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Measuring price sensitivity to the consumption situation

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Abstract. Consumer segmentation is very relevant in the design of wine marketing strategies. Previous studies showed that there is a relationship between the consumption situation and the willingness to pay for a bottle of wine. In this sense, the consumption situation is considered a segmentation variable. However, price sensitivity in relation to the consumption occasion was not measured. In this paper, we propose four measures of price sensitivity to the consumption occasion. We illustrate how to compute them and discuss their advantages and limitations. One of the measures only discriminates consumers that are sensitive to the consumption occasion from those who are not. In turn, the other measures are more informative and make it possible to distinguish between different degrees of sensitivity. The proposed measures can be used to classify consumers and further improve the knowledge of wine marketeers and decision makers in the wine industry about them.

Keywords: wine, consumption situation, willingness to pay, sensitivity measure.

1. INTRODUCTION

The consumption situation is an issue of interest for both academics and non-academics. In consumer behavior research, the importance of the consumption situation in the purchase decision process is recognized. Understanding such process is particularly relevant in the wine area, given the diversity of wine markets and the wide range of choices available to the consumer. In this context, Bruwer et al. [1] consider pertinent the adoption of segmentation methodologies in order to better analyze consumer behavior. Wine marketing theory portrays wine as a product possessing a set of cues that aim to satisfy consumer needs [2]. Lockshin and Hall [3] identify a set of attributes that motivate the wine choice, such as brand, country of origin, grape variety, winemaker's name, vintage, alcohol content, taste and packaging, but also price. However, Belk [4] questions the reliability of research results on consumer behavior that do not take into consideration the effect of the consumption situation. In the same line, Quester and Smart [5] state that studying market segmentation by consumption situations may allow

the reduction of the companies' target, leading to more assertive and profitable decision-making. Thus, for each consumption situation, the most valued attributes may be described, providing preponderant information that allows companies to define the segments in which they intend to operate [6,7]. According to Barber et al. [8], the recognition of new wine consumption occasions is a relevant topic in wine marketing research. Furthermore, Hall and Lockshin [9] stress the importance of the relationship between price and the situation in which the consumer intends to drink wine. Several studies suggest that price constitutes a discriminant variable in different consumption situations [10-12].

This work aims to study the influence of the consumption situation on the purchase decision, more specifically, on the willingness to pay. For this purpose, we introduce several ways to measure consumers' sensitivity in willingness to pay for a bottle of wine in different consumption situations. Our measures of sensitivity can be used to characterize and segment consumers, providing new and relevant knowledge about consumer behavior in different consumption situations.

After this brief introduction, a literature review is given, where the importance and impact of the consumption situation in wine consumer behavior and willingness to pay for a bottle are detailed. Subsequently, we present the main contribution of this paper: different measures of price sensitivity to the consumption occasion. We exemplify how to calculate them and discuss their advantages and disadvantages. Finally, we end with the conclusions and some suggestions for further research.

2. LITERATURE REVIEW

The volatility of the markets, changes in consumer behavior and the increasing number of players operating in the wine industry have made the market more demanding. Wine is identified as a product of multiple attributes, such as packaging, label, brand, price, region, grape variety, alcohol percentage and taste, among other. Its evaluation is a complex task and, for many consumers, choosing a wine appropriate for a specific occasion can be a complicated challenge. In this context, understanding the consumption habits and needs of consumers is crucial to design an effective marketing strategy. Given the diversity of wine markets, several authors mention the importance of adopting segmentation methodologies to analyze and understand wine consumer behavior [1,13,14]. Segmentation enables the division of markets that can be reached with different marketing tools [15]. Kotler et al. [16] identify classical marketing segmentation variables such as geographic, demographic, psychographic and behavioral. Thach and Olsen [17] propose a segmentation based on lifestyle with the purpose of highlighting motivations and consumption occasions. Naturally, the consumption situation plays a preponderant role in the definition of market strategies [18]. Market strategies are intricately linked with consumption situations as they are crafted to comprehensively grasp, shape and adjust to consumer behaviors and preferences [19]. This alignment is crucial for stimulating consumption and accomplishing business objectives effectively. By understanding the nuances of different consumption situations, such as social gatherings, special occasions or everyday consumption, marketeers can tailor their strategies to resonate with consumers' needs, desires and motivations. This approach allows companies to deliver targeted messages, products and experiences that enhance consumer engagement and drive sales. Ultimately, aligning market strategies with consumption situations enables businesses to build stronger relationships with their target audience, foster brand loyalty and achieve sustainable growth in a competitive marketplace [16]. According to this reference, the consumption situation is particularly relevant, because it can affect the link between purchase intention and purchase decision, so personal preference and purchase intention are not themselves absolute signals of buying behavior. In essence, purchase intention and purchase decision are interrelated stages within the consumer decision-making process. Purchase intention precedes the purchase decision, acting as a preliminary indicator of the consumer's inclination or readiness to buy. Subsequently, this intention significantly influences the eventual purchase decision and its outcome. Belk [4] refers the relevance of situational factors in consumer behavior for marketing, considering that understanding the effect of the consumption situation in conjunction with the knowledge of an individual consumer stands as an important basis for fine-tuned marketing efforts. Situational factors encompass the environmental or contextual elements that have the potential to influence an individual's behavior or decision-making process within a specific situation. These factors are often temporary and can fluctuate depending on the circumstances surrounding that particular moment. Situational factors play a significant role in shaping consumer behavior and decision-making by directly influencing perceptions, motivations and choices within those specific instances [4]. In the same sense, Bonner [20] considers that the consumption situation affects the consumer's decision-making structure in the purchase process. Therefore,

