TCER Working Paper Series

Market penetration of imported agricultural products: A hedonic analysis of the Japanese table wine market

Vincent Hoang
Takao Iida
Shigeru Matsumoto
Natsuki Watanabe
Clevo Wilson

September 2014

Working Paper E-83
http://tcer.or.jp/wp/pdf/e83.pdf

TOKYO CENTER FOR ECONOMIC RESEARCH
1-7-10-703 Iidabashi, Chiyoda-ku, Tokyo 102-0072, Japan

Abstract

Although hundreds of thousands of agricultural products are traded on a daily basis, it is less known how imported agricultural products gain consumer acceptance and penetrate a domestic market. This paper analyzes Japanese wine point of sale (POS) data and examines how consumer valuation of imported wines changes with their market penetration. Although there is a considerable variation in sales of wines, previous papers have not accounted for it in their hedonic analyses. The wine hedonic analysis accounted for the variation in sales shows that the retail sales prices of imported wine decreases with their market penetration. The analysis also shows that although consumers pay a premium for wine with a long sales history, this premium is not large enough to compensate for the price reduction brought about by sales expansion. Many exporting counties promote organic farming for environmental conservation. The paper further examines whether consumers in an importing country differentiate between local and imported organic products. The result shows that the premium for imported organic red (white) wines is about 42.996% (8.872%) while that for domestic red (white) organic wines is about 6.440% (1.214%), implying that Japanese consumers pay higher premiums for imported organic agricultural products than for those produced in Japan.

Vincent Hoang
Queensland University of Technology
School of Economics and Finance
Queensland University of Technology. GPO
Box 2434, Brisbane QLD 4001
vincent.hoang@qut.edu.au

Takao Iida
Faculty of Economics
Sapporo University
3-7, Nishioka Toyohira, Sapporo, Hokaido,
Japan 062-8520
iida@sapporo-u.ac.jp

Shigeru Matsumoto
TCER
and
Aoyama Gakuin University.
Department of Economics
Room 828, Building 8, 4-4-25 Shibuya,
Shibuya, Tokyo, Japan 150-8366
t71092@aoyamagakuin.jp

Natsuki Watanabe
The University of Tokyo
Department of Global Agricultural Sciences
Yayoi 1-1-1, Bunkyo, Tokyo, Japan, 113-8657
rdc0816@hotmail.com

Clevo Wilson
Queensland University of Technology
School of Economics and Finance
Queensland University of Technology. GPO
Box 2434, Brisbane QLD 4001
clevo.wilson@qut.edu.au

Market penetration of imported agricultural products:

A hedonic analysis of the Japanese table wine market

Vincent Hoang*

Takao Iida**

Shigeru Matsumoto***

Natsuki Watanabe****

Clevo Wilson*****

2014/09/07

* Senior Lecturer. School of Economics and Finance, Queensland University of Technology. GPO Box 2434, Brisbane QLD 4001, Australia. Email: vincent.hoang@qut.edu.au.

** Professor. Faculty of Economics, Sapporo University. 3-7, Nishioka Toyohira, Sapporo, Hokaido, Japan 062-8520. Email: iida@sapporo-u.ac.jp.

*** Corresponding Author: Professor. Department of Economics, Aoyama Gakuin University. Room 828, Building 8, 4-4-25 Shibuya, Shibuya, Tokyo, Japan 150-8366. Email: t71092@aoyamagakuin.jp.

**** Graduate Student. Department of Global Agricultural Sciences, The University of Tokyo. Yayoi 1-1-1, Bunkyo, Tokyo, Japan, 113-8657. Email. rdc0816@hotmail.com.

***** Professor. School of Economics and Finance, Queensland University of Technology. GPO Box 2434, Brisbane QLD 4001, Australia. Email: clevo.wilson@qut.edu.au.

Market penetration of imported agricultural products:

A hedonic analysis of the Japanese wine market

Although hundreds of thousands of agricultural products are traded on a daily basis, it is less known how imported agricultural products gain consumer acceptance and penetrate a domestic market. This paper analyzes Japanese wine point of sale (POS) data and examines how consumer valuation of imported wines changes with their market penetration. Although there is a considerable variation in sales of wines, previous papers have not accounted for it in their hedonic analyses. The wine hedonic analysis accounted for the variation in sales shows that the retail sales prices of imported wine decreases with their market penetration. The analysis also shows that although consumers pay a premium for wine with a long sales history, this premium is not large enough to compensate for the price reduction brought about by sales expansion. Many exporting counties promote organic farming for environmental conservation. The paper further examines whether consumers in an importing country differentiate between local and imported organic products. The result shows that the premium for imported organic red (white) wines is about 42.996% (8.872%) while that for domestic red (white) organic wines is about 6.440% (1.214%), implying that Japanese consumers pay higher premiums for imported organic agricultural products than for those produced in Japan.

Key Words: Hedonic Analysis; Japanese Wine Market; Market Penetration; Organic Farming

JEL Classification: F18, Q13, Q17

1. Introduction

Agricultural trade has grown dramatically over the past few decades. In nominal terms and expressed in US dollars, the value of world food exports has grown by an annual rate of 6.2% between 1980 and 2008 (Tangermann 2010). Agricultural trade now provides a significant proportion of national food supplies to major importing nations. A wide variety of imported agricultural products are available in local grocery stores. Nevertheless, it is less known how imported agricultural products gain consumer acceptance and penetrate a domestic market.

For more than four decades, scholars have reported that consumers exhibit a bias toward imported products (Schooler 1971; Bilkey and Nes 1982). A typical consumer prefers locally grown agricultural products (Loureiro and Umberger 2005, 2007; Scarpar and Del Giudice 2004; Scarpar et al. 2005) and differentiate between products based on their country of origin (Matsumoto 2011; Menapace 2011).[1] To successfully penetrate the domestic market, marketing managers have to understand how consumers evaluate the imported agricultural product.

This paper aims to empirically examine consumers' valuation of imported

[1] A typical consumer concern about the level of economic development of the exporting countries and the similarity of the culture of the exporting countries (Juric and Worsley 1998).

agricultural products. Specifically, we focus on the following two questions in this paper:

(1) How does the consumers' valuation of imported agricultural products change with their market penetration?

(2) Do consumers in importing countries value organic farming in exporting countries and pay premiums for organic products?

Consumers are concerned about food quality and food safety issues, looking to purchase a reliable agricultural product. They are willing to pay a premium for certified products (Hobbs et al. 2005, Lim et al. 2013). However, the same consumers enjoy unique food, spending extra money to purchase novel imported agricultural products (Shogren et al. 2000).

In some situations, a company introduces a new product at low price to gain market share, raising the price after the product is established and enjoys a reliability (brand) premium. In other situations, a company sells a new product at a high price and enjoys a novelty premium. The company then lowers the price once rivals introduce similar products.

