products (Table 29).

Required. (1) Probability of requiring Eating Quality > all attributes except Product Specifications. (2) Probability of requiring Product Specifications > Customer Service and Visual Characteristics.

Premium. Probabilities of paying premiums for Food Safety and Visual Characteristics > Eating Quality, Product Specifications, and Production History. The calculated WTP premiums for Food Safety and Visual Characteristics were 19.9 and 16.9%, respectively.

Japan

Whole Muscle Cuts (Table 27).

Required. (1) Probability of requiring Food Safety > Customer Service, Eating Quality, Product Packaging, and Production History. (2) Probability of requiring Product Specifications and Visual Characteristics > Customer Service and Product Packaging. (3) Probability of requiring Eating Quality and Production History > Customer Service.

Premium. Probability of paying a premium for Customer Service > any other attribute. The calculated WTP premium for Customer Service was 8.8%.

Variety Meats and Offal Products (Table 28).

Required. (1) Probability of requiring Product Specifications > Customer Service, Product Packaging, and Production History. (2) Probability of requiring Food Safety > Eating Quality and Production History.

Premium. (1) Probability of paying a premium for Food Safety > Product Specifications, Product Packaging, Visual Characteristics, and Production History. (2) Probability of paying a premium for Customer Service > Product Specifications and Visual Characteristics. The calculated WTP premiums for Food Safety, Customer Service, and Eating Quality were 9.2, 7.1, 9.0%, respectively.

Processed Products (Table 29).

Required. (1) Probabilities of requiring Food Safety and Eating Quality > all other attributes. (2) Probability of requiring Product Specifications > Customer Service.

Premium. Probability of paying a premium for Customer Service > Food Safety, Eating Quality, and Product Specifications. The calculated WTP premiums for Customer Service, Product Packaging, and Visual Characteristics were 11.6, 9.8, and 10.8%, respectively.

Mexico

Whole Muscle Cuts (Table 27).

Required. (1) Probability of requiring Visual Characteristics > all other attributes except Product Specifications. (2) Probability of requiring Product Specifications > Food Safety, Customer Service, Eating Quality, and Product Packaging. (3) Probability of requiring Product Packaging > Customer Service.

Premium. (1) Probabilities of paying premiums for Food Safety and Product Packaging > Product Specifications and Visual Characteristics. (2) Probabilities of paying premiums for Customer Service, Eating Quality, and Production History > Visual Characteristics. The calculated WTP premiums for Food Safety, Customer Service,

Eating Quality, Product Packaging, and Production History were 11.5, 9.4, 11.3, 7.6, and 7.9%, respectively.

Variety Meats and Offal Products (Table 28).

Required. (1) Probabilities of requiring Product Specifications and Visual Characteristics > Customer Service, Eating Quality, and Production History. (2) Probability of requiring Product Packaging > Eating Quality and Production History.

Premium. No significant differences were found between attributes. The calculated WTP premiums ranged from 5.9 (Product Packaging) to 10.9% (Product Specifications). The lack of observed differences suggest, possibly, that companies in Mexico have unique or independent views on what constitutes “quality” as it relates to variety meats, or are indifferent to product quality and driven by price.

Processed Products (Table 29).

Required. Probabilities of requiring Product Specifications and Product Packaging > Food Safety.

Premium. Probability of paying a premium for Food Safety > Product Specifications, Product Packaging, and Visual Characteristics. The calculated WTP premiums for Food Safety, Customer Service, Eating Quality, and Production History were 14.3, 12.1, 14.1, and 10.7%, respectively.

Russia

Whole Muscle Cuts (Table 27).

Required. (1) Probabilities of requiring Product Specifications and Product Packaging > Customer Service, Eating Quality, Visual Characteristics, and Production History. (2) Probability of requiring Food Safety > Customer Service and Production History.

Premium. (1) Probabilities of paying premiums for Customer Service and Eating Quality > Product Packaging and Production History. (2) Probabilities of paying premiums for Food Safety and Visual Characteristics > Product Packaging. The calculated WTP premiums for Food Safety, Customer Service, Eating Quality, Product Specifications, and Visual Characteristics were 11.0, 8.9, 10.9, 12.2, and 8.1%, respectively.

Variety Meats and Offal Products (Table 28).

Required. Probability of requiring Product Packaging > Eating Quality.

Premium. (1) Probability of paying a premium for Customer Service > Food Safety and Product Packaging. (2) Probability of paying a premium for Eating Quality > Product Packaging. The calculated WTP premiums for Customer Service, Eating Quality, Product Specifications, Visual Characteristics, and Production History were 7.1, 9.1, 10.4, 6.4, 5.7%, respectively.

Processed Products (Table 29).

Required. No significant differences were found between attributes. Only 6 of the 54 companies that were interviewed for this study had purchased imported processed

pork products in the past three years. Although product Eating Quality was, numerically, twice as important as the next closest attribute because of the small number of observations it was not statistically different from the other attributes.

Premium. Probability of paying a premium for Food Safety > Eating Quality.

The calculated WTP premiums for Food Safety, Customer Service, Product Specifications, Visual Characteristics, and Production History were 13.8, 11.7, 15.0, 10.9, and 10.2%, respectively.