Willingness-To-Pay for Reshuffling Geographical Indications

Monia Saïdi, monia.saidi@agrosupdijon.fr

CESAER, AgroSup Dijon, INRAE, Université Bourgogne Franche-Comté, 26 boulevard Docteur Petitjean, 21000 Dijon, France.

Jean-Sauveur Ay, jean-sauveur.ay@inrae.fr

CESAER, AgroSup Dijon, INRAE, Université Bourgogne Franche-Comté, 26 boulevard Docteur Petitjean, 21000 Dijon, France.

Stephan Marette, mail+ affiliation+ adresse

Christophe Martin, mail+ affiliation+ adresse

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Abstract

This article presents a new experimental protocol for estimating consumers' willingness-to-pay (WTP) for products involved in a reshuffle of Geographical Indications (GIs). Although the collective reputation of a given GI depends on its temporal stability, reshuffling a GI area could make it better aligned with product quality or consumers' perception. We first provide a simple theoretical model in which consumers put a negative value on within-GI quality variance, thereby showing that reshuffling the GI designation scheme may increase WTP without any change in product quality. Using the experimental protocol, we evaluate consumer perceptions of different reshuffling scenarios for the vineyards of *Marsannay*, Burgundy, France. The results reveal a significant increase in WTP following GI reshuffling for a given distribution of products' quality, elicited WTP values are then used to simulate the optimal GI reshuffle.

Key words: Experimental economics, wine appellation, quality signal, public policy.

I. Introduction

Geographical indications (GIs) provide certified information about the place of production as a quality signal given to consumers (Menapace and Moschini, 2012; Bonroy and Constantatos, 2015). The credibility of this information depends on consumer perception of the designation scheme that maps the physical attributes of production sites to the GI names used to reference the products.[1] Among the numerous determinants of this perception, the historical stability of the GI scheme is clearly important for creating and maintaining a collective reputation (Tirole, 1996). Nevertheless, in many situations, flexibility is required in order to maintain GIs adapted to changing human and natural environments (e.g., changing technology, changing climate, or changing consumer preferences). Moreover, even without external changes, the political bargaining and private lobbying surrounding the creation of GIs might have materialized historical biases (Fourcade, 2012; Ay, 2020) that could be removed by reshuffling the GIs.

This paper aims at understanding *ex ante* how consumers react to a change in a GI scheme, in the short and medium terms when the quality of the products supplied can be considered constant. The objective is to experimentally estimate consumer perceptions of different scenarios involving changes in GI classification without any change in products. We provide a simple theoretical model with imperfect information for consumers about product quality and introduce GIs as a quality signal to reduce the information gap. Consumer perception of quality as signalled by GIs is a weighted combination of the average quality of products within each GI level and their within-GI quality variance. For a given distribution of

[1] The importance of physical attributes (*terroir*) in explaining wine prices is not consensual in the literature (Gergaud and Ginsburgh, 2010 ; Ashenfelter and Storchmann, 2010). The debate is about separating the relative contribution of terroir and GIs, knowing that they are spatially correlated (Cross, Plantinga and Stavins, 2017). On the other hand, prices are always found to depend significantly on GIs (Lecocq and Visser, 2006), as confirmed by our experimental results on the willingness-to-pay.

quality supplied, introducing a new GI level and re-allocating the production sites within a given number of GI levels could be beneficial for consumers. There is nevertheless a trade-off in such a GI reshuffling: the WTP increased by adding a new high-quality level, potentially at the expense of the WTP of current lower-quality GI levels.

A recent study (Costanigro *et al.*, 2019) uses a theoretical framework inspired from Mussa and Rosen (1978) and Menapace and Moschini (2012) to examine the introduction of a new, high-quality GI level, namely the *Gran Selezione*, at the top of the *Chianti* wine hierarchy. From an online survey with randomized scenarios, the authors find that the new GI increases the market share of *Chianti* wines, with the effect of increased vertical differentiation more than offsetting the decline in the perceived quality of other *Chianti* wines. Because the creation of the new GI level does not modify the existing GIs for *Chianti* wines, the decline in the perceived quality of other wines is due exclusively to a subjective bias named the "comparative stigma". In fact, the creation of a high-quality GI level from the best vineyard plots is generally made jointly with a reshuffle of the spatial delineations of other GI levels, and a simultaneous reduction in the average quality of the existing GI levels. The decline in the perceived quality following such a reshuffle may be rational (i.e., not related to the comparative stigma) and still exist with full information, as is the case in the typical theoretical models of GI designation (Deconinck and Swinnen, 2014; Gokcekus and Finnegan, 2017; Yu *et al.*, 2017).

Our research question is also related to the work of Gokcekus and Finnegan (2017) about the creation of new sub-divisions within Oregon's Willamette Valley American Viticultural Area. Using wine price data before and after the creation of the sub-AVAs, they find that regional reputation premiums have significantly increased with GI reshuffling and that the price-quality ratio gap between sub-AVAs and the rest of Willamette has widened. Our approach stands out by providing an *ex ante* (instead of *ex post*) estimation of the impact of GI reshuffling on WTP through a lab experiment. This allows us to study different reshuffling

scenarios in order to determine which one maximizes the WTP for each GI level or for all GI levels in the area of interest. Our work contributes to fill the lack of knowledge to design more efficient GIs, as regularly recognized in the literature (Bonroy and Constantatos, 2015; Deconinck and Swinnen, 2014).