in addition to recognizing the triggers arising from the effect of the consumption situation in relation to the products and the buying situation, it is necessary to differentiate the consumption situation. Thus, it is important to understand the concept of consumption situation, which is defined by Belk [4] as "all those factors particular to a time and place of observation which do not follow from a knowledge of personal (intra-individual) and stimulus (choice alternative) attributes, and which have a demonstrable and systematic effect on current behavior" (p. 157). A variety of studies have addressed the prediction of demand behavior, particularly when analyzed with individual characteristics, and have found evidence on the role of the consumption situation in explaining consumer decision-making [20-23]. In the wine sector, consumers buy wine for a wide range of situations ranging from buying wine for consumption at home to buying wine for special occasions such as a dinner at home with friends, a celebration or a gift. The studies of Aqueveque [6] and Hall et al. [7] suggest that, on different consumption occasions, the same consumer may have different choices according to the consumption situation for which the wine is intended. Along the same line, several authors have collected evidence supporting the hypothesis that wine purchase and consumption are significantly influenced by the purchase and consumption situation [9,24-26]. Lockshin and Hall [3] present a thorough analysis of the causes that marketing studies recognize as being decisive in choice, in order to highlight the complexity of wine consumption. From this perspective, the consumption situation is seen as the scenario in which consumption occurs, having the ability to change the intensity with which product attributes are perceived. The intensity of perception for product attributes reveals the degree or strength of how consumers perceive the different characteristics or features of a product. This concept is fundamental in understanding consumer behavior and decision-making processes. It profoundly influences purchase decisions, marketing strategies, product development efforts and overall business success. The study by Quester and Smart [5] is a reference in this regard. The results obtained suggest that the attributes that consumers value when buying wine change according to the situation. This means that attributes such as grape variety, region of origin or price have a different impact on the purchase decision depending on the consumption situation for which the wine is intended. Likewise, Fountain and Lamb [27] address consumption occasions as contexts of choice and highlight the influence of age on wine preferences. Wine consumer behavior regarding the preferences expressed in relation to different consumption occasions calls for a change in the marketing and advertising strategy [28].

