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IMPORT DEMAND SYSTEM ANALYSIS OF THE SOUTH KOREAN WINE MARKET WITH THE SOURCE DIFFERENTIATED AIDS MODEL

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Under the assumption of block substitutability and partial aggregation, a source differentiated AIDS model was used to estimate South Korean wine import demand. Empirical results indicate that South Korean wine consumers have a strong preference for high quality French wines. French wines are shown to be substitutes for wines from other countries in the South Korean wine market. Since the implementation of a free trade agreement between South Korea and Chile, Chilean wines have steadily increased their market share exhibiting strong price competitiveness in the South Korean wine market.

Key words: wine, AIDS, block substitutability, import demand.

South Korea is one of the biggest markets for alcoholic beverages in the world. For many South Koreans, drinking is considered an important part of everyday life and is often encouraged at social and business occasions. Recently there has been a shift away from hard liquor consumption, in South Korea, to beverages that are lower in alcohol content mainly due to growing health concerns, physical well-being, and the increased number of female workers in the South Korean workforce. The consumption of hard liquor has been declining gradually in recent years (USDA Foreign Agricultural Service, 2007).

In contrast, the consumption of wine, which has a lower in alcohol content, has grown as a result of decreased hard liquor consumption, leading to a remarkable increase in imports of wine because domestic wine production in South Korea is negligible owing to domestic South Korean wine's lack of price competitiveness and quality against imports. High agricultural land prices and unfavorable weather conditions are the major

impediments that prevent any meaningful commercial local wine industry from evolving (USDA Foreign Agricultural Service, 2007). As shown in Figure 1, total South Korean wine imports in 2000 were valued at 18,039 thousand dollars, increasing to 143,582 thousand dollars in 2007, representing a more than 7.95 fold increase during this period of time.

[Place Figure 1 Approximately Here]

Wine is firmly positioned in South Korea as a “*healthy*” product due to highly publicized health benefits of red wine. As a result, South Korean tastes are heavily skewed to red wine due to public perception. In 2007, imports of red wine commanded 80 percent of total South Korean wine imports and is not likely to lose its dominant share in the near future. However, an increasing number of consumers are becoming interested in white and sparkling wines as the idea of wine-food pairing begins to filter into the market. A large part of the South Korean diet is composed of hot and spicy dishes which are better matched with white and/or sparkling wines rather than red wines. This recent trend of wine taste is helping to increase the imports of white and sparkling wines. In 2007, the imports of white and sparkling wines had increased, from 5,202 thousand dollars in 2000, to 29,117 thousand dollars, representing a 5.6 fold increase. (USDA Foreign Agricultural Service, 2007).

Imports from the United States grew from 3,371 thousand dollars in 2000 to 15,371 thousand dollars in 2007, representing an increase of 12 million dollars. However, even though U.S. wine exports to South Korea continue to grow along with the overall market, the American share of the South Korean wine market has seen a continuous decline in recent years. For instance, the market share of American wines in South Korea decreased from 27% in 2001 to 11% in 2007 (see Figure 2). The quantity base market

share, however, of American wine is greater than that of value base market share. This reflects the market stratagem where American wine exporters have primarily targeted the mid level price segment of the market, while French and Italian competitors mainly focus on high income level consumers. As shown in Figure 3, the weighted average price of imported U.S. wine is \$3.73 per kilogram in 2007, while it is \$6.02 for Italian wine and \$8.32 for French wine in the same year. Strong interest in American wines among local wine importers are closely related to the on-going depreciation of the U.S. dollar against local currency as well as the future opportunities that may arise from ratification of the free trade agreement recently concluded between South Korea and the United States (USDA Foreign Agricultural Service, 2007).

France is the biggest exporter of wine to South Korea with a 40.9 percent market share by value in 2007. Chile surpassed the United States to become the second largest exporter of wine to South Korea in 2005 when the South Korea-Chile free trade agreement was implemented. Chilean wine imports into South Korea continued their strong ascent into 2007, second in overall rank (behind France) with 17% of South Korean wine market share in 2007. According to the South Korea-Chile free trade agreement, import tariffs on all Chilean wines are scheduled to be eliminated by 2010, which is expected to give further price incentives to Chilean wines in competition in South Korea because local taxes imposed on liquors by local governments such as liquor tax and education tax will be reduced.¹ Italy jumped to the third largest wine supplier to South Korea with a stunning 218 percent of growth in 2007 (14% market share in 2007). Capitalizing on a perception that Italian cuisine culture is appealing to South Koreans, Italian wine made strong inroads in the South Korean market in 2007. Australia has

dramatically increased wine exports to South Korea by a 10.56 fold increase during the last seven years even though the market share of Australian wine is relatively small compared with those of the major exporting countries (7% market share in 2007). Although small in overall market share, products from unusual origins, including Argentina and New Zealand, continued to exhibit outstanding import growth in recent years.