In Burgundy, there is a long history of ranking vineyards according to their quality for wine production, dating back to the Middle Ages (Meloni and Swinnen, 2018). The first official classification come from a 1860 map that contains only three levels for each municipality of the *Côte d'Or* area (*Régional*, *Village*, and *Grand Cru*). This map, established from academic knowledge (Lavalle, 1855) and jurisprudence from previous legal disputes, was used extensively as a basis to regulate wine trade until the creation of the French national institute in charge of GI management (*Institut National de l'Origine et de la Qualité*, or INAO) in 1936. Some reshuffling was then implemented during the 20th century with, in particular, the creation of *Premier Cru* in 1943 and the fine-scale digitalization of the *Régional* level around 2000. The criteria of the classification come from accumulated empirical knowledge in connection with the requests from wine producers and traders.[2] Nowadays, the price differentials between the GI levels (*Premier Cru* included) are very high in Burgundy (Combris, Lecocq and Visser, 2000). There are regulatory requests to move up some vineyards in the hierarchy and thus benefit of the umbrella effects from wines currently designated in higher levels (Hakenes and Peitz, 2009). The processing of requests is entrusted to the INAO, which has a general administrative consideration procedure but no explicit criteria for redesigning the GIs.

We study the effect of reshuffling the GIs for the vineyards of *Marsannay* in the Burgundy region of France. This area counts three municipalities: *Chenôve*, *Couchey* and

[2] For example, neither the municipalities of *Volnay* nor *Nuits-St-Georges* has *Grands crus* because in the 1930s leading growers chose not to petition for them, for a range of reasons, including a reluctance to pay the higher taxes (https://www.decanter.com/learn/burgundy-premier-cru-vs-grand-cru-vineyards-ask-decanter-410099/#KPSkYut5TSE3rcZ7.99)

Marsannay-la-Côte, with a two-level GI hierarchy: *Régional* < *Village* (see Figure SM1 in the Supplementary Material). The GI classification for the whole Burgundy has higher levels *Premier Cru* and *Grand Cru* that are not currently present on the *Marsannay* area (these high-quality levels are present in surrounding municipalities such as *Fixin* and *Gevrey-Chambertin*). The proximity of this area to the city of *Dijon* has made these wines mainly intended for local consumption, which has resulted in a late introduction of the GIs in the twentieth century. The *Marsannay* syndicate of producers regularly ask to INAO to reshuffle the current GI boundaries for *Village* and *Régional* levels and to create a *Premier Cru* level.

The paper is organized as follows. Section 2 introduces a simple theoretical model. The experimental protocol is presented in Section 3. Section 4 reports the results, and Section 5 concludes.

II. Theoretical model

Assume that trade occurs in a single period, where a group of similar consumers want to purchase only one unit of the good, namely a bottle of wine of a given GI level. Consumers have a WTP equal to θk^*, where θ is a given taste parameter and k^* represents the perceived level of quality of the GI level. The perceived quality takes into account the mean and the variance of quality, which varies between GI levels. Consumers do not have precise information about the specific quality of the bottle that they will potentially buy, its GI level is assumed to be the only information available. The specific wine quality follows a uniform distribution $k \in [0,1]$, the perceived quality k^* is assumed to depend on the mean *E(k)* and variance *V(k)* of the specific quality distribution.

Without any GI, the perceived quality is assumed equal to

$$k^* = \gamma E(k) - \delta V(k) = \gamma/2 - \delta/12. \quad (1)$$

With $\gamma, \delta > 0$. The parameter γ captures the perception of the average quality and δ captures

the aversion to variability of quality that negatively affects consumer perception.

We consider a possible GI certification capable of providing credible information about the minimum limit for the wine quality. We assume a limit $0 \leq L \leq 1$ for a GI, such that if the consumer purchases a bottle under this GI, the quality variation follows a subpart of the uniform distribution with $k \in [L, 1]$. In other words, the GI reduces a part of the risk in addition to giving the signal about average quality. For a bottle below the threshold, the quality variation follows a subpart of the uniform distribution with $k \in [0, L]$. We assume that all the producers of quality $k \in [L, 1]$ use this GI scheme, if this system emerges. The limit L establishes a separation along the uniform distribution.

