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Consumer Perceptions of Wine Quality Assurance Programs: An Opportunity for Emerging Wine Markets

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Abstract: Quality assurance programs (QAPs) may add value to wines through reassuring consumers of wine quality prior to purchase and consumption. In Tennessee, the potential to use a wine QAP is being explored as a means to improve the industry's economic sustainability. To date, several QAPs exist, but studies directly related to their impact on consumer behavior for wines from emerging areas are scarce. We used an online survey instrument to elicit consumer perceptions of QAPs importance on wine purchasing decisions and how the presence of a QAP may impact their purchasing behavior for a wine from an emerging area (e.g., Tennessee). Wine involvement, QAP perceptions, and familiarity were also measured. A mixed-process model was used to estimate the two ordered probit models for importance of QAPs and the influence of QAPs on Tennessee wine purchases, where QAP importance was treated as a latent variable influencing Tennessee wine purchases. Ordinal probit estimates suggest that greater on-site spending and greater perceived benefits of QAPs (as indicators of quality and standardization) resulted in a higher probability of perceived QAP importance when making wine purchasing decisions. Reduced form estimates of the model of Tennessee wine purchases indicated distance to wine producing areas, female gender, and familiarity with Tennessee wines each negatively influenced the potential impact of QAPs on Tennessee wine purchases. However, on-site spending at wineries and perceived benefits of a Tennessee QAP increased likelihood of Tennessee wine purchases.

Keywords: familiarity; mixed-process model; ordered probit; purchase likelihood; Tennessee wine; wine involvement

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1. Introduction

In recent years, Tennessee's grape and wine industries have experienced substantial growth. In 2017, Tennessee had 462 grape farms with a cumulative 959 acres and 747 bearing acres, which is twice the 2007 acreage [1]. The majority of those farms supply grapes to Tennessee's 68 wineries. The growth in Tennessee's wine and grape industry is of particular importance given that approximately 60% of the industry is in rural areas [2], meaning the industry has potential to aid sustainability in rural communities through increased job opportunities and economic resources. As a result, greater consumer interest in Tennessee wines could benefit the industry through enhanced economic sustainability and rural communities through direct and indirect job and revenue generation, additional business activity, and increased agritourism visits. Often rural wineries serve smaller, local markets and Tennessee wineries are no exception. For example, only 9 out of 68 wineries (~13%) have wholesale licenses, indicating most Tennessee wines are sold through agritourism and direct-to-consumer channels [3]. The Tennessee Farm Wine Growers Alliance estimates that 58% of Tennessee wineries produce less than 5000 gallons per year [3]. Estimates show that 5000 gallons of wine needs to be produced within a given year for a winery to be profitable [4,5]. Given their rural location, small scale production, and dependence on agritourism, Tennessee wineries face unique challenges in attracting

and informing consumers about their products that are not observed in larger, well-known production areas.

A quality assurance program (QAP) may be a means of increasing consumer interest in Tennessee wines. QAPs signal a product's quality to end consumers through intrinsic and extrinsic attributes [6–8]. Origin has been identified as a key quality indicator, where wines from certain origins are perceived as superior to wines from other areas [9–12]. However, when an area is not well known for wine, how does the presence of a QAP impact purchasing behavior? Does it have a positive impact (such as reducing perceptions of risk and uncertainty)? Or does it have a negative impact (e.g., increased prices and consumer skepticism) [6,8]? Do other consumer factors (e.g., spending, involvement) impact these results? We do not know. Though Lim and Reed suggest QAPs could have a positive impact on consumer behavior, especially if the quality certification is tied to wine producing areas that are less known to consumers, such as Tennessee [13].

There is potential to use QAPs to build a local wine market and improve sustainability of local wineries; however, little evidence exists on how consumers may respond to QAPs on local wines from lesser-known wine-producing regions. The Tennessee wine industry is an example of an emerging wine market where QAPs are not currently used and the industry primarily consists of on-site direct-to-consumer sales in rural communities [1]. Improving consumer interest in Tennessee wines is one means of encouraging local wine purchases. In turn, increased local wine purchases can potentially bolster firm profits and aid the wine industry's economic sustainability. A vibrant local wine industry has the potential to improve rural communities' economic resources by drawing in tourists and related tourism expenditures [1,2,14]. Therefore, results from this study may be applicable to other wine industry stakeholders in similar situations, particularly those in emerging, lesser-known wine industries. This research study provides results that can address the knowledge gap regarding the effects of QAPs on consumer preferences for locally produced wines in lesser-known wine markets. In turn, these results can inform wine industry stakeholders' decision making as they consider whether to develop, implement, and use a QAP in their own wine marketing systems. Thus, the main contribution of this research is to address the relationship between consumers' QAP perceptions and how that influences their subsequent purchasing behavior for wines from lesser-known areas. The next section briefly reviews relevant literature and presents the hypotheses, followed by the experimental methods, econometric analysis, results, and then a conclusion.

1.1. Quality Assurance Programs

QAPs signal product quality to consumers, which reduces their risks when selecting a product to purchase [15,16]. QAPs may be extrinsic cues (e.g., origin, expert ratings, etc.) or intrinsic characteristics (e.g., aroma, taste, smell, etc.) and can be used to build a collective reputation in emerging markets and generate premiums for wines. For example, Babin and Bushardt (2018) determined that for each wine quality rating point increase, there was a $3 to $4 price increase for the rated wines [6]. Another example is the Association of German Quality Wine Estates (VDP), which represents 90 percent of Germany's wine-growers and also represents 90 percent of the top-rated German wines [17]. Members in this group generate a premium of €15.30 when compared to non-members. These findings highlight the potential to use a QAP to generate a premium for wines and improve economic sustainability for participating wineries.

