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A Hedonic Price Model for Rice Market in China

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Various domestic analyses have focused on rice prices, but there is no existing research that has studied the effects of rice quality on prices in Chinese retail markets. This article clarifies the price mechanism in China by analyzing the factors affecting retail rice prices using a hedonic price model. Econometric results suggest that rice grades are useful but insufficient in explaining observed price differences. Other attributes like quality certification and branding, packaging, production origin, and retail centers are significant determinants of retail rice prices in China.

Discipline: Agricultural economics

Keywords: Hedonic price model; attributes; grades; certification; rice

INTRODUCTION

Rice plays an important role in agricultural food markets around the world because of its nutritional benefits, its ability to produce consistently high yields in different agro–ecosystems, and its economic value. Demand for rice has steadily increased in recent years in international markets (He, 2003). In 2006 the United States Department of Agriculture (USDA) forecasted that global rice demand may reach about 418.26 million tons in 2007, a 1.22 percent increase compared with the previous year (Wu and Zhang, 2007). By 2015 world rice consumption may exceed 500 million tons. The new strategic plan of International Rice Research Institute (IRRI) for the period 2007–2015 suggests there may be significant changes in rice yields and demand in both production and consumption countries, especially in South and South–East Asia, and sub–Sahara Africa. And it is estimated that Africa may become the region which has the largest increased amplitude of rice consumption in the world over the next decade. However, increasing demand in South and South–East Asia will continue to rise but at a decreasing rate, and rice yields and consumption in East Asia will also decrease (IRRI, 2006). In China, over the past five years, per capita annual rice consumption decreased from 107.5 kg to 97.5 kg, but overall consumption remains stable because of natural population growth and the development of pasture industry (China Grain Network, 2007).

Consumers in developed countries increasingly focus on healthy, sanitary and high quality rice. But in China, with the rapid development of the economy and the improvement of living conditions, consumer preference has expanded towards product diversification and variety, as well as quality, and there are more and more imported rice products from Japan and Thailand in the markets with the opening–up of Chinese agricultural markers. In addition to demanding high quality rice, consumers increasingly pay more attention to attributes such as grade, brand names or certification logos, packaging, and production origin.

Previous studies have focused on the formation of retail rice prices (Yan, 2004; Tong, 2006), but to our knowledge there is no existing research examining the effects of rice quality attributes on rice retail prices in China. This article clarifies the price mechanism in the Chinese retail rice market using a hedonic price model. Three questions are addressed: (a) Do rice grades explain more of the variation in rice retail prices than other factors?; (b) Besides grades, do other attributes like certification, production regions, packaging, and branding affect rice prices?; and (c) To what extent, and in what ways, do these factors characterize Chinese retail rice prices?

THE CHINESE RETAIL RICE MARKET

Rice commands the lion's share of the Chinese diet. And it is extensively produced throughout China on more than 90 percent of the arable land. Rice production is roughly divided into Northern and Southern production regions (Zhu, 2004; Cha, 2005). Rice yields have steadily increased over the last few years due to mechanization, genetic improvements, and increased fertilizer use (Zhu, 2004). The National Grain and Oils Information Center (NGOIC) predicts that, given normal climate conditions, rice grain yield could reach 186.88 million tones in 2007 – a 2.36 percent increase compared with the previous year (China Food Network, 2007).

The world rice market can be divided into three categories; the Indica rice market (accounting for about

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more than 75 percent), the Japonica rice market (11–15 percent), and the sweet and glutinous rice market. Japonica rice production accounts for a small portion of the world rice production, but in Japan, North and South Korea, the Japonica variety accounts for the largest share of rice production (Wang Mingli, 2004). In China, although Indica rice remains the dominant cultivated crop, Japonica rice is mainly planted in the area of Northeast and the Middle and Lower Reaches of the Yangtze River, where yields have steadily increased since the 1990s. These changes are in part due to changes in consumer behavior, a decreasing farm population, a rapidly expanding economy, and improved logistics and transport infrastructure (Wang Fang, 2004). For example, in the Northern region, people who typically consume wheat flour are more frequently consuming Japonica rice. In the Southern region, there is a steady upward trend of consumers substituting Indica rice for the Japonica variety. These changes in rice consumption are directly related to the interplay between increases in household income, new employment opportunities, a growing population, shifts in consumer preferences, and the factors determining retail rice price formation.