[Place Figure 2 Approximately Here]

[Place Figure 3 Approximately Here]

The objective of this study is to estimate South Korean import demand for wine in order to obtain price and expenditure elasticities which are intended to provide valuable information helping in understanding South Korean wine consumers' behavior. In doing this, this study specifically emphasizes the importance of the origin and types of wines because previous studies have shown that not only price but also the country of origin and color and style are important factors in purchasing and drinking wines (Spahni, p47-49 2000; Lee et al, 2005; and Gil et al, 1997). For wine industries in exporting countries, import demand elasticities would provide more valuable information for better marketing strategy formulation. Wahl et al. (1991) emphasized reliable estimates of demand responsiveness to prices and expenditure in market analysis. However, no effort has been made to estimate South Korean wine import behavior in the literature even though South Korean wine drinkers' characteristics and preferences have been previously analyzed.² The main objective of this study is to provide reliable estimates of South Korean wine import elasticities in terms of origins by country and type. In order to achieve this objective, this study uses an Almost Ideal Demand System (AIDS), in which types and sources of wine are differentiated and expenditure is treated as endogenous (LaFrance,

1991). Estimates in this way are more reliable because they do not suffer from aggregation bias over import sources (as in Hayes, Wahl, and Williams, 1990) or over goods (as in Yang and Koo, 1993).

This study is designed as follows: In the next section, source differentiated import demand models considered in previous studies will be reviewed. Then, in the third section, the source differentiated AIDS model will be discussed. Data and estimates are explained in the fourth section, followed by a section that will contain of the empirical results of the model to be followed by conclusions which are presented in the final section.

Model Development

The Armington trade model had been used in previous studies for the analyses of source differentiated import demands. Although the Armington trade model differentiates goods by countries of origin, it suffers from the restrictive assumptions of a single constant elasticity of substitution (CES) and homotheticity, which may lead to biased parameter estimates (Yang and Koo, 1994). As an alternative to the Armington trade model, the AIDS model has been used in import demand estimations. Since the original AIDS model developed by Deaton and Muelbauer is flexible, theoretically plausible, and easy to use, Winters suggested using the AIDS model for import demand estimation instead of the Armington model. However, empirical applications of the AIDS model to import demand typically assume either product aggregation, under which the demand system does not differentiate products by country of origin (Hayes et al., 1990), or block separability among goods, which allows the model to consist only of share equations for a good from different origins (Alston et al., 1990).

Under assumption of proportional movement of all prices of individual products, aggregation over products is possible (Hicks, 1956 and Yang and Koo, 1994). This assumption, however, seems too strong for use in any analysis relating to the international trade of wine. For instance, South Korean wine importers may perceive U.S. wine differently from French wine because of taste and preference differences. Furthermore, different transaction costs also cause heterogeneous movements of import prices (Johnson et al., 1979). Proportional movements of individual prices of source differentiated wine imports seem practically unlikely. In fact, the prices of source differentiated wine imports moved differently from each other. Likewise, block separability between red and white wine imports is often counter-intuitive. This assumption, for example, allows modeling red wine demand independently of white wine demand. Most empirical research, however, suggests evidence against this assumption (Yang and Koo, 2004). As in the Armington model, block separability may bias elasticity estimates (Hayes et al., 1990 and Alston et al., 1990). Source differentiation is important in wine import demand analysis. However, block separability should not be required for source differentiation or vice versa.

This study uses the AIDS model for South Korean wine import demand estimation. The AIDS model is specified according to previous model development in which product sources are differentiated without imposing block separability. The source differentiated AIDS model includes the original AIDS formulation as a special case. The null hypothesis of block separability is tested, and as a consequence of the restriction on elasticity estimates, is also examined.

The Restricted Source Differentiated AIDS Model

From the original AIDS model developed by Deaton and Muellbauer, the SDAIDS model is specified as follows:

$$(1) \quad w_{i_h} = \alpha_{i_h} + \sum_j \sum_k \gamma_{i_h j_k} \ln(\pi_{j_k}) + \beta_{i_h} \ln P,$$

where subscripts h and k indicate goods, and i and j indicate countries of origin or sources. Good h may be imported from m different origins, while good k may have n origins (where $i \neq j$, $h = 1, \dots, m$, and $k = 1, \dots, n$). w_{i_h} measures the budget share of good h imported from source i (product i_h), π_{j_k} is the normalized price of good k imported from source j (product j_k)³, and $\ln P$ is a Stone price index which is defined as follows:

$$(2) \quad \ln P = \sum_i \sum_h w_{i_h} \ln(\pi_{i_h}).$$

However, using Stone's price index may create a simultaneous-equation bias since w_{i_h} , which is used as a dependent variable in (1), is employed as an independent variable in Stone's price index. To avoid simultaneity, Eales and Unnevehr (1987) suggested using a lagged w_{i_h} variable in the Stone's price index, $\ln P_t = \sum_i \sum_h w_{i_h, t-1} \ln(\pi_{i_h, t})$.

