


SHORT PAPER

# The determinants of winery visitors for local wine and non-wine products in the Northern Appalachian states

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## Abstract

The development and expansion of wineries in Appalachian states in the United States over the past 20 years has received attention, while the study of non-wine product consumption in wineries has been very limited. Wineries increasingly include these non-wine products as complementary products in their marketing portfolio. This study analyzes the determinants of wine and non-wine spending among winery visitors in selected Northern Appalachian states, including Pennsylvania, Ohio, Kentucky, and Tennessee. We develop a market segmentation model and a random utility theory with an interval regression model. Results from 1,609 participants show that wine knowledge has a positive effect on local wine spending, and spending on non-wine products should not be underestimated for its overall contribution to the winery business. Our results suggest that wineries have the potential to boost store sales associated with non-wine products. Diversifying the product lines in wineries to include more non-wine products would be a useful marketing strategy.

**Keywords:** estimated consumer spending; non-wine products; purchasing behavior; winery

**JEL classifications:** L66; L83; Q13

## 1. Introduction

Visiting a winery is a unique way to learn about wine products and to enjoy the vineyard and winery setting. During the visit, visitors will not only buy wine products but also spend on food products and related amenities. The revenue of the winery comes not only from wine sales but also from non-wine product sales. According to the Wine Institute (2023), the average wine consumption in the United States has not changed much between 2012 and 2021, from 2.78 to 3.18 gallons per person in 2021. Global wine consumption also shows the same pattern (International Organization of Vine

and Wine, 2022). During the post-pandemic era, it is anticipated that wine consumers will continue to increase their winery visits as they resume their local food experiences without restrictions. Understanding the behaviors of winery visitors can help winery owners shape their business strategy. The knowledge about consumption of non-wine products in wineries is particularly limited, demonstrating the necessary steps to take to enhance the growth of these agritourism businesses.

## II. Literature review

Studies on wine demand have broadly focused on generation differences (Thach and Olsen, 2006), marketing strategy (Thach, 2009), local wine (Kolyesnikova, Dodd, and Duhan, 2008; Woods *et al.*, 2015; Farris *et al.*, 2019), behavior dynamics and sensory preferences (Bruwer, Saliba, and Miller, 2011), wine consumption and preference (Hussain, Cholette, and Castaldi, 2007; Stanco, Lerro, and Marotta, 2020; Gustavsen and Rickertsen, 2020), wine labels (Loureiro, 2003; Mueller *et al.*, 2010; Eustice, McCole, and Ruddy, 2019), wine knowledge (Gustafson, Lybbert, and Sumner, 2016), as well as health benefits of wine (Yoo *et al.*, 2013). These studies emphasize wine itself but do not mention much about the role of non-wine products in the context of direct purchases from wineries. Complementary non-wine products are often additionally offered by wineries and can include food products, vineyard tours, merchandise in wineries, and wine festivals. Some research has highlighted the importance of other factors production addition to wine that can influence the visitor's purchase motivation and decision, including engagement with regions, tourist preference, cellar visits, festivals and events, and societal stability, in sustaining the business and increasing future patronage (Gaetjens, Corsi, and Plewa, 2023; Gómez, Pratt, and Molina, 2019; Mitchell, Hall, and McIntosh, 2000; Gergaud, Livat, and Song, 2018). Wineries frequently provide tasting events and other wine promotions to attract visitors. Understanding the scale and determinants of non-wine purchases during winery visits showcases the potential for owners, marketers, and managers to promote business growth in wine hospitality.

## III. Data and empirical model

This study focuses on winery consumers in selected Northern Appalachian states, including Pennsylvania, Ohio, Kentucky, and Tennessee. All respondents were required to be 21 years old. A total of 1,609 wine consumers completed a survey of wine-related purchase experiences in September 2012. This dataset is the same as in Woods *et al.* (2015). The sampling method was managed by SurveyMonkey, Inc. Respondents self-identified as wine drinkers. This dataset uniquely explores both wine and non-wine expenditures, presenting an opportunity for better understanding their determinants with a view toward strategic merchandising. A limitation of these data is that they are self-reported purchase activities based on wine consumption and winery visit recall rather than winery intercept sales.<sup>1</sup> The analysis, however, provides insight into

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<sup>1</sup>We provide a comparison of our survey data and the regional population in Appendix Table A1. While there is certainly an overrepresentation of an older and higher proportion of white population in the collected

important purchasing patterns from venues where these data may be otherwise difficult to gather.