Food quality and safety are major concerns in domestic food markets because consumers have better access to information about food supply, processing, and marketing. Consumers have gradually replaced low–quality or commonplace rice varieties with high–quality strains (Zhu, 2004). “Green” organic or “pollution–free” rice brands are becoming more and more popular. Rice grade is one of the most important factors influencing perceptions about rice quality. According to Chinese rice standards (UDC (Universal Decimal Classification) 664.782, GB (Chinese National Standards) 1354–86, implemented in 1987, each rice variety is separated by processing precision. There are four grades; “top–grade” is the highest, followed by “standard first grade”, “standard second grade”, and then “standard third grade” (the lowest quality). Quality factors that influence processing precision include grain faultiness, impurity, brokens, moisture, color, odor and taste. The grade quality standards of early and late Japonica and Indica rice are presented in table 1. These standards are applicable to the purchase, sale, storage, processing, and export of commercial rice. There is a direct relationship between rice price and grades because rice processing firms determine their rice prices

Table 1. The Grade Quality Standards of Early and Late Japonica Rice and Indica Rice in China UDC 664.782 GB1354–86

Grade	Faultiness Grain %	Maximum Impurity					Brokens %		Moisture %	Color, odor, taste
		Gross %	Chaff Powder %	Mineral %	Barnyard Millet in Husk (grain/kg)	Paddy Grain (grain/kg)	Gross	Small brokens		
Top–Grade										
Early Japonica rice	3	0.25	0.15	0.02	20	4	30	2.0		
Late Japonica rice	3	0.20	0.15	0.02	10	4	15	1.5		
Early Indica rice	3	0.25	0.15	0.02	20	8	35	2.5		
Late Indica rice	3	0.25	0.15	0.02	20	8	30	2.0		
Standard First Grade										
Early Japonica rice	4	0.30	0.20	0.02	50	6	30	2.0		
Late Japonica rice	4	0.25	0.20	0.02	20	6	15	1.5		
Early Indica rice	4	0.30	0.20	0.02	50	12	35	2.5	14.5[a] 14.5[b]	
Late Indica rice	4	0.30	0.20	0.02	50	12	30	2.0	15.5[a] 14.5[b]	
Standard Second Grade									14.0[c] 14.0[d]	Normal
Early Japonica rice	6	0.40	0.20	0.02	70	8	30	2.0	14.0[c] 14.5[d]	
Late Japonica rice	6	0.30	0.20	0.02	30	8	15	1.5		
Early Indica rice	6	0.40	0.20	0.02	70	16	35	2.5		
Late Indica rice	6	0.40	0.20	0.02	70	16	30	2.0		
Standard Third Grade										
Early Japonica rice	8	0.45	0.20	0.02	90	10	30	2.0		
Late Japonica rice	8	0.35	0.20	0.02	40	10	15	1.5		
Early Indica rice	8	0.45	0.20	0.02	90	20	35	2.5		
Late Indica rice	8	0.45	0.20	0.02	90	20	30	2.0		

NOTES: a represents the moisture of Japonica rice in general regions, and b represents the moisture of Japonica rice in six provinces. Six provinces include Sichuan, Guizhou, Yunnan, Fujian, Guangdong and Guangxi. The general regions are the areas besides these six provinces. c and d represent the moisture of Indica rice in first class regions and second class regions, respectively. The first–class regions include Guangdong, Guangxi, Fujian, Sichuan, Yunnan, Guizhou, Hubei, Henan and Shanxi. The second–class regions are the areas besides the first–class regions. The mineral includes sand, cinder, tile and others.

based on grades. Labeling rice grades on products package conveys basic information about quality to consumers. According to the authors' survey, rice products sold in Chinese retail markets are mainly top–grade or standard first grade rice. (Table 1)

A food safety summit held by the Chinese government in 2003 stimulated a flurry of research investigating consumer concern over food safety issues. Based on research findings, the government developed an array of national standards, certification systems, and requirements for quality and safety management (Calvin, Gale, Hu, and Lohmar, 2006). As a result, new legislation mandated revisions to update and enhance food safety. Some of China's food safety standards are mandatory but others are voluntary, and retail food products are often differentiated by the degree or stringency of safety measures (Wang, Mao and Gale, 2007). There are presently several certification logos on product packaging which signify that the product complies with safety standards and quality requirements, including certification. Examples of quality and safety certifications include ISO 9001, ISO 14001, Quality Safety (QS), Guarantee by Measurements, Green Food, Safer Grains and Oils, and HACCP. ISO 9001 and ISO 14001 are two popular worldwide quality management standards, and QS is the most important Chinese national quality standard and mandatory. Those certifications are widely accepted by Chinese agricultural manufactures and consumers.