As noted earlier, wine is a multi-attribute product, whose evaluation occurs during consumption. The ability to evaluate quality before purchase is asymmetric and consumers will tend to rely on extrinsic attributes to measure wine quality [29]. This asymmetry arises from several factors (ex: informational imbalance; complexity of products or services; subjectivity of quality; lack of expertise). The asymmetry in the ability to evaluate quality before purchase underscores the importance of transparency, consumer education and trust-building measures by sellers to mitigate uncertainties and enhance consumer confidence in their purchasing decisions [30]. The consumption occasion can amplify the issues of asymmetry in quality assessment, making it even more important for sellers to provide clear and transparent information about their products or services and establish consumer trust. In many consumption situations, consumers face time pressures, social influences and heightened expectations, which can hinder a comprehensive evaluation of product or service quality. Therefore, providing accurate and transparent information, along with building trust relationships with consumers, is crucial to mitigate information asymmetry and promote an informed and satisfactory purchasing decision. Consumers rely on intrinsic and extrinsic wine attributes to decide which wine to buy. Intrinsic cues encompass the inherent characteristics of the wine itself, comprising its taste profile, aroma and body. These cues stem directly from the sensory encounter with the wine and are fundamental in shaping consumers' evaluations and preferences. For example, factors such as the perceived complexity of flavors, the equilibrium between acidity and sweetness or the duration of the finish are all intrinsic cues that consumers take into account when assessing a wine. In opposition, extrinsic cues relate to external factors surrounding the wine, such as its price, brand reputation, packaging and labelling. While intrinsic cues focus on the inherent qualities of the product, extrinsic cues offer contextual information. From the set of extrinsic attributes, price is generally regarded as a relevant indicator of wine quality. In this sense, Spawton [2] states that price is an instrument to reduce the perception of risk in the purchase act, defining it as the amount the consumer is willing to pay for the perceived value of the product. Naturally, the price has a relevant impact on the perception of wine quality in cases where there are few cues available, in cases where it is impossible to evaluate the product or when there is a high perceived risk of making a wrong choice [31,2]. The relationship between wine quality and price makes it pos-

sible to establish the reasons for and extent of the purchase decision, evaluate the gap between different price ranges (minimum/maximum) as a function of the levels of perceived quality that consumers attribute to it, forming a relevant signal of potential demand [32]. Therefore, the theme of creating value for the consumer becomes essential for marketeers. Another aspect to take into account is the fact that some consumers show greater vulnerability to the social environment and, for this reason, guide their purchasing decisions based on the perception they will create in others. Thus, consumers seek to make purchase decisions that give them positive attributes [33]. Under these circumstances, consumers may be less apprehensive about price in social consumption environments given the reference group effect and the social evaluation arising from the purchase decision. In the wine market, the estimation of consumer valuation, that is, the process by which consumers assign a perceived worth or value to a product or service based on their individual preferences, needs and perceptions [34], is done based on two methodologies: the hedonic price analysis [35], which aims to establish a relationship between the price of a distinct product and its characteristics, and the estimation of willingness to pay [36-42], which has the purpose of determining the maximum price at which a consumer will certainly buy one unit of a product. Hall and Lockshin [9] recognize the importance of the relationship between price and the situation in which the consumer intends to drink the wine. A study by Orth [43] recognizes that the choice of brand and the benefits sought in a wine change according to three situations: self-consumption, receiving friends or giving as a gift. According to Stöckl [44], the preponderance of such circumstances can range from high to none, varying according to the situation/occasion. Actually, in the case of buying wine for consumption, a low price can have a significant impact on the purchase decision, but in the case of buying wine for a gift, the price has little impact [10]. Corroborating this, Yu et al. [11] suggest that price is a discriminating attribute and conclude that consumers are willing to pay higher prices for wine purchased as a gift.

The effect of wine consumption situations on the purchase decision and, more specifically, the willingness to pay a certain price for wine remains a topic of interest [12]. Segmentation according to consumption situations and the respective price sensitivity is a relevant indicator in the definition of a marketing strategy [45]. In this context, this study aims to measure the consumers' price sensitivity according to different consumption situations. The ability to measure this indicator will enable companies to segment consumers according to their sensitivity and characterize them to make the marketing strategy more assertive. The development of effective marketing strategies remains paramount for organizations striving to achieve sustainable growth and competitive advantage in today's dynamic business landscape [16]. These strategies serve as foundational frameworks, guiding organizations in identifying target markets, understanding consumer needs and positioning products or services effectively [16]. By leveraging market research and consumer insights, organizations can formulate tailored strategies that resonate with their audience and differentiate their offerings from competitors [46]. Successful marketing strategies facilitate brand building, customer acquisition and retention, ultimately driving revenue growth and profitability [47]. They also enable efficient resource allocation, optimization of marketing investments and adaptation to changing market trends. Ultimately, strategic marketing initiatives foster long-term customer relationships, enhance brand equity and establish a strong market presence, contributing to sustained organizational performance and competitiveness [47].