In the wine industry, QAPs are often origin dependent. Examples include the American Viticultural Areas (AVAs) in the U.S. [18], the Vintners Quality Alliance (VQA) in Canada [19], and the Association of German Quality Wine Estates (VDP) in Germany [17]. QAPs' connection to origin information aligns with the consumer behavior literature. Often consumer perceptions of wines are strongly influenced by origin information, which impacts their purchasing behavior [9,20–23]. Many studies demonstrate strong regional preferences [24–26], which are amplified if the region is the consumer's own [26] or a region known for wine [27]. Additionally, several studies show the positive correlation

between wine sales and origin information [9]. Johnson and Bruwer found that origin is the most important quality indicator when comparing several California wine regions [10]. Lim and Reed (2020) determined that origin information and eco-labels generate higher premiums on wines, an effect that is amplified for wines from lesser-known areas (such as Tennessee) [13]. When considering the AVAs in the U.S., evidence suggests these labels improve consumer preferences for wine when compared to state labels [18]. However, state labels are more appropriate when pursuing a local market [18].

The importance of a QAP may also be related to consumers' wine familiarity and consumption behavior. Di Vita et al. found that Italian wine consumption determinants changed by the wine quality rating, where increased consumption decreased the importance of the QAPs [28]. Interestingly, consumers who buy wine directly from the producer (i.e., on-site) were not interested in a QAP on the wine. The authors suggest a QAP may increase producer and consumer costs, which negatively impacts sales. Additionally, the reputation of the producer paired with the consumers' previous experiences with that wine may make a QAP unnecessary. Conflicting evidence was found by Kallas et al., who identified Spanish consumers' wine involvement and purchase frequency as positively impacting wine prices when used with origin information or greater familiarity with the wine [24]. Although somewhat contradictory, both studies highlight that QAPs have an impact on consumer behavior towards wines from well-known wine producing areas (Italy, Spain). The influence of QAPs on consumer behavior toward emerging wine areas is less understood and may encourage consumers to try new wines from emerging markets.

Currently, consumer perceptions of Tennessee wine are not well understood. Two studies address consumer preferences for Tennessee wine [29,30]. They demonstrate a positive relationship between consumers' increased valuation of Tennessee wine and winery visits, local food preferences, and interest in muscadine wines [23,29]. Shopping at a winery versus other retail outlets also improves participants' preferences for Tennessee wine [31]. Neither study addressed the influence of a QAP on consumer preferences for Tennessee wines. However, consumers are interested in QAPs and other extrinsic cues on wines [11,20,31]. The inclusion of these attributes in marketing Tennessee wines and how they influence consumer choices has not been addressed but may aid Tennessee wineries in reaching and engaging existing and new consumer groups. This research addresses consumer perceptions of QAPs on emerging wine areas, specifically wines produced in Tennessee.

1.2. Objectives

Given that origin information strongly impacts consumer perceptions of and preferences for wines, the potential impact of QAPs may vary depending upon where the wine is produced [9,20–22]. However, in emerging production areas, the reputation of the wines/wineries among consumers may not be well known and, consequently, purchasing behaviors may be impacted [7,10,11,17]. QAPs may reduce consumers' potential risks associated with purchasing an unknown wine or wine from an unknown winery or area [14,16]. To date, studies addressing consumer perceptions of Tennessee's wine industry are limited and focus primarily on wine attributes (e.g., sweetness, color, etc.), local preferences, and retailer preferences [29,30]. However, they do suggest consumers perceive Tennessee wines positively and are willing to pay premiums for those wines. Pairing the strong influence of origin on consumer preferences for wines and the limited amount of information on consumer preferences for Tennessee wines, the overall objective of this research is to provide estimates of how consumer demographics and perceptions influence the importance of QAPs in making their wine choice purchases, and more specifically the effect on purchases of local (Tennessee) wines. These estimates can inform an emerging regional (Tennessee) wine industry's decision of whether to adopt a QAP.

Under this objective, we propose two hypotheses. Since QAPs are designed to reduce risk [14,16] and consumer perceptions can influence purchasing decisions for wines [10,26], we propose the following hypothesis.

Hypothesis 1 (H1). *Consumer's perceived benefits of QAPs will positively impact the importance of QAPs' information on wines (H_1).*

If supported, Hypothesis 1 would suggest the importance of informing consumers about QAPs and what it entails in order to build a reputation and positively impact consumers' perceptions of that program and the associated wines.

Although understanding the factors that impact the perceived importance of QAPs is important, ultimately, we want to identify those that impact purchasing behavior. Specifically, does the presence of a QAP increase or decrease consumers' purchase likelihood for a wine from an emerging area? To address this research question, we postulate a second hypothesis.

Hypothesis 2 (H2). *Consumers' attitudes about the importance of QAPs will positively influence their use of QAPs when purchasing local wines (H_2).*

In general, emerging markets are riskier to consumers given their lack of familiarity/exposure [14,16,18]. If a QAP encourages the purchasing of wines from those markets (if hypothesis 2 is supported), this would support the development and use of a QAP in emerging markets.

2. Materials and Methods

An online survey was used to elicit consumer perceptions of QAPs (in general) and for wines produced in Tennessee. Participants were recruited through an online panel company (Qualtrics). The survey instrument and procedures were approved by the institutional review board (UTK IRB-21-06449-XM).

The survey consisted of several sections addressing participants' involvement with wine, wine purchasing behavior, perceptions of QAPs, and socio-demographic variables. Participants were screened to ensure they were at least 21 years old, live in Tennessee or have visited/plan on visiting Tennessee in the near future, and had purchased wine in the past 12 months. Lastly, given that most Tennessee wines are sold in state [3], a quota was placed on the sample to recruit the majority of the sample from Tennessee (60.9%). Prior to the main body of the survey, participants were provided the following QAP information: "Vintner (wine producer) quality assurance programs are designed to provide consumers with a level of quality assurance about the wines they purchase. Participation by wineries in the programs is voluntary. Vintner quality assurance programs subject wines to production rules, laboratory tests, and evaluation by a panel of experts." Providing a broad definition of a QAP ensured participants were aware of what it meant and could answer questions as informed consumers.

