

Factors Affecting Wine Price Mark-up in Restaurants*

Florine Livat^a and Hervé Remaud^b

Abstract

The purpose of this study is to examine how restaurants determine the percentage of wine mark-up. Wine sales are a substantial contributor to restaurants' profitability, therefore a better understanding of the factors affecting mark-up is critical for the industry. Here, the mark-up is expressed as a percentage over the cost and refers to a cost-plus pricing strategy. Sommeliers from around the world, the majority of whom were members of the International Sommelier Association, were approached to complete our Internet-based questionnaire administered between February 2014 and May 2014. Of the 800 who began the survey, 267 fully completed the questionnaire, generating 1,869 observations. We regressed the declared percentage mark-up against restaurant and wine list characteristics, including managerial practices and wine steward characteristics, and showed that if the restaurants apply a simple rule of thumb to set wine prices, focusing on every price segment, it appears that sommeliers do not have much impact on the percentage mark-up. (JEL Classifications: C23, D21)

Keywords: cost-plus pricing, mark-up, sommelier, wine.

I. Introduction

Sommeliers have a good understanding and knowledge of the wines they sell; however, designing and managing the wine list is a different type of job, requiring a different skill set. As such, a sommelier's managerial behavior seems critical to the success of a wine list and its associated profitability. Part of a wine list's profitability relates to the wine price mark-up, which is the amount the restaurant manager will charge in addition to the cost of purchasing the wine. We focus here on percentage mark-up, that is, the mark-up expressed as a percentage over the marginal cost

* We would like to thank an anonymous reviewer for his insightful comments and suggestions. The article has also benefited from discussions with seminar participants at Kedge Business School, and with AAWE 2015 and AWBR 2016 conference participants. The usual disclaimers apply.

^a Kedge Business School, 680 cours de la Liberation, 33405 Talence Cedex, France and Bordeaux Wine Economics; e-mail: florine.livat@kedgebs.com (corresponding author).

^b Kedge Business School, 680 cours de la Liberation, 33405 Talence Cedex, France and Ehrenberg-Bass Institute for Marketing Science, University of South Australia GPO Box 2471 Adelaide, South Australia 5001, Australia; e-mail: herve.remaud@kedgebs.com.

(here the purchase price), a measure that tell us, in a way, how the profit is gained. Mark-up pricing is a dominant strategy in imperfectly competitive models and seems quite common among firms (Fabiani et al., 2005; Hall and Yates, 2000). Indeed, as shown by Hall, Blanchard, and Hubbard (1986), the degree of market power of a given producer can be proxied by the mark-up ratio, which is defined as the ratio of output price to marginal costs. This mark-up, also known as the Lerner index, can be measured as $(Price - Marginal Cost)/Price$. If with perfect competition the Lerner index equals zero, it becomes positive and increases with the degree of monopoly power. We use here a more business-oriented approach, where the mark-up is defined as $(Price - Marginal Cost)/Marginal Cost$ and refers to the cost-plus pricing strategy (Avlonitis and Indounas, 2005).

“Restaurants overprice wine because they know you [the consumer] have no idea” (Cuozzo, 2015). Even if consumers are familiar with what mark-up means, they will probably underestimate the percentage of mark-up applied by restaurants, given that they know retail prices, which are higher than purchase prices at the restaurant level.¹ In many restaurants, the mark-up applied to “cheap” wines is larger compared to the one for “expensive” wines. Beyond this basic pricing rule, we consider whether there are other elements explaining how wines are priced in restaurants. In other words, what are the mark-up determinants of wines at restaurants?

Using the information from our survey completed by sommeliers in 2014, we regressed the declared percentage mark-up against characteristics of restaurants, wine lists, and wine stewards or sommeliers. Following a few words about mark-up determinants (Section II) and the research protocol (Section III), we present the findings of the survey (Section IV) and its main managerial implications (Section V).

II. Literature Overview

A. Restaurant Profitability

Managing restaurant profitability has long been based on restaurant revenue management (see Thompson, 2010, for an analysis of the literature), that is, the application of yield management to restaurants. One branch of the literature focuses on the mix of tables, which increases the effective capacity of a restaurant by better matching capacity to demand. Meal duration, influenced by the table mix, is identified as a strategic lever to manage revenue (Kimes, 2004) even if the effect is far from being systematic (Thompson, 2009). More recently, Thompson (2010) has proposed managing restaurant profitability through a decision-based framework. Several decisions

¹This underestimation decreases and converges toward the “true” price as consumers become more familiar with wine prices, especially through websites such as Wine-Searcher.com, which provides price comparisons from around the world.

can affect restaurant demand, among which are location, concept, décor, pricing, and the menu, including “the particular food and drink items offered” (Thompson, 2010, p. 312). As such, the wine list can be analyzed as a set of decisions related to a restaurant’s profitability. Wansink et al. (2006) suggest a direct link between wine sales and profits made by restaurants.