DATA AND METHODOLOGY

This study is based on a survey of rice products in 18 supermarkets in the Haidian district in northwestern Beijing in October 2006. The surveyed supermarkets are a good representation of most Beijing supermarkets, and to some extent reflect the consumers' purchasing behaviors and manufactures' pricing strategies in Chinese big cities. A survey team made detailed records of each rice product about its attributes including per–unit price, test weight, grade, variety, packaging, certification logos, origin of production, and brand. There were 208 usable observations being collected including 48 brands after eliminating observations with incomplete information.

The study measured the effect of each attribute on rice prices while holding other attributes constant using a hedonic price model. A hedonic pricing model explains price as a function of implicit prices based on rice attributes rather than the rice price itself. The underlying hypothesis is that rice products as goods are valued for their utility bearing attributes, and rice prices vary directly with respect to the attributes characterizing the rice. Therefore, observed rice prices are constructed as a composite of values identified by the rice's attributes.

The hedonic model was introduced by Waugh (1928) an ad hoc procedure to empirically estimate the contribution of attributes such as size, color, and ingredients to vegetable prices. In 1974, Rosen (1974) provided a rigorous theoretical foundation linking the hedonic price model to utility maximizing behavior of consumers. Since Waugh's application with vegetables, the hedonic approach has been applied in a variety of empirical situations. The methodology grew in popularity among applied researchers and was extended to investigate price formation of industrial products (e.g., Dean and Depodwin, 1961; Cagan, 1965; Dhrymes, 1967; Gavett, 1967). Witte, Sumka and Erekson (1979) used a hedonic price model to analyze housing prices. Dennis (1987) used a hedonic model to evaluate the supply and demand for various commodities. Kanemoto (1988) used a hedonic price model to estimate income effects on the provision of public projects. Ethridge and Davis (1982) used a hedonic price model to explain variation in cotton prices, while Livengood (1982) used the methodology to link deer hunting experiences to hunting leases. Brorsen, Grant and Rister (1984) used a hedonic model to explain the effects of rice grades and other attributes on rice prices. They concluded that the major quality factor in determining price was head yield, along with several other physical factors like brokens and color. In China, hedonic pricing models have been applied to examine the relationship between housing attributes and price (Wen and Jia, 2004) and the influence of certification on milk prices (Wang, Mao, and Chen, 2006).

In this analysis, we hypothesize that retail rice prices are determined by a bundle of characteristics signaling rice quality. We isolate the effects of these attributes on retail rice prices using the hedonic pricing methodology. The general hedonic function follows Lucas (1975):

$$P_i = P\,(Z_{i1},\ldots Z_{ij};\,u_i), \tag{1}$$

where P_i is the observed price of rice in market i; Z_{ij}, $j = 1,\ldots, J$ measures the amount of some intrinsic quality per unit of rice; and ui is a disturbance term.

It is hypothesized that prices of various rice products in Beijing supermarkets are determined by an array of product attributes related to test weight, grades, packaging, certification, branding, and origin. Attributes can affect rice prices by increasing or decreasing the cost of production and marketing.

The empirical model used in this study is log–log linear:

$$\ln P_i = \alpha_0 + \sum_{j=1}^{m} {}^{m}_{j=1}\ \beta_j \ln Z_{ij} + \sum_{k=1}^{n} {}^{n}_{k=1}\ \gamma_k Z_{ik} + u_i \tag{2}$$

where Z_{ij} are the continuous variables of test weight and shelf life affecting rice price P_i, and Z_{ik} are the dummy variables indicating rice grades, packaging, certification, branding type, and production region; α_0 is an intercept term; β_j represents the continuous price elasticity associated with m continuous attributes; γ_k represents the discrete price coefficients associated with n discrete attributes; and u_i is a random disturbance term.