For a bottle with a GI, the quality variation follows a subpart of the uniform distribution with $k \in [L,1]$ and the density is equal to $1/(1-L)$. The mean is equal to $E_L(k) = (1+L)/2$ and the variance to $V_L(k) = (1-L)^2/12$. The perceived quality of a bottle receiving the GI is

$$k_L^* = \gamma E_L(k) - \delta V_L(k) = \gamma(1+L)/2 - \delta(1-L)^2/12. \quad (2)$$

For a bottle without the GI, the quality variation follows a subpart of the uniform distribution with $k \in [0, L]$ and the density is equal to $1/L$. The mean is equal to $E_W(k) = L/2$ and the variance to $V_W(k) = L^2/12$. The perceived quality of a bottle without the GI is

$$k_W^* = \gamma E_W(k) - \delta V_W(k) = \gamma L/2 - \delta L^2/12. \quad (3)$$

If we assume that the GI designation scheme for one bottle tries to maximize the perceived quality from the consumer's point of view, the label limit L is selected in order to maximize

$$k(L) = k_L^* + k_W^*. \quad (4)$$

This function is concave with $d^2k(L)/dL^2$. The value L^* maximizing (4) is defined by

$$L^* = Min[\frac{1}{2} + \frac{3\gamma}{\delta}, 1[\,. \quad (5)$$

If, the parameter δ capturing the aversion to variability in quality is relatively low

(namely, $0 \leq \delta \leq 6\gamma$), the optimal limit L^* is equal to 1 and no GI signal is implemented. In this case, there is no distinctive signal set between 0 and 1, because the quality variance does not count much in the quality perception and consumer's utility. If the parameter γ is relatively large, the mean weighs more than the variance in consumer perceptions. Conversely, if δ is relatively high ($\delta > 6\gamma$), the consumer is very sensitive to the quality variance. In this case, a quality signal with L^* between 1/2 and 1 as the lower bound of the distribution is optimal and provides information to consumers. This signal limits the impact of the variance on the quality perceived by the consumer, since the variance under the GI, $V_L(k)$, is lower than the variance without the GI, $V_W(k)$, when L^* is between ½ and 1. It is important to notice that this signalling effect occurs even if the supply (i.e. the initial distribution) of quality does not change, since specific quality still follows the given uniform distribution.

Equation (5) shows the importance of the weight consumers attribute to the variance of quality (via the parameter δ) in the relevance of a GI scheme.This simple theoretical model with a constant range of produced qualities shows that a GI scheme when consumers significantly and negatively value the impact of the quality variance. Another interesting insight could come from an extension with heterogeneous consumers and price adjustments. Such consumers would buy one unit of a quality k at a price p with an indirect utility equal to $\theta k - p$ and a uniformly distributed taste parameter $\theta \in [0,1]$ (see Mussa and Rosen, 1978). Consumers with a relatively high θ will select high-quality products and consumers with a relatively low θ will select low-quality products. This means that consumers with a relatively high θ select the quality k_L^* defined by equation (2) and consumers with a relatively low θ select the quality k_W^* defined by equation (3) such that $k_W^* < k_L^*$. We leave the integration of Mussa and Rosen's specification and the analysis of consumers' surplus and social welfare for future work, as we are mainly concerned with the short and medium terms determinants of WTP for wines of different GIs.

III. Experimental protocol

A. General setting

We conducted the experiment in a dedicated laboratory room at the *Centre des Sciences du Goût et de l'Alimentation* (CSGA) in Dijon, Burgundy. The experiment was performed in June 2018 with 125 consumers from Dijon and the surrounding municipalities (except from the municipalities of the *Marsannay* area) who attended a session of about one hour. Ten sessions were organized over three days, each involving 10 to 15 participants (the number of places in the experimental room).

The participants were drawn randomly from the INRA *PanelSens* database. The sample was representative of the French population by its stratification in terms of age, gender, and socio-occupational categories. The database from which the sample was drawn includes individuals having already participated in other sensory tests or interested in doing so and having agreed to participate in CSGA research. A preliminary survey was sent to them to check if they were wine buyers or consumers. The results confirm that the vast majority (98%) had bought or consumed wines in the last 12 months. To encourage participants to be engaged in the incentive scheme, participants were informed at the beginning of each session that we would give them an extra €15, in addition to the compensation of €10 initially announced, to potentially buy a bottle of wine at the end of the experiment. If participants did not buy a bottle of wine, the protocol allowed them to leave with a compensation of €25 (€15+€10).

Ten 75 cl bottles of red wines from the area of *Marsannay* were selected: six bottles of GI level *Village* and four bottles GI level *Régional*. These wines were what the winegrowers were selling at the time of the experiment under the current GI designation scheme (in June 2018, it was the 2016 vintage). This selection of wines was designed to be balanced and to separate the producer effect from the GI effect. We selected four comparable producers (family vineyards with a high rate of direct sales) that made different *Cuvées* of both GI levels in order

to have different producers in each GI level and to have different GI levels for each producer. With 10 bottles from 10 different producers, the changes in GIs would have been conflated with the effects of producers. Information on the price of wines by direct sales (reported in Table 1) was not presented to the participants. We informed the participants that the 10 wines were ordered based on expert judgement about the quality of vineyards, in line with their natural characteristics and other GIs of the region. An eleventh wine from the municipality of *Fixin* (adjacent to the *Marsannay* area, see Figure SM1) that already has vineyards from the high GI level *Premier Cru* was presented to half of the participants. This benchmark wine will enable us to estimate an umbrella effect for the creation of the *Premier Cru* level in the *Marsannay* area. The wines of current GI levels were displayed in the experiment room so each participant could look at them before the start of the experiment. During the experiment, consumers were asked to answer different questions about their wine consumption and their wine knowledge.