B. Wine Lists and Wine Sales

Wine lists are developed in a way to differentiate restaurants (Berenguer, Gil, and Ruiz 2009; Gil-Saura, Ruiz-Molina, and Berenguer-Contrí, 2008) and as a merchandising tool (Yang and Lynn, 2009). Yang and Lynn (2009) show that some wine list characteristics, for example, adding wines into the food menu, can increase wine sales, whereas categorization of wines according to their style is associated with lower wine sales. Using a restaurant revenue management approach (Thompson, 2010), wine is a relevant item to manage restaurant profitability. The wine list can contribute to a restaurant’s performance and success through perceived quality, customer loyalty, customer satisfaction, and so forth (see Sirieix et al., 2011, for a review).

C. Wine Lists and Wine Stewards

According to the *Organisation Internationale de la Vigne et du Vin* (OIV, 2014), a wine steward or sommelier is “a professional from the viti-vinicultural and catering sectors, wineries or other distributors [who recommends and serves] beverages at a professional level” (p. 1). Their skills are applied to “the service of wine in the catering industry or in establishments selling wine, as well as the provision of specialized advice for those involved in the wine market to ensure good presentation and service of products” (OIV, 2014, p. 1). A “sommelier effect” has been documented in the empirical literature, especially for wine sales (Manske and Cordua, 2005): Sommelier education and training helps to develop employee skills and to increase sales as well as to improve credibility of the salesperson, who is perceived as trustworthy and competent. Dewald (2008) addresses the advantages of employing a sommelier in fine dining restaurants and shows that sommeliers identify the best products available to meet restaurant customers’ expectations; restaurants employing a sommelier or a wine steward also update the wine list more frequently than restaurants that do not have a designated sommelier.

D. Mark-up Size Determinants

Differentiation enables a firm to charge a mark-up, which is added to the marginal cost of production under monopolistic competition. As such, the mark-up amount measures the competitive pressure (Ponikvar and Tajnikar, 2012), although restaurants may have more personal reasons of which to decide mark-ups: While some

restaurant owners charge a minimum mark-up on all wine (to give an incentive for people to “drink more”), others make the wine category a profit driver by applying a higher mark-up.

The determinants for mark-up size are numerous. Some are firm-specific factors, connected to market power and firm strategies (Martin, 2001; Schmalensee, 1989), as well as to the productivity of the restaurant’s production factors and to the technological characteristics of the production process (Sutton, 2001). There are also some industry-specific factors (Sutton, 2001), such as concentration, entry barriers, product differentiation, technology in the industry, demand dynamics, and some environmental and institutional factors (Dunn, 2002) such as an antitrust policy, the role of unions, and economic trends (Motta, 2004).

Usually restaurants apply a proportionally smaller mark-up to higher-priced wines (Amspacher, 2011) and the potential wine margin determines the buying decisions made by the restaurant (Preszler and Schmit, 2009). Even if the wine’s cost is a key determinant of the mark-up decision, there are various additional variables that also influence the mark-up.

III. Research Protocol

A. Data Collection and Sample

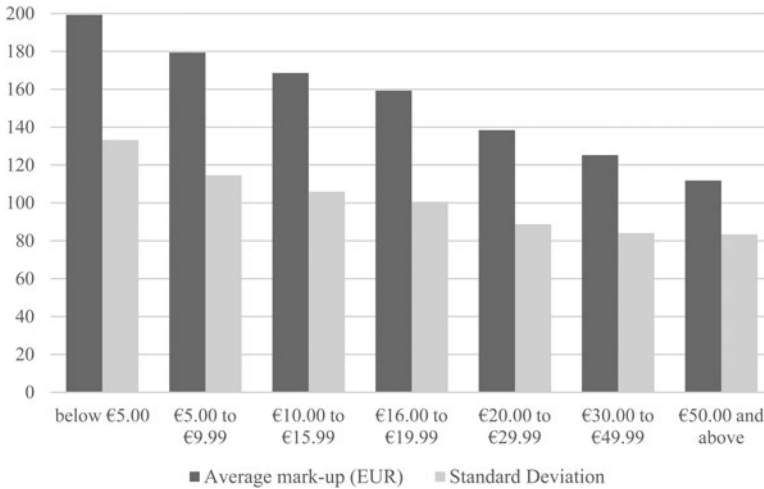
We conducted an Internet survey of sommeliers between February 2014 and May 2014. To recruit participants, an invitation was sent to all International Sommelier Association (ASI) presidents, who in turn forwarded the invitation to all their members. Of the 800 who began the survey, 267 fully completed the questionnaire. More than 35 countries are represented in the survey, and nearly 50% of the sommeliers who responded are located in Europe, about 25% are located in Asia, and 20% are in South America.

Questions about seven price segments were asked (i.e., wines purchased for less than 5 euros per bottle, between 6 and 10 euros, between 11 and 15 euros, between 16 and 20 euros, between 21 and 30 euros, between 31 and 50 euros, and more than 50 euros per bottle), generating 1,869 observations (267 restaurants \times 7 price segments = 1,869 observations).

First, a definition of “mark-up” was presented to all respondents: “If you buy a bottle of wine at 5€ (or \$5, RMB50, etc.) and sell it at 15€, it means that your mark-up equals 10€ (15–5 = 10). In percentage, this equals 200% ($[10/5] * 100 = 200\%$)”; which was then followed with this question about the percentage mark-up: “What is the average mark-up (in %) that you apply for the wines (per bottle) available on your wines list/menu?” (see Figure 1). Given that the standard deviation of the percentage mark-ups is high relative to the mean (Figure 1), the mark-up distribution is not normal, as confirmed by Figure 2.