A total of 1216 participants completed the survey and correctly passed the validation questions. Participants' summary statistics are presented in Table 1. On average, participants were 43 years old and nearly 70 percent were female. Participants had 2 to 3 people in their households and had a household income of $65,639 in 2020. Most participants had some college or a 2-year/associate degree or higher at the time of the study. On average, participants live 45 miles from a location that produces wine and spent $38.04 on wine during their last visit to a winery, vineyard, or orchard that produces wine. Tennessee state statistics are provided for comparison purposes [32]. In general, the sample overrepresented women and exhibited a slightly higher household income level relative to the Tennessee population.

2.1. Wine Perceptions and Metrics

To measure wine involvement, participants were provided a list of six statements and asked to select those that applied to them or their households. The wine involvement statements were based on Kallas et al. and Tennessee wine industry feedback [24]. The statements included: myself or someone in my household is a wine club member; I follow

wineries on social media; I receive winery newsletter(s); I like to read wine labels; I like to visit wineries; and I like to attend wine tasting events. The statements were coded to equal 1 if selected, 0 otherwise. The highest percent of participants (47.6%) indicated they like to visit wineries, followed by like to read wine labels (47.1%), attend wine tasting events (39.2%), follow wineries on social media (24.1%), are a wine club/loyalty club member (14.4%), and receive winery newsletter(s) (12.2%; Table 2). Given the statements were framed as 0 or 1 variables, in conducting a factor analysis their tetrachoric correlations were first calculated. Tetrachoric correlations assume a latent bivariate normal distribution underlying each of the binary variable correlations [33]. The tetrachoric correlation matrix was then used in a factor analysis to consolidate the number variables to be represented by underlying common factors. Factor analysis extracts latent constructs (termed 'factors') from a larger set of variables [34]. A principal component factor analysis identified the amount of variance for the factors. The six wine involvement statements resulted in one factor with a variance of 2.070 for factor 1 (called "wine involvement"). The wine involvement factor captures increased involvement with following wineries on social media, receiving winery newsletters, participating in winery visits, and enjoyment of tasting events.

Table 1. Summary socio-demographic variables for online consumer preference study (n = 1216).

Variable	Description	Mean or %	SD	TN [1] Mean
Age	Age of participant (in years)	42.919	15.633	38.7
	Gender			
Female	Female	69.5%		51.2%
	Otherwise	30.5%		
Household	Household size	2.811	1.440	2.52
	Education level (mean)	3.710		
	1 = some high school	2.0%		
	2 = high school diploma/GED	24.7%		
Education	3 = some college	27.6%	1.585	87.5%–high school grad or higher
	4 = 2-year/associate's degree	13.5%		27.3%–bachelor's degree or higher
	5 = 4-year/bachelor's degree	20.2%		
	6 = some graduate school	2.9%		
	7 = graduate or professionals' degree	9.3%		
Income	Household income mean for 2020 ($1000 s)	65.629	46.323	$53,320
TNresident	Tennessee resident	60.9%		
Miles	Distance from residence to a winery, vineyard, or orchard that produces wine (in miles).	45.244	52.805	
Onsite_spending	Amount (USD) spent on wine at the last on-site visit to a winery, vineyard, or orchard that produces wine.	38.039	40.101	

[1] Source: U.S. Census Bureau (2021) [32].

Table 2. Summary statistics and wine involvement factors indicating participants' involvement with wines and related activities (n = 1216).

Activities [1]	Mean	SD	Wine Involvement Factor Loadings	Wine Involvement Uniqueness
Myself or someone in my household is a wine club member	0.144	0.351	0.262	0.931
I follow wineries on social media	0.241	0.428	0.615	0.622
I receive winery newsletter(s)	0.122	0.327	0.647	0.582
I like to read wine labels	0.471	0.499	0.499	0.751
I like to visit wineries	0.476	0.500	0.684	0.533
I like to attend wine tasting events and courses	0.392	0.488	0.699	0.511
Variance			2.070	

[1] Wine involvement activities were coded to equal 1 if selected and 0 otherwise. The tetrachoric correlations matrix was used to estimate the factor loadings.

Three statements were used to assess participants' perceptions of QAPs. In general, participants agreed that wine QAPs indicate high-quality ingredients, consistency/standardization of the end product, and guarantee high-quality end products (Table 3). These perceptions were used to generate a QAP perceptions factor (QAP_perc) with a variance of 2.313 and Cronbach's alpha of 0.851, which is considered an acceptable level of reliability (≥0.6) [35].

Table 3. Summary statistics of quality assurance program (QAP) perceptions and factor loadings (n = 1216).

Statements [1]	Mean	SD	QAP_Perc Factor Loadings	
			QAP_Perc	Uniqueness
Wine QAPs are a guarantee of high-quality end products.	5.398	1.310	0.887	0.214
Wine QAPs are an indication of consistency/standardization in the end product.	5.424	1.246	0.857	0.266
Wine QAPs are an indication of high-quality ingredients.	5.444	1.245	0.890	0.207
Variance			2.313	
Cronbach's alpha			0.851	

[1] Statement order was randomized. Agreement with statements were recorded using a 7-point Likert scale where 1 = strongly disagree; 4 = neither agree nor disagree; 7 = strongly agree.

Next, the QAP perception statements relative to Tennessee wines and factor loadings were estimated (Table 4). Participants agreed the most with the statement that QAPs could grow the Tennessee wine market, followed by QAPs help them understand more about Tennessee wines, that they would be more likely to gift a Tennessee wine with a QAP, they would be more likely to try a greater variety of Tennessee wines with QAPs, and QAPs could increase their interest in buying Tennessee wines. The statement that received the lowest rating was that QAPs would increase the likelihood of serving a Tennessee wine at an event. The Tennessee wine QAP statements were used to generate a Tennessee QAP factor (TN_QAP) with a variance of 3.962 and Cronbach's alpha of 0.889.