3. MEASURING PRICE SENSITIVITY TO THE CONSUMPTION OCCASION

3.1. Preliminaries

Suppose that consumers are faced with the problem of deciding how much to pay for a certain product, depending on the consumption occasion. Assume that there are $L \in \{2,3,\ldots\}$ consumption occasions and $K \in \{2,3,\ldots\}$ price intervals, $I_1,\ldots,I_K$, such that

$$I_i < I_{i+1} \text{ for } i=1,\ldots,K\text{-}1, \tag{1}$$

which means that every element of I_i is less than all elements of I_{i+1}, and

$$\cup^{K}_{i=1} I_i = [0,+\infty[. \tag{2}$$

Each consumer chooses a price interval for each consumption occasion. Hence, if P_l denotes the price interval for the l-th consumption occasion, then P_l is an ordinal variable with values $I_1,\ldots,I_K$. We code these values numerically, representing the price interval I_k by the integer k. Therefore, writing $P_l=I_k$ and $P_l=k$ amounts to the same. Considering all L consumption occasions, each individual indicates an ordered sequence of price intervals $(P_1,\ldots,P_L)$, where $P_l \in \{1,\ldots,K\}$ for $l=1,\ldots,L$.

As an example, suppose that consumers are faced with the problem of evaluating and deciding how much to pay for a bottle of wine to drink at home and at a res-

taurant. In this case, we have L=2 consumption occasions. Furthermore, assume that there are K=3 price intervals, I_1=[0,10[, I_2=[10,20[and I_3=[20,+∞[euro. It is clear that these intervals satisfy conditions (1) and (2). Now, note that, for instance, a consumer may indicate (P_1,P_2)=(1,1) and another one (P_1,P_2)=(2,3), *i.e.*, the first consumer may choose the same price interval, I_1, in the two consumption occasions, while the second consumer may choose I_2 in the first occasion and I_3 in the second one.

3.2. Measures of price sensitivity to the consumption occasion

In the section, we will introduce four ways to measure price sensitivity to the consumption occasion. They will be represented by functions $S_1,\ldots,S_4$ of $(P_1,\ldots,P_L)$, *i.e.*, $S_i=S_i(P_1,\ldots,P_L)$ for i=1,…,4. In order to illustrate the computation and facilitate the comparison of these measures, we shall consider the data in Table 1, referring to a sample of eleven hypothetical consumers, L=6 consumption occasions and K=5 price intervals.

3.2.1. First sensitivity measure

Our first sensitivity measure, denoted by S_1, is inspired by the way how the authors of [48] distinguish between loyal and nonloyal purchases. They consider that a consumer is loyal to a brand if he/she buys that brand in more than 50% of the purchase occasions and nonloyal otherwise. As remarked by the authors, the threshold of 50% can be adjusted to a different, suitable value, like 60% or 70%. In this context, we consider that a consumer is loyal to a price interval if he/she chooses that price interval in more than 50% of the consumption occasions and nonloyal otherwise. Furthermore, we consider that a consumer is insensitive to the consumption occasion if he/she is loyal to a price interval and sensitive otherwise.

Formally, given an ordered sequence of price intervals $(P_1,\ldots,P_L)$, where $P_l\in\{1,\ldots,K\}$ for l=1,…,L, assume that value 1 has a relative frequency f_1 in the L consumption occasions, etc., until value K with a relative frequency f_K. Let

$$f_{\max}=\max\{f_1,\ldots,f_K\}. \tag{3}$$

Then, the sensitivity measure is defined as

$$S_1=\begin{cases}0 & \text{if } f_{\max}>50\%\\ 1 & \text{otherwise}\end{cases}. \tag{4}$$

Table 1. Price choices on L=6 consumption occasions by eleven hypothetical consumers. K=5 price intervals are considered. Also shown are the values of four measures of price sensitivity to the consumption occasion.

Consumer	P_1	P_2	P_3	P_4	P_5	P_6	S_1	S_2	S_3	S_4
1	1	1	1	1	1	1	0	0	0	0
2	1	1	1	1	1	3	0	0.25	0.139	0.062
3	1	1	1	3	3	3	1	0.25	0.25	0.111
4	1	1	1	4	4	4	1	0.25	0.563	0.25
5	1	1	1	5	5	5	1	0.25	1	0.444
6	1	1	1	4	5	5	1	0.5	0.868	0.772
7	3	4	4	4	5	5	1	0.5	0.118	0.105
8	1	2	4	4	5	5	1	0.75	0.563	0.75
9	1	1	2	4	5	5	1	0.75	0.75	1
10	1	2	3	4	5	5	1	1	0.556	0.988
11	1	2	3	3	4	5	1	1	0.417	0.741

In the first case, the price the consumer is willing to pay for the product is considered insensitive to the consumption occasion; in the second case, it is classified as sensitive.