Figure 1

Average Percentage Mark-Up Over Cost by Price Bracket
Price Brackets Refer to Restaurant Cost Prices



Source: Authors' calculations.

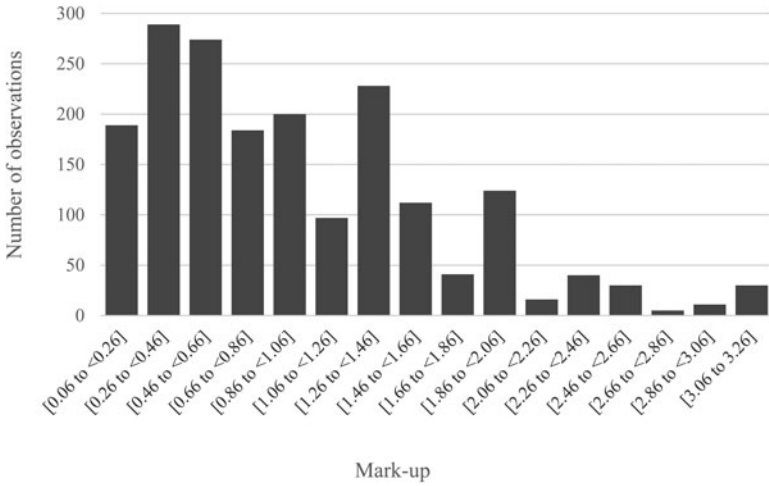
We asked participants to provide additional information to pricing, including:

- Restaurant (firm-specific) characteristics: size (number of seats), style, kind of ownership, average cost of a meal (used as a proxy for the number of waiters), percentage of wine sales in the whole restaurant, and revenue. Furthermore, we know if restaurant is associated with a hotel and whether restaurant also provides a wine storage area where the temperature and the hygrometry are controlled.
- Wine list characteristics and design: person in charge of the wine list design (sommelier, food and beverage manager, chef, restaurant owner, or other person), frequency of update, supplier profiles (directly from the wine estate, agent, merchant or distributor, importer, or another way). Buying wine futures is included in technology, and the number of different wines and number of wines offered by the glass represent restaurant differentiation.
- Sommelier characteristics: gender, years of experience (proxy for age), qualification (sommelier certification; WSET² level 1, 2, or 3; WSET level 4; title at sommelier competition; or other qualification), or other occupation in the restaurant (only a sommelier, also a waiter, also a wine director, also a food and beverage

²The Wine and Spirits Education Trust (WSET) is a British organization founded in 1969 that provides education and qualifications in wine, spirits, and sake. In the wine and spirits trade, it is generally regarded as one of the world's leading providers of wine education. Four levels are proposed, and level 4 is associated with expert level knowledge in all aspects of wine and spirits. See <https://www.wsetglobal.com/>.

Figure 2

Distribution of Percentage Mark-ups across All Wine Categories



Source: Authors' calculations.

manager, or also some other function³). The sommelier is part of the restaurant's function of production and so his or her profile can be viewed as one element of the technology developed by the restaurant to produce the meal.

We indirectly consider environmental and institutional factors through location (country) dummy variables. Because our study concerns a single industry, we focused on firm-specific factors.

B. Statistical Approach

The choice of the right estimator is a key issue here. Indeed, our variable of interest is a fraction or a proportion, being defined only on the unit interval, that does not exhibit any normal distribution (see Figure 2). We also have a balanced panel, given that every surveyed person answers the same question for several products (i.e., in our case price ranges of wine, which means several observations on the same experimental unit) during only one period of time. Papke and Wooldridge (2008) and Wagner (2008) suggest that one can use population-averaged panel data models (xtgee) or generalized linear models (glm). Even though glm does not exploit the panel structure, it is an accepted strategy for handling proportion data, almost as efficient as xtgee (Papke and Wooldridge, 2008), whereas xtgee does not easily allow the introduction of individual effects. Another advantage of a glm estimation is the possibility of applying a stepwise procedure.

³ For the last option, that is, "also some other function," the respondents had to self-declare what this function was. Most of them mentioned bartender or trainer; some mentioned restaurant owner.

We estimated two different mark-up equations:

1. We regressed the percentage mark-up against a series of dummies for every price segment (one if the wine had been purchased by the restaurant in the given price segment, zero otherwise). We used pooled data and compared a classical panel model that included some restaurants' individual effects and a glm estimation.
2. For every price segment, we estimated an equation in which the percentage mark-up size (M_i) was a function of the restaurant characteristics (R_i) and wine list characteristics and design, including managerial practices (L_i) and wine steward characteristics (S_i):

$$M_i = \alpha + \sum_i \beta R_i + \sum_i \gamma L_i + \sum_i \delta S_i + \varepsilon_i,$$

with α a constant term; β , γ , and δ parameters to be estimated; and ε an i.i.d. error term. Indeed, wine price mark-ups exhibited a significant range within every segment, and it made sense to investigate the determinants of the mark-up size within each of those price segments. As frequently mentioned in wine articles, two different restaurants can sell the same bottle at dramatically different prices: For example, in New York City, "Silver Oak 2009 cabernet sauvignon from Napa, a mere \$200 on Tamarind Tribeca's remarkably fair-priced list, costs more elsewhere, up to \$300 at Asiate in the Mandarin Oriental hotel" (Cuozzo, 2015).

