

Effects of Product Origin on Millers' Choice of Imported Wheat For Noodle Market Segments in Japan and South Korea

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Abstract

Wheat importation into Japan and South Korea is becoming more flexible and efficient as these nations reform their import policies.. Wheat exporters require a better understanding of the demand for wheat and specific quality characteristics desired by Japanese and South Korean buyers. Noodle making wheat market segments in Japan and South Korea are the target market of this study since these markets consume significant portion of imported wheat. Millers in Japan and South Korea were surveyed to elicit responses on their demand for specific wheat characteristics. A non-nested multinomial logit (MNL) model is used with data from a stated preference questionnaire to evaluate the potential effects of selected quality factors on the probability of buyers selecting different wheats for the noodle flour market in Japan and South Korea. Millers in Japan appeared to be more sensitive to small price changes than were millers in South Korea, apparently because of differences in the trading systems of the two nations. The responses of millers differ to several quality factors of wheat. In general, Japanese millers seem to exhibit more stringent quality requirements for their wheat purchases. Millers in both markets place a higher value on wheat originating from Australia, compared to wheat of either U.S. or Canadian origin, in their choice decisions of wheat for noodle making.

Introduction

Wheat is an important staple food grain, and one of the more extensively traded agricultural products in world markets. Amongst wheat importers, Japan and South Korea are identified as important players since they purchase high quality wheat classes and since wheat consumption in these two nations is principally dependent on importation. Japan imports 6.3 some million metric tones [MMT] of wheat annually, 35 percent of which is consumed in the form of noodles. Japan is also recognized to have high quality standards for food, including wheat. The system of import arrangements for wheat has been regulated and administered by the Japan Food Agency (JFA). However, the JFA has started to reform its policy relating to wheat imports and marketing, due in part to internal problems relating to excess capacity of the domestic milling sector, the high costs of subsidizing domestic wheat farmers, and fiscal constraints (JFA, 1999). The 1994 Agreement on Agriculture of the General Agreement of Tariff and Trade (GATT) reinforced the pressures for change in trading practices to liberalize world trade in agricultural commodities, including reduction of export subsidies, increased market access and reduced domestic protection and support. Thus the Agreement on Agriculture involved commitments that have reduced restrictions on wheat importation. This

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process will continue, in future as, for example, with further reduction of Japan's import tariffs on wheat that can be expected to result from the next round of multilateral trade negotiations through the World Trade Organization (WTO). Thus, Japan's wheat sector is at a critical junction, faced with many internal and external challenges.

South Korea is also a significant wheat import market. It is the third largest wheat buyer in Asia, importing an average 4.7 MMT of wheat per annum in recent years (KOFMIA, 1999). Supplies of domestic wheat consumption are entirely dependent on importation. Consequently, South Korea is expected to continue to be an appreciable and consistent buyer of wheat in international wheat markets. The milling sector in South Korea was deregulated in 1995 (KOFMIA, 1999). There has been continuing consolidation of firms in this industry and this may have led to changes in the structure of millers' demand for imported wheat.

One prominent feature of the demand for wheat in Japan and South Korea is the predominance of consumption of wheat flour in the form of noodles. Noodle consumption has grown in both South Korea and Japan. In particular, the market segment for instant Ramen noodles in South Korea has grown at 10.1 percent annually in the ten-year period from 1980 to 1990 (Samyang, 1999). This nation accounts for 15 percent of total world instant Ramen consumption. The Japanese instant noodle industry grew at 1.8 percent and 3.3 percent in 1995 and 1996, respectively, while the total growth rate of bread production in Japan in the four years prior to 1997 was near zero percent (JFA, 1997). The market for noodles is by far the most important category of use for wheat flour in South Korea and Japan (Kubomura, 1998).

Wheat exporters such as Canada and the United States are interested in a better understanding of the wheat noodle market and in exporting wheat to these markets. This study focuses on millers' demand for wheat, focusing in particular on millers' preferences for various types of wheat and for specific wheat characteristics demanded for noodle processing.