It is given that in the wine category there are three kinds of non-separable substitutes such as red, white, and sparkling wines available for import from various origins. However, sparkling wine has been intermittently imported and in relatively small amounts as compared with red and white wines, which restrict data availability in an empirical model. Since a sufficient sample size in empirical applications cannot be ensured, the SDAIDS model might suffer from a degrees-of-freedom problem. For empirical applicability, it is necessary to reduce the number of parameters. As a result, this study assumes block substitutability with partially aggregated goods in which white and sparkling wine are considered as homogenous goods.⁴

Block substitutability implies that the cross-price effects of products in good j on the demand for products from j are the same for all products from i (see Yang and Koo, 1994). Hence, the prices of other goods from various origins are represented by an aggregated price for that good in the equation for a given source differentiated product. For instance, in the estimation of South Korean demand for U.S. red wine, the prices of wine imported from various sources are represented by one aggregate price for red and white wine. In other words, South Korean demand for U.S. red wine is assumed to have the same cross-price response to both that of French red and white wine. The assumption of block substitutability leads to a reduction of the number of parameters in each equation from $mn + 2$ to $m + (n-1) + 2$. The SDAIDS model becomes the restricted SDAIDS model (RSDAIDS) when the assumption of block substitutability is imposed.

The RSDAIDS is specified as follows:

$$(3) \quad w_{i_h} = \alpha_{i_h} + \sum_k \gamma_{i_{hk}} \ln(\pi_{i_k}) + \sum_{j \neq i} \gamma_{i_{hj}} \ln(\pi_j) + \beta_{i_h} \ln P,$$

$$\text{where } \ln P = \sum_j \sum_k w_{j_k, t-1} \ln(\pi_{j_k, t}).$$

The general demand restrictions of adding up, homogeneity, and symmetry can be imposed by restricting the parameters of the import demand system as follows:

$$(4) \quad \text{Adding up: } \sum_i \sum_h \alpha_{i_h} = 1, \sum_h \gamma_{i_{kh}} = 0, \sum_i \sum_h \gamma_{i_{hj}} = 0, \sum_i \sum_h \beta_{i_h} = 0.$$

$$(5) \quad \text{Homogeneity: } \sum_k \gamma_{i_{hk}} + \sum_{j \neq i} \gamma_{i_{hj}} = 0.$$

$$(6) \quad \text{Symmetry: } \gamma_{i_{hk}} = \gamma_{i_{kh}}.$$

Because of block substitutability, symmetry conditions among countries cannot be applied in the RSDAIDS model.

Marshallian measures of price elasticities, then, are calculated from the estimated parameters as follows:

$$(7) \quad \varepsilon_{i_h i_h} = -1 + \frac{\gamma_{i_h h}}{w_{i_h}} - \beta_{i_h},$$

$$(8) \quad \varepsilon_{i_h i_k} = \frac{\gamma_{i_h k}}{w_{i_h}} - \beta_{i_h} \left(\frac{w_{i_k}}{w_{i_h}} \right),$$

$$(9) \quad \varepsilon_{i_h j} = \frac{\gamma_{i_h j}}{w_{i_h}} - \beta_{i_h} \left(\frac{w_j}{w_{i_h}} \right).$$

Equation (7) represents own-price elasticities, Equation (8) represents cross-price elasticities between red and white wine from one country, and Equation (9) represents cross-price elasticities between red wine (or white wine) from source i and aggregated wine from source j .

Finally, expenditure elasticity is specified as follows:

$$(10) \quad \eta_{i_h} = 1 + \frac{\beta_{i_h}}{w_{i_h}}.$$

To test for the statistical significance of price and expenditure elasticities, standard errors were calculated using the Delta method.⁵ This method is used here to calculate the standard errors and subsequently the statistical significance of the elasticities.

Data and Estimation

Data

Quarterly data from 2000 to 2008 were used to estimate the parameters of the RSDAIDS model. The wines studied here are red, white, and sparkling wines. And as discussed in the previous section, white and sparkling wines are combined as one homogeneous good. Hereafter, white wine represents the sum of both white and sparkling wines. In this study,

weak separability from other liquor is assumed without providing any evidence or test results. South Korea imports red and white wines from various countries. However, in this study, a country was identified as a supply source if imports from that country constituted over 5% of the total South Korean imports of red and white wines. Otherwise, importations are included in the rest-of-the-world (ROW) category. With this criterion, source-differentiated imported wines are red and white wines from the United States, Italy, Chile, French, Australia, and ROW.

