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Willingness-to-Pay for Reshuffling Geographical Indications

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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), e.g., a change of hierarchical levels within a restricted area. 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 for the current distribution of products' quality. Elicited WTP values are then used to simulate the optimal GI reshuffle. (JEL Classifications: L66, Q18, Q28)

Keywords: experimental economics, public policy, quality signal, wine appellation.

I. Introduction

A geographical indication (GI) provides certified information about the location of production as a quality signal given to consumers (Menapace and Moschini, 2012; Bonroy and Constantatos, 2015). The credibility of this information depends on

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consumers' perception of the designation scheme that maps the physical attributes of production sites regarding the GI.[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 to adapt GIs to new contexts, such as changing technologies, modifying consumer preferences, or climate change. Moreover, even without any external evolutions, both 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 article aims to understand *ex ante* how consumers react to a change in a GI scheme, when the quality distribution of the bottles supplied is constant. The objective is to experimentally estimate consumers' perceptions of different scenarios involving changes in GI classification without any change in products.

Before presenting the experiment, 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 product quality within each GI level and their variance within-GI quality. For a given distribution of 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 complex trade-off in such a reshuffle of GIs. Indeed, the average WTP probably increases by adding a new high-quality level, but potentially at the expense of the WTP of current lower-quality GI levels.

Another kind of GI change is studied by Costanigro, Scozzafava, and Casini (2019) who examine the introduction of a new and high-quality GI level, namely *Gran Selezione*, at the top of the *Chianti* wine hierarchy. From an online survey with random scenarios, the authors find that the new GI would increase the market share of *Chianti* wines, with the effect of increased vertical differentiation more than offsetting the decline in 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 exclusively due to a subjective bias named "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 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 typical theoretical models of the

[1] The importance of physical attributes (*terroir*) for explaining the link between wine qualities and prices is not consensual in the literature (Gergaud and Ginsburgh, 2010; Ashenfelter and Storchmann, 2010). In particular, part of the debate consists of separating the relative contribution of terroir and GIs, knowing that they are spatially correlated (Cross, Plantinga, and Stavins, 2017).

GI designation (Deconinck and Swinnen, 2014; Gokcekus and Finnegan, 2017; Yu, Bouamra-Mechemache, and Zago, 2017).

Our research question is also related to the work of Gokcekus and Finnegan (2017) about the creation of new subdivisions within the Willamette Valley American Viticultural Area of Oregon. Using wine price data before and after the creation of the sub-AVAs, they found *ex post* that regional reputation premiums have significantly increased with GI reshuffling. Compared to this contribution, our approach innovates by providing an *ex ante* estimation of the impact of GI reshuffling on WTP through a lab experiment, organized before any "real" institutional decisions. Our protocol allows us to virtually study different reshuffling scenarios in order to determine which one maximizes the WTP for each GI level or for all the GI levels in the area of interest. Eventually, our work contributes to thwart the lack of knowledge regarding the design of more efficient GIs, as regularly underlined in the literature (Bonroy and Constantatos, 2015; Deconinck and Swinnen, 2014).

Our new protocol is applied to a Burgundian configuration. Indeed, Burgundy has a long history of ranking vineyards according to their quality, dating back to the Middle Ages (Meloni and Swinnen, 2018). The first official classification came from a map from 1860 that only contained three GI levels for each municipality in the *Côte d'Or* area, namely, the *Régional*, the *Village*, and the *Grand Cru* levels. This first map, established from both academic knowledge (Lavalle, 1855) and the jurisprudence of previous legal disputes, was extensively used as a basis for regulating the wine sector, until the creation of the French national institute in charge of the GIs management, entitled *Institut National de l'Origine et de la Qualité* (INAO) in 1936. Some reshuffling was then implemented during the 20th century with, in particular, the creation of *Premier Cru* level in 1943 and many marginal changes at the vineyard scale thereafter.[2]

There is currently no explicit procedure for determining GI reshufflings. Current delineations come from empirical knowledge accumulated on the quality potential of vineyards, in connection with requests of wine producers and traders.[3] Nowadays, the range of price differentials across the historical GI levels (*Premier Cru* included) is very high in Burgundy (Combris, Lecocq, and Visser, 2000). Because of these price premiums, there are numerous "regulatory" requests made by the *Organismes de Défense et de Gestion* (ODG), the producer organizations that defend GIs interests, to move up some vineyards in the hierarchy. These requests are made in order to benefit from the so-called "umbrella effect" of wines currently

[2] In 2013, INAO decided to stop considering marginal changes inside each specific GI but chose to arbitrate requests during "collective" reshuffling operations inside a significant region.