As an example, for the second consumer in Table 1, we have $(P_1,P_2,P_3,P_4,P_5,P_6)$=(1,1,1,1,1,3). Hence, f_1=5/6≈83%, f_3=1/6≈17% and $f_2=f_4=f_5$=0%. Since $f_{\max}$=5/6≈83%>50%, it follows that S_1=0, *i.e.*, the price is considered insensitive to the consumption occasion. In turn, for the eighth consumer in the same table, we have $(P_1,P_2,P_3,P_4,P_5,P_6)$=(1,2,4,4,5,5). In this case, $f_1=f_2$=1/6≈17%, $f_4=f_5$=2/6≈33% and f_3=0%. Since $f_{\max}$=2/6≈33%≤50%, it follows that S_1=1, *i.e.*, the price is classified as being sensitive to the consumption occasion.

This first measure of price sensitivity to the consumption occasion is limited, because it only discriminates consumers that are sensitive to the consumption occasion from those who are not. The next measures are more informative, since they make it possible to distinguish between different degrees of sensitivity.

3.2.2. Second sensitivity measure

Our second sensitivity measure is denoted by S_2. Given an ordered sequence of price intervals $(P_1,\ldots,P_L)$, where $P_l\in\{1,\ldots,K\}$ for l=1,…,L, let $N(P_1,\ldots,P_L)$ represent the number of different values in $(P_1,\ldots,P_L)$. It can be seen that the maximum value of $N(P_1,\ldots,P_L)$ is

$$N_{\max}=\min\{L,K\}. \tag{5}$$

In fact, if the number of consumption occasions, L, is less than the number of possible price intervals,

K, that is, $L<K$, then $N_{max}=L$. Otherwise, if $L\geq K$, then $N_{max}=K$. Now, we define

$$S_2 = \frac{N(P_1, \ldots, P_L) - 1}{N_{max} - 1}. \quad (6)$$

Given that $N(P_1,\ldots,P_L)\in\{1,\ldots,N_{max}\}$, the value of S_2 is always between 0 and 1. Note that, if a consumer chooses the same price interval in all consumption occasions, then all values in $(P_1,\ldots,P_L)$ are equal, $N(P_1,\ldots,P_L)=1$ and $S_2=0$, *i.e.*, the price to pay for the product is considered insensitive to the consumption occasion. In turn, if a consumer chooses the price intervals in such a way that the number of different values in $(P_1,\ldots,P_L)$ is the maximum possible, N_{max}, then $S_2=1$, *i.e.*, the sensitivity of the price to the consumption occasion is considered to be the maximum possible. Finally, it is worthwhile to remark that the value of S_2 increases with an increase in the value of $N(P_1,\ldots,P_L)$, *i.e.*, the higher the number of different values in $(P_1,\ldots,P_L)$, the higher the value of S_2, *i.e.*, the more sensitive the price to the consumption occasion.

As an example, consider the data in Table 1. Since $L=6$ and $K=5$, it follows that $N_{max}=5$. For the fifth consumer, we have $(P_1,P_2,P_3,P_4,P_5,P_6)=(1,1,1,5,5,5)$. Hence, $N(P_1,P_2,P_3,P_4,P_5,P_6)=2$ and $S_2=(2\text{-}1)/(5\text{-}1)=0.25$. In turn, for the ninth consumer, we have $(P_1,P_2,P_3,P_4,P_5,P_6)=(1,1,2,4,5,5)$. In this case, $N(P_1,P_2,P_3,P_4,P_5,P_6)=4$ and $S_2=(4\text{-}1)/(5\text{-}1)=0.75$. Therefore, the latter consumer, with a higher value of S_2, is considered more sensitive, because he/she chooses a higher number of different price intervals in the same consumption occasions.