Despite some fundamental differences in their markets and industries, the markets for wheat in Japan and Korea, which are viewed by many exporting countries to have very high quality standards (Kim, Y.S., 1997), are changing in ways that will lead them toward more transparent and competitive market structures. As these two markets deregulate and as their industries become more efficient, preferences for different wheats and associated characteristics by millers in Japan and South Korea are expected to be evident in import markets. Consequently, information on quality preferences that influence demand for wheat by millers and end-users is expected to become more important to wheat exporters for efficient wheat trading. Information on millers' wheat preferences has been limited due to the highly regulated structure of both wheat importation and the domestic milling sectors in these two nations in the past'. One very important characteristic of wheat that may influence millers' preferences is country of origin of imported wheat. This is one focus of this study.

Objective:

The purpose of this paper is to evaluate the potential effects of product origin on the probability of choices for noodle making wheat by flour millers in Japan and South Korea. A comprehensive evaluation of the preferences of millers in Japan and South Korea for

characteristics of wheat, including whether this originated from three major wheat exporting nations (Australia, Canada and the U.S.) is conducted for this purpose. This information may be useful in considering effective pricing and market development strategies for various exporters of wheat for use in the noodle market. A direct interview method of survey was employed in this study. The interviewer met 57 Japanese mill representatives in eight different cities and 41 of these answered the full survey questionnaire. The interviewer met 35 mill representatives in South Korea and 23 of these answered the full survey questionnaire. These survey interviews were conducted through the year of 1999.

Theoretical Framework

A stated preference (SPM) choice experiment was chosen as the basis of the analysis and this was designed to enable the estimation of coefficients on identified quality attributes of noodle making wheat at four specified levels. The SPM, often referred to as experimental or stated choice analysis, is an extension of conjoint analysis. The approach allows the assessment of buyer's stated responses to specified levels of particular actual or potential product characteristics. The analytic framework is based on the premise that buyers' perceptions of a selected product, as represented by its various characteristics, including price, influence the decision to purchase a product. The SPM applied in this study is based on buyers' hypothetical choice behavior for purchase of wheat with different attributes. Respondents are asked to simulate discrete choice behavior for wheat with particular levels of specified attributes (Figure 1). This can allow researchers to assess the potential demand for a new product, based on buyers' perceptions of that product or to estimate the response to a change in an existing product.

The SPM is particularly appealing for this study since actual market choices of buyers for noodle processing wheat classes from some wheat exporters, such as Canada, are not available. The SPM has been applied extensively in empirical work in examining choice of travel, environmental amenities, recreational facilities, and in food marketing studies. Recent examples are provided by Unterschultz et al. (1997); Quagraine et al. (1998) and Kuperis et al. (1999).

The (SPM) is based on economic principles. Discrete choices among product alternatives are modeled in a random utility framework using a multinomial logit (MNL) model. With an appropriate definition of the attributes and the attribute levels that enter an individual's indirect utility function this can be expressed as below, following Ben-Akiva and Lerman (1985), Bastell and Louviere (1991) and Adamowicz et al. (1992).

$$U_{in} = V(X_{in}) + e(X_{in}) \quad (1)$$

where: U_{in} is person n's utility of choosing alternative i ; V is the systematic component of utility; e is a random element; X_{in} , is a vector of attribute values for alternative i as viewed by respondent n. Total utility, U_{in} is a sum of observable and unobservable components, which can be expressed as V and e , respectively. The systematic component is a function of observable attributes of products or brands of a product and individuals, while the random component relates to variations in choice due to within- and between-individual variance, omitted variables, measurement errors and imperfect information (Ben-Akiva and Lerman, 1985).

The probability of individual n choosing alternative i is equal to the probability that the utility of alternative i is greater than the utilities of all other alternatives in the choice set. This can be written as follows:

$$P_n(i) = \Pr(V_{in} + e_{in} \geq V_{jn} + e_{jn}; \text{for all } j \in C_n) \quad (2)$$

where C_n is the choice set for respondent n . Assuming that the error terms are independently, identically and Gumbel distributed with a scale parameter $m > 0$, the probability of choosing an alternative i is defined as the multinomial logit (MNL) model:

$$P_n(i) = \frac{\exp(mV_{in})}{\sum_j \exp(mV_{jn})} \quad (3)$$

Assuming that V_{in} is linear in parameters, the functional form can be expressed as:

$$V_{in} = b_1 + b_2 x_{in2} + \dots + b_k x_{ink} \quad (4)$$

where V_{in} is respondent n 's conditional indirect utility function; x_{ink} is k th attribute values for alternative i as viewed by respondent n and b_1 to b_k are coefficients to be estimated. The functional form expressed in equation (4) is additive and indicates that the factors are independent in their respective effects on consumer utility. Thus, interaction effects are assumed to be negligible; consequently only main effects are assessed. The non-nested MNL model as outlined above was applied to analyze the data collected from the survey questionnaires through direct interviews with millers in Japan and South Korea.