Following the market segmentation model adapted from the Hartman Organic Lifestyle Shopper Study 2000 (Hartman Group, 2000) and the framing of Wells and Haglock (2008), who segmented consumers of health and sustainable foods, wine consumers are segmented into Core (purchased wine at least once per week), Mid-level (at least once per month), and Periphery (at least once per year). Wine consumption frequency, local wine expenditure, winery purchase activity, and knowledge can then be analyzed by segment. A similar segmentation model is currently used by the Wine Market Council (McMillan, 2023). A random utility theory with interval regression models is to elicit the estimated consumer spending (ECS) for local wine monthly purchases<sup>2</sup> and non-wine products<sup>3</sup> in a winery visit. There are 24 independent variables used to explain the monthly average local wine ECS and non-wine product ECS in a winery visit. In order to decrease the hypothetical bias, the true ECS is assumed and can be observed by the latent variable  $y_i^*$ . The model can be set as Equation (1):

$$y_i^* = x_i' \beta + u_i \text{ and } y^* | x \sim \text{Normal}(x' \beta, \sigma^2) \quad (1)$$

where  $y_i = 1$  presents the range of ECS that is chosen by respondents,  $x_i$  represents the independent variables including social-demographic, consumer background, and wine preference,  $\beta$  exhibits the coefficient of the variable,  $u_i$  represents the error term, and the normal distribution is assumed in the interval regression. The empirical models of monthly average local wine ECS and non-wine product ECS are as follows:

$$\text{Local Wine} = y_{LW}^* = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \dots + \alpha_{24} X_{24} + \varepsilon \quad (2)$$

$$\text{Non\_Wine\_Products} = y_{NWP}^* = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_{24} X_{24} + \varepsilon \quad (3)$$

Thus, the ECS differences between local wine and non-wine products can be a potential indicator to winery owners of the relative magnitude and importance of the non-wine product business. A correlation of independent variables is performed and presented in Table 1. Most variables have low correlation, suggesting less concern for multicollinearity.

#### IV. Empirical results<sup>4</sup>

Wine consumers in different consumption frequency classes are expected to behave differently with respect to non-wine purchase behavior during a winery visit. In order

data, we would expect the results to be generalized with caution and it still provides a snapshot of regional preferences for winery visits and related products.

<sup>2</sup>First of all, respondents were asked to indicate whether they had tried local wine within the past 12 months. Once they answered “yes,” respondents were requested to indicate their average monthly expenditure on local wine during the past 12 months.

<sup>3</sup>Respondents were asked to indicate how much of their spending included non-wine products during the previous local winery visit.

<sup>4</sup>For our empirical results, we also tried several variants of the models for validity testing, while the thrust of the findings still holds. The results are in the Appendix, Tables A2–A5.

**Table 1.** Correlation matrix for independent variables

Variables (code)	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Male (A)	1.00											
Age (B)	0.14	1.00										
White (C)	0.00	0.19	1.00									
Income (unit:1000) (D)	0.05	0.04	0.08	1.00								
Have kids at home (E)	-0.08	-0.41	-0.12	0.02	1.00							
Urban (F)	0.02	-0.02	-0.10	0.11	0.00	1.00						
PA (G)	0.03	0.16	0.08	0.05	-0.10	0.01	1.00					
KV (H)	-0.04	-0.18	-0.06	-0.03	0.16	-0.12	-0.33	1.00				
TN (I)	-0.03	-0.11	-0.07	-0.02	0.06	0.01	-0.33	-0.33	1.00			
Wine drinker (J)	0.00	-0.08	-0.01	0.14	0.17	-0.04	-0.05	0.06	0.02	1.00		
Core (K)	0.01	-0.13	-0.09	0.12	0.11	0.08	-0.09	0.10	0.04	0.10	1.00	
Mid_level (L)	0.02	-0.04	-0.03	0.01	0.04	0.05	-0.06	0.00	0.09	0.05	-0.34	1.00
Food_channels (M)	-0.06	-0.14	-0.08	0.03	0.11	0.00	-0.05	0.06	0.05	0.06	0.09	0.07
Wine_Expert (N)	0.12	-0.04	-0.03	0.12	0.07	0.08	-0.05	0.04	0.05	0.10	0.23	0.09
Freq_visit_local_winery (O)	0.05	-0.10	0.00	0.06	0.08	-0.04	0.00	-0.02	0.04	0.13	0.17	0.05
Popular (\$4-7/bottle) (P)	-0.05	0.01	-0.02	-0.05	-0.01	-0.01	-0.08	0.04	-0.06	0.03	0.03	0.01
Super (\$7-14/bottle) (Q)	-0.03	-0.03	-0.02	0.05	0.01	0.05	-0.01	0.00	0.02	0.07	0.08	0.15
Ultra (\$14-25/bottle) (R)	0.01	-0.15	-0.03	0.12	0.13	0.06	-0.01	0.04	0.10	0.10	0.15	0.16
Luxury (>\$25) (S)	0.00	-0.18	-0.11	0.12	0.21	0.06	-0.04	0.09	0.06	0.10	0.24	0.07
White_wine (T)	-0.07	-0.04	-0.02	0.10	0.04	0.09	-0.04	0.00	0.06	0.09	0.12	0.08
Red_wine (U)	0.05	-0.02	-0.06	0.04	0.00	0.05	-0.03	0.01	0.09	0.08	0.14	0.18