Table 4. Summary statistics of QAP perceptions relative to Tennessee wines and factor loadings (n = 1216).

Statements [1]	Mean	SD	TN_QAP Perceptions Factor Loadings	
			TN_QAP	Uniqueness
QAPs are a means of increasing my interest in buying TN wines.	5.016	1.382	0.791	0.375
QAPs are a good way of growing the TN wine market.	5.340	1.270	0.759	0.423
QAPs area good way to help me understand more about TN wines.	5.216	1.334	0.768	0.411
I would be more likely to give a TN wine as a gift if it had a QAP.	5.049	1.542	0.810	0.345
I would be more likely to serve a TN wine at an event I am hosting if it had a QAP.	4.982	1.514	0.828	0.315
I would be more willing to try a greater variety of TN wines if they had a QAP.	5.039	1.469	0.855	0.269
Variance			3.862	
Cronbach's alpha			0.889	

[1] Statement order was randomized. Agreement with statements were recorded using a 7-point Likert scale where 1 = strongly disagree; 4 = neither agree nor disagree; 7 = strongly agree.

Lastly, participants indicated their level of familiarity with Tennessee wines, wine trails, and wine clubs. Participants were most familiar with Tennessee wines, followed by Tennessee wine trails, and Tennessee wine clubs (Table 5). A single factor was generated from the Tennessee wine familiarity statements (TN wine familiarity) with a variance of 2.299 and Cronbach's alpha of 0.847.

Table 5. Summary statistics of participants' familiarity with Tennessee wines, wine trails, and wine clubs and factor loadings (n = 1216).

Statements [1]	Mean	SD	TN Wine Familiarity Factor Loadings	
			TN Wine Familiarity	Uniqueness
Familiarity with TN wines	4.422	1.890	0.844	0.287
Familiarity with TN wine trails	3.516	1.915	0.913	0.166
Familiarity with TN wine clubs	3.316	1.979	0.867	0.248
Variance			2.299	
Cronbach's alpha			0.847	

[1] Familiarity was recorded using a 7-point Likert scale where 1 = not at all familiar; 7 = extremely familiar.

2.2. Econometric Analysis

In this study, two consumer decisions are examined. First, in Model 1, the importance of QAPs in making wine purchasing decisions (1 = not at all important; 5 = extremely important) is estimated. Second, in Model 2, the influence of a QAP on consumers' Tennessee wine purchase likelihood (−1 = decrease; 0 = no impact; 1 = increase) is estimated given the importance levels they placed on wine QAPs.

To obtain estimates from the two ordered probit models, a mixed-process regression was estimated in Stata/SE 17.0 using the cmp module, which enables the error terms of two ordered probits to be correlated. This allows for the importance of QAPs to serve as a latent variable in explaining probability of purchase of Tennessee wines given QAP information.

Given the ordinal nature of the dependent variables, ordered probit models were estimated. In an ordered probit model, the latent variable y^* ranges from $-\infty$ to ∞ to the observed variable y. If there are J categories as the dependent ordinal variable, the association between the observed and latent variables is expressed as:

$$y_i = m \; if \; k_{m-1} \leq k_m \; for \; m = 1 \; to \; J, \tag{1}$$

The *ks* indicate threshold boundaries for categories m in distribution y^*. When the *ks* are crossed, a category change occurs. The categories can be translated into the QAP importance rating with 5 categories (1 = not at all important; 5 = extremely important) in Model 1 or the 3 purchase likelihood categories (−1 = decrease; 0 = no impact; +1 = increase) in Model 2.

Using the QAP importance ratings (Model 1) as an example, this can be expressed as:

$$y_i^1 = \begin{cases} 1 & if \quad \kappa_0 = -\infty \leq y_i^{1*} < \kappa_1 \\ 2 & if \quad \kappa_1 \leq y_i^{1*} < \kappa_2 \\ \vdots & \vdots \quad\quad \vdots \\ 5 & if \quad \kappa_4 \leq y_i^{1*} < \kappa_5 = \infty \end{cases} \tag{2}$$

Based on Equation (2), the structural model can be defined as:

$$y_i^{1*} = \mathbf{x_l^1}\beta^{\mathbf{1}} + \varepsilon_{\boldsymbol{i}}^{\mathbf{1}} \tag{3}$$

where $\mathbf{x_l^1}$ represents a row vector of explanatory variables for the *i*th observation used in Model 1, $\beta^{\mathbf{1}}$ is a column vector of structural parameters to be estimated, and $\varepsilon_{\boldsymbol{i}}^{\mathbf{1}}$ is the random error term for the *i*th individual. The assumption of the distribution of the error term allows for relating probabilities of outcomes (y) given values of $\mathbf{x}$, as shown in the following equation [36]:

$$\text{Prob}\left(y_i^1 = m \middle| \mathbf{x_l^1}\right) = \text{Prob}\left(\kappa_{m-1} \leq y_i^{1*} < \kappa_m | \mathbf{x_l^1}\right) \tag{4}$$

Substituting $\mathbf{x_l^1}\beta^{\mathbf{1}} + \varepsilon_{\boldsymbol{i}}^{\mathbf{1}}$ for y_i^* in Equation (4) results in the probability of any observed outcome $y_i = m$ given $\mathbf{x}_i$ to be generalized as the difference between cumulative distribution functions evaluated at any given m value, shown as:

$$\text{Prob}\left(y_i^1 = m\middle|\mathbf{x}_i\right) = F\left(\kappa_m - \mathbf{x_l^1}\beta^{\mathbf{1}}\right) - F\left(\kappa_{m-1} - \mathbf{x_l^1}\beta^{\mathbf{1}}\right) \tag{5}$$

where F indicates the standard normal cumulative distribution function assuming a probit model. Given Equation (5), the probability of observed value of y_i^1 for the ith observation in Model 1 can be expressed as:

$$p_l^1 = \begin{cases} \text{Prob}\left(y_i^1 = 1\middle|\mathbf{x_l^1}, \beta^{\mathbf{1}},\ \kappa\right)\ \ if\ \ y_i^1 = 1 \\ \vdots \\ \text{Prob}\left(y_i^1 = m\middle|\mathbf{x_l^1}, \beta^{\mathbf{1}},\ \kappa\right)\ \ if\ \ y_i^1 = m \\ \vdots \\ \text{Prob}\left(y_i^1 = 5\middle|\mathbf{x_l^1}, \beta^{\mathbf{1}},\ \kappa\right)\ \ if\ \ y_i^1 = 5 \end{cases} \tag{6}$$

The multi-equation feature of cmp in State/SE 17.0 enables estimation of the two ordered probit models (Models 1 and 2) with correlated error terms [37], where the correlation between the error terms from Models 1 and 2 is represented as ρ_{12} (or $\varepsilon^{\mathbf{1}},\ \varepsilon^{\mathbf{2}}$).