As a product gains market share, it gains reliability while losing novelty. The former has a positive impact on consumers' willingness to pay and the latter has a

negative impact. The first object of this paper is to empirically examine whether the price of imported agricultural products increases or decreases as a result of their market penetration.

Many countries promote organic farming to lower the environmental impact associated with agricultural production. Consumers concerned about the environment in their home country may be persuaded by promotional material to purchase homegrown organic products at higher price to protect the local environment. The second purpose of this paper is to compare the consumers' valuation of imported organic products with that of domestic organic products.

To address these questions, we analyze point of sales (POS) data from the Japanese wine market. Although agricultural country-of-origin information is available at retail stores in many countries (United States General Accounting Office 2003), it is rarely recorded in POS data. However, the POS data for wine includes country-of-origin information.[2] Furthermore, wines are sold in a standardized container and are comparable internationally. Consequently, many researchers have examined the price

[2] The increasing competition from foreign wines and the evolution of consumer behavior towards an increasing appreciation of quality implies the implementation of origin-oriented strategies (Malorgio, Camanzi, and Grazia 2008).

determinants of wines. The results from this study can be compared with those of previous studies.

The Japanese wine market has expanded rapidly in recent years. From 2008 to 2012, the domestic consumption of wine has increased by 30.95% (Vinexpo 2014). However, domestic production is relatively low, and cannot meet the expansion in demand. Japan imported 70% of its consumption in 2009 (Deutsche Industrie 2011) as the second largest importer in Asia Pacific region. It is expected that both the import and consumption will continue to grow since wine consumption per-capita is much lower than that of other industrialized countries. These statistics tell us that Japan is an important market for world wine producers.

In this paper, we analyze the POS data from the Japanese wine market to examine whether consumers' valuation of imported wine changes with market penetration. The empirical results demonstrate that wine with a long sales history is sold higher prices. Hence, consumers pay a premium for product reliability. Nevertheless, we find that the reliability premium is quite small, as wines sold at many stores are less expensive. The result implies that a novelty premium is important for wine.

We also examine whether consumers' valuation of imported organic wines differs from that domestic organic wines. Surprisingly, we find that the premium on imported

organic wines is higher than that of domestic organic wines.

The structure of the remaining paper is as follows. In the next section, we provide the literature review of hedonic wine studies. In Section 3, we explain our POS data and specify our empirical model. In Section 4, we summarize our empirical findings, ending with a conclusion in Section 5.

2. Hedonic analysis of wine

The hedonic analysis of wine is a popular research topic, as shown by the large body of literature.[3] However, the attributes can be categorized into four major groups: climatic conditions, production methods, objective characteristics, and sensory characteristics (Oczkowski 2001).

Although red wines in the Bordeaux region of France have been produced in much the same manner, significant differences in quality and price are observed between years. Ashenfelter (2008) estimated hedonic price functions and demonstrated that the

[3] Unwin (1999) criticized wine hedonic analyses that were data driven approaches lacking theoretically rationales and relied on inappropriate econometric models. He then concluded that they should be abandoned in the future. Thrane (2004) reviewed Unwin's critiques and argued that wine hedonic analyses would provide useful information to consumers even if the analyses could not describe consumers' market behavior precisely.

climatic condition during the growing season has a substantial impact on the quality and price of Bordeaux wine.

Wine quality is not only determined by natural endowments (land characteristics, the exposure of vineyards), but also by technological choices (from grape variety and picking, to bottling wine). Gergaud and Ginsburgh (2008) estimated both rating and price equations for Bordeaux wine, reporting that technological choices affect quality much more than natural endowments.

Oczklowski (1994) estimated a hedonic price function for Australian premium table wine. They found that six attribute groups (objective characteristics of wine) were statistically important: quality, cellaring potential, grape variety/style, grape region, grape vintage, and producer size.

Sensory characteristics may also affect consumers' valuation, although consumers cannot know these prior to purchase since they are experience attributes. When the true quality of a product is not known, consumers may rely on expert opinion or product reputation in their product selection.

Combris et al. (1997, 2000) estimated hedonic price functions for Bordeaux and Burgundy wines to examine whether sensory characteristics such as taste, texture, and odor affect the price. They found that although sensory characteristics affect an expert's

opinion, the wine's price is essentially determined by objective characteristics described on the label.

Landon and Smith (1998) estimated hedonic price functions for Bordeaux wine to examine the impact of reputation and current quality on price. Although they find that both expected quality (reputation) and current quality influence the price, the price premium associated with a better reputation far exceeds that associated with improvements in current quality. Using the same dataset, Landon and Smith (1997) examined the impact of collective reputation recognized as appellation or product region, finding that collective reputation has as large an impact on consumer willingness to pay as that of individual firm reputation.

Shamel and Anderson (2003) estimate hedonic price functions for premium wine from Australia and New Zealand. They found that expert rating appears to have a significant impact on the price of wine, considering wine's reputation assessment of grape varieties and growing regions.

Past studies investigated the effect of these four attributes separately. Roma et al. (2013) combined these attributes to provide a better estimation. They find that the price of Sicilian wine depends heavily on objective features. At the same time, they find that some sensory characteristics affect the price. Additionally, they find that both current

guides' grade and firm reputation play a crucial role in determining wine prices, concluding that all four attributes determine the price of wine.

Consumers may differentiate quality wines from table wines. Costanigro et al. (2007, 2009) argue that separate hedonic equation estimations for different price ranges is superior to estimation on pooled data. At the first stage, they categorize California red wines into four wine classes. Subsequently, they estimated hedonic equations and showed that the effect of attributes on the price varies substantially across wine classes.

While there are many more hedonic studies not covered in this review, our paper has several distinct features. Most papers use recommended prices from guidebooks for their analyses.[4] However, the same wine is sold at different prices in different stores. Furthermore, there is a considerable variation in sales. Although it seems natural to give more emphasis on the wines with larger sales in the hedonic estimation, the use of weights has been ignored in previous studies. In this paper, we use retail market transaction data and estimated price hedonic models accounted for the variation in sales.

Past studies focus on consumer valuations in Europe, North America, and Australia, where wine culture has penetrated deeply. They have not examined consumer

[4] The papers examining expensive wines use auction prices (Ashenfelter 2008).

valuations in countries that have started to import wine.[5] Wine tasting and ratings vary even among experts, so it is natural to expect that consumers in new markets evaluate wines differently from consumers in traditional western countries.

Organic products are considered healthier and more environmentally friendly, and are therefore sold at higher prices than conventional agricultural products. However, the situation is different for organic wine, since the reputation of organic wine has not yet been established. Alessandro and Strøm (2013) estimated hedonic farm-gate price equations for Piedmont organic and conventional wines, reporting that organic wine tends to sell for higher prices than conventional wine.[6] In this paper, we not only estimate the price premium for organic wine, but also compare the price premium for imported organic wines with that of domestic organic wines. Previous papers have not conducted this type of organic product comparison.