(Continued)

Table 1. (Continued.)

Variables (code)	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Fruit_wine (V)	-0.10	-0.19	-0.10	-0.11	0.11	-0.09	-0.04	0.08	0.01	0.14	0.03	0.00
Sparkling (W)	-0.04	-0.15	-0.11	-0.07	0.08	-0.06	-0.05	0.07	0.03	0.10	0.08	-0.04
Sugar_content (dry/sweet) (X)	-0.13	-0.18	-0.04	-0.15	0.09	-0.11	-0.08	0.07	-0.02	0.09	-0.08	-0.09
Variables (code)	(M)	(N)	(O)	(P)	(Q)	(R)	(S)	(T)	(U)	(V)	(W)	(X)
Male (A)												
Age (B)												
White (C)												
Income (unit:1000) (D)												
Have kids at home (E)												
Urban (F)												
PA (G)												
KY (H)												
TN (I)												
Wine_drinker (J)												
Core (K)												
Mid_level (L)												
Food_channels (M)	1.00											
Wine_Expert (N)	0.09	1.00										

(Continued)

Table 1. (Continued.)

Variables (code)	(M)	(N)	(O)	(P)	(Q)	(R)	(S)	(T)	(U)	(V)	(W)	(X)
Freq_visit_local_winery (O)	0.11	0.22	1.00									
Popular (\$4-7/bottle) (P)	0.01	-0.02	0.00	1.00								
Super (\$7-14/bottle) (Q)	0.07	0.07	0.12	0.11	1.00							
Ultra (\$14-25/bottle) (R)	0.13	0.21	0.17	-0.28	0.16	1.00						
Luxury (> \$25) (S)	0.15	0.24	0.15	-0.10	-0.05	0.42	1.00					
White_wine (T)	0.08	0.11	0.11	0.09	0.12	0.10	0.10	1.00				
Red_wine (U)	0.05	0.23	0.12	0.00	0.11	0.17	0.13	-0.06	1.00			
Fruit_wine (V)	0.06	-0.01	0.19	0.05	0.05	0.03	0.07	-0.03	-0.02	1.00		
Sparkling (W)	0.05	0.03	0.16	0.04	0.07	0.03	0.11	0.04	-0.02	0.74	1.00	
Sugar_content (dry/sweet) (X)	-0.01	-0.16	0.00	0.07	-0.03	-0.09	-0.05	-0.04	-0.15	0.43	0.27	1.00