In addition, the mixed-process regression in cmp allows estimation of simultaneous equations with a latent variables. In the case of this study, the variable y_i^{1*} can be modeled as a determinant of y_i^2. Here, it is hypothesized that y_i^{1*} (QAP importance in wine purchase decisions) serves as a latent variable in Model 2 (QAP influence on Tennessee wine purchase decisions). Hence is postulated p_l^2 for a reduced form model would become

$$\begin{cases} \text{Prob}\left(y_i^2 = -1\middle|\mathbf{x}^{\mathbf{2}}_{-\boldsymbol{x}^{\mathbf{1}},\boldsymbol{i}}, \beta^2_{-x^1},\ \mathbf{x_i^1}, \Gamma^{\mathbf{2}}_{\boldsymbol{x}^{\mathbf{1}}}, \kappa\right) \text{ if } y_i^2 = -1 \\ \vdots \\ \text{Prob}\left(y_i^2 = 0\middle|\mathbf{x}^{\mathbf{2}}_{-\boldsymbol{x}^{\mathbf{1}},\boldsymbol{i}}, \boldsymbol{\beta}^{\mathbf{2}}_{-\boldsymbol{x}^{\mathbf{1}}},\ \mathbf{x_i^1}, \Gamma^{\mathbf{2}}_{\boldsymbol{x}^{\mathbf{1}}}, \kappa\right) \text{ if } y_i^2 = 0 \\ \vdots \\ \text{Prob}\left(y_i^2 = 1\middle|\mathbf{x}^{\mathbf{2}}_{-\boldsymbol{x}^{\mathbf{1}},\boldsymbol{i}}, \beta^{\mathbf{2}}_{-\boldsymbol{x}^{\mathbf{1}}},\ \mathbf{x_i^1}, \Gamma^{\mathbf{2}}_{\boldsymbol{x}^{\mathbf{1}}}, \kappa\right) \text{ if } y_i^2 = 1 \end{cases} \tag{7}$$

where $\mathbf{x}^{\mathbf{2}}_{-\boldsymbol{x}^{\mathbf{1}},\boldsymbol{i}}$ are the regressors in Model 2 not shared with Model 1 and $\beta^{\mathbf{2}}_{-\boldsymbol{x}^{\mathbf{1}}}$ are the associated parameters to be estimated. The $\mathbf{x_i^1}$ are the regressors shared with Model 1 and $\Gamma^{\mathbf{2}}_{\boldsymbol{x}^{\mathbf{1}}}$ are the associated reduced form parameters on regressors associated with both Models 1 and 2. Both the structural form of Model 2 where $\left(y_i^2 = \text{m}\middle|\mathbf{x}^{\mathbf{2}}_{-\boldsymbol{x}^{\mathbf{1}},\boldsymbol{i}}, \beta^{\mathbf{2}}_{-\boldsymbol{x}^{\mathbf{1}}},\ y_i^{1*}, \beta^{\mathbf{2}}_{y_i^{1*}}, \kappa\right)$ and the reduced form of Model 2 (as in Equation (7)) were obtained using the cmp module, results form (reduced) command. While the structural form presents the estimated coefficient on the latent variable in Model 2, the reduced form shows the Model 2 estimated coefficients of the regressors in Model 1. The associated marginal effects of the regressors on the probability of a given importance level of QAPs (Model 1) and the probability of QAP influence on Tennessee wine purchase (reduced form Model 2) were calculated using the margins command in CMP.

3. Results

The mixed-process regression ordered probit estimates for Models 1 and 2 are presented in Table 6. The structural form estimates are shown in the second column, while the reduced form estimates for the models are displayed in the third column. As shown at the bottom of Table 6, the LLR test of the model against an intercept only model shows the model with the regressors to be significant overall. In addition, the estimate of the correlation, ρ_{12}, was significantly different from zero in both the structural and reduced form models, suggesting that the correlation between the error terms between Models

1 and 2 should be accounted for in the overall combined model estimation. To further test whether Models 1 and 2 should be estimated together, the log-likelihood from the combined model (C) was compared with the sum of the log likelihood from Models 1 and 2 estimated separately as ordered probits. This LLR test, $LLR_2 = -2[(LL_1 + LL_2) - LL_C]$ where LLR_2 is distributed as X^2 with $k_c - (k_2 + k_1)$ df and showed the combined model to be preferred over Models 1 and 2 being estimated independently. In addition, the estimated coefficient on QAP importance in the structural equation for Model 2 in the second column (bottom half) of Table 6, suggests significant effects of QAP importance in Model 2, hence requiring simultaneous estimation of the two models.

Starting with the model estimates for QAP importance displayed in the second column of Table 6 (note the estimates for QAP importance are identical to those in the third column for the reduced form model), the estimated parameters suggest that participants who spent more on wine during their last on-site visit to a winery, vineyard, or orchard that produces wine had a higher level of perceived importance of QAPs. The distance between the participant's home and an on-site wine producing location (miles) was not significant in explaining QAP importance. The wine involvement factor was also not significant. However, participants who perceived QAPs as an indicator of quality and standardization (QAP_perc factor) had an increased probability of greater importance of a QAP in making wine purchase decisions. None of the estimated coefficients for the demographic variables were significant in Model 1, with the exception of being a Tennessee resident, which had a negative effect on QAP importance.