The following Table 1 presents the characteristics of the wines proposed to the participants, the producers, the names of GIs, the *Cuvée,* and the price. The pictures of wine labels are presented in Figure SM2. We sorted the sample of wines in order to include the different producers, while maintaining the rank of current GI levels. This strategy was central in order to control for producer effects arising from a GI reshuffle, which will be confirmed by the empirical results. However, the price hierarchy reported in Table 1 was not perfectly observed, with three wines (*WINE* 6, *WINE 8* and *WINE 9*) creating discontinuities along the price gradient. Recall that participants were informed only about the position of the wine on the quality gradient that we propose, and not about the true price gradient.

Table 1: Wines proposed during the experiment, all from the 2016 vintage

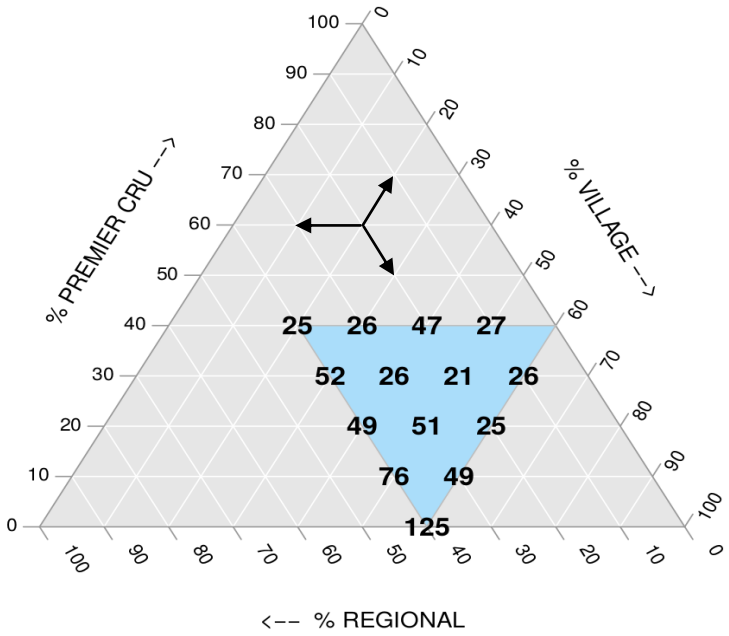
No	Producer	GI name	*Cuvée*	GI level	Price[(1)]	Tasting[(2)]
0	*Vieux Collège*	*Fixin Premier cru*	*Les Hervelets*	*Premier Cru*	28	22 (17.6%)
1	*Jean Fournier*	*Marsannay*	*Les Longeroies*	*Village*	22	10 (8%)
2	*Charles Audoin*	*Marsannay*	*Les Longeroies*	*Village*	18	13 (10.4%)
3	*Vieux Collège*	*Marsannay*	*Les Récilles*	*Village*	15	4 (3.2%)
4	*René Bouvier*	*Marsannay*	*Le Finage*	*Village*	16	12 (9.6%)
5	*Charles Audoin*	*Marsannay*	*Cuvée Marie Ragonneau*	*Village*	15	7 (5.6%)
6	*Jean Fournier*	*Marsannay*	*Cuvée Saint Urbain*	*Village*	17.25	4 (3.2%)
7	*René Bouvier*	*Bourgogne*	*Le Chapitre Suivant*	*Régional*	13.5	20 (16%)
8	*Vieux Collège*	*Bourgogne*	*Les Champs Foreys*	*Régional*	10	5 (4%)
9	*Sylvain Pataille*	*Bourgogne*	Not mentioned	*Régional*	15	9 (7.2%)
10	*Jean Fournier*	*Bourgogne*	Not mentioned	*Régional*	12.5	12 (9.6%)

(1) Price including consumption tax, in direct sales for private individuals.
(2) Numbers and percentages of participants having already tasted the wine. Any participant could have tasted several wines.

B. Eliciting WTP

To reproduce the typical wine purchase situation, the participants did not taste the wines during the experiment. Their declared WTP was based solely on their perceptions of the GI information derived from looking at the bottles of wine and their labels. Instead of asking about the WTP for each bottle of wine individually, the wines were first grouped into batches of bottles corresponding to their current GI levels. Participants were asked to report three WTP values (one for each GI level presented to them, *Premier Cru*, *Village* and *Régional*) through the following question: "What is the maximum price you are willing to pay for a bottle of wine randomly drawn from this batch of bottles?" The rest of the experiment simulated, for each of the 10 groups of participants, four scenarios for reshuffling the GI levels with the creation of a *Premier Cru* level in the *Marsannay* area for wines from the best *Cuvées* of current *Village* level and upgrading of *Régional* level wines to *Village* level. The highest quality wines at the *Village* level were those that were promoted to *Premier Cru* and the highest quality wines at the *Régional* level were those that were upgraded to the *Village* level (see Figure SM3). For each of these scenarios, participants were asked to state their WTP through the same question as before. Notice that the WTP was elicited before the random draw of the bottle was made. Fourteen possible reshuffle scenarios were selected for this study, as they appear on Figure 1.

In order to limit the duration of the sessions, each participant was subjected to a subset of just four scenarios with a random order of presentation between groups.