Because actual retail or wholesale level prices for imported wines were not available, unit import values were used to measure market prices for imported wine. Unit values will be a suitable index for market prices because wines have been imported according to market demand since the South Korean wine market was liberalized in 1991. According to the World Trade Organization (WTO), South Korea imposes a 15% tariff on imported wine except for Chilean wine because of the South Korea-Chile FTA. After this, border tariffs, local taxes (liquor tax and education tax) and distributor mark-ups are imposed upon imported wine in deriving final wine market values (see Footnote 1). Data on import values (in thousand dollars) and quantities (in kilogram) were obtained from the Korean Customs Service (KCS). Source differentiated import prices (unit values) for red and white wines were calculated by dividing total import value by the total import quantity. Price data were normalized by expenditure and quantity data were normalized by average quantity (see Footnote 3). The summary of sample statistics of source differentiated expenditure shares for individual wine is presented in Table 1.

[Place Table 1 Approximately Here]

Estimation

In order to eliminate quarterly seasonal effects and to represent the property of discrete numbers, the fourth difference RSDAIDS model is used here as follows:

$$(11) \quad \Delta w_{i_h} = \alpha_{i_h} + \sum_k \gamma_{i_hk} \Delta \ln(\pi_{i_k}) + \sum_{j \neq i} \gamma_{i_hj} \Delta \ln(\pi_j) + \beta_{i_h} \Delta \ln P,$$

where Δ represents $w_t - w_{t-4}$ for the budget share variable, $\pi_t - \pi_{t-4}$ for the price variable, and $\ln P_t - \ln P_{t-4}$ for the Stone's price index variable.

Zellner's Seemingly Unrelated Regression (SUR) was used as an econometric methodology because it is sensible to assume that individual wine imports are contemporaneously correlated as substitutes. In the econometric estimation procedure, this study will confirm that the summation of the residuals for the 12 system equations are equal to zero before dropping one equation to show whether or not the adding up condition is automatically satisfied. The elasticity parameters will be estimated by imposing conditions of homogeneity (5) and symmetry (6) on the SUR model.

Because wine expenditure shares (w_{i_h}) sum to one, the demand system composed of the expenditure share equations for all 12 source differentiated wines would be singular. Therefore, the last equation (ROW white wine) was dropped from the system for estimation purposes. The coefficients of the dropped equation were then calculated from the adding up restriction. Here, this study dropped another equation and re-estimated the system in order to determine the parameters and the standard errors of the last equation. The results are the same as calculating the parameters of the last equation from the adding up condition.

The RSDAIDS model used in this study is based on the assumption that South Korean wine consumers place different values on the same commodity originating from different countries. In addition, weak separability is frequently assumed as a maintained

hypothesis in a two-stage demand analysis. Here, this study tried to assess whether or not could we could study the two types of wine separately. If separability is assumed, each type of wine could then be considered as being separable from the other at a more aggregated level. Block separability allows for each type of wine to be estimated individually, without having to incorporate the prices of the other wine. In this study, the test by Moschini, Moro, and Green is used to test for block separability. Using the following parametric restrictions, the block separability in the RSDAIDS model is tested as follows:

$$(12) \quad \frac{(\gamma_{i_h j} + w_{i_h} w_j)}{(\gamma_{j_k i} + w_{j_k} w_i)} = \frac{(w_{i_h} + \beta_{i_h})(w_j + \beta_j)}{(w_{j_k} + \beta_{j_k})(w_i + \beta_i)},$$

where i_h represents red wine from country i , j_k represent white wine from country j , β_i represents expenditure elasticity parameter of aggregate wine from country i in aggregate model, and β_j represents the expenditure elasticity parameter of aggregate wine from country j in our aggregate model.

Test results for block separability indicate the rejection of the null hypothesis that red and white wines are separable from one another at the 1% significance level. The P-value of the statistic was 5.208E08, greater than the 1% critical value in the F -distribution of 6.63 (1, 225). Therefore, the results indicate that studying each wine separately from another is not an appropriate assumption for the South Korean source differentiated wine import demand estimation.

Empirical Results

Marshallian demand elasticities were calculated from the estimated parameters by using equation (7)–(10). The first two diagonal blocks in Table 2 depict the estimated elasticities

of the RSDAIDS models that assume block separability between red and white wine. The last block of Table 2 shows the elasticity estimates for the AIDS model that does not differentiate wine type. In the wine market, all expenditure elasticities are positive, and red wine from France and Australia and white wine from Chile have statistically significant expenditure elasticities. Red wines from the U.S., Italy, Chile, and Australia show elastic expenditure elasticities, while red wines from French and ROW show inelastic expenditure elasticities. Red wine from Australia shows the highest expenditure elasticity (1.2692), as compared with the other red wines. White wines from the U.S., Italy, Chile, Australia, and ROW show elastic expenditure elasticities, while white wine from French shows inelastic expenditure elasticity. White wine from Chile shows the highest expenditure elasticity (1.4392), as compared with the other white wines. Aggregate wines from the U.S., Italy, Chile, Australia, and ROW show elastic expenditure elasticities, while aggregate wine from French shows inelastic expenditure elasticity. Aggregate wine from Australia shows the highest expenditure elasticity (1.3140), as compared to the other aggregate wines. Expenditure elasticities of red wines show more elasticity than those for aggregate wines from the U.S., Italy and Chile, while expenditure elasticities of white wines show more elastic than those of aggregate wines from Chile and French. These results shows source differentiated red wine and white wine have responded differently to any changes in market size. In particular, this result shows that Australia has enlarged share of the South Korean red wine market, while Chilean white wine has most effectively captured a large proportion of the South Korean white wine market.