Examining the second and third columns of coefficients in the top half of Table 6 for the structural model and reduced form estimates for Model 1, the positive and significant estimated coefficients suggest that greater on-site spending at wineries increased the probability of greater QAP importance in making wine purchase decisions. Furthermore, greater perceived benefits of a QAP (QAP_perc factor) increased the probability of greater QAP importance, supporting hypothesis 1. Other variables, such as miles from the wine producing region, wine involvement, and demographics of the participant, with the exception of area of residence, did not significantly influence the probability of QAP importance level on wine purchase decisions. Only the demographic variable, TNresident had a statistically significant and negative estimated coefficient, indicating that being a Tennessee resident decreased the probability of greater QAP importance.

The bottom half of Table 6 shows the structural and reduced form estimates for Model 2, the probability of a QAP influencing Tennessee wine purchases. As can be seen from the structural model in the second column, the overall importance of a QAP on wine purchase decisions positively influenced the probability of choosing a Tennessee wine. The perceived benefits of a Tennessee QAP (TN_QAP) also positively influenced participants' probability of purchasing a Tennessee wine with a QAP, supporting hypothesis 2. However, several variables had negative effects. These included miles from a wine producing area, greater familiarity with Tennessee wines, and female gender. Other variables, including on-site spending and wine involvement, did not significantly affect the probability of the QAP influencing Tennessee wine purchases, nor did the demographic variables Age, Household, Education, Income, or TNresident.

For the reduced form estimates of Model 2 (shown in the third column, bottom half of Table 6), Miles, Female, and TN wine familiarity each negatively influenced the effect of a QAP on Tennessee wine purchases. The variables that had a positive influence Tennessee wine purchase behavior included on-site spending at wineries, perceived benefits of a Tennessee QAP (TN_QAP), and Household.

Table 6. Mixed-regression estimates of ordered probit models addressing the relationship between QAP importance (in general) and its influence on consumers' purchase likelihood for Tennessee wine.

QAP Importance [1]	**Structural Model**			**Reduced Model**		
	Coef.	**SE**		**Coef.**	**SE**	
Miles	0.000	0.001		0.000	0.001	
Onsite_spending	0.004	0.001	***	0.004	0.001	***
Wine involvement	0.099	0.107		0.099	0.107	
QAP_perc	0.513	0.036	***	0.513	0.036	***
Age	−0.001	0.002		−0.001	0.002	
Female	−0.064	0.074		−0.064	0.074	
Household	0.037	0.025		0.037	0.025	
Education	−0.031	0.024		−0.031	0.024	
Income	0.000	0.000		0.000	0.000	
TNresident	−0.221	0.072	***	−0.221	0.072	***
QAP Influence on TN Wine Purchase [2]						
	Coef.	**SE**		**Coef.**	**SE**	
QAP Importance	0.449	0.099	***	—		
Miles	−0.001	0.001	*	−0.001	0.001	*
Onsite_spending	0.001	0.001		0.002	0.001	**
Wine involvement	0.054	0.125		0.098	0.121	
QAP_perc	—-	—-		0.231	0.050	
TN_QAP	0.371	0.065	***	0.371	0.065	***
TN wine familiarity	−0.177	0.047	***	−0.177	0.047	***
Age	−0.002	0.003		−0.003	0.003	
Female	−0.275	0.087	***	−0.304	0.085	***
Household	0.035	0.030		0.052	0.029	*
Education	0.024	0.028		0.010	0.027	
Income	0.000	0.000		0.000	0.000	
TNresident	0.040	0.085		−0.059	0.082	
Threshold Parameters [3]						
/cut_1_1 −	0.190	−9.280	***	−1.768	0.190	***
/cut_1_2	0.185	−6.320	***	−1.171	0.185	***
/cut_1_3	0.183	−1.070		−0.195	0.183	
/cut_1_4	0.184	4.120	***	0.758	0.184	***
/cut_2_1	0.216	−9.300	***	−2.011	0.216	***
/cut_2_2	0.207	−0.210		−0.044	0.207	
rho_12	−0.282	0.101	**	0.172	0.095	*
/lnsig_2	—-	—-		−0.026	0.048	
N	1031					
Log-Likelihood Ratio (LLR) Test of Model Against Intercept Only	22 df	428.680	***			
VIF—QAP Importance	1.16					
VIF—QAP TN Wine Purchase	1.25					

[1] QAP importance was measured using a 5-point Likert scale where 1 = not at all important and 5 = extremely important. [2] QAP impact on TN wine purchase was measured using a 3-point scale where −1 = decrease purchase likelihood, 0 = no impact on purchase likelihood, and 1 = increase purchase likelihood. [3] Threshold parameters indicate the cutpoints between each perceived importance level (in model 1) or purchase likelihood level (in Model 2). The first number in the threshold parameters indicates the model number while the second number indicates the level. For example, in "cut_1_2" the 1 indicates Model 1 and the 2 indicates the threshold level between rating 2 and rating 3. ***, **, * indicate significance at the 0.1%, 1%, and 5% levels.

The positive influence of overall QAP importance in the structural equation for likelihood of purchasing Tennessee wines suggests that the perception that a QAP is important does influence local wine purchases. Furthermore, the positive effects of the perceived benefits of a Tennessee QAP (and lack of significance of QAP_perc in the reduced form model) suggests that more focused QAP information targeted at Tennessee wines may be most useful to those shopping for Tennessee wines. In addition, the negative effect of

Tennessee wine familiarity factor (TN wine familiarity) suggests that QAPs may be more useful to new or first-time Tennessee wine consumers and could be a means to expand the consumer-base for Tennessee wines. Likely, this also reflects the sampling procedure weighing heavily toward Tennessee residents (60.9% of the sample) and that as familiarity increased, quality assurances may be less impactful due to past experiences reducing perceived risk [28]. Additional supporting evidence comes from the QAPs importance model where the Tennessee residency variable was significant and negative indicating Tennessee residents were less likely to perceive QAPs as important. However, it should be noted that Tennessee residence ultimately did not significantly influence the likelihood of using QAPs to make Tennessee wine purchase decisions (as shown in Model 2 of the structural or reduced form equations).