The Questionnaire and Survey Methodology

A survey applying SPM was developed and applied in this study to collect the necessary data. To construct the survey questionnaire, significant factors and factor levels were determined based on consultation with milling industry representatives. An initial round of interviews with industry members identified key factors and factor levels for each wheat class. Follow-up interviews were scheduled to conduct the final SPM survey questionnaire. An example of a choice question is in Figure 1.

In the choice sets, price, protein content, country of origin and dockage level were selected as the most important attributes. Following discussions with millers the questionnaire was structured into three sub-sets based on three different wheat classes which were specified as: hard, semi-hard and medium wheat for Japan, and hard, medium and soft wheat for South Korea. Each major attribute was specified to have four different possible levels in the survey. A fractional factorial experiment was designed for each product, resulting in 32 choices for each product. To reduce respondent burden, these questions were blocked into four sets, providing eight questions on each product per questionnaire. Each respondent answered eight questions on each wheat subset related to specific wheat characteristic and country of origin. The questionnaires were pre-tested in initial discussions and interviews with millers who also advised on the appropriate attributes and their levels..

Respondents chose from two product alternatives based on descriptions of the product in terms of specific levels of attributes (alternative A and alternative B). Alternatively, respondents could choose alternative C, a non-choice option (Figure 1). Alternative A and

alternative B provide different profiles of the product, based on the specified attributes, while alternative C, the non-choice option, provides a “base” alternative that sets the origin of the utility scale. The base alternative acts as a constant subtracted from the utilities of the other alternatives [Louviere, 1992].

A direct interview method of survey was employed in this study. The interviewer met 57 mill representatives in eight different cities, and 41 of these answered the full survey questionnaire in Japan from January to June in 1999. The interviewer met 35 mill representatives in South Korea and 23 of these answered the full survey questionnaire from March to April in 1999. The multinomial logit model of Equation (4) was applied to the data elicited from the survey responses. This model assumes that there is only one level of decision-making in the millers’ wheat purchase decision process. Dummy variables (-1,+1) are used to effect-code the attribute levels so that the base alternative is exactly equal to the origin. The fourth level of each attribute is omitted during estimation, to avoid singularity, and estimates for this level are subsequently calculated, using the effect-coding constraint that all four attributes must sum to zero. The non-linear logit procedure of the statistical program LIMDEP 7.0 is used for estimation of the MNL model of Equation 4.

Results and Discussion

Estimates of the multinomial logit model (MNL) based on SPM data from both Korea and Japan are outlined and interpreted in this section. For both markets, separate models were developed and estimated. Both Japanese and South Korean models used the segmented-data set based on three main wheat classes to estimate the impacts of four important quality factors on millers’ choice probability (Table 1 and Table 2). The impacts of price, protein content, country of origin and dockage level on millers’ probability of product choices are estimated in each case. However, the estimated coefficients cannot be directly compared since there are some differences in both the wheat classes and attribute levels that were specified by millers to be most appropriate in each nation.

The coefficients on price factors had expected signs for both models. The price variable represents the change from the previous price paid by the miller. For example “2% down” represents a price 2% lower than the previous price. The coefficients on lower prices are positive and statistically significant for both Japan and South Korea. Lower prices increase buyers’ utility. Discussions with the millers prior to developing the survey indicated that the Japanese millers are very sensitive to small price changes. Price responses between Japan and South Korean cannot be directly compared due to the different range of prices used in the two surveys. The indications of a particularly high level of sensitivity in millers’ response to price changes in the Japanese market may arise from characteristics of the trading system in this market. The Japan Food Agency (JFA) continues to administer wheat imports into Japan, thus there is a limited choice of products to be purchased by millers. Hence, marginal increases in prices of imported wheat may have a significant negative impact on millers’ utility. The Korean wheat trade was liberalized in 1995, and South Korean millers have a higher degree of choice in their product purchases. Hence, a marginal increase in price for a particular wheat product may not have a substantial impact on millers’ utility since they can substitute with another wheat of similar quality or possibly adjust their flour price.