Own-price elasticities for individual wines from different origins are all negative, as theory predicts. In particular, all wines including red, white, and aggregate wines have statistically significant own-price elasticities at 5% level. French wines including red, white, and aggregate wines show inelastic own-price elasticities. This may reflect South Korean wine consumers' preference for high quality wine because French wine still has strong dominance in South Korean wine market even though the price of French wine remarkably increased during the sample period of time. Red wines from the U.S., Italy, and Australia are more sensitive to a change in own prices than white wines from those countries. However, all own-price elasticities show to be close to negative one ($-0.9802 \sim -1.0520$), implying proportional price effects on their own products.

Cross-price elasticities may reveal empirical competitive relations among products. Cross price elasticities between French and the other countries wines are shown to be positive, implying that French wines are substitutes for the other countries wines in the South Korean wine market. The absolute value of cross-price elasticities are shown to be small ranging between 0.0021 and 0.0796 and small number of cross elasticities are shown to be significant at the 10% significance level, which implies that cross effects might be negligible in the South Korean wine markets. Even though imported wine prices have increased remarkably, individual wines coming from different origins have expanded their sale's volumes in the South Korean wine market during the sample period of time, which explains why most negative signs of cross-price elasticities are estimated.

Conclusions

The source differentiated AIDS model was specified to estimate South Korean import demand for individual wines. Both block substitutability and partial aggregation over

white and sparkling wines were employed for empirical estimation due to limitations in sample size. The block substitutability test result showed that the source differentiated AIDS model as specified in this study would provide more reliable and detailed information about import demand behaviors.

A country is regarded as having strong export potential in an import market if demand for the product is insensitive to price changes but increases with import expenditure. In the South Korean wine import market, French wines are shown to be in this position. This is consistent with the strong dominance of French wines in the South Korean wine market.

In addition, French wines are shown to be substitutes for other wines from the other countries, while all other countries' wines are shown to be complementary with each other. However, all of cross effects are shown to be negligible not only because cross-price elasticities are small but also because most of them are shown to be statistically insignificant (even at the 10% significance level).

Finally, Chilean wine's market share of the South Korean wine market is shown to have remarkably increased. In particular, expenditure elasticity of Chilean white wine is shown to be the largest one among all others. In fact, since 2004 when South Korea and Chile implemented their free trade agreement, which eliminated boarder tariff imposed on Chilean wines, the import of Chilean wines into South Korean have been increased with price competition.

Footnote 1.

Effects of free trade agreement on import tariffs, local taxes and distributor mark-ups imposed on a \$10 imported wine

		Current	Under FTA
A	CIF invoice value	\$10.00	\$10.00
B	Tariff (Customs Duty) ^a : $A \times 15\%$	\$1.50	\$0.00
C	Wine Liquor Tax: $(A+B) \times 30\%$	\$3.45	\$3.00
D	Education Tax: $C \times 10\%$	\$0.35	\$0.00
E	Subtotal: $(A+B+C+D)$	\$15.30	\$13.30
F	Value Added Tax ^b : $E \times 10\%$	\$1.53	\$1.33
G	Handling fees for customs clearance ^c : $A \times 8\%$	\$0.80	\$0.80
H	Total cost of wine upon customs cleared: $(E+F+G)$	\$17.63	\$15.43
I	Typical Importer Mark-ups ^d :		
	1. Importer's selling price to discount store: 15-30%	\$18.52-20.93	\$16.22-18.33
	2. Importer's selling price to supermarket/liquor store: 40-50%	\$22.54-24.15	\$19.74-21.15
	3. Importer's selling price to luxury hotel: 40-50%	\$22.54-24.15	\$19.74-21.15
J	4. Importer's selling price to wholesaler: 15-30%	\$18.52-20.93	\$16.22-18.33
	Typical Retailer Mark-ups:		
	1. Discount store's selling price:	\$22.22-27.21	\$19.46-23.83
	2. Supermarket & liquor store's selling price: 30-40%	\$29.30-33.81	\$25.66-29.61
	3. Luxury hotel restaurant's selling price: 50-300%	\$33.81-96.60	\$29.61-84.60

^aOnce the KORUS FTA is implemented, import tariff on U.S. wine will go to zero percent immediately

^bThe paid Value-Added Tax (VAT) is eventually refunded to the importer as the tax is carried over the consumer.