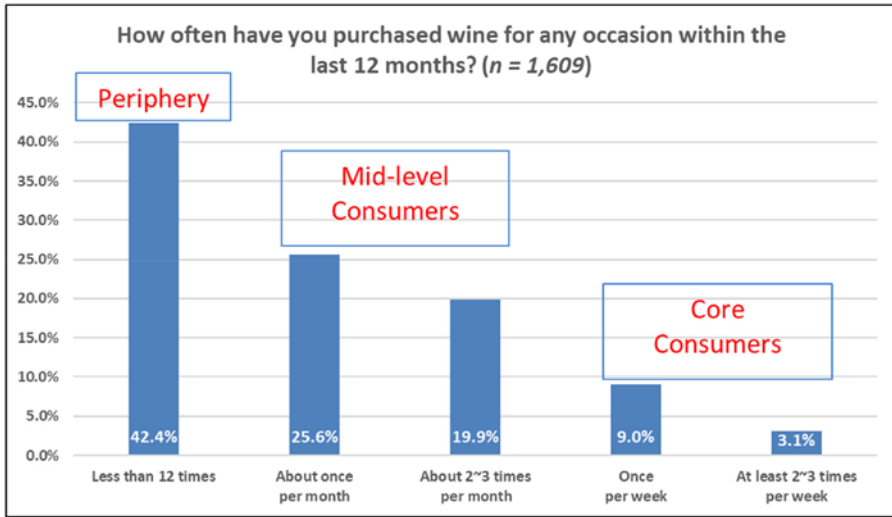
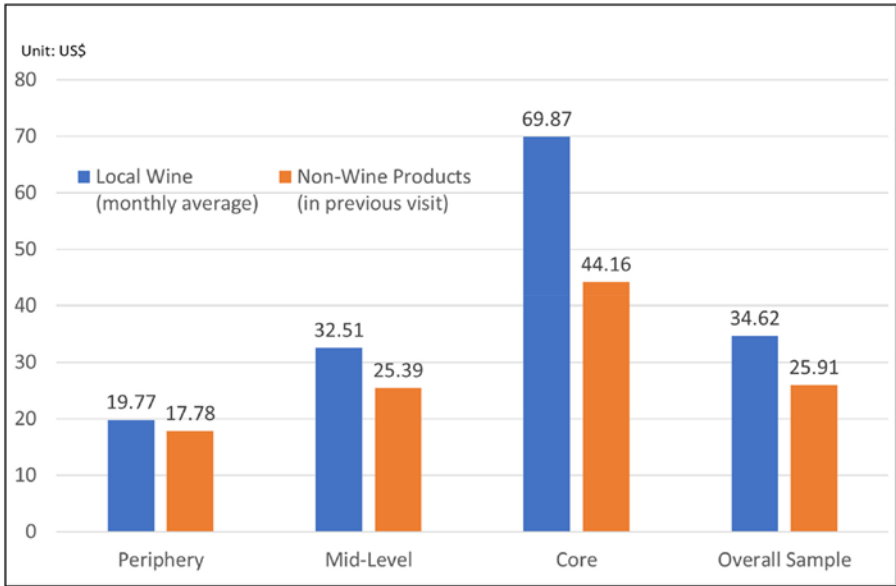


Figure 1. The definition of wine consumers based on the frequency of wine consumption.

to define the wine consumer via the market segmentation model, three consumer groups, that is, core consumers, mid-level consumers, and periphery consumers, are identified based on the frequency of their wine purchasing in a year. Results in Figure 1 show that the core consumers (about 12.1% of total respondents in the region) drink wine more than 52 times in a year; mid-level consumers (about 45.5%) roughly drink wine about 12 to 52 times in a year; and periphery consumers (about 42.4%) drink wine less than 12 times in a year. In other words, more than half of consumers in the region at least drink wine once per month.

The spending between local wine and non-wine products is further compared based on the market segmentation model. Figure 2 shows that core consumers on a monthly average spent about \$69.87 for local wine, which is about two times higher than the overall monthly average of \$34.62. Meanwhile, core consumers spent, on average, about \$44.16 on non-wine products at their last winery visit. Recognizing the nominal differences in wine and non-wine products across segments, it is helpful to explore ECS potential determinants to better understand marginal effects based on the model specification.

The definitions and sample statistics of variables are presented in Table 2. Only a partial share of wine consumers from the region ( $n = 627$ ) reported buying local wine from all retail sources at an average of \$34.62 monthly. Of those respondents who indicated having visited a local winery within the past 12 months ( $n = 712$ ), they reported purchasing an average of \$25.91 for non-wine products in their previous visit. These two groups are not fully identical since not all respondents who have spent on non-wine products have purchased local wine before. Most respondents in this study overall (all wine consumers in the region) are female (about 69%), and the average age of respondents is about 52 years old. Most respondents are white. The annual average income of respondents is \$67,340. Roughly 63% of respondents are urban residents. About 76% of respondents watch a food channel. Respondents indicated that, on average, they visited



**Figure 2.** The spending comparison between local wine and non-wine products.

a local winery about 1.26 times in the past three years. Average bottle prices purchased indicate that respondents most frequently purchase in the Super (\$7–\$14/bottle) wine category (71%). Among the types of wine, most respondents (52%) buy red wine. In terms of sugar content (dry/sweet), respondents prefer dry and sweet approximately equally.