Notes: The *Marsannay* area is divided into three GI levels (*Régional, Village, Premier Cru*). This allows a triangular representation where each inner point represents a combination of the distribution that adds up to 100%. The Figure illustrates the 14 combinations proposed and the number of participants for each. For example, 125 participants indicated a WTP for the scenario corresponding to 0% *Premier Cru*, 60% *Village* and 40% *Régional*, which corresponds to the current distribution. The arrow in the middle represents how the projections on the axis were made.

Figure 1: Number of WTP responses for each of the 14 proposed scenarios

The purpose of randomly drawing the bottle that will be offered for sale from the BDM mechanism was to represent the quality uncertainty that exists when buying wine from a given GI level. We informed the participants that this artificial procedure corresponded to the uncertainty with which any wine buyer is regularly confronted, as detailed in the theoretical model. During the presentation of the protocol, participants were also informed that only one of the WTPs they declared would be drawn at the end of the session and could result in a real purchase through a BDM mechanism (see Lusk and Shogren, 2007). The purchase rule was devised to be individual: any participant whose randomly drawn WTP was greater than the

randomly drawn purchase price had to purchase this bottle at the drawn price. Conversely, if the participant's WTP was less than or equal to the purchase price of the bottle, the purchase could not go ahead. For each GI level (corresponding to one batch of bottles), the classical BDM procedure was applied to each price choice. More concretely, we made three random draws at the end of each session:

1. One of the WTP values declared during the session.

2. One bottle from the batch corresponding to this WTP.

3. A purchase price for the corresponding bottle.

This way of eliciting WTP opens up a new way to measure collective reputation based on WTP for a group of bottles. Our paper clearly innovates with respect to the BDM mechanism, since participants are bidding for one bottle among batches of bottles, rather than a given bottle.

C. Description of data

With 125 participants, five scenarios proposed and three GI levels for each scenario, we had a total of 1825 declared WTP values. It will be recalled that for 65 participants a *Fixin Premier Cru* (*WINE 0* in Table 1) was presented, whereas this wine was removed for the other 60 participants in order to estimate the umbrella effect from an existing *Premier Cru*. In all scenarios, the *Fixin Premier Cru* was classified as *Premier Cru*. *WINE 5* and *WINE 6* were always classified as *Village* and *WINE 10* was always classified as *Régional* (see Figure SM3). Table 2 presents the main summary statistics about the WTP elicited with respect to the average and the variance of the quality from batches of bottles. According to the theoretical model, the distribution of wine quality in the experiment is uniform with one bottle of each wine, with an average quality increasing along the GI hierarchy and with a variance that depends on the number of bottles in each GI batch. We see that the average WTP for a bottle of *Marsannay* is €9.65, with significant differences between GI levels: €6.75 on average for *Bourgogne*, €9.50

for *Village*, and €13 for *Premier Cru*.

Table 2: Summary statistics about the elicited WTP and GI characteristics

Variable	N	Mean	St. Dev.	Min	Q1	Q3	Max
WTP	1815	9.64	6.35	0.00	5.50	12.50	42.00
WTPreg	625	6.76	4.62	0.00	4.00	9.00	38.00
WTPvil	625	9.48	5.59	0.00	6.00	12.90	37.00
WTPpcr	565	13.01	7.14	0.00	8.20	17.00	42.00
MEAN	1815	4.92	3.15	0.00	1.50	8.00	10.00
MEANreg	625	1.10	0.49	0.00	1.00	1.50	1.50
MEANvil	625	5.10	1.06	3.00	4.50	6.00	6.50
MEANpcr	565	8.56	0.79	7.50	8.00	9.00	10.00
VAR	1815	1.50	1.03	0.00	0.50	1.70	4.00
VARreg	625	1.19	0.56	0.00	1.00	1.66	1.66
VARvil	625	2.43	0.96	0.50	1.66	3.50	3.50
VARpcr	565	0.89	0.81	0.00	0.00	1.66	2.50

Note: The first (*WTP*), fifth (*MEAN*) and ninth (*VAR*) rows report respectively the WTP, the average quality and the variance of the quality for the pooled sample of all 1815 prices elicited from participants. The suffixes "*reg*", "*vil*" and "*pcr*" in the other rows indicate the corresponding GI levels respectively: *Régional, Village, or Premier Cru.*

For all the scenarios proposed to the participants, we define the variables *MEAN* and *VAR* as representing the quality of each batch of bottles of GI level, through the average quality and the variance of quality computed from a grade allocated to each bottle distributed between 0 (for *WINE 10* at the bottom of the hierarchy) and 10 (for *WINE 0* at the top of the hierarchy), as displayed in Figure SM3. From Table 2, the average *MEAN* quality of all GI levels is approximately 5 and the average *VAR* is 1.5, confirming the balance of the experimental design in reference to the uniform distribution of the theoretical model. The *MEAN* variable is by construction increasing with the GI hierarchy (*MEANreg* < *MEANvil* < *MEANpcr*) while the variance is higher on average for the *Village* level that counts on average a greater number of bottles by batch (Figure SM3). The *Fixin Premier Cru* was not presented to all the participants, so they were not asked for an elicited *WTP* for the *Premier Cru* in the first round of the experiment. Consequently, we observe only 565 *WTP*, *MEAN* and *VAR* (instead of 625) for this higher GI level.