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

designated at higher levels (Hakenes and Peitz, 2009). The requests supervision is entrusted to the INAO, which has the general administrative power, but no explicit scientific criteria for reshuffling the GIs.

We study the effect of reshuffling the GIs for the vineyards of *Marsannay* in the Burgundy region. This area has three municipalities: *Chenôve*, *Couchey,* and *Marsannay-la-Côte*, with only a two-level GI hierarchy: the *Régional* level, lower than the *Village* level (see Figure SM1 in the Supplementary Material). The GI classification for the whole of Burgundy has higher levels *Premier Cru* and *Grand Cru* that are not currently present in 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* (capital of Burgundy) has made these wines mainly intended for local consumption, which has resulted in a late introduction of the GIs in the 20th century. The ODG of *Marsannay* asks the INAO to reshuffle the current GI boundaries for the *Village* and the *Régional* levels and to create a *Premier Cru* level in 2012. At the time of writing the article, this request is still under investigation by the INAO.

The article 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 the trade occurs in a single period, when 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 variance of the 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 quality of the wine follows a uniform distribution $k \in [0,1]$, the perceived quality k^* is assumed to depend on the mean $E(k)$ and the variance $V(k)$ of the specific distribution of the quality.

Without any GI, the perceived quality is assumed equal to

$$k^* = \gamma E(k) - \delta V(k) = \gamma/2 - \delta/12, \tag{1}$$

with $\gamma, \delta > 0$. The parameter γ captures the perception of average quality and δ captures the aversion to quality variability that negatively affects consumer perception.

We consider a possible GI certification capable of providing credible information about the minimum quality limit of the wine. We assume a limit $0 \leq L \leq 1$ for a GI, such that if the consumer purchases a bottle under this GI, the variation in quality

follows a subpart of the uniform distribution with $k \in [L, 1]$. In other words, the GI reduces part of the risk in addition to giving the signal of average quality. For a bottle below the threshold, the variation in quality 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 variation in quality 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

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

For a bottle without 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 GI is

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

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

$$k(L) = k_L^* + k_W^*. \tag{4}$$

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

$$L^* = Min\left[\frac{1}{2} + \frac{3\gamma}{\delta}, 1\right]. \tag{5}$$

If the parameter δ capturing the aversion to the variability of the 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 variance in quality does not count much in the perception of quality and consumer's utility. If the parameter γ is relatively large, the mean weights more than the variance of consumers' perceptions. Conversely, if δ is relatively high ($\delta > 6\gamma$), the consumer is very sensitive to the variance in quality. 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 that consumers attribute to the variance in quality (via the parameter δ) in the relevance of a GI scheme. This simple theoretical model with a constant range of qualities produced shows a GI scheme when consumers significantly and negatively value the impact of quality variance. Another interesting insight could come from an extension with heterogeneous consumers and price adjustments. These consumers would buy a 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-term determinants of WTP for wines of different GIs.

III. Experimental Protocol

A. General Setting

We conducted the experiment in a laboratory room dedicated to 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 (excluding the municipalities of *Marsannay*) 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).

Participants were randomly drawn from the INRAE *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 who have already participated in other sensory tests or are interested in doing so and who have agreed to participate in CSGA research. A preliminary survey was sent to them to check whether they were buyers or consumers of wine. The results confirm that the vast majority (98%) had bought or consumed wines in the past 12 months. To encourage participants to be engaged in the incentive scheme, they 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 the compensation of €25 (€15 + €10).