The variables for country of origin and dockage factors and the levels of these are the same in the SPM data from Japan and South Korea. Protein level specifications differ, and this is For the Korean hard wheat class, the protein level of 12.2 % is preferred while for Japanese hard and semi-hard wheat classes, the preference is for 14% and 12 % respectively. and has For the medium wheat class in both markets, the preferred protein content is 10.7%.. For soft wheat, South Korean millers had a preference for protein content of 9.5 %.

Dockage levels for both Japanese and Korean markets were defined to have an identical range of factor levels between [or below] 0.8 and 0.2 percent. Japanese millers preferred dockage at or below 0.4 percent for all three wheat classes, while Korean millers preferred dockage at or below 0.2 percent for all wheat classes.

Both Korean and Japanese millers showed identical preferences for product origin on the medium wheat class. Both groups identified Australia as the most preferred supplier of medium wheat. However, Japanese millers ranked domestic producers as the second most preferred supplier of medium wheat class, while Korean millers ranked the U.S. as the second most preferred supplier. For hard wheat purchases by South Korean millers and for semi-hard wheat in Japan, Australia is again the preferred supplier, followed by the U.S. and Canada. Thus, Australia has the strongest marketing position in both markets for the noodle making wheat classes.

Conclusions

This study used stated preference methods (SPM) to obtain survey data on millers' attitudes to selected quality attributes of wheat in Japan and South Korea. Japanese millers appear to be particularly sensitive to price changes of wheat available for purchase. This is likely related to Japan's restricted access to product choice. Wheat of Australian origin, rather than from U.S. or Canadian origins appears to be preferred for the noodle market in both markets.

Specification of relevant wheat classes and the preferred levels of protein content by millers in the two nations showed some differences. However millers in both nations preferred medium wheat to have 10.7 % protein content, relative to other levels of this attribute. For the hard wheat class in South Korea and the semi-hard wheat class in Japan, approximately 12 percent of protein content was found to be most preferred. For all three wheat classes, both Japanese and Korean millers showed a low level of acceptance of dockage, indicating the highest acceptable level to be 0.2 percent.

In summary, it seems that millers in Japan and South Korea responded differently to some aspects of wheat attributes. They indicated somewhat different wheat classes to be of importance to their wheat purchase decisions and indicated rather different preferences for some quality factors for wheat. It may also be the case that Japanese millers are particularly sensitive price changes and it seems plausible that this may be due to features of their trading system. Japanese millers exhibit particularly stringent quality requirements for wheat purchases. The major preferences as to the country of origin for noodle making wheat were, however, found to be similar for comparable wheat classes in both Japan and Korea.

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Tables and Figures

Figure 1. Example of stated preference method question

Segment 3: Trade, Medium wheat

Assume that the following alternatives are the only ones on your next order for medium wheat. Would you choose A or B or would you choose neither?

Product Attribute	Alternative A	Alternative B	Alternative C
Price	5% less than previous price paid	Same price as previous price paid	Neither alternative A nor B
Protein level	10.8%	11.5%	
Country of origin	Canada	Australia	
Dockage	0.4	0.6	
I would choose			

Table 1. Estimated Coefficients of the Non-linear Multinomial Logit Model: Japanese Market Results on segmented Models, Model V: Comparison of Responses across Three *wheat classes* N=