This second measure of price sensitivity to the consumption occasion not only discriminates consumers that are sensitive to the consumption occasion from those who are not, but also enables to distinguish between different degrees of sensitivity. Therefore, it is obviously more informative than the first one. In spite of this, we think it is not completely adequate, as explained next. Take the third and the fifth consumers, for whom $(P_1,P_2,P_3,P_4,P_5,P_6)=(1,1,1,3,3,3)$ and $(P_1,P_2,P_3,P_4,P_5,P_6)=(1,1,1,5,5,5)$, respectively. They have the same S_2 value, namely, 0.25, *i.e.*, according to this measure, they are considered equally sensitive. However, the price intervals chosen by the third consumer are closer to each other than those chosen by the fifth consumer, since interval 1 is closer to interval 3 than to interval 5 (remember from (1) that $I_1<I_2<I_3<I_4<I_5$). In this context, we feel that the third consumer should be considered less sensitive. This is the outcome if we apply the next two sensitivity measures.

3.2.3. Third sensitivity measure

Our third sensitivity measure is denoted by S_3. Given an ordered sequence of price intervals $(P_1,\ldots,P_L)$, where $P_l\in\{1,\ldots,K\}$ for $l=1,\ldots,L$, let

$$\overline{P} = \frac{1}{L}\sum_{\ell=1}^{L} P_\ell \quad (7)$$

represent the average of the integers used to code the intervals. Consider the sum of squares

$$SS(P_1, \ldots, P_L) = \sum_{\ell=1}^{L}\left(P_\ell - \overline{P}\right)^2, \quad (8)$$

whose maximum value

$$SS_{max} = \frac{(K-1)^2}{4} \times \begin{cases} L & \text{if } L \text{ is even} \\ \left(L - \frac{1}{L}\right) & \text{if } L \text{ is odd} \end{cases} \quad (9)$$

can be obtained from Popoviciu's inequality (see, for instance, [49] and references therein). Then, we take

$$S_3 = \frac{SS(P_1, \ldots, P_L)}{SS_{max}}. \quad (10)$$

Note that the value of S_3 corresponds to the value of the variance of the integers used to code the price intervals, normalized to the interval [0, 1]. Therefore, the higher the variability of the price intervals about the average price interval, the higher the value of S_3. It is obvious that $S_3=0$ when there is no variability and $S_3=1$ when there is maximum variability.

As an example, consider the data in Table 1. Since $L=6$ is even and $K=5$, it follows that $S_{max}=(5\text{-}1)^2/4\times 6=24$. For the third and the fifth consumers, we have $(P_1,P_2,P_3,P_4,P_5,P_6)=(1,1,1,3,3,3)$ and $(P_1,P_2,P_3,P_4,P_5,P_6)=(1,1,1,5,5,5)$, respectively. In the former case, the average price interval is $\overline{P}=2$, the sum of squares is $SS(P_1,P_2,P_3,P_4,P_5,P_6)=6$ and $S_3=6/24=0.25$. For the latter case, $\overline{P}=3$, $SS(P_1,P_2,P_3,P_4,P_5,P_6)=24$ and $S_3=24/24=1$. Hence, according to S_3, the third consumer is considered less sensitive than the fifth one and this happens because the variability of the price intervals is lower in the first case. We feel that this conclusion is more adequate than the one based on the values of the previous sensitivity measures, S_1 and S_2, which are the same for the two consumers, and, therefore, suggest that the two are equally sensitive.

Now, let's compare the choices of the fifth consumer, $(P_1,P_2,P_3,P_4,P_5,P_6)=(1,1,1,5,5,5)$, with the choices of the eighth one, $(P_1,P_2,P_3,P_4,P_5,P_6)=(1,1,2,4,5,5)$. The average price interval is the same in both cases, but the variability about the average is greater in the first case, leading to a higher value of S_3. In turn, the number of different price intervals in the same consumption occasions is greater in the second case, leading to a higher value of S_2. Both S_2 and S_3 are informative. They provide different information about the consumers and thus complement each other. This motivated us to consider a measure which combines the information of both. It is described in the next subsection.

3.2.4. Fourth sensitivity measure

Our fourth sensitivity measure is denoted by S_4 and combines the information given by the second measure, S_2, defined in (6), with the one given by the third measure, S_3, defined in (10). Given an ordered sequence of price intervals $(P_1,\ldots,P_L)$, where $P_l\in\{1,\ldots,K\}$ for $l=1,\ldots,L$, we take

$$S_4=\frac{S_2\times S_3}{M_{\max}}, \tag{11}$$

where $M_{\max}$ is the maximum value of $S_2\times S_3$. It is obvious that the value of S_4 is always in $[0,1]$ and that it increases with S_2, for a fixed S_3, and with S_3, for a fixed S_2. Next, we explain how to obtain $M_{\max}$.