Ten 75 cl bottles of red wines from the *Marsannay* area were selected: six bottles at the *Village* GI level and four bottles at the *Régional* GI level. 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

Table 1
Wines Proposed During the Experiment (All from the 2016 Vintage)

No	*Producer*	*GI Name*	*Cuvée*	*GI Level*	*Price*[a]	*Tasting*[b]
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%)

[a]Price including consumption tax, in direct sales for private individuals.

[b]Numbers and percentages of participants having already tasted the wine. Any participant could have tasted several wines.

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) who made different *Cuvées* of both GI levels in order to have different producers at each GI level, and to have different GI levels for each producer. With ten bottles from ten different producers, the GIs changes would have been conflated with the producers' effects. Information on the price of wines for direct sale (reported in Table 1) was not presented to the participants. We informed the participants that the ten wines were hierarchically arranged following experts' judgments on the quality of the vineyards according to their natural characteristics. An 11th 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. Wines at current GI levels were displayed in the experiment room so that 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 knowledge of wine.

Table 1 presents the characteristics of the wines offered to participants, producers, names of GIs, the *Cuvée,* and the price. Pictures of wine labels are shown in Figure SM2. We have sorted the wine sample to include the different producers, while maintaining the rank of current GI levels. This strategy was central to controlling the effects on producers 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 the participants were only informed of

the position of the wine on the quality gradient that we offer, and not of the true price gradient.

B. Eliciting WTP

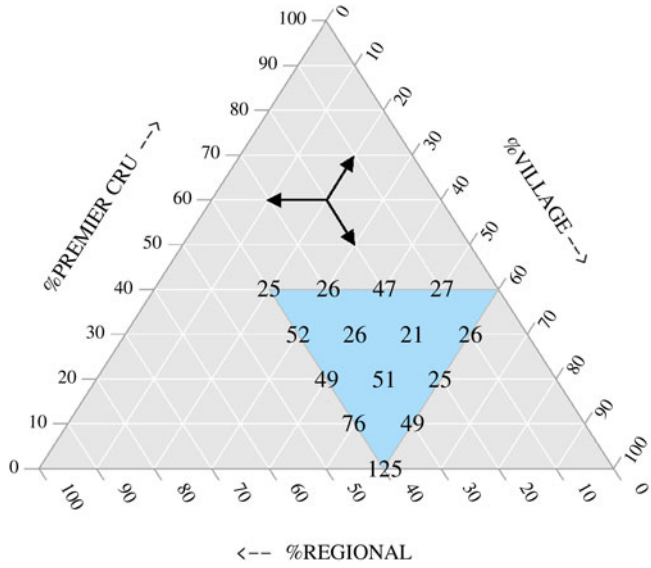
To reproduce the typical wine purchasing situation, the participants did not taste the wines during the experiment. Their declared WTP was based solely on their perception of the GI information derived from looking at the bottles of wine and their labels. Instead of asking questions about the WTP for 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 ten groups of participants, four scenarios of reshuffling the GI levels with the creation of a *Premier Cru* level in the *Marsannay* area for wines of the best *Cuvées* of the current *Village* level and upgrading wines from *Régional* to *Village* level. The highest quality wines at the *Village* level are those that have been promoted to *Premier Cru* and the highest quality wines at the *Régional* level are those that have been 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 for the bottle. Fourteen possible reshuffle scenarios were selected for this study, as they appear in 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 the groups.

The purpose of randomly drawing the bottle that will be offered for sale from the Becker, DeGroot, and Marschak (BDM) mechanism (Becker, DeGroot, and Marschak, 1964) was to represent the quality uncertainty that exists when buying wine at 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, the participants were also informed that only one of the WTPs that 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 a 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.

Figure 1

Number of WTP Responses for Each of the 14 Proposed Scenarios



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.