[5] Estrella Orrego, Defrancesco and Gennari (2012) reviewed a large number of hedonic wine studies. No author has examined consumer valuations in Asian countries.

[6] They also find that some farm and producer characteristics of no interest to consumers also significantly affects wine prices.

3. Method

Data

We purchased POS data from Knowledge on Sales Promotion Provider (KSP-SP) Corporation Limited. Established in 2003, KSP-SP provides a collaborative platform used by many consumer goods suppliers, wholesalers, and retailers to increase efficiency through retailer-focused activities. It acquires point-of-sale (POS) data from 880 nationally representative supermarkets.[7] For wines, it collects data from 590 supermarkets.

We focus on still red and white wines sold in 2012.[8] To ensure that the data is representative, we removed wines whose annual sales were less than 10 bottles. In 2012, 2,541,983 bottles of red wine and 1,289,859 bottles of white wine were sold at a value of 1,607,442,026 yen and 817,374,879 yen, respectively.

Table 1 provides summary statistics for the data. The average price of red wines is 1.663 yen/ml while that of white wines is 1.616 yen/ml. Since a standard bottle of wine is 750 milliliters, the average price of red wine is 1246.905 yen/bottle, while that of

[7] It is estimated that there were 1,106 companies operating 200,169 supermarkets in Japan (Supermarkets Statistics Analysis 2013).

[8] Considering the impact of the Great East Japan Earthquake, we removed the data for 2011.

white wine is 1211.996 yen/bottle. Figures 1a shows the frequency of observations of red wine price while Figure 1b shows that of white wine price. The figures show that wines included in our dataset are mostly table wines sold at less than 5,000 yen.

KSP data includes the initial stocking date of each wine. Using this information, we calculated the number of days after the initial sales by subtracting the initial sales day from the last sales day in the corresponding year, i.e. March 31, 2012. Hence, it is the days after the store begins to stock the wine. For red wines, the average number of days after the initial sales is 1591.666, while for white wines it is 1991.192. Since consumer reliability increases as the number of days after the initial sales increase, we expect that this variable will have a positive impact on the wine price.

Wine *i*'s sales share is calculated by dividing wine *i*'s sales by all wines sales. The table shows that the average sales share of red wines is 0.030% while that of white wines is 0.019%. Therefore, the sales share of each wine is quite small, as even the most popular red wine has only 1.67% of sales share.

Wine *i*'s store share is calculated by dividing the number of stores selling wine *i* by the total number of stores. The table shows that a particular wine is available at only 2.655 stores ($= 590 \times 0.0045$) on average. The most popular red wine is sold at 5.133 stores ($= 590 \times 0.0087$).

Both sales and store shares are associated with reliability and novelty of wine. If consumers value reliability over novelty, then they purchase wines with large market shares at higher prices. Otherwise, they purchase wines with small market shares at higher prices.

In Japan, the market share of organic wines is relatively small. The share of organic red (white) wines is 1.962% (1.887%). In Section 4, we estimate the price premiums of organic wines.[9]

Although most wines sold in Japan contain antioxidants (sulfurous acid), 4.281% of red wines and 3.215% of white wines do not have this ingredient. Since companies promote these as additive-free wines, we estimate their price premium.[10]

Table 1 shows the many varieties of Japanese and French wines. Japanese wines are represented by 357 varieties of red wines (= 1682×0.212) and 403 varieties of white wines (= 1431×0.282). French wines are represented by 486 varieties of red wines (= 1682×0.289) and 319 varieties of white wines (= 1431×0.223).

[9] Although the definition of organic agriculture is provided by International Federation of Organic Agriculture Movement (2008), the conditions for organic certification vary across countries. In this paper, we define any wine advertised as an organic wine in the supermarket as an organic wine.

[10] Almost all imported wines contain this antioxidant. Therefore, domestic companies are promoting antioxidants-free wines to attract consumers.

In Table 2, the left columns present the import share by country in 2011. France is the biggest exporter to Japan, representing 28.5% of the quantity and 55.3% of the sales value. Chile, Italy, Spain, and the US also have large market shares. The right columns show POS data presenting market shares calculated from our dataset. The comparison between left and right columns reveals that the data includes French and Italian wines than Japanese wines because the POS data comprises table wines sold at supermarkets.

Since our focus rests with the retail wine market, we examine how information accessible to ordinary wine consumers affects the price of wine. We do not include the wine's age in the hedonic analysis because this paper studies table wine. The quality of table wines generally declines with age and vintage information is not important.

Empirical Specification

The hedonic price model is derived from Lancaster's (1966) consumer theory wherein goods are sold as a package of attributes. Rosen (1974) formalized hedonic price analysis as a two-stage process. In the first stage, the hedonic price function is estimated by regressing product characteristics on the product price. The estimated coefficient is associated with the marginal willingness-to-pay. However, the hedonic price function itself does not provide sufficient information for welfare analysis. The second stage of

analysis is required to estimate the full willingness-to-pay.[11]

This paper focuses on consumers' valuation on product characteristics and therefore includes the first stage analysis only. Our model includes many dummy variables, and potential options for functional forms are restricted (McConnell and Strand 2000; Oczkowski 1994). Following Chang, Lusk, and Norwood (2010) and Diewert (2003), we estimate the following semi-log model for both red and white wines to avoid potential heteroskedasticity problems:

$$\ln(Price_i) = \alpha + \sum_j^3 \beta_1^j \, Penetration_i^j + \sum_j^3 \beta_1^j \, Production\ Method_i^j + \sum_{j=1}^7 \gamma_1^j \, Country_i^j + \sum_{j=1} \gamma_2^j \, Grape\ Variety_i^j + \sum_{j=1}^5 \gamma_3^j \, Company_i^j + \varepsilon_i,$$

where $Price_i$ is the unit price of wine, $Penetration_i^j$ are variables related to market penetration (Days after the initial sales, Sales share, and Store share), $Production\ Method_i^j$ are dummy variables related to production method (Domestic organic wine, Import organic wine, and antioxidant-free wine). $Country_i^j$ are dummy

[11] If a researcher can find repeat purchase data, it is possible to recover a demand function in the second stage. However, in most situations, such a data is not available. Therefore, many scholars have proposed various methods to recover demand function. Chattopadhyay (1999) considered various utility functions in air pollution analysis and confirm the robustness of the welfare measure. Bajari and Kahn (2005, 2008) include demographic variables to evaluate heterogeneity of home buyers.

variables for seven countries: Japan, Australia, Chile, France, Italy, Spain, and the US. $Grape\ Variety_i^j$ are dummy variables for grape varieties, of which 13 are red and 10 white. $Company_i^j$ are dummy variables for the major wine sales company, and D_{2012} is the dummy variable for wines sold in 2012. The last variable ε_i is the error term.