^cIn addition to tariffs and taxes, additional fees of 7 to 8 percent of CIF value will occur for miscellaneous expenses, including customs clearance fees, warehousing fees, transportation fees, etc.

^dEach mark-up calculation is based on \$16.10, i.e., the customs cleared cost (H: \$17.63) minus the value added tax (F: \$1.53).

Footnote 2.

Dodd and Morse (1994) showed that the heightened health concerns have motivated increased wine consumption in South Korea. Stephens (2003) showed that many South Korean traditional dishes, such as *bulgogi* and *kimchi*, could be harmonious with full-bodied Cabernet Sauvignon and Merlot. Lee et. al (2005) identified specific preferences and characteristics of South Korean wine consumers according to gender, age, and experience.

Footnote 3.

$\pi_{j_k} = \frac{p_{j_k}}{w}$ is a normalized price of good k from source j , where p_{j_k} represents a nominal price of good k from source j and $w = \sum_j \sum_k p_{j_k} q_{j_k}$ represents total expenditure. $q_{j_k} = \frac{q_{j_k}^*}{\bar{q}_{j_k}}$ represents a normalized quantity, where $q_{j_k}^*$ represents import quantity of good k from source j and $\bar{q}_{j_k} = \frac{\sum_k q_{j_k}^*}{N}$ represents average import quantity of good k from source j .

Footnote 4.

For example, suppose we estimate an SDAIDS model for South Korean wine import demand for three types of wine, each imported from six sources. The SDAIDS model will include 20 parameters (18 own- and cross-price parameters, plus intercept and expenditure coefficient), to be estimated in each of the 18 equations for each type of source differentiated wine. When we consider the limited sample period of time, it can cause degree of freedom problem. This problem was solved by employing block substitutability and partial aggregate of white and sparkling wines by which the SDAIDS model reduce 11 own- and cross-price parameters.

Footnote 5.

The standard errors of the elasticities were calculated using the “Delta method”. For

example,

$$g(b) = \begin{bmatrix} -1 + \frac{\gamma_{i_{hh}}}{w_{i_h}} - \beta_{i_h} & \frac{\gamma_{i_{hk}}}{w_{i_h}} - \beta_{i_h} \left(\frac{w_{i_k}}{w_{i_h}} \right) & \frac{\gamma_{i_{hj}}}{w_{i_h}} - \beta_{i_h} \left(\frac{w_j}{w_{i_h}} \right) & 1 + \frac{\beta_{i_h}}{w_{i_h}} \end{bmatrix}$$

represents own-price elasticity in (7), two cross-price elasticities in (8) and (9), and expenditure elasticity in (10). The Delta method provides an asymptotic distribution of $g(b)$ and can be used for any asymptotically normal estimator.

$$g(b) \overset{a}{\sim} n(g(\beta), GVG') \quad , \quad \text{where} \quad V = a \text{cov}(b) \quad \text{and} \quad G = \frac{\partial g(\beta)}{\partial \beta'} \quad , \quad \text{where}$$

$$\beta = \begin{bmatrix} \gamma_{i_{hh}} & \gamma_{i_{hk}} & \gamma_{i_{hj}} & \beta_{i_h} \end{bmatrix}.$$

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Table 1. Summary Statistics for Quoterly Expenditure Shares of South Korean Wine Imports
for 2000 - 2008

Variable	Mean	Std. Dev.	Minimum	Maximum
Total				
United States	0.139228	0.040647	0.061959	0.233273
Italy	0.174817	0.031209	0.135002	0.253187
Chile	0.129547	0.078051	0.021433	0.254935
French	0.273676	0.070648	0.165568	0.435515
Australia	0.165628	0.035753	0.078314	0.226702
Other	0.117104	0.024774	0.067640	0.174944
Red Wine				
United States	0.135549	0.037672	0.059715	0.236243
Italy	0.194075	0.028562	0.147439	0.259471
Chile	0.125884	0.076597	0.023646	0.245287
French	0.278850	0.083941	0.162228	0.467678
Australia	0.172929	0.038400	0.078086	0.239968
Other	0.092713	0.029127	0.042880	0.157534
White Wine				
United States	0.156212	0.069715	0.042743	0.286728
Italy	0.142363	0.067147	0.062549	0.349494
Chile	0.146096	0.070504	0.013321	0.280668
French	0.265381	0.045311	0.179568	0.352160
Australia	0.146328	0.041049	0.061291	0.239909
Other	0.143620	0.034726	0.077324	0.218305

Table 2. Marshallian Elasticities of South Korean Wine Import Demand Using the Restricted AIDS Model