IV. Results

We first present econometric regressions for studying how elicited WTP is influenced by the different scenarios of reshuffling the GIs, through the various batches of bottles proposed. After discussing the results, we simulate the changes in GIs in order to maximize the average WTP across all participants for each GI level separately and for all levels.

A. Econometric estimations

In the following regressions, the individual WTP values from the experiment are pooled and explained by different sets of independent variables. The most general empirical model is:

$$WTP_{ijs} = \alpha_i + \beta_V\, VILL_j + \beta_P\, PCRU_j + \gamma_R\, MEAN_{js} + \gamma_V\, VILL_j \times MEAN_{js} + \gamma_P\, PCRU_j \times MEAN_{js} + \delta_R\, VAR_{js} + \delta_V\, VILL_j \times VAR_{js} + \delta_P\, PCRU_j \times VAR_{js} + \varepsilon_{ijs} \quad (6)$$

Where *i* represents the participant, *j* the GI level claimed for the corresponding batch of bottles, *s* the corresponding scenario, and ε are the residuals. In this equation, WTP is the dependent variable and the explanatory variable *VILL* is a dummy that codes 1 if the batch of bottles is claimed of the *Village* level and *PCRU* codes 1 if the batch of bottles is claimed of the *Premier Cru* level (the *Régional* level is the reference category). The other variables in equation (6) are the main effects of the variables *MEAN* and *VAR* (respectively the average and the variance of quality within GIs) and their interactions with the dummy variables about GI levels. These models are estimated by OLS (Ordinary Least Squares) both without and with participant fixed effects α_i. The variance-covariance matrix of errors is clustered within each participant (as random effects) to take into account the dependences between the different WTP values of a given participant. Standard errors of the coefficients estimated are corrected accordingly.

In Table 3, the *Régional* level is the reference category with an average WTP of €6.77 per bottle (see the *Intercept* row of Model 1). A bottle from the *Village* level commands a WTP of €2.71 more than the reference category (leading to an average WTP of €9.50), and the

Premier Cru level has a WTP about €6.25 higher (leading to an average WTP of €13). The R2 shows that 16% of pooled WTP variations are explained by just these two dummy variables about GI levels. The relatively high WTP for the *Premier Cru* level, independently of the bottles in the corresponding batches, is preliminary evidence of the credibility of the creation of the *Premier Cru* level in the *Marsannay* area. This result is robust to the inclusion of participant fixed effects, as presented in Model 2 of Table SM1 in the supplementary material. Controlling for individual characteristics does not change the premiums for GI levels.

Table 3: Regression Results for the WTP on batches characteristics

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
(Intercept)	6.77***	6.63***	6.07***	6.38***	6.42***	6.19***
	(0.41)	(0.43)	(0.42)	(0.41)	(0.47)	(0.45)
VILL	2.71***	2.80***		1.42***	1.74***	1.88***
	(0.20)	(0.25)		(0.37)	(0.35)	(0.43)
PCRU	6.25***	5.43***		3.02**	1.43	6.17***
	(0.40)	(0.78)		(1.03)	(1.02)	(0.80)
PCRU x WINE 0				1.45	1.32	1.84
				(1.26)	(1.27)	(1.26)
MEAN			0.79***	0.32***		
			(0.05)	(0.09)		
REG x MEAN					0.31	4.08
					(0.24)	(3.89)
VILL x MEAN					0.26**	0.17
					(0.09)	(0.15)
PCRU x MEAN					0.51***	0.48***
					(0.10)	(0.11)
VAR			-0.17***	0.03		
			(0.05)	(0.06)		
REG x VAR						-3.29
						(3.31)
VILL x VAR						0.22
						(0.20)
PCRU x VAR						-0.41***
						(0.08)
Num. obs.	1815	1815	1815	1815	1815	1815
Wine Fixed Effects	No	Yes	No	No	No	No
R2 (full model)	0.16	0,16	0.16	0.17	0.17	0.17

***p < 0.001, **p < 0.01, *p < 0.05

Note: Regressions are from pooled data with WTP as the dependent variable with participant clustered standard errors in parentheses. *MEAN* and *VAR* are continuous variables representing the average and the variance of wine grades within each batch of bottles. The interaction *PCRU x WINE 0* controls for the presence of *Fixin Premier Cru* for umbrella effects.