It seems natural to give more emphasis on the wines with larger sales in the hedonic price estimation. Nevertheless, past hedonic wine analyses have largely ignored the variation in sales. Thus, the same weight is applied to all wines regardless of sales. Diewert (2003), Silver (2002) and Silver and Heravi (2005) argue that a weighted least square (WLS) should be employed to treat observations as representative in hedonic analyses. They further argue that the WLS with value weights is better than the one with quantity weights since quantity weights give too little weight to the expensive products and too much weight to cheap products.

4. Results

Nonweighted vs. Weighted Models

Tables 3a and 3b present the estimation results of red and white wines, respectively. Two tables report the estimation results of four type of hedonic price models. Model 1 uses the most frequent price data for a dependent variable while Model 2-4 use the

average price data. Models 1 and 2 are unweighted hedonic price models while Models 3 and 4 are weighted hedonic price models. Model 3 uses quantity weights (the number of bottles) while Model 4 uses value weight (sales values).

The estimation results of Model 1 are similar to those of Model 2. It may be because the price variation of the same wine is relatively small. In contrast, we find a large difference between unweighted and weighted models. After taking account of the variation in quantity or value, most explanatory variables become statistically significant. We also find that the explanatory power of Model 4 is larger than that of Model 3. Therefore, the paper provides the support for Diewert's argument−that is, the hedonic model with value weight is superior to the one with quantity weight.

Product Origin and Grape Variety

Australian and French wines are sold at higher prices while Chilean, Japanese, and Spanish wines are sold at lower prices. The percentage effect on price is $100\left(e^{\beta}-1\right)$ where β is the coefficient of a country dummy variable. Using this formula, we estimated the premium and discount for each country, reported in Table 4. The estimated premium for French red (white) wine is about 48.468% (42.242%), while the estimated discount on Spanish red (white) wine is 30.393% (1.550%). Similarly, the estimated

discount on Japanese red (white) wine is 23.921% (29.774%).

According to the estimation result, Japanese consumers prefer Zweigelt from Australia, Tempranillo from Spain, and Pinot Noir among red wine varieties. They also purchase French Beaujolais Nouveau at high prices.[12] Among white wine varieties, they prefer Kerner and Koshu wines. In contrast, Semillon and Trebbiano are unpopular among Japanese consumers.

Bicknell et al. (2005) estimated hedonic price functions of premium wines in New Zealand over the vintage 1994-2003. Then they report that Chardonnay and Sauvignon Blanc are the most preferred white wine varieties. They also report that Pinot Noir is the most preferred red wine variety. Carew and Florkowski (2008) estimated hedonic price functions for red Australian wines imported by the British Columbia Liquor Distribution Branch. They reported that Cabernet Saugvigon, Cabernet blends and Merlot are significantly price discounted relative to Shiraz and Pinot Noir. However, they also find that grape variety effects have a smaller influence on prices than brand variables.

Japanese consumers like the same red wine variety as western consumers−that is, they like Pinot Noir among red wines. In contrast, they like different white wine variety

[12] Japanese wine imports in November (Beaujolais Nouveau season) are approximately double that of other months.

as western consumers. They enjoy Kerner and Koshu more than Chardonnay and Sauvignon Blanc.

Effect of Market Penetration

The variable of days after the initial sales is positive and statistically significant at the 1% level in both Tables 3a and 3b. This implies that wine with a long sales history obtains a reliability premium. However, the size of the premium is considerably small.

The sales share variable produced mixed results. It has a negative or statistically insignificant effect for red wine while it has positive and statistically significant effect for white wine. It implies that for red wine, the popular ones are less expensive than unpopular ones, but the opposite effect is observed for white wines.

After controlling for sales share, we evaluate the effect of the store share on the price. The store share variable becomes negative and statistically significant at the 1% level in both cases. It implies that wine sold through many stores is less expensive. In other words, expensive wines are available only at limited stores.

Domestic vs. Imported Organic Wine

Table 4 presents the estimated premiums for organic wines. The premium for domestic

organic red wine is about 6.440%, while that of imported organic red wine is about 42.996%. Similarly, the premium for domestic organic white wine is about 1.214%, while that of imported organic white wine is 8.872%. Therefore, the premiums for imported organic wines are substantially larger than for domestic wines.

As mentioned previously, Japanese companies advertise their wine as antioxidant-free and claim that the wine is safe and environmentally friendly. Although we find a price premium for such antioxidant-free wines, the size of the premium is much smaller for imported organic wine.

Only few scholars have examined the relative importance of origin and organic information. James et al. (2009) conducted a conjoint analysis to assess the relative importance of organic, local, and nutrition attributes of applesauce. They showed that consumers were willing to pay more for locally grown applesauce compared to organic applesauce. Wirth et al. (2011) conducted a conjoint analysis to assess the relative importance of search and credence attributes of a fresh apple. They find that quality is the most important attribute. Although origin affects consumers' perception of apple quality, production method do not affect it. In this paper, we show that production method has a significant positive impact on consumer valuation of wine. However, the size of the impact varies across countries. Organic standard are not currently

standardized internationally (Sawyer et al. 2008) and thus consumers in an importing country differentiate organic information.

5. Conclusion

This paper applied hedonic regressions to wine POS data from Japanese markets to examine the effect of market penetration on consumers' valuation of imported agricultural products.

Past studies have used recommended prices from guidebooks for their hedonic wine price analyses. They have largely ignored the variation in sales in the analyses. This paper estimated weighted hedonic wine models to take account of the variation. We then show that the effects of the product attributes on the price will be underestimated when the variation in sales is ignored.

Consumers consider themselves lucky when finding agricultural products sold in limited quantities, at fewer stores, and for a limited time, preferring novel agricultural products. However, they simultaneously demand reliability from agricultural products. The empirical results of this paper show that novelty is much more important than reliability for wine sales. Perhaps wine is a special product in the sense that production methods are fairly standardized, with a well-established identification system. Research

into market penetration for other agricultural products is required.

Consumers pay premiums for organic products to protect either their health or the environment (Nimon and Beghin 1999). We find that Japanese consumers purchase organic wines at higher prices, but spend less money on domestic organic wines. If consumers spend money to protect the local environment, then we should observe the opposite. Therefore, the result suggests that consumers purchase organic wine primarily to protect their health. The result also suggests that Japanese consumers do not equally value organic identification, trusting domestic organic identification less. This phenomenon also requires future research.

References

Alessandro, C. and Strøm, S. (2013). The price premium for organic wines: Estimating a hedonic farm-gate price equation. *Journal of Wine Economics*, Vol. 8 No. 1, pp. 29–48.