	Block Separable AIDS Model												Aggregated AIDS Model							
	Red						White													
	U.S.	Italy	Chile	French	Australia	Other	U.S.	Italy	Chile	French	Australia	Other	U.S.	Italy	Chile	French	Australia	Other		
Prus	-1.0073						-0.0021													
Pwus	-0.0058						-1.0027													
Prit		-1.0162						-0.0060												
Pwit		-0.0119						-1.0044												
Prch			-1.0112						-0.0290											
Pwch			-0.0121						-1.0312											
Prfr				-0.9802						0.0124										
Pwfr				0.0202						-0.9873										
Prau					-1.0232						-0.0251									
Pwau					-0.0197						-1.0212									
Prrw						-0.9993						-0.0091								
Pwrw						0.0011						-1.0145								
Pus		-0.0237	-0.0236	0.0206	-0.0375	0.0022		-0.0087	-0.0612	0.0129	-0.0405	-0.0272	-1.0068	-0.0146	-0.0132	0.0136	-0.0437	-0.0033		
Pit	-0.0196		-0.0297	0.0259	-0.0471	0.0027	-0.0057		-0.0768	0.0162	-0.0509	-0.0342	-0.0086	-1.0183	-0.0166	0.0170	-0.0549	-0.0042		
Pch	-0.0145	-0.0220		0.0192	-0.0349	0.0020	-0.0042	-0.0081		0.0120	-0.0377	-0.0254	-0.0063	-0.0136	-1.0123	0.0126	-0.0407	-0.0031		
Pfr	-0.0306	-0.0466	-0.0464		-0.0737	0.0042	-0.0090	-0.0172	-0.1202		-0.0796	-0.0536	-0.0134	-0.0287	-0.0259	-0.9734	-0.0859	-0.0065		
Pau	-0.0185	-0.0282	-0.0281	0.0246		0.0026	-0.0054	-0.0104	-0.0727	0.0154		-0.0324	-0.0081	-0.0174	-0.0157	0.0161	-1.0520	-0.0040		
Prw	-0.0131	-0.0199	-0.0199	0.0174	-0.0315		-0.0038	-0.0073	-0.0514	0.0109	-0.0341		-0.0057	-0.0123	-0.0111	0.0114	-0.0368	-1.0028		
Y	1.1120	1.1701	1.1697	0.8517	1.2692	0.9845	1.0327	1.0627	1.4392	0.9073	1.2910	1.1957	1.0490	1.1048	1.0948	0.9027	1.3140	1.0239		
System $R^2 =$.8802												System $R^2 =$.3274	