The lack of significance of miles from a wine producing region on QAP importance, but the negative effect of miles on QAP influence on Tennessee wine purchases, could reflect two issues. First, lack of significance of the miles variable on QAP importance could reflect the ability of wine consumers to access QAP information through a variety of means, including the internet and social media, that do not require close proximity to wine producing regions. Second, the negative effect of miles on the influence of QAP information on Tennessee wine purchases could suggest that QAP information will be more influential on shoppers who are closer to wine producing areas within the state. Notably, Tennessee's wineries are primarily located in eastern Tennessee or are clustered around Nashville and the majority of Tennessee wines are still sold at the cellar door [3].

The marginal effect (ME) estimates for the reduced form models are presented in Table 7 for those variables having one or more significant MEs. The MEs represent the change in probability of a given level of QAP importance or impact on Tennessee wine purchase, given a unit change in the explanatory variable. When considering the importance of QAPs (the top portion of Table 7), three variables significantly impacted participants' perceived QAP importance. On-site spending had a significant positive effect across the rating categories. Greater agreement with the QAP perceptions factor (QAP_perc) also increased the probability of having a higher QAP importance rating. Conversely, Tennessee residents had a decreased probability of viewing QAPs as important compared with non-Tennessee residents.

The MEs of the variables on participants' probability of Tennessee wine purchases derived from the reduced form model are shown in the bottom half of Table 7. Seven variables were statistically significant. The distance from a winery/vineyard/orchard (miles variable) and familiarity with Tennessee wines (TN wine familiarity) negatively affected probability of QAPs positively impacting participants' Tennessee wine purchases. Being a female respondent also negatively affected the probability of QAPs positively impacting their Tennessee wine purchases compared with non-female respondents. Conversely, on-site spending, positive QAP perceptions (QAP_perc), and positive perceptions of QAPs on Tennessee wines (TN_QAP) increased the probability of QAPs positively impacting participants' purchase likelihood of Tennessee wines. Larger household size also increased the probability of a QAP positively impacting Tennessee wine purchase likelihood.

Table 7. Marginal effects of QAP importance based on ordinal probit model estimates (n = 1031).

Marginal Effect of Variable on Probability of QAP Importance										
	Not at all important (rating = 1)		Slightly important (rating = 2)		Moderately important (rating = 3)		Very important (rating = 4)		Extremely important (rating = 5)	
	dy/dx		dy/dx		dy/dx		dy/dx		dy/dx	
Onsite_spending	−0.036	***	−0.047	**	0.023	***	0.023	***	0.102	***
QAP_perc	−0.050	***	−0.065	***	0.031	***	0.031	***	0.142	***
TNresident	0.022	***	0.028	***	−0.013	***	−0.013	***	−0.061	***

Table 7. *Cont.*

Marginal Effect of Variable on Probability of Tennessee Wine Purchase						
	Positive impact (rating = 1) dy/dx		No impact (rating = 0) dy/dx		Negative impact (rating = −1) dy/dx	
Miles	−0.046	*	0.034	*	0.012	*
Onsite_spending	0.075	**	−0.055	**	−0.020	**
QAP_perc	0.079	***	−0.058	***	−0.021	***
TN_QAP	0.129	***	−0.093	***	−0.033	***
TN wine familiarity	−0.060	***	0.044	***	0.016	***
Female	−0.103	***	0.076	***	0.027	***
Household	0.018	*	−0.013	*	−0.005	*

***, **, * indicate significance at the 0.1%, 1% and 5% levels.

4. Discussion

Several studies have linked wine industry development in rural areas to economic well-being of the local rural economy [15,38]. However, many local wines suffer from lack of familiarity among wine consumers. In particular, in lesser-known wine producing regions, consumers may be reticent about purchasing local wines due to a lack of familiarity with the quality of the wines. Lack of awards or certifications that reflect the quality of these lesser-known local wines may increase this reticence [13]. Means to attract additional consumers to consume local wines from a lesser-known wine producing region could include the use of QAPs. However, little research exists on how QAPs may influence consumer preferences for local wine produced in lesser-known regions.

The results from this study suggest that the perceived benefits from QAPs influence the importance of QAPs to wine consumers. Furthermore, the importance of QAPs to wine consumers positively influence the effects of QAP information on likelihood of a local (Tennessee) wine purchase. While the perceived benefits of a QAP are influential on the overall importance of QAPs, the perceived benefits of a Tennessee wine QAP are more influential on likelihood of local wine purchases. These results suggest that perceived benefits of QAPs should likely be communicated to wine consumers to help shape the overall importance of QAPs to them. The results also suggest that information about QAPs in general should be paired with information about local wine QAPs specifically in order to attract customers.

Interestingly on-site wine purchases positively influence both the overall importance of QAPs and the influence of QAPs on local wine purchases. This result may suggest that local wine QAPs may be the most impactful at the cellar door. However, additional research would be needed to confirm this hypothesis. In contrast, familiarity with the local wines had negative effects on QAP influence on local wine purchases. Hence, local wine QAPs are likely most useful for those who are not already familiar with the local wines.