Ashenfelter, O. (2008). Predicting the quality and prices of Bordeaux wine. *The Economic Journal*, Vol. 118 No. 529, pp. F174–F184.

Bajari, P. and Kahn, M. (2005). Estimating Housing Demand with an Application to Explaining Racial Segregation in Cities. *Journal of Business and Economic*

Statistics, Vol. 23 No. 1, pp. 20-33.

Bajari, P. and Kahn, M. (2008). Estimating Hedonic Models of Consumer Demand with an Application to Urban Sprawl, Chapter pp.129-155 in Baranzini, Ramirez, Schaerer and Thalmann (eds.) *Hedonic Methods in Housing Markets: Pricing Environmental Amenities and Segregation*. New York: Springer.

Bilkey, W. J. and Nes, E. (1982). Country-of-origin effects on product evaluations. *Journal of International Business Studies*, Vol. 14 No. 1, pp. 89-99.

Carew, R and Florkowski, W.J. (2008). The importance of Australian corporate brand and grape variental wines. Hedonic pricing in the British Columbia wine market. *Journal of Wine Economics*, Vol. 3 No. 2, pp. 194-204.

Chang, J. B., Lusk, J. L., and Norwood, F. B. (2010). *Journal of Agricultural and Resource Economics*, Vol. 35 No. 3, pp. 406-423.

Chattopadhyay, S. (1999). Estimating the Demand for Air Quality: New Evidence Based on the Chicago Housing Market. *Land Economics*, Vol. 75 No. 1, pp. 22-38.

Combris, P., Lecocq, S., and Visser, M. (1997). Estimation of a hedonic price equation for Burgundy wine: Does quality matter? *The Economics Journal*, Vol. 107, pp. 390-402.

Combris, P., Lecocq, S., and Visser, M. (2000). Estimation of a hedonic price equation

for Burgundy wine. *Applied Economics*, Vol. 32 No. 8, pp 961-967.

Deutsche Industrie – und Handelskammer in Japan (2011). Japanese wine market. Retrieved July 27, http://www.japan.ahk.de/jp/publikationen/studien/der-japanische-weinmarkt/ (Japanese)

Costanigro, M., McCluskey, J. J., and Mittelhammer, R. C. (2007). Segmenting the wine market based on price: hedonic regression when different prices mean different products. *Journal of Agricultural Economics*, Vol. 58 No. 3, pp. 454-466.

Costanigro, M., Mittelhammer, R. C., and McCluskey, J. J. (2009). Estimating class□specific parametric models under class uncertainty: local polynomial regression clustering in a hedonic analysis of wine markets. *Journal of Applied Econometrics*, Vol. 24 No. 7, pp. 1117-1135.

Diewert, E. (2003). Hedonic regressions: A review of some unsolved issues. Paper presented at conference on research in income and wealth. *National Bureau of Economic Research*. Retrieved August 4, http://www.nber.org/CRIW/papers/diewert.pdf

Estrella Orrego, M.J., Defrancesco, E. and Gennari, A. (2012). The wine hedonic price models in the "Old and New World": state of the art. *Revista de la Facultad de Ciencias Agrarias*, Vol. 44 No. 1, pp. 205-220.

Gergaud, O. and Ginsburgh, V. (2008). Natural endowments, production technologies and the quality of wines in Bordeaux. Does terroir matter? *The Economic Journal*, Vol. 118, F142-F147.

Hobbs, J. E., Bailey, D., Dickinson, D. L., and Haghiri, M. (2005). Traceability in the Canadian Red Meat Sector: Do Consumers Care? *Canadian Journal of Agricultural Economics*, Vol. 53 No. 1, pp. 47-65.

International Federation of Organic Agriculture Movement. (2008). Definition of organic agriculture definition of organic agriculture. Retrieved August 3, http://www.ifoam.org/en/organic-landmarks/definition-organic-agriculture

James, J.S., Rickard, B.J. and Rossman, W.J. (2009). Product differentiation and market segmentation in applesauce: Using a choice experiment to assess the value of organic, local, and nutrition attributes. *Agricultural and Resource Economics Review*, Vol. 38 No. 3, pp. 357-370.

Japan Custom. (2014). Trade Statistics of Japan. Retrieved August 5, http://www.customs.go.jp/toukei/info/index_e.htm

Juric, B and Worsley, A. (1998). Consumers' attitudes towards imported food products. *Food Quality and Preference*, Vol. 9 No. 6, pp. 431–4411.

Lancaster, K. (1966). A New Approach to Consumer Theory. *Journal of Political*

Economy, Vol. 74 No. 2, pp. 132-157.

Landon, S. and Smith, C. E. (1997). The use of quality expectation indicators by consumers: The case of Bordeaux wine. *Journal of Consumer Policy*, Vol. 20 No. 3, pp. 289-323.

Landon, S. and Smith, C. E. (1998). Quality expectation, reputations, and price. *Southern Economic Journal*, Vol. 64 No. 3, pp. 628-647.

Lim, K. H; Hu, W., Maynard, L. J., and Goddard, E. (2013). U.S. Consumers' Preference and Willingness to Pay for Country-of-Origin-Labeled Beef Steak and Food Safety Enhancements. *Canadian Journal of Agricultural Economics*, Vol. 61 No. 1, pp. 93-118.

Loureiro, M. L. and Umberger, W. J. (2005). Assessing consumer preferences for country-of-origin labeling. *Journal of Agricultural and Applied Economics*, Vol. 37 No. 1, pp. 49-63.

Loureiro, M. L. and Umberger, W. J. (2007). A choice experiment model for beef: What US consumer responses tell us about relative preference for food safety, country-of-origin labeling and traceability. *Food Policy*, Vol. 32 No. 4, pp. 496-514.

Matsumoto, S. (2011). Impact of Country-of-Origin Labeling on Bovine Meat Trade *Journal of Agricultural & Food Industrial Organization*, Vol.9 No. 41, Article 1.

Malorgio, G., Camanzi, L., and Grazia, C. (2008). Geographical indications and international trade: evidence from the wine market. *New Medit*, Vol. 7 No. 3, pp. 4-13.

McConnell, K. and Strand, I. E. (2000). Hedonic prices for fish: Tuna prices in Hawaii. *American Journal of Agricultural Economics*, Vol. 82 No. 1, pp. 133-144.

Menapace, L, Colson, G., Grebitus C. and Facendola, M. (2011). Consumers' preferences for geographical origin labels: evidence from the Canadian olive oil market. *European Review of Agricultural Economics*, Vol. 38 No. 2, pp. 193-212.

Nimon, W. and Beghin, J. (1999). Are Eco-Labels Valuable? Evidence from the Apparel Industry. *American Journal of Agricultural Economics*, Vol. 81, No. 4, pp. 801-811

Oczkowski, E. (1994). A Hedonic Price Function for Australian Premium Table Wine. *Australian Journal of Agricultural Economics*, Vol. 38 No. 1, pp. 93-110.