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

C. Description of Data

With 125 participants, five scenarios proposed and three levels of GI for each scenario, we had a total of 1,825 declared WTP values. Recall that for 65 participants a *Fixin Premier Cru* (*WINE 0* in Table 1) was presented, while this wine was removed for the other 60 participants in order to estimate the umbrella effect of an existing *Premier Cru*. In all scenarios, *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 on the WTP elicited with respect to the average and the variance of the quality of the batches of bottles. According to the theoretical model, the distribution of wine quality in the experiment is uniform with a 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

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
WTP_ REG	625	6.76	4.62	0.00	4.00	9.00	38.00
WTP_ VILL	625	9.48	5.59	0.00	6.00	12.90	37.00
WTP_PCRU	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
MEAN_ REG	625	1.10	0.49	0.00	1.00	1.50	1.50
MEAN_ VILL	625	5.10	1.06	3.00	4.50	6.00	6.50
MEAN_ PCRU	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
VAR_ REG	625	1.19	0.56	0.00	1.00	1.66	1.66
VAR_ VILL	625	2.43	0.96	0.50	1.66	3.50	3.50
VAR_ PCRU	565	0.89	0.81	0.00	0.00	1.66	2.50

Notes: 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 1,815 prices elicited from participants. The suffixes "*REG*," "*VILL*," and "*PCRU*" in the other rows indicate the corresponding GI levels respectively: *Régional, Village, or Premier Cru.*

Marsannay is €9.65, with significant differences between the GI levels: €6.75 on average for *Bourgogne*, €9.50 for *Village*, and €13 for *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. According to 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 with reference to the uniform distribution of the theoretical model. The *MEAN* variable is by construction increasing with the GI hierarchy (*MEAN_REG* < *MEAN_VILL* < *MEAN_PCRU*) while the variance is higher on average for the *Village* level that counts on average a larger number of bottles per 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 to study how elicited WTP are 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 the GIs in order to

maximize the average WTP for all participants for each level of GI separately and for all levels.

A. Econometric Estimations

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

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

In Equation (6), the index 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 at the *Village* level and *PCRU* codes 1 if the batch of bottles is claimed at 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 the GIs) and their interactions with the dummy variables on GI levels. These models are estimated by ordinary least squares (OLS) both without and with participant fixed effects α_i. The variance-covariance error matrix is clustered within each participant (as random effects) to take into account the dependencies between the different WTP values of a given participant. The standard errors of the estimated coefficients are corrected accordingly.

In Table 3, the *Régional* level is omitted, in order to be the reference category with an average WTP of €6.77 per bottle, as shown in the *Intercept* row of Model 1. A bottle of the *Village* level (denoted *VILL*) entails a significant WTP increase of €2.71 compared to the reference category, leading to an average WTP of €9.50. The *Premier Cru* level (denoted *PCRU*) implies a significant increase in the WTP of €6.25 compared to the reference category, leading to an average WTP of €13. The *R2* shows that 16% of the pooled WTP variations are explained by these two dummy variables on the GI levels. The relatively high WTP for the *Premier Cru* level, independently of the bottles in the corresponding batches, is striking evidence of the credibility of the creation of the *Premier Cru* level in the *Marsannay* area. This result is robust when we consider alternatively the inclusion of participants' 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.

Model 2 of Table 3 introduces 11 wine fixed effects, not reported here, for the presence of each wine in the batches offered to participants (the coefficients are available in Table SM1). This allows us to control for the individual values of each wine from

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.	1,815	1,815	1,815	1,815	1,815	1,815
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.

Notes: 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.

WTP only elicited for batches of bottles. Compared to Model 1, the introduction of these fixed effects on wine does not significantly change the WTP differential for the *Village* level, which shows that individual wine characteristics (producer, color of label, etc.) do not matter for consumer WTP. However, the WTP differential for the *Premier Cru* level decreases by €0.80 (from €6.25 to €5.43). The explanation comes from the so-called "umbrella effect," related to the *Fixin Premier Cru* which is now controlled the the dummy variable *WINE 0* (in Table SM1).