IV. Results

The glm estimation results for every price segment are presented in the [Table 1](#). The dummy variables associated with every price range are very significant. A comparison with a naïve estimation of the classical panel model with some individual fixed effects⁴ shows that the explanation for the mark-up size is entirely captured by these dummies and that the estimated coefficient decreases when the price paid by the restaurant to purchase the wine increases. Indeed, as discussed by Amspacher (2011), we also found a negative correlation between the declared mark-up and the cost of the wine to the restaurant ([Table 1](#)).

The detailed estimation results for every price segment are presented in the Appendix. Very few explanatory variables are significant:

- Restaurants characteristics: Restaurants and sommeliers located in Asia tend to have a negative impact on wine percentage mark-up; being a fine dining style of restaurant and being associated with a hotel tend to increase wine

⁴Using xtreg, the individual restaurant effects are not significant. The results are available from the authors upon request.

Table 1
Mark-up Size Equation Estimation Results

<i>Price Range</i>	<i>Coef.</i>	<i>z-stat</i>
Wine purchased at less than 5 euros per bottle	87.438***	9.82
Wine purchased between 6 and 10 euros per bottle	67.573***	7.59
Wine purchased between 11 and 15 euros per bottle	56.753***	6.37
Wine purchased between 16 and 20 euros per bottle	47.468***	5.33
Wine purchased between 21 and 30 euros per bottle	26.599***	2.99
Wine purchased between 31 and 50 euros per bottle	13.408	1.51
Wine purchased at more than 50 euros per bottle	Ref.	
Intercept	111.820***	17.76
AIC	12.109	

*** Significantly different from 0 at the 1% level. AIC is the Akaike Information Criterion.

Source: Authors' calculations.

percentage mark-up; and the average cost of a meal positively affects percentage mark-ups.

- Person in charge of the wine list: Food and beverage managers have a negative effect on percentage mark-up size; the restaurant owner has a positive effect on percentage mark-up size for the cheapest wines.
- Sommeliers' expertise and knowledge does not matter that much, except sommeliers with 10 or more years of experience, have a positive affect on the most expensive wines.

The few numbers of significant variables suggest multicollinearity of some explanatory variables. To control for this issue, given that most of our regressors are zero or one, we apply a stepwise backward regression at 10%. Results are presented in [Table 2](#) and confirm what we obtained with the general estimation.

V. Conclusion and Discussion

The most interesting finding is the absence of a relationship between the sommelier's characteristics (expertise, etc.) and percentage wine price mark-up. We could have expected that sommeliers with a greater knowledge about wine (measured by a formal degree) would be able to sell their more expensive wines with a greater mark-up. Although this is a firm-specific characteristic that depends on a restaurant's strategy and could create differentiation, having a sommelier does not matter in terms of the mark-up size applied to wines in restaurants.

Wine price percentage mark-ups are positively related with the style of the restaurant: the more expensive and fine dining the restaurant, the greater the percentage mark-up applied to the wine prices. This is interesting because the style of the restaurant itself (its image, positioning, etc.) enables the restaurant manager to charge more for the cheapest wines (bought for less than 20€). In the same vein, and for

Table 2
Stepwise Regression Results (Backward at 10%)

<i>Wine Purchase Cost Variables</i>	<i>Below €5 Coeff. (z-stat)</i>	<i>€5 to €9.99 Coeff. (z-stat)</i>	<i>€10 to €14.99 Coeff. (z-stat)</i>	<i>€15 to €19.99 Coeff. (z-stat)</i>	<i>€20 to €29.99 Coeff. (z-stat)</i>	<i>€30 to €49.99 Coeff. (z-stat)</i>	<i>€50 and above Coeff. (z-stat)</i>
Restaurant location:							
South America			-34.83 (-2.15)				
Asia		-37.77 (-2.20)	-41.73 (-2.62)				
Europe	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Casual or bistro style			33.88 (1.77)				
Fine dining style	68.57 (4.15)	50.60 (3.49)	53.78 (2.89)	27.62 (2.18)	26.70 (2.44)	18.29 (1.75)	
Other style	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Associated with a hotel		37.19 (2.45)	36.44 (2.63)	31.02 (2.39)	25.46 (2.28)	26.37 (2.47)	26.83 (2.50)
Average cost of a meal	0.49 (3.41)	0.37 (2.99)	0.46 (4.08)	0.41 (3.78)	0.44 (4.82)	0.41 (4.60)	0.35 (3.99)
Wine list characteristics:							
Restaurant buys wine futures							-19.802 (-1.75)
Percent of wines purchased from a merchant or distributor		0.35 (1.91)	0.35 (2.11)				
Food and beverage managers in charge of wine list design	-35.93 (-1.79)	-34.30 (-1.95)	-34.96 (-2.19)	-32.89 (-2.14)	-40.19 (-3.04)	-32.68 (-2.58)	
Owner in charge of wine list design	38.10 (1.97)	31.07 (1.86)					
Other person in charge of the wine list	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Wine steward characteristics:							
More than 10 years of experience as sommelier						-19.231 -1.87	-18.174 -1.73
WSET level 4					31.885 1.88	35.002 2.13	
No qualification	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Also a wine director				27.481 1.88			
Also some other function	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Intercept	133.74 (9.48)	113.72 (7.94)	97.70 (5.17)	110.39 (11.17)	97.88 (11.23)	90.63 (10.52)	95.86 (10.90)
Number of observations	267	267	267	267	267	267	267
AIC	12.49	12.17	11.98	11.93	11.63	11.54	11.61