Model 2 of Table 3 introduces 10 dummy variables for the presence of each wine in the batches proposed to participants. This allows us to control for the individual values of each wine only elicited for batches of bottles. The introduction of wine fixed effects does not change significantly the WTP differential for *Village* level, which shows that other wine characteristics (producer, colour of label, etc.) do not matter for consumers' WTP. However, introducing the wine fixed effects in Model 2 (in particular the introduction of the dummy variable that codes the presence of WINE0 *Fixin Premier Cru*, see Table SM1) decreases the WTP differential for *Premier Cru* level of 0.80€ (from 6.25 to 5.43). This value corresponds to the umbrella effect from the *Premier Cru* of the neighbouring municipality of *Fixin.*

Model 3 of Table 3 removes the GI levels dummies to include the variables *MEAN* and *VAR.* In line with our theoretical results, the average quality has a positive effect on WTP (€0.79 for a one-point increase) and the variance of quality has a negative effect on WTP (€-0.17 for a one-point increase). These values are also robust to the inclusion of participants' fixed effect (see Model 2 of Table SM2). Model 4 of Table 3 adds GI level dummies in order to show that the average quality effect from the variable *MEAN* is robust to the control of GI level effects. Compared to Model 2 of Table 3, the *Village* premium is halved (€2.8- €1.4) and the *Premier Cru* premium declines by €2.4 (€5.4- €3). The introduction of GI dummies cancels the significance of the variable *VAR*, which mean that quality uncertainty is related to GI levels in consumer perceptions. As we have shown in the summary statistics of Table 1, the effect of the quality variance cannot be significantly disentangled from the effects of GIs levels. By multiplying the number of scenarios in future researches, it would be possible to estimate the effect of *VAR* more precisely while controlling for GI levels.

We introduce some interaction between *MEAN*, *VAR* and GI level dummies, in the results reported in Models 5 and 6 of Table 3. The positive effect of average quality is significant for *Village* (€0.26) and for *Premier Cru* (€0.51), while it is less precisely estimated for *Régional*.

Increasing heterogeneity within this GI level is shown to lower the average WTP significantly for the highest GI level. The uncertainty about wine quality within GI levels has a greater impact at the top of the hierarchy. In no cases do we find significant effects of the variability at *Régional* and *Village* levels (see Table SM3). More research with more participants and more contrasted scenarios is needed.

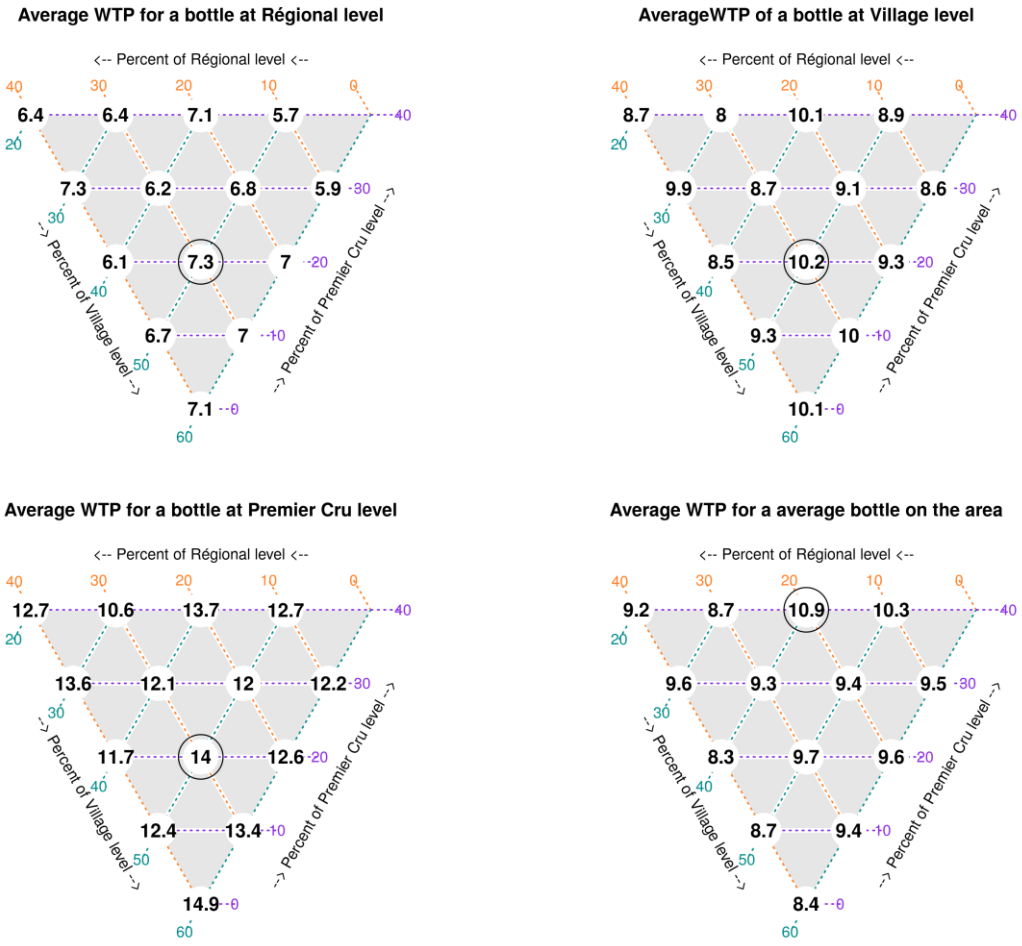
B. Simulating change in Geographical Indications

WTP elicited in the experiment is now used for simulating scenarios of GI change in order to maximize consumer WTP in accordance with the guidelines provided by the theoretical model. We use the WTP declared during the experiment (and not the values that could be predicted from one of the previous regressions). This can be done safely as the premiums estimated for GI levels are robust to the inclusion of the participant fixed effects.