The ECS for local wine and non-wine products interval regression model is estimated and presented in [Table 3](#). Results show that these two models received valid outcomes from the Likelihood Ratio (LR)  $\chi^2$  test. The estimated parameters in the interval regression model reflect the actual value of spending in U.S. dollars. Regarding the monthly average ECS of local wine, respondents who are from Pennsylvania, have more wine drinkers in a household, represent core and mid-level wine consumers, are wine experts, more frequently visit local wineries, prefer to buy Luxury wine, and prefer more sweet wine are more likely to report a higher average monthly spending for local wine. Interestingly, respondents who self-rated themselves as wine experts (i.e., above average and expert level) have significantly higher local wine spending compared to those who report a lower wine knowledge level in the region. Johnson and Bastian (2007) also point out that wine knowledge is an important expenditure indicator for wine generally. This study extends this outcome, suggesting that consumers with higher wine knowledge spend more specifically on local wine.

The ECS for non-wine products uses similar determinants to explore marginal effect but points to different spending relationships. Male respondents with higher income, respondents that have kids at home, are from Pennsylvania and Ohio, are from an urban area, include more wine drinkers in a household, are core consumers, those who watch food channels, identify as wine experts, more frequently visited local wineries,



Table 2. Definitions and sample statistics of independent variables ( $n = 1,609$ )

Variables	Description of variables	Mean	Std. dev.	Min.	Max.
Local wine spending	Continuous variable; the monthly average expenditure for those who buy local wine ( $n = 627$ ).	34.62	71.48	0	900
Non-wine product spending	Continuous variable; the average non-wine product spending in a visit in local winery ( $n = 712$ ).	25.91	27.66	0	115
Male	Binary variable=1 if respondent is male.	0.31	0.46	0	1
Age	Continuous variable; year of age.	51.80	14.29	21	82
White	Binary variable=1 if respondent's race is white.	0.90	0.29	0	1
Income	Continuous variable; total yearly household income before tax (unit: US\$1,000).	67.34	41.12	7.5	225
Have kids at home	Binary variable=1 if respondent has kids under 18 at home.	0.27	0.44	0	1
Urban	Binary variable=1 if respondent is from urban (including city and suburb).	0.63	0.48	0	1
PA	Binary variable=1 if respondent is from Pennsylvania.	0.25	0.43	0	1
KY	Binary variable=1 if respondent is from Kentucky.	0.25	0.43	0	1
TN	Binary variable=1 if respondent is from Tennessee.	0.25	0.43	0	1
OH	Binary variable=1 if respondent is from Ohio (Reference group).	0.25	0.43	0	1
Wine drinker	Discrete variable; numbers of wine drinkers in a household.	1.78	0.70	1	6
Core	Binary variable=1 if respondent has purchased wine for any occasion within the last 12 months at least once per week.	0.12	0.32	0	1
Mid_level	Binary variable=1 if respondent has purchased wine for any occasion within the last 12 months at least once per month.	0.46	0.49	0	1
Periphery	Binary variable=1 if respondent has purchased wine for any occasion within the last 12 months less than 12 times in a year (Reference group).	0.42	0.49	0	1
Food_channel	Binary variable=1 if respondent watches the food channel or similar programs.	0.76	0.42	0	1
Wine_Expert	Binary variable=1 if respondent rates their wine knowledge as "above average" and "expert" levels.	0.12	0.33	0	1

(Continued)

Table 2. (Continued.)

Variables	Description of variables	Mean	Std. dev.	Min.	Max.
<i>Freq_visit_local_winery</i>	Discrete variable; the frequency of respondents visiting local winery within the past 3 years.	1.26	1.82	0	6
<i>Popular (\$4–7/bottle)</i>	Binary variable=1 if respondent purchases Popular wine (\$4–\$7/bottle) at the frequency of sometimes and often.	0.50	0.50	0	1
<i>Super (\$7–14/bottle)</i>	Binary variable=1 if respondent purchases Super wine (\$7–\$14/bottle) at the frequency of sometimes and often.	0.71	0.45	0	1
<i>Ultra (\$14–25/bottle)</i>	Binary variable=1 if respondent purchases Ultra wine (\$14–\$25/bottle) at the frequency of sometimes and often.	0.43	0.49	0	1
<i>Luxury (&gt;\$25/bottle)</i>	Binary variable=1 if respondent purchases Luxury wine (over \$25/bottle) at the frequency of sometimes and often.	0.16	0.36	0	1
<i>White_wine</i>	Binary variable=1 if respondent purchases white wine at the frequency of often and always.	0.43	0.49	0	1
<i>Red_wine</i>	Binary variable=1 if respondent purchases red wine at the frequency of often and always.	0.52	0.49	0	1
<i>Fruit_wine</i>	Binary variable=1 if respondent purchases fruit wine at the frequency of often and always.	0.33	0.47	0	1
<i>Sparkling</i>	Binary variable=1 if respondent purchases sparkling at the frequency of often and always.	0.24	0.43	0	1
<i>Sugar_content (dry/sweet)</i>	Discrete variable; the respondent's wine preference of sugar content from very dry (1) to very sweet (5).	3.10	1.10	1	5