Source: Authors' calculations.

all wine price segments, the greater the average cost of the meal, the greater the percentage mark-up applied to the wine prices. In brief, the most expensive restaurants attract clients with a greater willingness to spend money for their meal, regardless of the mark-up applied to the wines. On average, there is an alignment of the price positioning of the meal and the price positioning of the wine. This in turn gives the restaurant manager the opportunity to apply greater percentage mark-up to the wines, including the cheapest ones. For wines bought by the restaurant for less than 5 euros, the percentage mark-up will be 75 points higher in a fine dining restaurant than in a casual or bistro-style restaurant, if we consider other styles of restaurant as a reference. The difference is about 50 points on average for other wines.

Being part of a hotel also provides the opportunity to generate a greater percentage mark-up, including for the cheapest of wines. On average, the percentage mark-up is 40 points higher when the restaurant is associated with a hotel, regardless of the price of the wine. This may be explained by the fact that some of the clients going to the restaurant are also clients of the hotel, and they go for a meal because of convenience. The restaurant is easy to access, and so they are less concerned about the price of the meal.

The expertise of the sommeliers is another story. Our findings may suggest that the more experienced the sommelier the more opportunity he or she will likely be involved with the pricing strategy of the restaurant's wines. In brief, designing the wine list and selecting the wines to be offered to the clients is not the same as applying a mark-up rule as part of the restaurant's pricing strategy. Sommeliers select wines also based on the mark-up that they should apply; therefore, they do not have that much influence on the mark-up itself.

Sommeliers are a costly resource for restaurants, but such costs must be balanced with their contribution to the restaurant's performance and reputation. On the one hand, we found that sommeliers do not have much of an impact on the percentage mark-up applied to wines. This result is in line with prior research about the affect of sommeliers or wine stewards on wine sales. Indeed, Granucci, Huffman, and Sue Couch (1994) have shown that wine instruction is not related to a significant increase in wine sales, although these authors consider that investing in a sommelier or in wine training can be financially significant to restaurateurs because such training results in increased revenue.

On the other hand, we also believe that sommeliers are a useful resource for restaurants for multiple reasons: to manage wine inventories, to be part of the diners' culinary experience, and to advise clients. With that perspective, advice given by trained staff members can decrease the risk associated with wine purchases in fine-dining restaurant contexts, as shown by Lacey, Bruwer, and Li (2009) and more recently by Terrier and Jaquinet (2016). Sommeliers are also part of the meal experience, which can be enhanced when they advise food and wine pairings (Billing, Öström, and Lagerbielke, 2008), often increasing consumer loyalty and word-of-mouth marketing (Ruiz-Molina, Gil-Saura, and Berenguer-Contrí, 2010).

More generally, sommeliers are front-line employees who drive consumer satisfaction at restaurants (Hwang and Kunc, 2015).

Further research should be conducted with restaurant owners and managers to better understand the key role they assign to sommeliers and therefore to assess sommeliers' contribution to these objectives.

Our research does have several limitations, especially regarding the empirical analysis. The estimator used here ignores the panel structure of the data, even if it is suitable given the nature of our dependent variable. Moreover, most of our explanatory variables are related to metrics internal to restaurants, while the literature suggests the existence of some potential industry-specific factors as well as some environmental and institutional factors. Focusing on a single industry, as is the case here, alleviates the problem of industry-specific factors. Nevertheless, that industry might be different in Thailand, Brazil, or Russia, due to different environmental and institutional contexts. If we integrate here some detailed information about the restaurant, we lack description of the wine list itself. It would be worthwhile to explore whether the origin of the wine, the degree of specialization in a style of wine (e.g., Italian, New World, organic), or its age can explain the mark-up applied by the restaurant.

