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Distance Decay in the Willingness to Pay for Wine: Disentangling Local and Organic Attributes

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Abstract This paper investigates how the residents of a French wine-producing region value the attributes of wine. We elicit the willingness-to-pay (WTP) for organic/non-organic and local/non-local wines with increasing levels of information on the impact of agricultural practices at both global and local scales. The analysis shows that there is a significant organic premium associated with both local and non-local wines. This organic premium significantly increases with information and significantly decreases with the distance between the consumer's home and the vineyard. Based on the econometric predictions of the WTP, we show that a per-unit tax on non-organic wines or a standard imposing organic practices increases welfare through the internalization of the attributes revealed by the experiment.

Keywords Organic premium · Local premium · Experimental economics · Wine demand

1 Introduction

The organic wine sector in Europe is booming, the areas dedicated to organic vineyards almost tripled between 2007 and 2012 in France and Spain. Organic production has been

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strongly encouraged by public policies to reduce the application of chemical pesticides in the agricultural sector. New European regulation which came into force in August 2012 allows wine producers to display the European Union (EU) logo which signals organic practices.[1] Regulatory efforts in France include subsidies and technical advice on conversion to organic production. Organic production is also encouraged by authoritarian measures requiring the withdrawal from the market of certain pesticides and/or the precise targeting of areas where some intensive practices are prohibited. The French Ministry of Agriculture considers the development of organic agriculture as a solution to the negative externalities of non-organic practices.

However, despite all the efforts that have been made to increase organic production in France, 20 % of the pesticides used in 2011 were applied to vineyards, which account for only 3.7 % of the French agricultural land area. Pesticides are the cause of major health problems. The French Health Institute underlines "high or medium presumptions" of a link between exposure to pesticides and various diseases including prostate cancer, Parkinson's disease, cognitive disorders and human fertility problems. A report published in June 2013 highlights the danger of exposure to pesticides for the workers handling them and for the inhabitants of rural areas.[2] Agricultural practices result in both global and local pollution. Globally, chemical fertilizers used in regular wine production are responsible for GreenHouse Gas (GHG) emissions, contributing to global warming. Locally, 93 % of French watercourses are polluted by pesticides, a problem that is particularly acute in wine producing regions.

Nevertheless, it seems that often consumers are reluctant to favor organic food in their purchases. In 2012, consumption of organic products in France was estimated at 2.4 % of the food market (against 1.3 % in 2007). The main reason for this small market share seems to be the relatively high prices of organic products. For instance, 75 % of French people who do not buy organic products stated that they found them too expensive.[3] This negative effect of a high price for organic products could be diminished by: (1) promoting organic products and increasing the consumers' willingness-to-pay (WTP) through information campaigns; (2) imposing organic practices; and/or (3) imposing taxation on selective non-organic production implying an increase in its price. There is ongoing debate on the best way to develop the organic wine segment. We contribute to this debate by studying what determines the WTP for organic products, and constructing welfare simulations for potential feasible policies.

Our study investigates whether consumers living close to a vineyard area in the Burgundy region of France are interested in organic and local wines. In particular, we investigate whether the distance to a vineyard and the level of information on the externalities of agricultural practices have an impact on the wine premium. We conducted a lab experiment to elicit the WTP for organic/non-organic, local/non-local wines, promoted by increasing levels of information on organic practices and on the health and environmental impacts of agricultural practices related to wine grape production. Our study exploits experimental precision to measure both the subjective (declared) distance and the objective (computed on the basis of home addresses) distance between these consumers' places of residence and the vineyards considered. Our empirical models account for the negative effect of a small participant sample

[1] US organic classifications for wine include two distinct categories, "organic grape wine" and "organic handling wine", which differ in the allowable use of artificially derived preservatives such as sulphites. European organic classification allows the use of preservatives, but fixes a smaller maximal concentration for organic wines.

[2] See the website http://www.inserm.fr/content/view/full/72494.

[3] http://www.agencebio.org/sites/default/files/upload/documents/4_Chiffres/Dossier_Presse_AgenceBIO_06022013.pdf.

size, by smoothing the idiosyncratic WTP of outliers, using a robust econometric estimation method.