**Table 3.** The ECS for local wine and non-wine products

Interval regression model		Local wine spending	Non-wine product spending	Mean or assumed values	Local wine ECS	Non-wine product ECS
		Coefficient	Coefficient			
Socio-demographic	Male	0.851	9.741***	1		9.74
	Age	0.065	-0.011	52.80		
	White	1.206	-5.085	1		
	Income	-0.030	0.083***	67.34		5.60
	Have kids at home	-0.089	7.259***	1		7.26
	Urban	-0.243	5.351**	1		5.35
	PA	6.750**	6.599**	1	6.75	6.60
	KY	3.860	-4.784	1		
	TN	3.974	-5.591*	1		-5.59
Consumer background	Wine_drinker	5.858***	2.973*	1	5.86	2.97
	Core	13.367***	10.612***	1	13.37	10.61
	Mid_level	7.620***	1.402	1	7.62	
	Food_channels	1.614	6.830**	1		6.83
	Wine_Expert	6.116*	6.760**	1	6.12	6.76
	Freq_visit_local_winery	4.170***	1.892***	1.26	5.25	2.38
Wine preference	Popular (\$4-7/bottle)	-1.646	5.524**	1		5.52
	Super (\$7-14/bottle)	3.241	-4.271	1		
	Ultra (\$14-25/bottle)	2.467	2.526	1		
	Luxury (>\$25/bottle)	12.413***	17.153***	1	12.41	17.15
	White_wine	-1.392	-0.381	1		
	Red_wine	-2.817	1.036	1		
	Fruit_wine	3.672	-4.586	1		
	Sparkling	-1.330	6.632*	1		6.63
	Sugar_content (dry/sweet)	2.624**	1.886*	3.10	8.13	5.85

(Continued)

**Table 3.** (Continued.)

Interval regression model	Local wine spending	Non-wine product spending	Mean or assumed values	Local wine ECS	Non-wine product ECS
	Coefficient	Coefficient			
Constant	-23.268**	-17.483*	1	-23.27	-17.48
Number of observations	627	712	Total ECS		76.19
LR $\chi^2$	175.63***	231.05***			

Note: Asterisks indicate levels of significance: \* = 0.10, \*\* = 0.05, and \*\*\* = 0.01.

preferred to buy Popular (\$4–7/bottle) and Luxury (>\$25/bottle) sparkling wine, and preferred more sweet wine are more likely to spend more money at wineries for non-wine products. It is interesting to see that male consumers' spending on non-wine products is positive, especially where it is not significant in local wine purchases. Other variables, that is, income, have kids at home, urban, food channels, Popular (\$4–7/bottle), and sparkling, are also important for the ECS of non-wine products and reflect different impacts on non-wine purchases compared to local wine. These characteristics identify a distinct consumer group, indicating a positive tendency toward non-wine products, and would justify a potentially different approach to the marketing of these products.

These non-wine purchases provide a strong indication that there are heterogeneous preferences around both local wine and non-wine purchase activities that need to be considered for wineries. The ECS of non-wine products is difficult to elicit since most respondents can remember how much they spent on non-wine products in their previous visit rather than their monthly or yearly total spending. Although the aggregated ECS of non-wine products can be calculated in this study, the \$76.19 should be used with caution. It implies that preferences and spending are likely to be highly heterogeneous, depending on the visitors. There may likely be helpful corresponding marketing strategies that could subsequently be effective in raising non-wine spending.

## V. Conclusion

The development of wineries in these Northern Appalachian states has increased significantly over the past 20 years. The COVID-19 pandemic issue further impacted the U.S. winery industry, especially with respect to consumption and tourism (Good, 2020). This study attempts to present the potential product and segmented marketing opportunities for winery businesses after the COVID-19 crisis. Studies related to wine and winery expenditures in the period post COVID-19 are still limited. This research provides a strong argument for the significance of non-wine expenditures likely being realized by wineries as part of their overall revenue and suggests a need for understanding the level and determinants of both wine and non-wine products.