Forty–nine attributes were initially considered as explanatory variables in the model, but nearly half of them were dropped in preliminary regressions due to multi–collinearity or absence of data. Finally, twenty–five attributes were included in the model, which are divided into six major categories: physical attributes, packaging, certification, production region, brand, and supermarket. A summary of types, definitions, and the expected relationships between the attributes and retail

Table 2. Summary Types, Definitions of Variables and Expected Influence on Price

Variable Name	Variable Type	Definition	Expected Influence on Price
Physical attributes:			
Test weight	Continuous	The weight of one package of rice (kilograms)	–
Top–grade	Dummy	1=top–grade, 0=other	+
Standard first grade	Dummy	1=standard first grade, 0=other	+
Japonica rice	Dummy	1=Japonica rice, 0=other	+
Thai rice	Dummy	1=Thai rice, 0=other	+
Rice figure	Dummy	1=short, 0=long	–
Brokens degree	Dummy	1=excellent, 0=good	+
Packaging:			
Vacuum	Dummy	1=vacuum, 0=other	+
Transparent	Dummy	1=transparent, 0=other	+
Free–elutriating	Dummy	1=free–elutriating, 0=other	+
Shelf life	Continuous	The length of time that rice can remain in a salable condition on a retailer's shelf (days)	+
Certification:			
ISO 9001	Dummy	1=ISO 9001, 0=other	+
ISO 14001	Dummy	1=ISO14001, 0=other	+
QS	Dummy	1=QS, 0=other	+
The Guarantee by Measurement	Dummy	1= the guarantee by measurement , 0=other	+
Production region:			
Thailand	Dummy	1=Thailand, 0=other	+
Japan	Dummy	1=Japan, 0=other	+
Hunan	Dummy	1=Hunan province, 0=other	+
Northeast	Dummy	1=Northeast of China, 0=other	+
BeijingandTianjin	Dummy	1=Beijing or Tianjin city, 0=other	+
Brand:			
Shenyu	Dummy	1=Shenyu, 0=other	+
Jinyuan	Dummy	1=Jinyuan, 0=other	+
Qiheyuan	Dummy	1=Qiheyuan, 0=other	+
Supermarket:			
Xiaobaiyang	Dummy	1=Xiaobaiyang supermarket, 0=other	+

price are presented in table 2. (Table 2)

We estimate four models. The first model (Model 1) focuses on the relationship between rice quality attributes, including test weight, grade, variety, figure and brokens degree. In the second model (Model 2), rice packaging attributes are included with the quality measures. Model 2 is extended by including certification factors (Model 3). Finally, the last model (Model 4) includes quality, packaging, and certification information along with brand and product origin.

RESULTS

Regression results are presented in table 3. Model 1 includes seven variables representing rice grades and other physical attributes such as test weight, rice variety, grain shape, and brokens degree. The reported F–value of 4.2216 for the dummy variables representing grades suggests that rice grade is important with respect to consumer preferences for rice products. The coefficient corresponding with the Japonica rice variety is negative and significant at 1% level, and this happens because most Japonica rice sold in Beijing is from Northeast China and the price is relatively low, while Indica rice is mainly imported from Thailand, which are considered high quality, exotic and fragrant and the prices are relatively high. (Table 3)

Model 2 includes four additional variables identifying

Table 3. Regression Models for Rice Retail Price

Independent Variable	Model 1	Model 2	Model 3	Model 4
Intercept	1.9284*** (21.7175)	1.6456*** (12.7339)	1.4387*** (11.6348)	1.2198*** (8.0452)
Ln (Test Weight)	–0.0262 (0.8670)	–0.1553*** (4.5378)	–0.1322*** (4.2864)	–0.1413*** (5.6203)
Top–Grade	0.1044** (2.3147)	0.0058 (0.1304)	0.0065 (0.1563)	0.0015 (0.0392)
Standard First Grade	–0.0254 (0.4304)	–0.1671*** (3.0316)	–0.1355*** (2.6462)	–0.0891* (1.9367)
Japonica Rice	–0.2217*** (3.0563)			
Thai Rice	0.1284* (1.7686)			
Rice Figure	–0.1116** (2.5008)	–0.1971*** (5.2547)	–0.2127*** (6.2907)	–0.1695*** (5.0013)
Brokens Degree	0.1192*** (2.8573)	0.0210 (0.5844)	0.0282 (0.8801)	0.0437 (1.4982)
Packaging: Vacuum		0.1527*** (3.4995)	0.1586*** (3.9499)	0.0654* (1.8436)
Transparence		0.1134** (2.1085)	0.1007** (1.9992)	0.0876** (2.0828)
Free–elutriating		0.0357 (1.0020)	0.0488 (1.4141)	0.0663** (2.3343)
Ln (Shelf life)		0.1454*** (2.9994)	0.1884*** (4.2210)	0.1763*** (3.8075)
Certification: ISO 9001			0.2733*** (4.6960)	0.1341** (2.4035)
ISO 14001			0.0705 (0.8174)	0.0395 (0.5260)
QS			0.0641 (1.3022)	0.0930** (2.2159)
The Guarantee by Measurement			–0.1336*** (3.0881)	–0.0191 (0.4901)
Production Region: Thailand				0.3236*** (4.7432)
Hunan				0.4545*** (4.3786)
Japan				0.8817*** (6.2951)
Northeast				0.1694** (2.3302)
Beijing and Tianjin				0.1361* (1.6709)
Brand: Shenyu				0.3257*** (3.6913)
Jinjian				0.1094** (2.3831)
Qiheyuan				0.0919* (1.7582)
Supermarket: Xiaobaiyang				0.0928*** (1.9854)
N	194	173	173	173
Adjusted R^2	0.4340	0.5778	0.6641	0.7861
F value	22.1433***	27.1525***	27.1553***	29.7372***
F value for grades	4.2216***	7.0147***	5.6758***	3.3794**
F value for vacuum, transparency, free–elutriating, ln (shelf life)		24.8487***	26.8203***	25.7623***
F value for rice figure and brokens degree		16.1870***	21.0853***	15.5931***
F value for certification			9.1241***	2.8225**