Section 2 discusses the relevant literature and contribution made by our study. Sections 3 and 4 describe the experiment and the data. The econometric results are presented in Sects. 5 and 6 provides some policy simulations with welfare variations. The paper concludes in Sect. 7.

2 Literature Review and Contribution

There is a large literature on the reasons to consume organic food. According to the literature surveys in Hughner et al. (2007), Aertsens et al. (2009) and Pearson et al. (2011), the predominant reasons are related to the expected benefits for personal health and environmental protection. Bernard and Bernard (2009), Smed (2012), Bazoche et al. (2014) and Zanoli et al. (2013) show that the consumption of organic goods is influenced significantly by socio-demographic factors (income, gender, education level), the attributes of the goods (price, flavour, colour), and their public good characteristics (reduced use of pesticides, animal welfare). In relation to preferences for local food, the review by Feldmann and Hamm (2015) shows that consumers' reasons for choosing local products are that local food is considered to be fresher, safer, healthier and more environmentally friendly than non-local food. In the empirical literature, the consumption of local products is explained by age, gender, and income as well as perceived product quality and a desire to support the local economy (Morris and Buller 2003; Born and Purcell 2006; Thilmany et al. 2008; Carpio and Isengildina-Massa 2009; Hu et al. 2012).

It is only recently that researchers have begun to assess the role of substitution or complementarity between the attributes of organic and local food (Onozaka and McFadden 2011; Gracia et al. 2014; Denver and Jensen 2014; Costanigro et al. 2013; Adams and Salois 2010; Meas et al. 2015) although there is still much confusion over these features. Many consumers confuse the terms "local food" and "sustainable food", seeing local as a synonymous with characteristics such as fresh, healthy and environmental and socially responsible production. Hughner et al. (2007) found that many consumers buy organic food because they believe it supports the local economy, while Naspetti and Bodini (2008) show that consumers who buy organic products infrequently are more likely to think that local used to describe a food product, is synonymous with organic. In addition, the results in Feldmann and Hamm (2015) show that compared to organic food, local food is not perceived as expensive.

Despite many empirical and theoretical papers, it is difficult to distinguish the boundaries between the motivations for consuming organic food and, so far, there is not empirical framework allowing such differentiation. Indeed, consumption of organic products can be motivated by (1) a consumption fad, (2) a "warm glow" satisfying my conscience feeling, (3) a wish to improve the immediate environment, or (4) conspicuous spending and status which influence the desire for green products (Griskevicius et al. 2010).[4] In addition, these motivations can vary with the conspicuous aspects of a specific product. In the case of wine, its organic or local attributes can be displayed to dinner guests (through the label on the bottle), but this does not apply, for instance, to the carrots served as part of the meal. However, the conspicuous aspects may be limited because wealth can be signalled by a more expensive wine which may not be an organic wine.

[4] We thank an anonymous referee for the suggestion to detail the motivations for organic consumption.

In this paper, we study the effect of an overlooked characteristic related to consumers' WTP, namely the distance between their dwelling and the wine producing area. Evaluating positive and negative externalities based on the proximity of residents is a frequent strategy used in the revealed preferences literature, and it is based mainly on hedonic analysis of house prices (Li and Brown 1980; Bockstael 1996; Chattopadhyay 1999). To our knowledge, the present study is the first to employ a lab experiment to infer the significance of distance by matching production location to consumers' place of residence.The advantage of a lab experiment is that it allows access to very precise information about consumer attitudes and a tight control of the environment, participants' actions, and the information revealed during the experiment.[5] Our results shed light on the motivations for consuming organic/local wine, based on precise variations in the distance from participants' home and their impact on the WTP. The significant impact of declared distance on the WTP suggests a positive value for motivation (3), that is, a desire to improve the immediate local environment. The shorter the distance to a vineyard, the higher the WTP for a bottle of organic wine, which contributes to improving the immediate environment. In our study, the distances influencing WTP are between 0 and 20 km, which contrasts with previous studies where the local dimension is often associated with large regions, such as Burgundy in France, or US states.