References

- Amspacher, W. (2011). Wine price mark-up in California restaurants. *Journal of Food Distribution Research*, 42(1), 4–7.
- Avlonitis, G. J., and Indounas, K. A. (2005). Pricing objectives and pricing methods in the services sector. *Journal of Services Marketing*, 19(1), 47–57.
- Berenguer, G., Gil, I., and Ruiz, M.E. (2009). Do upscale restaurant owners use wine lists as a differentiation strategy? *International Journal of Hospitality Management*, 28(1), 86–95.
- Billing, M., Öström, Å., and Lagerbielke, E. (2008). The importance of wine glasses for enhancing the meal experience from the perspectives of craft, design and science. *Journal of Foodservice*, 19(1), 69–73.
- Cuozzo, S. (2015). Restaurants overprice wine because they know you have no idea. *New York Post*. Accessed June 23 from <http://nypost.com/2015/06/23/the-real-reason-your-wine-costs-so-much-at-restaurants/>.
- Dewald, B. W. A. (2008). The role of the sommeliers and their influence on US restaurant wine sales. *International Journal of Wine Business Research*, 20(2), 111–123.
- Dunn, S. P. (2002). A post-Keynesian approach to the theory of the firm. In Sheila C. Dow and John Hillard (eds.), *Post-Keynesian Econometrics, Microeconomics and the Theory of the Firm*, 60–80. Cheltenham: Edward Elgar Publishing.
- Fabiani, S., Druant, M., Hernando, I., Kwapil, C., Landau, B., Loupias, C., and Stokman, A. C. (2005). The pricing behaviour of firms in the euro area: New survey evidence. European Central Bank, Working Paper No. 535, October. Available from <https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp535.pdf?3fe960921919feb5484df89c7475211f>.
- Gil-Saura, I., Ruiz-Molina, M. E., and Berenguer-Contró, G. (2008). Qualitative and quantitative engineering criteria of restaurant wine lists. *Journal of Wine Research*, 19(1), 19–31.

- Granucci, P. R., Lynn Huffman, V., and Sue Couch, A. (1994). Effects of wine training on restaurant sales of wine. *International Journal of Wine Marketing*, 6(3), 11–19.
- Hall, R. E., Blanchard, O. J., and Hubbard, R. G. (1986). Market structure and macroeconomic fluctuations. *Brookings Papers on Economic Activity*, 1986(2), 285–338.
- Hall, S., Walsh, M., and Yates, A. (2000). Are UK companies' prices sticky? *Oxford Economic Papers*, 52, 425–446.
- Hwang, J., and Kunc, M. (2015). Business dynamics of on-premise wine trade: Cases from South Korea. *International Journal of Wine Business Research*, 27(3), 239–254.
- Kimes, S. E. (2004). Restaurant revenue management: Implementation at Chevys Arrowhead. *Cornell Hotel and Restaurant Administration Quarterly*, 45(1), 52–67.
- Lacey, S., Bruwer, J., and Li, E. (2009). The role of perceived risk in wine purchase decisions in restaurants. *International Journal of Wine Business Research*, 21(2), 99–117.
- Manske, M., and Cordua, G. (2005). Understanding the sommelier effect. *International Journal of Contemporary Hospitality Management*, 17(7), 569–576.
- Martin, S. (2001). *Industrial Organization: A European Perspective*. Oxford: Oxford University Press.
- Motta, M. (2004). *Competition Policy: Theory and Practise*. Cambridge and New York : Cambridge University Press.
- Organisation Internationale de la Vigne et du Vin. (2014). Definition of sommelier. RESOLUTION OIV-ECO 474-2014. Available from <http://www.oiv.int/public/medias/1924/oiv-eco-474-2014-fr.pdf>.
- Papke, L. E., and Wooldridge, J. M. (2008). Panel data methods for fractional response variables with an application to test pass rates. *Journal of Econometrics*, 145(1), 121–133.
- Ponikvar, N., and Tajnikar, M. (2012). The impact of foreign trade on mark-up size: Evidence from a dynamic panel model of Slovenian manufacturing firms. *Eastern European Economics*, 50(1), 46–64.
- Preszler, T., and Schmit, T. M. (2009). Factors affecting wine purchase decisions and presence of New York wines in upscale New York City restaurants. *Journal of Food Distribution Research*, 40(3), 16–30.
- Ruiz-Molina, M. E., Gil-Saura, I., and Berenguer-Contrí, G. (2010). Instruments for wine promotion in upscale restaurants. *Journal of Foodservice Business Research*, 13(2), 98–113.
- Schmalensee, R. (1989). Inter-industry studies of structure and performance. In R. Schmalensee and R. Willig (eds.), *Handbook of Industrial Organization*, Vol. 2, 951–1009. Amsterdam: North Holland.
- Siriex, L., Remaud, H., Lockshin, L., Thach, L., and Lease, T. (2011). Determinants of restaurant's owners/managers selection of wines to be offered on the wine list. *Journal of Retailing and Consumer Services*, 18(6), 500–508.
- Sutton, J. (2001). *Technology and Market Structure, Theory and History*. Cambridge, MA: MIT Press.
- Terrier, L., and Jaquinet, A. L. (2016). Food-wine pairing suggestions as a risk reduction strategy: Reducing risk and increasing wine by the glass sales in the context of a Swiss restaurant. *Psychological Reports*, 119(1), 174–180.
- Thompson, G. M. (2009). (Mythical) revenue benefits of reducing dining duration in restaurants. *Cornell Hospitality Quarterly*, 50(1), 96–112.
- Thompson, G. M. (2010). Restaurant profitability management: The evolution of restaurant revenue management. *Cornell Hospitality Quarterly*, 51(3), 308–322.
- Wagner, J. (2008). Exports and firm characteristics: First evidence from fractional probit panel estimates. University of Lüneburg Working Paper Series in Economics No. 97, August.