NOTES: Dependent variable is ln (P), where P = Price per kilogram. The parameter estimates with t–statistics are in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. In this analysis, authors define vacuum, transparence, free–elutriating and shelf life factors as packaging attributes variables.
Source: Estimates based on a survey of supermarket prices by authors.

different packaging methods for retail rice (higher volumes of rice have lower production cost, as hypothesized. As a result, Japonica rice with high quality and lower prices is one of Chinese consumers' favorite choices in the rice market), vacuum, transparent packaging materials, free–elutriating and shelf life[1]. Although these factors are not explicitly represented by the Chinese grade standards, they are hypothesized to be a determinant of retail rice price. The F value of 24.8487 supports this hypothesis; packaging methods are important with respect to price formation in the Chinese retail rice market, while holding other factors, such as physical attributes and rice grade, constant.

Certifications are becoming more and more important in Chinese retail food markets. To assess the relationship between different types of certification programs on retail rice prices, four certification programs were included in the hedonic model (Model 3); ISO 9001, ISO14001, Quality Safety (QS), and the Guarantee by Measurement. The F value of 9.1241 suggests that certification is important with respect to explaining retail rice prices in Chinese markets. The significance of the ISO 9001 certification program on rice price is consistent with the relatively long history of this policy, and its wide recognition by Chinese consumers. The ISO14001 certification program is relatively new in China. This policy requires firms to monitor environmental standards with respect to packaging. Most consumers are not familiar with this particular certification policy, which is consistent with the model result; its impact on rice prices is negligible.

Given that production region, brand and supermarket are becoming increasingly important factors when Chinese food consumers choose rice products, variables

Table 4. Estimates of Mean, Price Elasticity and Variation from the Mean Price for the Dummy Variables

Variable	Mean	Elasticity Coefficient	Variation from the Mean Price (RMB/kilogram)
Grade:			
Top–Grade	0.6047	0.1727	0.77
Standard First Grade	0.1744	–0.5108	–0.59
Rice Figure	0.3837	–0.4417	–1.09
Packaging:			
Vacuum	0.5930	0.1103	0.47
Transparence	0.8256	0.1061	0.64
Free–elutriating	0.4767	0.1391	0.48
Certification:			
ISO 9001	0.0756	1.7742	1.00
ISO 14001	0.0407	0.9706	0.28
QS	0.9012	0.1032	0.68
Production Region:			
Thailand	0.2674	0.0882	0.17
Hunan	0.0291	15.6348	4.01
Japan	0.0116	75.8262	9.86
Northeast	0.5000	0.3388	1.29
Beijing and Tianjin	0.1570	0.8670	1.02
Brand:			
Shenyu	0.0349	9.3367	2.68
Qiheyuan	0.0814	1.1291	0.67
Jinjian	0.1279	0.8553	0.81
Supermarket:			
Xiaobaiyang	0.0756	1.2278	0.68

NOTES: The result of Top Grade is estimated based on model 1, and other results are estimated based on model 4. The mean price P_0 is 6.97 RMB/kilogram. The elasticity coefficient of dummy variables equals regression coefficient/mean; the variation of dummy variables from the mean price equals exp [ln (P_0) + regression coefficient] – P_0.
Source: Estimates based on a survey of supermarket prices by authors.