Model 3 in Table 3 removes the GI levels dummies and includes the variables *MEAN* and *VAR* (respectively the average and the variance of quality within the GIs). In line with our theoretical results, the average quality has a positive effect on the WTP (€0.79 for an increase of one point) and the quality variance has a negative effect on the WTP (€–0.17 for an increase of one point). These values are also robust with the inclusion of participant fixed effects (see Model 2 of Table SM2). Model 4 in Table 3 adds GI level dummies to the *MEAN* and *VAR* to show that the average quality effect of the *MEAN* variable is robust to controlling the GI level effects. Compared to Model 2 in Table 3, the *Village* premium is halved (namely, €2.8 – €1.4) and the *Premier Cru* premium also declines by €2.4 (from €5.4 – €3). The introduction of GI dummies cancels the significance of the *VAR* variable, which means that the uncertainty of quality is related to GI levels in consumer perception. As the summary statistics in Table 1 show, the effects of both quality and variance cannot be significantly disentangled from the effects of GIs levels.[4]

Models 5 and 6 in Table 3 focus on the interactions between *MEAN*, *VAR,* and dummies on the GI levels. The positive effect of average quality is statistically significant for both *Village* (€0.26) and *Premier Cru* (€0.51), while it is less precisely estimated for *Régional*. Hence, the effect of average wine quality is higher for high-quality GI levels. Model 6 shows that heterogeneity within *Premier Cru* significantly decreases the average WTP for the highest GI level. Uncertainty about the quality of wine in GI levels has a greater impact at the top of the hierarchy. Similar regressions did not find any significant effects of the variability at *Régional* and *Village* levels (see Models 3 to 6 in Table SM3).

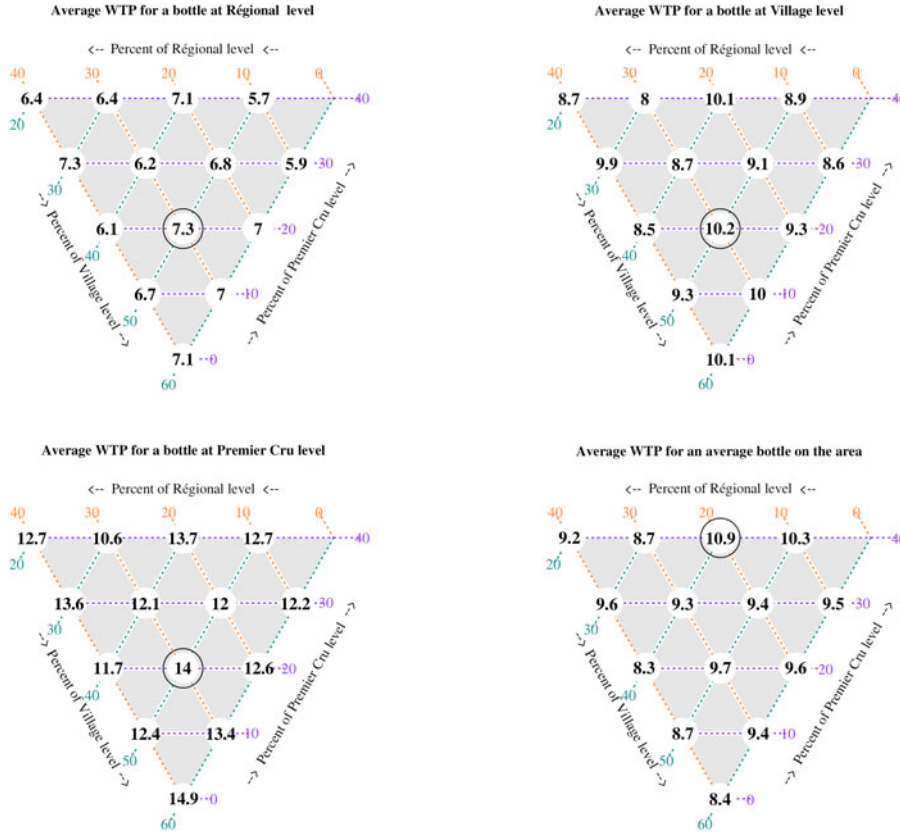
B. Simulating Change in Geographical Indications

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

[4] By multiplying the scenarios in future research, it would be possible to estimate more precisely the effect of *VAR* while controlling the GI levels.