Available from https://www.leuphana.de/fileadmin/user_upload/Forschungseinrichtungen/ifvwl/WorkingPapers/wp_97_Upload.pdf.

Wansink, B., Cordua, G., Blair, E., Payne, C., and Geiger, S. (2006). Wine promotions in restaurants: Do beverage sales contribute or cannibalize? *Cornell Hotel and Restaurant Administration Quarterly*, 47(4), 327–336.

Yang, S. S., and Lynn, M. (2009). Wine list characteristics associated with greater wine sales. *Cornell Hospitality Report*, 9(11), 6–14.

Appendix

Variables	Wines Purchased													
	Below €5		€5 to €9.99		€10 to €14.99		€15 to €19.99		€20 to €29.99		€30 to €49.99		€50 and Above	
	Est. Coeff.	z-stat	Est. Coeff.	z-stat	Est. Coeff.	z-stat	Est. Coeff.	z-stat	Est. Coeff.	z-stat	Est. Coeff.	z-stat	Est. Coeff.	z-stat
Restaurant characteristics														
North America	-43.46	-1.09	-23.68	-0.99	-20.80	-0.68	-8.18	-0.27	-7.50	-0.29	-0.88	-0.04	-5.11	-0.2
South America	-40.56	-1.60	-33.75	-1.56	-39.37**	-2.02	-32.56*	-1.72	-23.86	-1.44	-14.72	-0.92	-7.61	-0.46
Asia	-48.93**	-1.98	-52.85**	-2.52	-49.13**	-2.59	-36.57*	-1.99	-20.52	-1.28	-10.75	-0.69	-11.01	-0.69
Europe	Ref.		Ref.		Ref.		Ref.		Ref.		Ref.		Ref.	
Less than 60 seats	-0.473	-0.02	-0.85	-0.04	-10.68	-0.62	-15.91	-0.95	-4.09	-0.28	-6.17	-0.44	0.77	0.05
From 60 to 100 seats	-10.73	-0.50	-5.86	-0.32	-19.98	-1.20	-28.08*	-1.74	-13.52	-0.96	-7.60	-0.56	-5.31	-0.38
More than 100 seats	Ref.		Ref.		Ref.		Ref.		Ref.		Ref.		Ref.	
Casual or bistro style	17.85	0.64	21.68	0.91	35.68*	1.66	27.66	1.32	5.84	0.32	6.64	0.38	4.51	0.25
Fine dining style	65.60**	2.42	62.12***	2.69	57.82***	2.77	44.83**	2.21	25.07	1.42	21.33	1.25	13.01	0.74
Other style	Ref.		Ref.		Ref.		Ref.		Ref.		Ref.		Ref.	
Chain	19.43	0.57	22.33	0.77	20.25	0.77	13.59	0.53	30.61	1.37	16.01	0.74	11.06	0.5
Franchise	-11.68	-0.18	-5.30	-0.10	-1.47	-0.03	-19.15	-0.40	7.16	0.17	-6.00	-0.15	-15.11	-0.36
Independent	7.36	0.28	14.72	0.67	21.10	1.06	18.25	0.94	16.96	1.00	12.23	0.75	9.79	0.58
Other kind of ownership	Ref.		Ref.		Ref.		Ref.		Ref.		Ref.		Ref.	
Associated with a hotel	30.41	1.49	37.48**	2.16	42.65***	2.71	37.03**	2.43	22.10*	1.66	25.38**	1.98	21.20	1.6
Cellar or temperature-controlled area to store wine	-12.20	-0.51	-17.15	-0.84	-24.56	-1.34	-19.86	-1.11	-9.86	-0.632	-2.86	-0.19	-8.48	-0.55
Average cost of a meal	0.48***	2.73	0.36**	2.44	0.49***	3.67	0.42***	3.26	0.44***	3.86	0.40***	3.7	0.28**	2.49
Percent of wine sales	-0.73	-1.39	-0.54	-1.20	-0.39	-0.95	-0.25	-0.63	-0.19	-0.56	-0.11	-0.33	-0.13	-0.39