Wineries are not the only place for buying and tasting wine but are also a unique place for enjoying other non-wine products, such as food products, entertainment, winery tours, and related merchandise. Results show that about 12% of wine consumers

in this region are core consumers (i.e., drinking wine more than 52 times in a year), about 46% of respondents are mid-level consumers (i.e., drinking wine about 12–52 times in a year), and about 42% of respondents are periphery consumers (i.e., drinking wine less than 12 times in a year). Further, the core consumers have the highest ECS for local wine and non-wine products in their winery visits. It implies that core consumers should be targeted by local wineries for both kinds of products.

The ECS on non-wine products is notably different in magnitude and factors. This notable difference is based on the model specification. It significantly points out that the non-wine products in wineries should be heavily paid attention to since consumers are willing to spend more dollars on non-wine products during their visit. Among those individual indicators for non-wine products, some factors with higher ECS should be given more attention for strategic merchandising, such as male consumers with higher wine knowledge and a higher frequency of drinking wine and consumers who sometimes and often buy Luxury wine (>\$25/bottle). In addition to the monthly average ECS of local wine, some factors with higher ECS are those who have a higher frequency of drinking wine, higher wine knowledge, and who sometimes and often buy Luxury wine (>\$25/bottle). During this post-pandemic era, the market is opening up, and consumers are more likely to visit wineries. It is highly suggested that wineries explore more varieties of products and services that can potentially increase their sales. Particularly, these indicate that frequent wine drinkers, those with higher wine knowledge, and Luxury wine buyers are the potential consumers of local wine and non-wine products in local wineries.

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## Appendix

**Table A1.** Sampling comparison with census reports

	Median age		White population (%)	
	Census reports, 2012 (whole population)	Sampling (at least 21 or more)	Census reports, 2012 (whole population)	Sampling (at least 21 or more)
PA	40.5	59	82	95
OH	39.3	57	83	93
KY	38.4	49	88	87
TN	38.2	51	78	87
Average	39.1	54	83	90

Source: ProximityOne (2012).

**Table A2.** Interval regression results of local wine WTP based on each state

Local wine WTP		PA	OH	KY	TN
Interval regression model		coefficient	coefficient	coefficient	coefficient
Socio-demographic	Male	3.144	-3.091	-1.459	12.512**
	Age	0.292	-0.021	0.058	-0.200
	White	-21.598*	-4.464	-4.716	33.376***
	Income (unit:1000)	-0.064	-0.009	-0.052	0.065
	Have kids at home	-10.508*	-5.400	-2.914	15.004***
	Urban	6.632	-3.490	-3.027	-4.443
Consumer background	Wine_drinker	4.008	6.073**	7.374**	7.247**
	Core	30.710***	2.128	8.430	9.745
	Mid_level	9.034*	6.654	5.696	1.027
	Food_channels	-3.797	0.804	2.995	10.468
	Wine_Expert	5.451	11.046**	1.517	4.358
	Freq_visit_local_winery	3.969***	3.388***	5.396***	4.535***
Wine preference	Popular (\$4-7/bottle)	-0.537	0.998	-2.859	-5.937
	Super (\$7-14/bottle)	-14.524**	7.830	11.526*	9.658*
	Ultra (\$14-25/bottle)	9.800*	4.125	7.537	-7.385
	Luxury (>\$25)	7.628	-2.770	19.699***	9.501
	White_wine	4.393	-9.371**	1.746	4.788
	Red_wine	-4.162	0.499	-6.783	1.459
	Fruit_wine	4.170	-3.957	3.331	9.833
	Sparkling	-1.286	8.160	-4.583	-9.588
	Sugar_content (dry/sweet)	4.350*	3.878*	-3.284	3.844
Constant	1.210	-12.336	-2.947	-60.512***	
/Insigma	3.265***	3.074***	3.270***	3.171***	
Number of observations	155	167	175	130	
LR $\chi^2$	55.54***	52.21***	71.82***	77.02***	
Log-Likelihood	-301.57	-285.12	-314.13	-232.68	

Note: Asterisks indicate levels of significance: \* = 0.10, \*\* = 0.05, and \*\*\* = 0.01.