This paper shows also that the econometric estimation using robust M-regressions (Andersen 2008) smoothes the idiosyncratic WTP given directly by the process of elicitation related to the experiment. The declared distance, which is statistically significant in the econometric models, improves the quality of the predicted value, compared to an estimator that does not account for this distance. The welfare variations using the predicted WTP are lower than the corresponding welfare variations using the elicited WTP observed directly in the lab; this demonstrates that a predicted WTP based on econometrics can be used to estimate welfare variations. Previous papers using lab experiments focus on welfare estimations related to the impact of information, by taking account only of the elicited WTP observed directly in the lab. The importance of the predicted WTP is overlooked in the studies by Disdier et al. (2013), Huffman et al. (2007), Lusk et al. (2005), Lusk and Marette (2010), Roosen and Marette (2011), Rousu et al. (2007).

3 The Experiment

3.1 General Setting

In June 2013, we conducted a lab experiment in *Dijon*, the capital of the wine-producing region of Burgundy (France). We organized 10 sessions in which participants were asked to declare their different WTP for the four bottles of wine displayed to them. Participants were not asked to taste the wines because, generally, consumers do not taste a wine before making the decision to purchase it from supermarkets, cellars or restaurants.

Participants were recruited from the INRA database 'Chemosens Platform's PanelSens", which includes around 10,000 households in or close to *Dijon*, and provides details on their precise location, their sex, age and number of household members. We imposed location restrictions on our recruitment procedure. We recruited 50 participants from *Dijon* city (from

[5] However, some authors question the external validity of lab experiments, namely the possibility to generalize results to other situations and to other people (e.g., Harrison and List 2004; Levitt and List 2007). In the lab, external validity is dampened particularly by the artificial mechanism used to elicit WTP, the relatively small number of products offered compared to the variety of products available in supermarkets, and the limited participant sample.

circa 150,000 inhabitants) and 70 from *Chenôve* (circa 15,000 inhabitants), *Marsannay-la-Côte* (circa 5000 inhabitants) and some much smaller communes in the immediate vicinity of the vineyards (see Supplemental Material Figure S1). From these subgroups of 50 and 70 participants, selection of participants was random, based on a quota method, in order to be representative of the population age groups and socio-economic status. Participants were contacted by phone. They were informed that the experiment would focus on behaviours related to food and wine consumption, would last around one hour, and that they would receive monetary compensation of €20.

3.2 The Selected Wines

Each participant was shown four different wines in each information round (see next subsection for the details of the information revealed). The objective characteristics of the wines were distinguishable from the labels: (1) they originated from two *Appellations d'Origine Contrôlée* (the French equivalent of Geographical Indications - GIs) related directly to the producing area; (2) there was an organic and a non-organic wine for each GI (see Table 1). The selected GIs were *Marsannay* and *Vacqueyras*, which can be considered an intermediate quality segment with wines priced at around €10 per bottle purchased directly from the wine makers. *Marsannay* is a Burgundy GI and *Vacqueyras* is a Rhône Valley GI. The non-local GI *Vacqueyras* is located about 350 km from the centre of the city of *Dijon* and the local GI *Marsannay* is located at 4.5 km distance (see Supplemental Material Figure S1). The producer prices of the *Vacqueyras* wines used in the experiment were slightly higher than the prices of the wines from *Marsannay*, but they were the most similar wines based on price. *Vacqueyras* is a good control; its production is mainly red wines, in the same quality segment, with similar economic structure and reputation to *Marsannay*.

The wines were chosen to be as comparable as possible in relation to characteristics that could be inferred from the labels on the bottles. Figure S2 in the Supplemental Material is a photograph of the four 75cl wine bottles. All the labels are in a classic-stylized font, indicating a 2010 vintage, the *Domaine* name and the alcohol content, which last was similar for all four wines. All the wines, including the organic ones, contain preservatives, described on the labels as "contains sulphites", which is a labelling requirement. All four wines are from individual producers (*vignerons indépendants*), which implies that the same operator cultivates the vineyard, harvests the grapes, vinifies and sells the wine. Hence, the four wines were from small-scale wineries, typically unknown to the participants before the experiment. The local GI *Marsannay* includes some 222 hectares (550 acres) shared among more than 30 small-scale producers with highly fragmented and intertwined plots. So the inhabitants of *Marsannay-la-Côte* typically knew neither the local producers selected for the experiment, nor the precise location of the vineyards within the GI area. However, it could be assumed that participants living in *Marsannay-la-Côte* would be more familiar with the local wine