Factor Effect- coded Price	Hard wheat		Semi-hard wheat		Medium wheat	
	Factor level	Coefficient (std.err)	Factor level	Coefficient (std.err)	Factor level	Coefficient (std.err)
Price	2% down	0.76* (0.17)	2% down	0.98* (0.17)	2% down	1.14* (0.17)
	1% down	0.61* (0.17)	1% down	0.57* (0.17)	1% down	0.67* (0.16)
	No change	-0.21 (0.17)	No change	-0.18* (0.17)	No change	-0.36* (0.18)
	1% up	-1.17* (0.21)	1% up	-1.37* (0.21)	1% up	-1.46* (0.22)
Protein	12.0%	-0.90* (0.20)	10.2%	-0.78* (0.20)	9.5%	-0.30* (0.18)
	12.7%	-0.37* (0.18)	11.0%	-0.46* (0.18)	10.2%	-0.06 (0.18)
	13.5%	0.59* (0.17)	12.0%	0.73* (0.17)	10.7%	0.24* (0.17)
	14.0%	0.69* (0.16)	12.8%	0.51* (0.16)	11.5%	0.13 (0.16)
Country of Origin	The U.S.	0.36* (0.16)	The U.S.	0.12 (0.17)	The U.S.	-0.12 (0.17)
	Canada	0.21* (0.17)	Canada	0.04 (0.18)	Canada	-0.47* (0.17)
	Australia	-0.12 (0.17)	Australia	0.17* (0.17)	Australia	0.37* (0.17)
	Domestic	-0.46* (0.18)	Domestic	-0.32* (0.18)	Domestic	0.22* (0.18)
Dockage	0.8	-0.80* (0.20)	0.8	-0.83* (0.20)	0.8	-1.14* (0.22)
	0.6	-0.27* (0.17)	0.6	-0.41* (0.17)	0.6	-0.32* (0.17)
	0.4	0.28* (0.17)	0.4	0.30* (0.17)	0.4	0.41* (0.17)
	0.2	0.81* (0.16)	0.2	0.94* (0.17)	0.2	1.06* (0.18)
Log likelihood function			-803.55			
Log likelihood ratio test (χ^2 statistic)			475.86*			
Pseudo R^2			0.23			
* Significant at 5% level						

Table 2. Estimated Coefficients of the Non-linear Multinomial Logit Model: South Korean Market

Results on segmented Models, Model V: Comparison of Responses across Three *wheat classes*

N=

Factor Effect- coded	Hard wheat		Medium wheat		Soft wheat	
	Factor level	Coefficient (std.err)	Factor level	coefficient (std.err)	Factor level	Coefficient (std.err)
Price	10% down	0.99* (0.23)	10% down	0.93* (0.22)	10% down	0.93* (0.21)
	5% down	0.66* (0.27)	5% down	0.55* (0.26)	5% down	0.50* (0.23)
	No change	-0.60* (0.25)	No change	-0.22* (0.23)	No change	-0.34* (0.23)
	5% up	-1.04* (0.27)	5% up	-1.26* (0.27)	5% up	-1.09* (0.26)
Protein	10.8%	-1.04* (0.29)	9.5%	-0.90* (0.27)	8.5%	-0.01 (0.23)
	11.5%	0.15 (0.25)	10.2%	0.18 (0.23)	9.0%	-0.46* (0.24)
	12.2%	0.48* (0.24)	10.7%	0.84* (0.24)	9.5%	0.73* (0.22)
	12.8%	0.41* (0.23)	11.5%	0.04 (0.22)	10.0%	-0.26* (0.23)
Country of Origin	The U.S.	0.57* (0.25)	The U.S.	0.20* (0.23)	The U.S.	0.41* (0.24)
	Canada	-0.13* (0.24)	Canada	0.32 (0.23)	Canada	0.02 (0.22)
	Australia	1.19* (0.26)	Australia	0.54* (0.23)	Australia	0.25* (0.22)
	Domestic	-1.62* (0.33)	Domestic	-1.06* (0.28)	Domestic	-0.69* (0.25)
Dockage	0.8	-0.88* (0.29)	0.8	-0.64* (0.26)	0.8	0.25* (0.24)
	0.6	-0.20 (0.23)	0.6	-0.03 (0.23)	0.6	-0.68* (0.24)
	0.4	-0.18 (0.26)	0.4	-0.12 (0.25)	0.4	-0.04* (0.24)
	0.2	1.25* (0.25)	0.2	0.79* (0.23)	0.2	0.47* (0.22)
Log likelihood function			-332.11			
Log likelihood ratio test (χ^2 statistic)			263.22*			
Pseudo R^2			0.41			

* Significant at 5% level