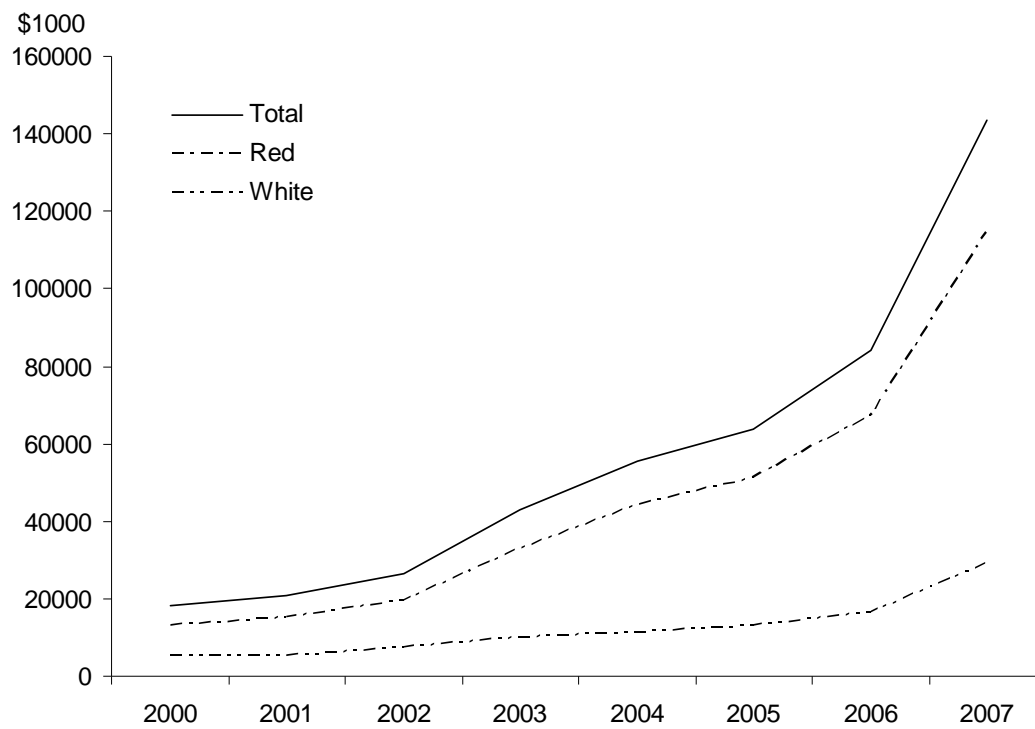


Figure 1. South Korean Wine Imports, 2000-2007

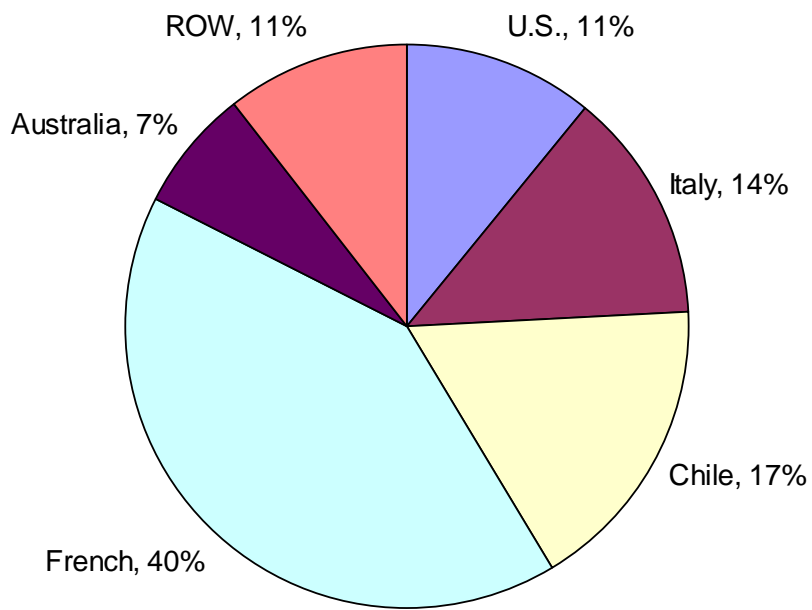


Figure 2. Imported Wine Market Shares in 2007

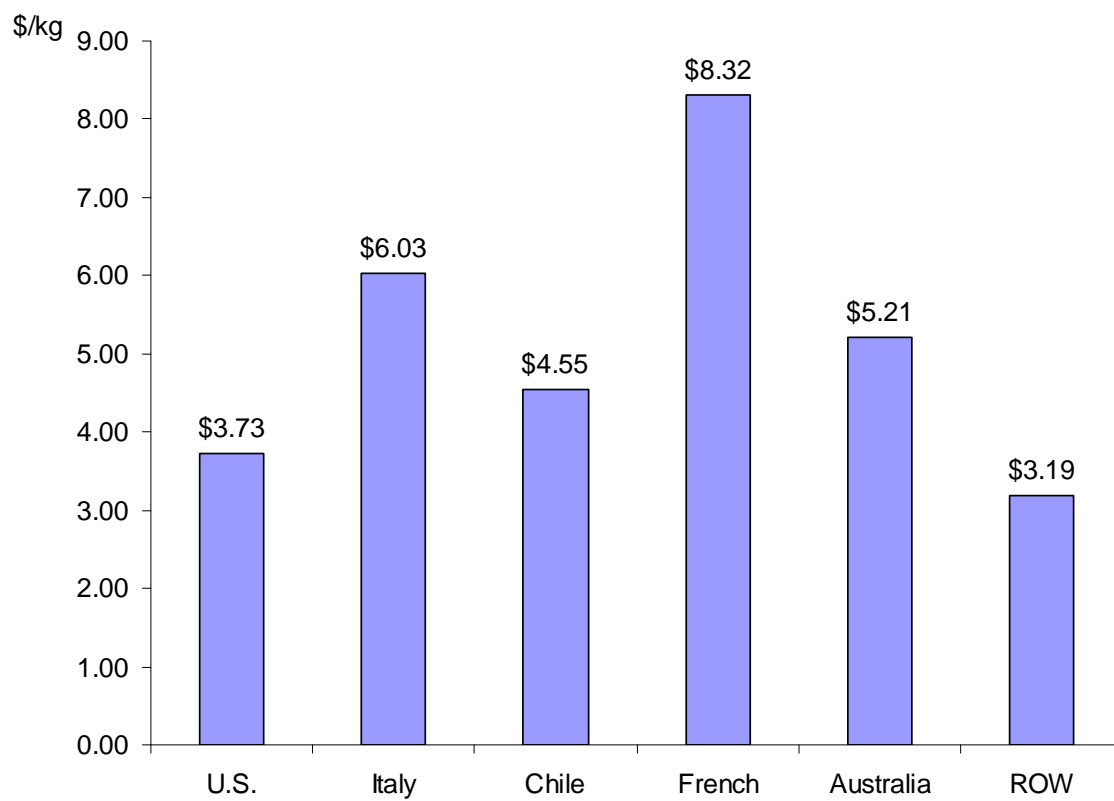


Figure 3. Imported Wine Prices in 2007