When $L=2$ or $K=2$, we have $M_{\max}=1$. First of all, remark that

$$S_2\times S_3\leq 1, \tag{12}$$

since $S_2\leq 1$ and $S_3\leq 1$. When $L=2$ or K=2, this upper bound on $S_2\times S_3$ is attainable, *i.e.*, the maximum value of $S_2\times S_3$ is given by $M_{\max}=1$. Note that the sum of squares $SS(P_1,\ldots,P_L)$ in S_3, given by (8), attains its maximum value $SS_{\max}$, given by (9), in the following conditions [49]: if L is even, when $L/2$ of the P_l are equal to 1 and the other $L/2$ to K; if L is odd, when $(L\text{-}1)/2$ of the P_l are equal to 1 and the other $(L+1)/2$ to K or vice versa. Hence, $SS(P_1,\ldots,P_L)$ attains its maximum value $SS_{\max}$ and $S_3=1$ when there are only two different values in $(P_1,\ldots,P_L)$, *i.e.*, when $N(P_1,\ldots,P_L)=2$. In this context, $N(P_1,\ldots,P_L)$ attains its maximum value $N_{\max}$, given by (5), and $S_2=1$ if $N_{\max}=2$ and, since $N_{\max}=\min\{L,K\}$, this means having $L=2$ or $K=2$.

For $L>2$ and $K>2$, we have no explicit formula to compute $M_{\max}$ and we propose two ways to obtain it. In both ways, we explore the fact that the value of $S_2\times S_3$ as a function of $(P_1,\ldots,P_L)$ is the same for all possible permutations of $(P_1,\ldots,P_L)$, because the value of S_2 and S_3 does not change with a change in the order of the price intervals considered. Therefore, instead of searching for the maximum value of $S_2\times S_3$ in all K^L possible values of $(P_1,\ldots,P_L)$, it suffices to search in all values of $(P_1,\ldots,P_L)$ such that $P_l\leq P_{l+1}$ for $l=1,\ldots,L\text{-}1$. Note that the number of values of $(P_1,\ldots,P_L)$ in the previous conditions equals the number of multisets of length L using K symbols, called L multichoose K, which is represented by

$$\left(\binom{K}{L}\right) \tag{13}$$

and is given in terms of the binomial coefficient by

$$\left(\binom{K}{L}\right)=\binom{K+L-1}{L}=\frac{(K+L-1)!}{L!\,(K-1)!}, \tag{14}$$

where the exclamation mark stands for factorial [50]. For instance, there are $\left(\binom{3}{3}\right)=10$ multisets of length 3 using 3 symbols, say 1, 2 and 3:

1 1 1
1 1 2
1 1 3
1 2 2
1 2 3
1 3 3
2 2 2
2 2 3
2 3 3
3 3 3

If the number of consumption occasions, L, and the number of price intervals, K, is not very high, which is, in general, the case in practice, all multisets of length L occasions using K price intervals can be generated using any appropriate software, like Matlab. In this context, the value of $S_2\times S_3$ can be computed in all of the multisets and the maximum value $M_{\max}$ can be obtained. This is our first approach to get $M_{\max}$. It is an exhaustive search method and should be applied only when L and K are not very high. Our second approach consists in using an appropriate software, like Matlab, to solve the nonlinear integer problem with linear restrictions

$$\begin{aligned}\max_{(P_1,\ldots,P_L)}\quad & S_2\times S_3\\ \text{subject to}\quad & P_\ell\leq P_{\ell+1}\quad \ell=1,\ldots,L-1\\ & P_\ell\in\{1,\ldots,K\}\quad \ell=1,\ldots,L\end{aligned}$$

Table 2. Maximum value of $S_2 \times S_3$ as a function of $L,K \in \{2,\ldots,10\}$.