Previous research demonstrates that consumers' quality perceptions improve purchase likelihood and preferences for wines from well-known wine producing areas [11]. Interestingly, our results align with these findings and indicate that this effect is similar in lesser-known wine production areas. Overall, our results demonstrate that consumer perceptions influence the importance of QAPs and their impact on Tennessee wine purchasing behavior. QAPs' importance is heightened for individuals who perceive benefits to using QAPs on wines (e.g., increased standardization and quality). Additionally, all QAP perception variables (i.e., TN_QAP, QAP importance) increased consumers' purchase likelihood for Tennessee wines. Supporting evidence demonstrates that quality perceptions are more important than other wine attributes (e.g., organic production, taste, etc.) when determining purchase intent [11]. Given that consumers are willing to pay premiums for Tennessee wines [29,30], a positive reputation associated with wines from Tennessee may exist. Everett et al. states that the association with local and supporting local farmers were key drivers of this premium [29,30]. Our results add to this discussion by demonstrating

that perceptions of QAPs also aid Tennessee wine purchasing decisions. Therefore, actions to aid in developing consumers' confidence in QAPs (e.g., promotions, policies, etc.) may be a way to encourage Tennessee wine purchases.

Familiarity impacted the importance of QAPs given that Tennessee residency decreased QAP importance. These results imply that QAP importance may be somewhat tied to familiarity with the firm or products and agritourism (similar to Kallas et al. [24]). Supporting evidence was found in the second model addressing consumers' purchasing behavior for Tennessee wines with QAPs, where familiarity with Tennessee wines decreased purchase likelihood for QAP wines. The familiarity results align with Di Vita et al. [28] who determined that consumers who buy from the producer (i.e., exhibit greater familiarity with those wines) value QAPs less than consumers buying from other sources. However, this also implies that individuals who are less familiar with Tennessee wines (e.g., tourists) may have an increased purchase likelihood for Tennessee wines with a QAP designation. Therefore, the QAP information may be relatively more useful to tourists visiting from out of state, which is an important component to the viability of the Tennessee wine industry [3]. This suggests that for locally-produced wines in less known markets, QAPs could be one avenue to help build local wine revenues. These results align with Lim and Reed who found that QAPs would have a stronger impact on consumers' preferences if the wines were produced in lesser-known areas [13].

One interesting difference between the models was the on-site spending variable. The on-site spending variable was positively correlated with QAP importance, but not significant in the Tennessee wine purchase model. These results imply that while on-site spending impacted probability of the QAP influencing Tennessee wine purchases, it predominantly came from the on-site spending effects on importance of QAPs in general. Hence, cellar door spending influences probability of local wine purchases, but primarily through shaping their perceptions about the importance of QAPs.

Both the QAP importance and Tennessee wine purchase likelihood models demonstrate the importance of consumers' perceptions of QAPs on their behavior. The importance of these variables implies that, for QAPs, reputation is critical. QAPs must be known for high quality, consistent wines made from quality ingredients, aspects captured in the QAP_perc factor. If wine industry stakeholders in Tennessee can create a QAP with these attributes, the results imply that consumers will be more interested in purchasing, gifting, serving, and trying Tennessee wines (e.g., TN_QAP variable). Previous studies highlight how regional reputations for quality wines decrease the perceived risk associated with purchasing wines from those areas [14]. Additional information has been identified as the most important risk-reducing strategy when selecting a wine, regardless of occasion [16]. In a study of three AVAs in New Jersey (another lesser-known state for wine production), Lim states that the New Jersey AVA is deemed "riskier" in terms of quality than the Outer Coastal Plain (OCP) AVA [18]. In this instance, a broader AVA (OCP) was preferred to the state designated AVA, because of an existing perception of New Jersey wine having lower quality. However, a state AVA may be more appealing to wineries targeting local audiences or where they are interested in establishing their own niche. The existing studies on Tennessee wines show consumers are willing to pay premiums for Tennessee wines indicating an existing positive reputation, which may positively impact a Tennessee designated QAP [29,30].

The results from this study highlight the potential to use QAPs in emerging wine areas. Future studies could address other factors related to creating a QAP and the best means of communicating a QAP to consumers. For instance, although outside the scope of the present research, it is important to note that the visual appearance of the QAP label likely impacts consumers' receptiveness to wines displaying this attribute. Future research could build off the current findings and address the aesthetics and label content to further understand the relationship between QAP promotions and consumer purchasing of wines from less known areas.

It is important to note, there are several limitations to this study. The current study only addressed the effects of QAPs on consumer perceptions for wines in one region. Effectiveness of QAPs could vary across differing regions, particularly where this means different maturity of the wine industry. Additional research should be conducted to extend this study to other regions to see if the effects of QAPs are similar. A second limitation is the hypothetical nature of the experiment. As such, the results are subject to hypothetical bias that may occur due to no actual purchase taking place. Future studies could use non-hypothetical, revealed preference methods (e.g., auctions, etc.) or scanner-based data to explore the actual purchasing behavior of consumers when confronted with wines displaying QAPs. Lastly, a cost-benefit analysis was not conducted, meaning industry stakeholders interested in utilizing QAPs in their businesses need to carefully consider the costs related to the implementation and maintenance of a QAP.

5. Conclusions

Encouraging consumer interest in wines from emerging markets is one means of supporting the wine industry and their home communities' economic sustainability. QAPs are a potential value-added attribute that communicates the wine has undergone testing and adheres to defined quality standards. A QAP may be a means of encouraging consumer interest in Tennessee wines. In turn, increased consumer interest aids in securing the wine industry's economic sustainability and provides more opportunities in rural communities through attracting tourists and related expenditures. Overall, results from this study support the use of QAPs to generate consumer interest in Tennessee wines. However, consumers' perceptions of QAPs appear to be the driving factor of their importance. Additionally, QAP perceptions and perceived QAP importance positively impact purchase likelihood of Tennessee wines with QAPs. This implies that when developing a QAP, a strong reputation would be essential to its success, meaning industry support and other actions to aid in building the program and developing key standards are very important. In turn, the QAP could aid in building the local wine market through increased consumer interest, which could positively impact the industry's and rural community's economic sustainability. This was the first study addressing the feasibility of a QAP on Tennessee wines. Future studies could address the relationship between these factors and the best means of communicating a QAP to consumers for wines from emerging areas.

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