Figure 3 shows the average WTP for each GI level individually (top three panels) and for the weighted average over the whole *Marsannay* production area (bottom-right panel). For each individual GI level, the scenario maximizing the average WTP corresponds to 20% *Premier Cru*, 50% *Village*, and 30% *Régional*. This combination presents slight improvements in general with respect to the current situation: an average gain per bottle of €0.2 for *Régional* and €0.1 for *Village*. The small size of these improvements is potentially due to the area substitution patterns that lowers the WTP for the *Village* level with the creation of the higher level *Premier Cru* in these scenarios. The gains from the optimal scenarios compared to other scenarios can nevertheless be significant: as much as €1.2 (€7.3- €6.1) for *Régional*, €2.2 for *Village*, and €3.4 (€14- €10.6) for *Premier Cru*. This indicates that the WTP under the current GI designation is close to the optimum in terms of individual values of individual GI levels.

Over the whole area, the scenario that maximizes the average WTP does not correspond to the previous scenario that maximizes the WTP for each GI level individually. A GI

designation scheme with 40% *Premier Cru*, 40% *Village*, and 20% *Régional* presents an average WTP of €10.9 per bottle for the whole *Marsannay* area. This result is explained by the weights put on the designated acreages in the new high level, which weight the gains for *Premier Cru* level more heavily. The gain compared to the current GI designation scheme is significant, €2.5 (€10.9-€8.4) per bottle on average. While this scenario maximizes the average WTP for a bottle from the *Marsannay* area, maximizing the WTP for each GI individually could also be policy-relevant. In particular, the scenario that maximizes the WTP for the *Premier Cru* is probably the scenario that limits the impact of this change in GI for the other *Premiers Crus* of the area (i.e., from other municipalities). Knowing the umbrella effects from other GIs in the region, it could make the GI reshuffling of *Marsannay* more acceptable at the regional scale.



Note: Each triangle represents the full set of combinations proposed between the three GI levels (see Figure 2). The two

triangles at the top represent the average WTP for a *Villag*e and *Régional* level bottle respectively. The triangle at the bottom left represents the average WTP for a *Premier Cru* bottle from the *Marsannay* area, with the value of €14.9/bottle reported at the bottom (for 0% *Premier Cru*) corresponding to the average WTP for the *Fixin Premier Cru* bottle (*WINE 0*). The last triangle at the bottom right aggregates the previous triangles. The numbers represent the average WTP of the three levels, weighted by the proportions of the acreages delineated in each scenarios.

Figure 3: Average WTP for the three GI levels individually and for all levels.

V. Conclusion

We use elicited WTP from an original experimental protocol to simulate the optimal reshuffling of vineyard plots among the current GI levels, jointly with the introduction of a new high-quality level. We contribute to the empirical literature by proposing a BDM-based experiment to elicit *ex ante* consumers' WTP when changes are made to GIs that enjoy a long history and good reputation. The results reveal a significant increase in WTP for wine bottles benefiting from a new high-quality ranking, while the loss is limited in other current levels. This confirms results from the simple theoretical model showing that a change in the GI scheme may increase the consumer surplus without changing the quality of the products supplied.

The decision to reshuffle GIs is obviously important for local wine producers who are naturally in favour of moving the maximum quantity of the best parcels of their vineyard up the hierarchy. They hope to benefit from the umbrella effect of the higher quality wine of the surrounding municipalities. From consumer perceptions, this decision to reshuffle current GIs engenders a trade-off. On the one hand, the promotion of the best wines from the medium level to higher level makes it easier to identify high-quality wines from this area, thereby increasing WTP compared with the current situation. On the other hand, the removal of these high-quality wines from the medium level lowers the average quality found at this level, which reduce WTP for it. Moreover, the credibility of current GI levels following the introduction of a new high-quality GI level could also be impacted by the comparative stigma. Distinguishing certain products (or places of production) as high-quality products could adversely affect consumer

perception of other products remaining at the current levels. We do not find such effect, as the optimal allocations among the different GI levels shows a relatively high number of wines joining the high-quality level.

This approach can be applied to other wine regions or food products that are hierarchically structured by GI designation schemes. Following the Burgundy model, it is now quite common for Italian, German or US wine GIs to include a vertical dimension in their designation schemes. Moreover, the theoretical framework underscores the benefits of changing GIs so as to provide consumers with more accurate, albeit still imperfect, information. We do not study the impact of GI reshuffling on others surrounding municipalities, which already have vineyards designated as *Premier Cru*. The introduction of *Marsannay Premier Cru* could change the perception of the information signaled through this high-quality level. This potential effect of GI reshuffling has an important political importance at the regional scale that need to be adressed in future researches. Nevertheless, we suggest that maximising the WTP for *Marsannay Premier Cru* alone, instead of the average WTP for all the wines of the area, could be more acceptable by surrounding wine producers. Beyond the case study under investigation, the mechanism and the protocol presented in this paper might be replicated by the INAO, the organization in charge of the administrative control of GIs, when addressing the reshuffling demand of other GIs.

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