Oczkowski, E. (2001). Hedonic wine price functions and measurement error. *The Economics Record*, Vol. 77 No. 239, pp. 374-382.

Roma, P., Di Martino, G., and Perrone, G. (2013). What to show on the wine labels: a hedonic analysis of price drivers of Sicilian wine. *Applied Economics*, Vo. 45 No. 19, pp. 2765-2778.

Rosen, S. (1974). Hedonic Prices and Implicit Markets: Product Differentiation in Pure

Competition. *Journal of Political Economy*, Vol. 82 No. 1, pp. 34-55.

Sawyer, E.N., Kerr, W.A. and Hobbs, J.E. (2008). Consumer preferences and the international harmonization of organic standards. *Food Policy,* Vol. 33 No. 6, pp. 607-615.

Scarpar, R. and Del Giudice, T. (2004). Marketing segmentation via mixed logit: extra virgin olive oil in urban Italy. *Journal of Agricultural and Food Industrial Organization*, Vol. 2 No. 4, Article 7.

Scarpar, R., Philippidis, J. and Spalatro, F. (2005). Product-country images and preference heterogeneity for Mediterranean food products: A discrete-choice framework. *Agribusiness*, Vol. 21 No. 3, pp. 329-349.

Schooler, R. D. (1971). Bias phenomenon attendant to the marketing of foreign goods in the United States. *Journal of International Business Studies*, Vol. 2 No. 1, pp. 71-80.

Shamel, G. and Anderson, K. (2003). Wine Quality and Varietal, Regional and Winery Reputations: Hedonic Prices for Australia and New Zealand. *The Economic Record*, Vol. 79 No. 246, pp. 357–369.

Silver, M. (2002). The use of weights in hedonic regressions: The measurement of quality adjusted price changes. mimeo, Cardiff Business School, Cardiff

University.

Silver, M. and Heravi S. (2005). A failure in the measurement of inflation: Results from a hedonic and matched experiment using scanner data. Journal of Business and Economic Statistics, Vol. 23 No. 3, pp269–281.

Shogren, Jason F; List, John A; Hayes, Dermot J. (2000). Preference Learning in Consecutive Experimental Auctions. *American Journal of Agricultural Economics, Vol.* 82 No. 4, pp. 1016-1021.

Supermarkets Statistics Analysis. (2013). Number of supermarket stores. Retrieved July 30, http://www.j-sosm.jp/ (Japanese)

Thrane, C. (2004). In defence of the price hedonic model in wine research. *Journal of Wine Research*, Vol. 15 No. 2, pp. 123-134.

Tangermann, S. (2010). Agricultural trade 1980 vs 2010: some progress, but still so far to go. Working Paper prepared for the Theme Day of the 2010 General Meeting of the International Agricultural Trade Research Consortium.

United States General Accounting Office. (2003). Country-of- Origin Labeling. Opportunities for USDA and Industry to Implement Challenging Aspects of the New Law, Report to Congressional Requesters. GAO-03-780.

Unwin, T. (1980). Hedonic price indexes and the qualities of wine. *Journal of Wine*

Research, Vol. 10 No. 2, pp. 95-105.

Vinexpo. (2014). Current status of Japanese wine and sprit markets and projection until 2017. Vinexpo market analysis. Retrieved July 27, http://www.franceshoku.com/pdf/2_TRADE_IWSR-Japon_jp.pdf (Japanese)

Wirth F.F., Stanton, J.L. and Wiley, J.B. (2011). The relative importance of search versus credence product attributes: organic and locally grown. *Agricultural and Resource Economics Review*, Vol. 40 No. 1, pp. 48-62.

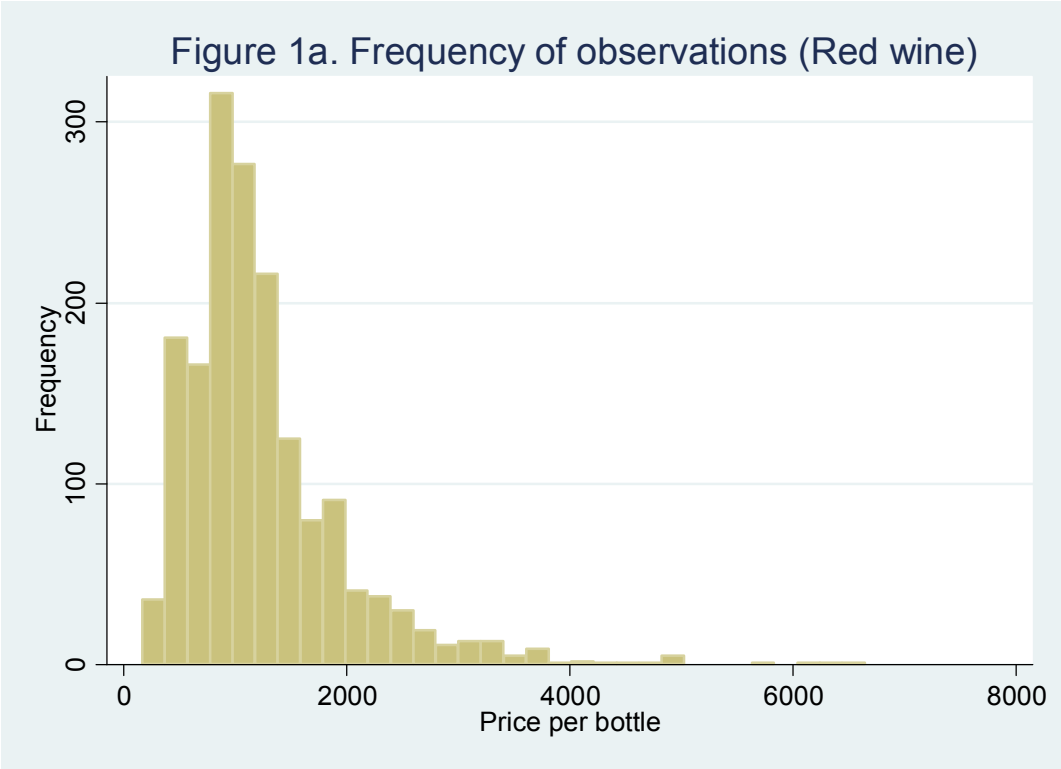
Figure 1a. Frequency of observations (Red wine)
Frequency
0
100
200
300
0
2000
4000
6000
8000
Price per bottle