M_{max}		K								
		2	3	4	5	6	7	8	9	10
	2	1	1	1	1	1	1	1	1	1
	3	1	3/4	7/9	13/16	21/25	31/36	43/49	57/64	73/81
	4	1	11/16	5/9	5/8	17/25	13/18	37/49	25/32	65/81
	5	1	5/6	17/27	25/48	43/75	67/108	97/147	133/192	175/243
L	6	1	29/36	19/27	9/16	548/1125	212/405	83/147	29/48	155/243
	7	1	7/8	20/27	21/32	208/375	157/324	65/126	1255/2304	139/243
	8	1	55/64	7/9	43/64	3/5	115/216	165/343	225/448	113/216
	9	1	9/10	4/5	117/160	16/25	23/40	894/1715	1227/2560	1/2
	10	1	89/100	37/45	37/50	17/25	541/900	4656/8575	161/320	343/729

Table 2 gives the value of M_{max} as a function of $L,K \in \{2,\ldots,10\}$. It was obtained using our two approaches, with the same results. We provide this table so that the reader can know the value of M_{max} for values of L and K that are likely to be considered in practice, without having to compute it.

As an example, consider the data in Table 1. Let us compare the fourth consumer with the eighth one. The value of S_3 is the same in both cases, but the value of S_2 is higher in the latter. Therefore, the value of S_4 is also higher in the latter. In turn, when we compare the sixth consumer with the seventh one, we see that the value of S_2 is the same in both cases, but the value of S_3 is higher in the former. Hence, the value of S_4 is also higher in the former. Now, note that, since L=6 and K=5, it follows that M_{max}=9/16 (see Table 2). For the fifth consumer, we have $(P_1,P_2,P_3,P_4,P_5,P_6)=(1,1,1,5,5,5)$, S_2=0.25, S_3=1 and $S_4=(0.25\times1)/(9/16)\approx0.444$. Therefore, the consumer is considered one of the least sensitive according to S_2, the most sensitive according to S_3 and reasonably sensitive according to S_4. As expected, the conclusion obtained with S_4 is more balanced, because S_4 is a combination of S_2 and S_3.

In summary, following all discussions presented in this subsection and previous ones, we consider S_4 more complete and adequate than S_2 and S_3 alone.

4. CONCLUSIONS AND FUTURE WORK

Wine consumers are always faced with the problem of deciding how much to pay for a bottle of wine, depending on whether they are going to drink it at home with family, at a restaurant with friends or in another context.

In this paper, we introduced and compared four measures of price sensitivity to the consumption occasion. The first measure only discriminates consumers that are sensitive to the consumption occasion from those who are not. In turn, the other measures make it possible to distinguish between different degrees of sensitivity. The second measure and the third one provide different information about consumer behavior. The fourth and last measure is a combination of the previous two and, in our opinion, it is the most informative.

All measures can be used to segment consumers according to their sensitivity to the consumption occasion. Therefore, we plan to use them in the future as segmentation variables. Analyzing price sensitivity data across consumer segments enables marketeers to recognize groups exhibiting diverse purchasing behaviors and preferences. These insights collected from segmentation can enable the customization of marketing strategies, pricing structures and promotions to effectively target each segment. For instance, identifying a segment of price-sensitive consumers who prioritize value for money allows to obtain information on the development of budget-friendly wine options or promotional offers. Through the evaluation of the impact of consumption occasions on willingness to pay, marketing professionals can refine pricing strategies to increase revenue and profitability. By assessing price sensitivity across a spectrum of wine consumption occasions, including social gatherings, celebrations or everyday consumption, marketeers can assemble valuable insights into the degrees of sensitivity to price across diverse contexts. Furthermore, insights obtained from measuring price sensitivity across different consumption occasions can shape marketing communication strategies aimed at effectively expressing value propositions to consumers. For example, in marketing campaigns targeted at consumers who have shown to be price-sensitive due to the consumption occasion, messages emphasizing value, such as discounts, promotions or affordability, can be highlighted.

In the future, we also plan to carry out an empirical statistical study to answer this research question: how do our measures of sensitivity relate to consumers' characteristics, such as gender, age and income? Hence, we need to develop a questionnaire and apply it to a representative sample of individuals, where we can collect data corresponding to the aforementioned consumers' characteristics and to how much they are willing to pay for a bottle of wine in different occasions, so that we can calculate our measures of sensitivity.

It should be stressed that our measures can also be considered for other products, besides wine. Therefore, as another future research endeavor, it would be interesting to know what would be the results if we decided to use our measures for other markets and products.

Finally, as limitations, we identify the possibility of response bias, that is, participants in such studies may provide biased responses influenced by their perception of what is socially acceptable or desirable, rather than their true opinions or behaviors. Furthermore, it is important to note that cultural differences may influence perceptions and behaviors regarding price and product consumption, making it important to consider culture as a control or moderating variable in cross-cultural studies.

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