**Table A3.** Interval regression results of non-wine products WTP based on each state

Non-wine products WTP		PA	OH	KY	TN
Interval regression model		coefficient	coefficient	coefficient	coefficient
Socio-demographic	Male	13.995***	8.779*	9.024*	6.917
	Age	-0.060	-0.080	0.179	0.075
	White	-12.538	-3.142	-11.914*	0.825
	Income (unit:1000)	0.024	0.095	0.164***	0.056
	Have kids at home	-5.079	6.865	7.980	18.118***
	Urban	7.715**	10.244**	0.348	5.928
Consumer background	Wine_drinker	3.840	1.827	0.752	5.632*
	Core	12.561**	5.591	22.602**	5.269
	Mid_level	3.167	1.979	2.931	3.439
	Food_channels	8.259**	4.849	6.059	14.943**
	Wine_Expert	3.306	7.206	13.587**	-1.396
	Freq_visit_local_winery	1.968**	1.822	0.142	3.683***
Wine preference	Popular (\$4-7/bottle)	2.079	1.959	11.601**	3.994
	Super (\$7-14/bottle)	-2.664	0.874	-2.164	-11.219**
	Ultra (\$14-25/bottle)	1.525	2.012	0.305	6.483
	Luxury (>\$25)	4.437	2.861	19.199***	27.638***
	White_wine	-4.806	-0.886	6.029	-4.987
	Red_wine	-6.847**	-2.922	2.212	8.582
	Fruit_wine	5.441	-3.895	1.614	-20.458**
	Sparkling	-1.522	6.421	-1.182	18.028**
	Sugar_content (dry/sweet)	0.771	-1.321	2.960	4.073
Constant	9.842	-3.174	-35.709*	-56.297***	
/lnsigma	2.934***	3.287***	3.332***	3.378***	
Number of observations	180	172	170	190	
LR $\chi^2$	58.16	25.61	90.81***	102.09***	
Log-Likelihood	-242.86	-248.76	-236.38	-253.06	

Note: Asterisks indicate levels of significance: \* = 0.10, \*\* = 0.05, and \*\*\* = 0.01.



**Table A4.** The SUR model results for local wine and non-wine products WTP

		Local wine WTP	Non-wine product WTP
SUR model		coefficient	coefficient
Socio-demographic	Male	6.249	10.173***
	Age	-0.167	0.026
	White	12.684	-3.237
	Income (unit:1000)	-0.045	0.080***
	Have kids at home	-0.083	4.908*
	Urban	-0.924	2.974
	PA	16.323*	0.892
	KY	-0.036	-2.107
	TN	8.722	-1.435
Consumer background	Wine_drinker	19.604***	2.155
	Core	16.150	13.205***
	Mid_level	3.875	2.432
	Food_channels	-0.684	4.070
	Wine_Expert	27.027***	6.500**
	Freq_visit_local_winery	4.615***	0.706
	Constant	-48.310*	-15.121
Wine preference	Popular (\$4-7/bottle)	-9.309	4.864**
	Super (\$7-14/bottle)	-0.579	-2.458
	Ultra (\$14-25/bottle)	-8.460	3.097
	Luxury (>\$25)	36.350***	14.896***
	White_wine	2.794	-0.389
	Red_wine	-3.036	2.144
	Fruit_wine	0.867	-6.788*
	Sparkling	10.628	8.768**
	Sugar_content (dry/sweet)	4.543	3.428***
	Constant	-48.310*	-15.121
Number of observations	482	482	
$\chi^2$	133.42***	235.59***	
RMSE	62.667	23.593	
Log-Likelihood	-4,883.33		

Note: Asterisks indicate levels of significance: \* = 0.10, \*\* = 0.05, and \*\*\* = 0.01.

**Table A5.** The OLS model testing for ratio of local wine and non-wine products WTP

	OLS regression	Ratio of local wine/non-wine product WTP
		coefficient
Socio-demographic	Male	0.448*
	Age	-0.000
	White	-0.096
	Income (unit:1000)	0.007**
	Have kids at home	0.175
	Urban	0.248
	PA	-0.217
	KY	-0.209
	TN	-0.715**
Consumer background	Wine_drinker	-0.053
	Core	-0.108
	Mid_level	-0.512*
	Food_channels	0.087
	Wine_Expert	0.452
	Freq_visit_local_winery	-0.071
Wine preference	Popular (\$4-7/bottle)	0.474*
	Super (\$7-14/bottle)	0.311
	Ultra (\$14-25/bottle)	-0.030
	Luxury (>\$25)	0.216
	White_wine	-0.122
	Red_wine	0.082
	Fruit_wine	-0.172
	Sparkling	0.134
	Sugar_content (dry/sweet)	0.057
	Constant	0.909
Number of observations	441	
F value	1.50*	
Adj. R <sup>2</sup>	0.026	

Note: Asterisks indicate levels of significance: \* = 0.10, \*\* = 0.05, and \*\*\* = 0.01.