Figure 2

Average WTP for the Three GI Levels Individually and for All Levels



Note: Each triangle represents the full set of combinations proposed between the three GI levels (see Figure 1 for explanations). The two triangles at the top represent the average WTP for a *Village* 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 number of bottles in each scenario.

With the same representation as Figure 1, Figure 2 shows the average WTP for each specific GI level (top two panels and bottom-left panel). The last panel at the bottom right displays the average WTP for the entire Marsannay area, where the three specific WTPs are weighted by the share represented by the corresponding GI levels. For each specific GI level, the scenario maximizing the average WTP corresponds to the following combination: 20% *Premier Cru*, 50% *Village*, and 30% *Régional*, as circled on the three panels in Figure 2. This combination presents slight improvements compared to the current situation without *Premier Cru*, with average gains per bottle equal to €0.2 for the *Régional* and €0.1 for the *Village* level. These gains are small due to the substitution of quantities that lower the

WTP for the *Village* level with the creation of the *Premier Cru* of a higher level. However, the gains from the optimal scenarios compared to the worst scenarios are significant: €1.2 (€7.3 – €6.1) for the *Régional*, €2.2 (€10.2 – €8) for the *Village*, and €3.4 (€14 – €10.6) for the *Premier Cru*. This indicates that the WTP under the current GI designation is close to the optimum.

Over the entire *Marsannay* area, the scenario that maximizes the average WTP does not correspond to the previous scenario that maximizes the WTP for each GI level individually. The average WTP is maximized for the GI designation scheme with 40% *Premier Cru*, 40% *Village*, and 20% *Régional,* as indicated by the circle at the bottom-right panel of Figure 2. This combination presents an average WTP of €10.9 per bottle for the entire *Marsannay* area. This result is explained by the weights given to the designated acreages in the new high level, which weight the gains for the *Premier Cru* level more heavily when more bottles are designated as *Premier cru*. The gain compared to the current GI designation scheme is significant, €2.5 (€10.9 – €8.4) per bottle on average. Although this scenario maximizes the average WTP for a bottle in the *Marsannay* area, maximizing the WTP for each GI individually could also be relevant for policy. 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* in the area (i.e., other municipalities). Knowing the umbrella effects of other GIs in the region, this could make the GI reshuffling of *Marsannay* more acceptable at the regional scale.

V. Conclusion

We use WTP elicited 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 the WTP of consumers *ex ante* when changes are made to GIs enjoying a long history and a good reputation. The results reveal a significant increase in the WTP for the bottles of wine benefiting from a new high-quality ranking, while the loss is limited to other current levels. This confirms the 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 favor of moving the maximum quantity of the best parcels of their vineyard up the hierarchy. They hope to benefit from the umbrella effect of higher quality wine from surrounding municipalities. From consumers' perception, this decision to reshuffle the current GIs engenders a trade-off. On the one hand, the promotion of the best wines from the medium level to the higher level makes it easier to identify high-quality wines from this area, thereby increasing the WTP compared to

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 reduces the 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 comparative stigma. Distinguishing certain products (or places of production) as high-quality products could adversely affect consumers' perception of other products remaining at current levels. We do not find such an effect, because the optimal allocations among the different GI levels show 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 United States 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 did not study the impact of the GI reshuffling in others surrounding municipalities, which already have some vineyards designated as *Premier Cru*. The introduction of a *Marsannay Premier Cru* could change the perception of other *Premier Cru* of Burgundy. This potential effect of GI reshuffling has an important political importance at the regional scale that needs to be addressed in future research. Nevertheless, we suggest that maximizing the WTP for *Marsannay Premier Cru* alone, instead of the average WTP for all wines in the area, could be more acceptable for the surrounding wine producers.

Beyond the case study under investigation, the mechanism and protocol presented in this article could be replicated by the INAO (in France), or by any administrative authority worldwide, when addressing the reshuffling demand of other GIs.

Supplementary Material

To view supplementary material for this article, please visit https://doi.org/10.1017/jwe.2020.5.

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