Continued

Continued

Variables	Wines Purchased													
	Below €5		€5 to €9.99		€10 to €14.99		€15 to €19.99		€20 to €29.99		€30 to €49.99		€50 and Above	
	Est. Coeff.	z-stat	Est. Coeff.	z-stat	Est. Coeff.	z-stat	Est. Coeff.	z-stat	Est. Coeff.	z-stat	Est. Coeff.	z-stat	Est. Coeff.	z-stat
Wine list characteristics														
Number of different wines	-.004	-0.10	.007	0.22	-.002	-0.06	.001	0.02	.021	0.90	.018	0.79	.029	1.23
Number of wines offered by the glass	.285	0.44	-.076	-0.14	-.363	-0.73	-.407	-0.85	-.328	-0.78	-.22	-0.54	-.354	-0.85
Monthly update	-13.80	-0.59	-19.50	-0.98	-19.39	-1.08	-21.97	-1.26	-15.41	-1.01	-5.82	-0.4	-6.39	-0.42
Every 3 months update	-20.63	-0.82	-17.99	-0.84	-22.69	-1.18	-24.29	-1.3	-19.27	-1.18	-13.58	-0.86	-8.71	-0.54
Every 6 months update	3.35	0.14	-0.69	-0.03	-1.69	-0.09	-12.06	-0.68	-7.41	-0.48	-4.53	-0.30	-11.31	-0.73
Less frequent update	Ref.		Ref.		Ref.		Ref.		Ref.		Ref.		Ref.	
Buys wine futures	-10.437	-0.53	-15.257	-0.91	-12.8	-0.84	-9.377	-0.63	-18.39	-1.43	-13.952	-1.12	-16.526	-1.29
Percent of wines purchased directly from the wine estate	-0.23	-0.40	-0.13	-0.25	0.06	0.14	0.11	0.25	.055	0.14	0.29	0.79	0.36	0.94
Percent of wines purchased from an agent	-0.27	-0.43	-0.01	-0.03	0.00	0.00	-0.049	-0.1	-.172	-0.42	-0.16	-0.41	0.00	0.00
Percent of wines purchased from a merchant or distributor	0.30	0.56	0.56	1.24	0.65	1.58	0.502	1.27	.26	0.75	0.24	0.73	0.21	0.61
Percent of wines purchased from an importer	-0.00	-0.00	0.24	0.54	0.34	0.87	0.388	1.01	.228	0.68	0.23	0.73	0.23	0.69
Percent of wines purchased from another kind of supplier	0.47	0.62	0.54	0.84	0.50	0.87	0.389	0.69	.271	0.55	0.27	0.56	0.31	0.64
Sommelier in charge of wine list design	19.09	0.80	14.57	0.72	7.36	0.40	0.42	0.02	1.90	0.12	-7.06	-0.47	-20.05	-1.30

Food and beverage managers in charge of wine list design	-41.82*	-1.74	-39.89*	-1.95	-40.82**	-2.21	-40.86**	-2.28	-43.01***	-2.75	-37.10**	-2.45	-27.72**	-1.78
Chef in charge of wine list design	-53.78	-0.88	5.56	0.11	13.58	0.29	-23.90	-0.53	-21.42	-0.54	-44.83	-1.17	-57.48	-1.46
Owner in charge of wine list design	49.06**	2.08	35.64*	1.77	23.27	1.28	10.26	0.58	5.13	0.33	9.31	0.63	4.40	0.29
Other person in charge of the wine list	Ref.		Ref.		Ref.		Ref.		Ref.		Ref.		Ref.	
<hr/>														
Wine steward characteristics														
Gender (male = 1)	28.37	1.17	15.02	0.73	10.69	0.58	11.42	0.63	-1.84	-0.12	3.01	0.2	6.18	0.39
More than 10 years of experience as sommelier	-14.57	-0.79	-13.74	-0.87	-6.88	-0.48	-17.96	-1.30	-18.03	-1.50	-23.97**	-2.06	-24.93**	-2.08
Sommelier certification	-5.23	-0.27	-5.59	-0.34	-8.87	-0.59	-17.77	-1.22	-15.5	-1.22	-8.93	-0.73	-10.52	-0.83
WSET level 1, 2, or 3	3.221	0.16	-0.91	-0.05	-1.30	-0.09	-3.33	-0.23	0.71	0.06	-1.10	-0.09	-8.20	-0.64
WSET level 4	23.07	0.79	18.41	0.74	21.39	0.95	14.05	0.64	20.88	1.09	21.91	1.19	13.79	0.73
Title at sommelier competition	-7.69	-0.36	-10.75	-0.59	-12.74	-0.77	-18.54	-1.16	-8.13	-0.58	-9.04	-0.67	-11.14	-0.8
Other or no qualification	Ref.		Ref.		Ref.		Ref.		Ref.		Ref.		Ref.	
Only sommelier	2.69	0.10	-5.25	-0.28	-8.20	-0.41	-6.88	-0.35	-0.43	-0.03	-3.27	-0.20	-5.55	-0.33
Also waiter	-9.59	-0.43	-0.69	-0.04	-9.62	-0.55	-7.15	-0.42	-6.57	-0.45	-19.95	-1.41	-10.64	-0.73
Also wine director	15.34	0.68	21.47	1.13	20.37	1.18	24.48	1.46	10.12	0.69	8.81	0.63	12.40	0.85
Also food and beverage manager	-6.96	-0.27	18.43	0.85	15.38	0.78	9.62	0.50	14.57	0.88	3.44	0.21	3.77	0.23
Also restaurant manager	4.53	0.21	6.74	0.37	1.7	0.1	-2.55	-0.16	-6.25	-0.45	-11.94	-0.89	-1.64	-0.12
Also other function	Ref.		Ref.		Ref.		Ref.		Ref.		Ref.		Ref.	
Intercept	138.8*	1.94	112.1*	1.84	108.6*	1.98	134.7***	2.53	123.9***	2.67	99.9**	2.23	112.1**	
Number of observations	267		267		267		267		267		267		267	
AIC	12.67		12.34		12.14		12.08		11.80		11.74		11.80	

Source: Authors' calculations.