[1] The rice variety (Japonica, Indica, and Thai) variables were omitted in this model because of multi–collinearity problems.

representing those factors are incorporated into Model 4. In this model, the adjusted R^2 of 0.7861 suggests the grade and other factors combined jointly provide a more powerful explanation of observed price variation than either grade or other factors alone. Top–grade effects have a relatively small but positive effect on price formation. Standard first grade rice has negative effect on retail rice prices. Comparing the four models, the top–grade positively affects rice price, but standard first grade has the opposite relationship. But regional effects tend to override grade and certification effects on price. The coefficient representing rice figure implies that the price of short rice is lower than long one, and this result is in line with the fact that short rice is Japonica rice and long rice is Thai rice, and that the former price is lower than the latter.

The results of regional attributes suggest that the six production regions have positive effects on retail rice prices, especially the regions of Thailand, Japan, Hunan and Northeast China. Japanese rice is well known for fine quality and good taste, reflecting higher prices for this variety. Hunan is the major region producing Indica rice in China. In recent years, Indica rice prices have increased because production has declined. Northeast Chinese rice has a long history and positive reputation for producing high quality and good tasting rice among Chinese consumers. Chinese consumers are becoming more astute as media exposes counterfeit products. As a result, branding and certification may play larger roles in rice price formation, as evidenced by the positive effect of these characteristics on price.

Xiaobaiyang supermarket has a significant positive impact on rice prices. Xiaobaiyang is a local supermarket, whose scale is relative small when compared with other retailers like WalMart and Carrefour, but the locations are more convenient.

Table 4 presents the price elasticities evaluated at the means. The estimates suggest that top–grade rice generates a 17.27 percent increase of rice price from the average, while standard first grade rice generates a 51.08 percent decrease of rice price from the average. This is because in the model standard first grade rice is coded as 1 (one), and 0 (zero) otherwise, which means both top–grade rice and lower than standard first grade rice are coded as 0 (zero), while in the market a lot of products are top–grade rice, and as a result, standard first grade rice generates a negative price change from the average. The elasticity of short figure, and vacuum and transparent packaging with respect to the rice price are –0.4417, 0.1103 and 0.1061, respectively. Adoption of ISO9001, ISO14001 and QS certification logos on rice products increase rice price 1.00, 0.28 and 0.68 RMB, respectively. Production origin has a positive relationship with rice price. The largest regional factor is associated with Japanese rice, followed by rice produced in Hunan. And among rice brands, the elasticity of Shenyu is greatest on retail rice prices. (Table 4)

CONCLUSIONS

The formation of rice retail price is determined by a variety of factors including consumer consumption patterns, rice mill productivity, agricultural output, processing firms, domestic and international trade patterns, farm gate–to–retail market networks, and government policies. Empirical studies of rice grades and other attributes provide important information for rice processing firms to price their rice products accordingly in order to maximize profit, and for government to evaluate appropriateness of rice grade standards, and to implement effective regulations and management strategies for rice retail market.

We focused this hedonic price analysis on the effects of rice grades, certification programs, branding, and other attributes with respect to rice prices in Chinese retail markets. The study provides evidence that rice grades are useful, but fall short, with respect to explaining most of the observed variation in retail market prices. When only considering physical attributes, top–grade had a significant effect on retail rice price. But when other attributes, such as packaging, certification, and production origin were included in the hedonic model, the influence of top–grade rice was moderated, and standard first grade quality ended up having a negative influence on rice retail prices. The strongest retail price determinants are packaging (vacuum, transparence, free–elutriating), shelf life, certification programs (ISO 9001, QS), production regions (Thailand, Japan, and Northeast China), rice brand (Shenyu, Qiheyuan and Jinjian) and the Xiaobaiyang supermarket. Thus, adopting advanced package technology may boost rice price, and although many certifications have been adopted by rice firms, the most important ones are ISO9001 and QS, which have positive effects on rice retail prices. The influences of production regions and branding suggest that production regions and brands are two of the most important factors in pricing rice in Beijing's retail market. In addition, with the improvement of Japonica rice production technology and high yield varieties, the price is much lower than other rice, which makes it very competitive in the market. Thai rice and Japanese rice have significant positive effects on prices, and the results suggest that Chinese consumers are increasingly fond of foreign rice.

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