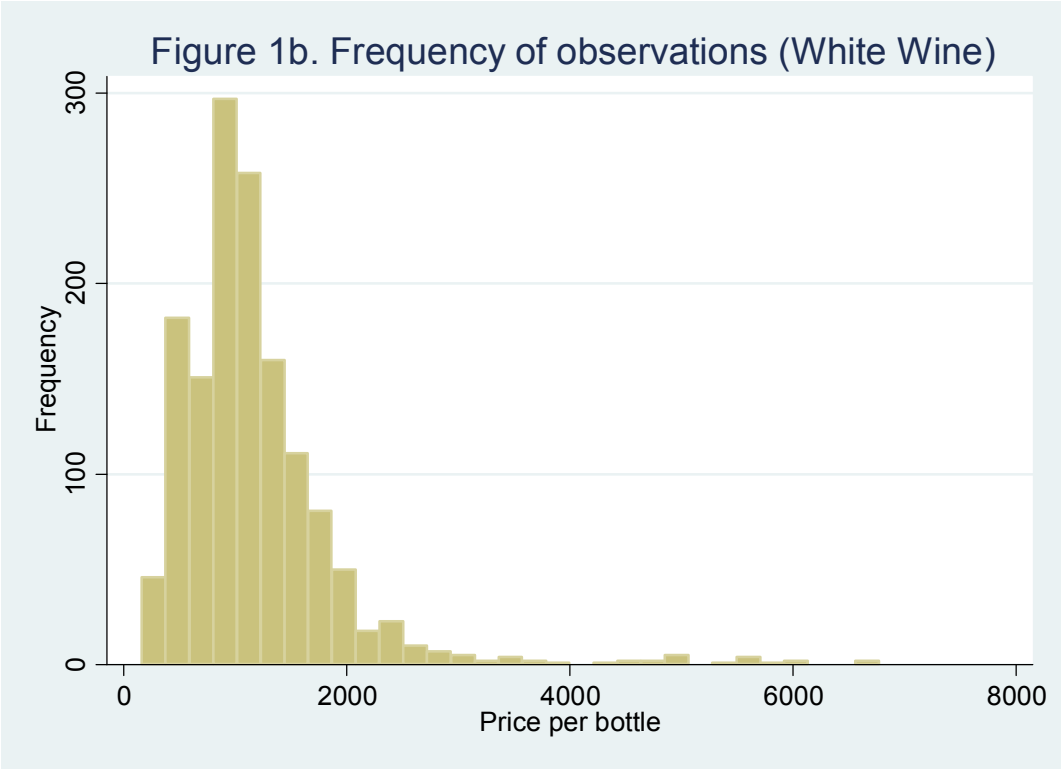
Figure 1b. Frequency of observations (White Wine)
Frequency
0
100
200
300
0
2000
4000
6000
8000
Price per bottle

Table 1. Summary statistics, Wine POS data

Variable	Unit	Red wine (N = 1682)		White wine (N = 1431)	
		Average or share[1]	Standard deviations	Average or share[1]	Standard deviations
Unit price	yen / ml	1.663	0.972	1.616	1.277
Volume	Ml	735.969	280.539	719.573	345.912
Days after the initial sales	Days	1581.666	1132.112	1991.192	1336.508
Sales share	%	0.030	0.109	0.017	0.061
Store share	%	0.045	0.092	0.045	0.088
Organic dummy	%	1.962		1.887	
Antioxidant-free dummy	%	4.281		3.215	
Japan dummy	%	21.225		28.162	
Australia dummy	%	2.735		3.075	
Chile dummy	%	6.956		7.757	
France dummy	%	28.894		22.781	
Italy dummy	%	12.604		11.880	
Spain dummy	%	5.351		8.875	
USA dummy	%	3.686		3.215	
Asahi dummy	%	3.448		0.070	
Kikoman dummy	%	4.281		3.634	
Sapporo dummy	%	6.243		5.311	
Suntory dummy	%	4.935		4.822	
Merusyan dummy	%	9.156		7.617	

Note. 1. The share of the corresponding wine variety.

Table 2. Country of origin of imported wines

	National data [a]				POS data			
Country	Quantity (kl)		Sales value (million yen)		Quantity (kl)		Sales value (million yen)	
Chile	39,819	18.3%	8,700	8.2%	340.7	24.4%	298.9	21.7%
France	62,170	28.5%	58,993	55.3%	245.4	17.6%	359.3	26.1%
Italy	35,241	16.2%	14,138	13.3%	118.8	8.5%	138.0	10.0%
Spain	26,005	11.9%	7,230	6.8%	283.2	20.3%	219.3	15.9%
USA	24,905	11.4%	7,164	6.7%	227.3	16.3%	157.9	11.4%
Other	29,867	13.7%	10,462	9.8%	182.2	13.0%	205.9	14.9%
Total	218,007	100.0%	106,687	100.0%	1397.7	100.0%	1379.4	100.0%

Note. a. Source: Japan Custom (2014).

Table 3a. Semi-log hedonic models (Red wine, N = 1682)

	Model 1		Model 2		Model 3		Model 4	
Variables	Coef.	S. Err.	Coef.	S. Err.	Coef.	S. Err.	Coef.	S. Err.
Constant	0.813*	0.044	0.784*	0.044	0.156*	0.001	0.370*	0.002
Volume	-6.1E-04*	4.0E-05	-6.1E-04*	3.9E-05	-3.0E-04*	5.9E-07	-3.4E-04*	7.6E-07
Market Penetration								
Days after	2.0E-05*	9.7E-06	1.8E-05	9.7E-06	1.3E-05*	2.3E-07	1.1E-05*	3.1E-07
Sales share	0.219	0.194	0.174	0.194	-0.315*	0.001	-0.337*	0.002
Store share	-1.816*	0.237	-1.713*	0.236	-0.018*	0.002	-0.143*	0.003
Organic								
Domestic	-0.157	0.110	-0.144	0.109	0.185*	0.001	0.062*	0.002
Import	0.236	0.127	0.245	0.127	0.465*	0.005	0.358*	0.005
Antioxidant-free	-0.059	0.061	-0.066	0.061	0.214*	0.001	0.145*	0.001
Country								
Japan	-0.007	0.039	0.006	0.039	-0.271*	0.001	-0.273*	0.002
Australia	0.113	0.075	0.132	0.075	0.185*	0.002	0.169*	0.003
Chile	-0.044	0.051	-0.027	0.051	0.039*	0.001	0.049*	0.002
France	0.283*	0.034	0.287*	0.034	0.343*	0.001	0.395*	0.002
Italy	0.034	0.042	0.033	0.042	0.128*	0.001	0.081*	0.002
Spain	-0.152*	0.057	-0.147*	0.056	-0.364*	0.001	-0.362*	0.002
USA	-0.025	0.065	-0.013	0.065	0.046*	0.001	0.005*	0.002
Grape variety								
Beaujolais nouv.	0.241*	0.070	0.240*	0.069	0.396*	0.002	0.312*	0.002
Cabernet	-0.090*	0.035	-0.091*	0.035	0.100*	0.001	0.007*	0.001
Carmenere	-0.180	0.162	-0.186	0.161	-0.075*	0.002	-0.206*	0.003
Sangiovese	-0.125	0.166	-0.143	0.166	-0.044*	0.010	-0.132*	0.012
Syrah	-0.022	0.061	-0.023	0.061	0.066*	0.002	0.008*	0.003
Zinfandel	0.196	0.176	0.188	0.176	0.347*	0.009	0.336*	0.010
Zweigelt	0.425*	0.167	0.416*	0.167	0.975*	0.010	0.861*	0.010
Tempranillo	-0.005	0.113	-0.013	0.113	0.380*	0.004	0.329*	0.005
Nero	-0.012	0.167	-0.023	0.167	0.084*	0.010	0.012	0.012
Pinotage	-0.037	0.196	-0.033	0.196	0.210*	0.005	0.060*	0.006
Pinoir	0.171*	0.074	0.179*	0.074	0.352*	0.003	0.250*	0.003
Malbec	-0.081	0.119	-0.057	0.119	0.104*	0.003	-0.002	0.004
Merlot	-0.103*	0.049	-0.103*	0.049	0.070*	0.002	-0.023	0.002

Table 3a. Continue

	Model 1		Model 2		Model 3		Model 4	
Variables	Coef.	S. Err.	Coef.	S. Err.	Coef.	S. Err.	Coef.	S. Err.
Sales company								
Company 1	0.070	0.064	0.052	0.064	-0.079*	0.001	-0.031*	0.002
Company 2	-0.195*	0.054	-0.192*	0.054	-0.264*	0.001	-0.305*	0.002
Company 3	-0.025	0.046	-0.029	0.046	-0.098*	0.001	-0.110*	0.001
Company 4	0.029	0.052	0.013	0.052	-0.101*	0.001	-0.068*	0.001
Company 5	0.191*	0.040	0.186*	0.040	0.084*	0.001	0.104*	0.001
Adjusted R^2	0.313		0.309		0.538		0.558	

Note. Coef. And S. Err. stand for coefficient and standard error, respectively.

* implies significant at the 5% level (two-tailed testing).

Table 3b. Semi-log hedonic models (White wine, N = 1434)

	Model 1		Model 2		Model 3		Model 4	
Variables	Coef.	S. Err.	Coef.	S. Err.	Coef.	S. Err.	Coef.	S. Err.
Constant	0.779*	0.046	0.739*	0.045	0.378*	0.002	0.581*	0.002
Volume	-6.0E-04*	3.5E-05	-6.1E-04*	3.5E-05	-4.0E-04*	6.9E-07	-4.5E-04*	8.8E-07
Market Penetration								
Days after	2.4E-05*	9.1E-06	2.4E-05*	9.0E-06	2.3E-05*	2.8E-07	4.2E-05*	3.9E-07
Sales share	1.313*	0.374	1.206*	0.368	-0.215*	0.003	0.175*	0.004
Store share	-2.031*	0.270	-1.921*	0.266	-0.236*	0.003	-0.622*	0.005
Organic								
Domestic	-0.144	0.113	-0.164	0.111	0.106*	0.002	0.012*	0.003
Import	0.000	0.172	0.024	0.169	0.120*	0.007	0.085*	0.008
Antioxidant-free	-0.103	0.074	-0.121	0.073	0.090*	0.001	0.030*	0.002
Country								
Japan	-0.023	0.042	-0.002	0.042	-0.367*	0.002	-0.353*	0.002
Australia	0.155	0.078	0.126	0.077	0.205*	0.002	0.199*	0.003
Chile	-0.118	0.056	-0.123*	0.055	-0.031*	0.002	-0.057*	0.002
France	0.229*	0.041	0.236*	0.040	0.179*	0.002	0.352*	0.002
Italy	-0.009	0.048	-0.009	0.048	0.074*	0.002	0.018*	0.003
Spain	-0.088	0.052	-0.074	0.051	-0.086*	0.002	-0.016*	0.002
USA	0.193*	0.075	0.210*	0.074	-0.148*	0.002	-0.142*	0.003
Grape variety								
Chardonnay	-0.012	0.034	-0.003	0.033	0.005	0.001	-0.152*	0.002
Viognier	0.024	0.161	0.051	0.159	0.113*	0.020	0.020	0.025
Kerner	0.383*	0.138	0.386*	0.136	0.823*	0.009	0.687*	0.010
Koshu	0.344*	0.078	0.360*	0.077	0.925*	0.005	0.785*	0.005
Chenin	-0.271	0.186	-0.242	0.183	-0.100*	0.009	-0.225*	0.012
Semillon	-0.387*	0.126	-0.343*	0.125	-0.449*	0.003	-0.511*	0.004
Sauvignon	0.122	0.120	0.146	0.118	-0.120*	0.004	-0.133*	0.006
Trebbiano	-0.277	0.147	-0.247	0.145	-0.241*	0.007	-0.263*	0.010
Muscat	0.149	0.109	0.154	0.108	0.165*	0.003	0.061*	0.005
Muller	0.121	0.261	0.094	0.258	0.649*	0.016	0.467*	0.018

Table 3b. Continue

	Model 1		Model 2		Model 3		Model 4	
Variables	Coef.	S. Err.	Coef.	S. Err.	Coef.	S. Err.	Coef.	S. Err.
Sales company								
Company 1	-0.143	0.465	-0.166	0.458	-0.113*	0.002	-0.223*	0.004
Company 2	-0.112	0.064	-0.124	0.064	-0.246*	0.003	-0.376*	0.003
Company 3	-0.090	0.055	-0.093	0.055	-0.121*	0.001	-0.152*	0.002
Company 4	-0.099	0.059	-0.101	0.058	0.002*	0.001	-0.043*	0.002
Company 5	0.077	0.047	0.066	0.047	-0.018*	0.001	-0.051*	0.002
Adjusted R^2	0.292		0.302		0.463		0.518	

Note. Coef. And S. Err. stand for coefficient and standard error, respectively.

* implies significant at the 5% level (two-tailed testing).

Table 4. Estimated price premium or discount (%)

	Red wine		White wine	
	Model 3	Model 4	Model 3	Model 4
Organic				
Domestic	20.320	6.440	11.224	1.214
Import	59.207	42.996	12.796	8.872
Antioxidant-free	23.849	15.619	9.432	3.054
Country				
Japan	-23.771	-23.921	-30.697	-29.774
Australia	20.305	18.356	22.797	22.073
Chile	4.024	5.007	-3.027	-5.581
France	40.898	48.468	19.571	42.242
Italy	13.650	8.412	7.644	1.862
Spain	-30.494	-30.393	-8.251	-1.550
USA	4.679	0.487	-13.739	-13.247