Table 1 The four wines presented to the participants

CODE	GI	Type	Origin	Price (€)
NO-L	*Marsannay*	Non-organic	Local	8
O-L	*Marsannay*	Organic	Local	10.5
NO-NL	*Vacqueyras*	Non-organic	Non-local	13
O-NL	*Vacqueyras*	Organic	Non-local	14

than the non-local wines. During the experiment, we asked for the frequency of local wine purchase and found no evidence of such a correlation (see Supplemental Material Figure S3). Consequently, we expect the effect of distance between participants' dwellings and vineyards to be free of any familiarity effect.

3.3 Information Disclosure

Information was revealed successively to the participants, and the WTP for the four wines was elicited in each information round. Information messages given to participants orally and in writing are reported in Figure S4 of Supplemental Material.

Information # 1 was with no information message, representing the benchmark level of information,
Information # 2 introduced general information on the differences between organic and non-organic agriculture,
Information # 3 focused on information on the GHG emissions from non-organic fertilization practices,
Information # 4 explained the presence of pesticides residues in the blood and hair of vineyard workers,
Information # 5 provided information on the effects of water treatment on the water bills in *communes* that include vineyards.[6]

Information # 1 was used to provide a comparative benchmark on the general level of information of participants prior to the experiment. Information # 2 was designed to ensure that all participants knew the particularity of organic agricultural practices. Information # 3 was an example of the indiscriminate harm to people living near a wine producing area. Information # 4 was an example of non-monetary harm to people living close to a wine producing area. Information # 5 revealed the monetary penalty for people living close to a vineyard area (the user cost of water is higher in areas close to vineyards). The disclosed information ranges from the most general/global to the most precise/local and was revealed in that order to all the participants. We do not focus on potential ordering effects; our interest is in the cumulative importance ascribed to the messages related to the distance between residential address and a vineyard. This allows more precise estimates of the values of the more general to the more particular effects. Randomizing the revelation of information would be useful to obtain marginal values, but would be at the cost of fewer observations for each bilateral comparison. Because our policy simulations use the differences only between no and full information, they are not affected by this choice.

3.4 Determination of the WTP

To elicit participants' WTP, our experiment uses the Becker-deGroot-Marschak (BDM) procedure (Becker et al. 1964). At each round we posed the same question: "What is the maximum price you are willing to pay for the following wine bottle?" In the BDM mechanism, the individual states her/his maximum price, say WTP b, which determines whether or not she/he will receive the bottle of wine. At the beginning of the session, we explained the BDM mechanism using the example of a candy bar. We told participants that the WTP would be elicited several times, for different bottles, after successive rounds of information. We told them also that one of the elicited WTP indications would be randomly selected at the end of the experiment, to determine whether the participant was able to buy the bottle of wine

[6] In France, the *commune* typically is the administrative scale on which water bills are calculated.

using the compensation they would receive for participation in the experiment. At the end of the experiment, a random price p was drawn from a box, with an exogenous distribution ranging from €0.1 and €20. When we explained the BDM procedure to participants at the beginning of the session, no information was revealed about the distribution of the randomly generated number acting as the market price p. This avoids risk of an anchoring effect on the WTP; Bohm et al. (1997) show that results are sensitive to the choice of the upper bound of the generated buyout price.

The BDM procedure was explained to participants (at the beginning of the experiment) as follows. If the declared WTP b is smaller than the randomly drawn price p, the participant does not purchase the bottle and receives the €20 indemnity. If the WTP b is higher than the random price p, the participant purchases the bottle of wine and the compensation is equal to €20 less the randomly drawn price p. We insisted on the possibility of a zero bid $b = 0$ for a participant who did not want to purchase the wine. In the BDM procedure, bidding to one's true maximum WTP is a dominant strategy for expected utility maximizers. Because of these performance-based financial incentives, the elicited WTP is non-hypothetical

3.5 Organization of Sessions

The timing of each session is the following (see Figure S4 in the Supplemental Material for more details):

- The sessions began with a trial round to explain the BDM mechanism. Simulations using a candy bar helped participants to understand the mechanism. The possibility in the BDM procedure of zero bids was carefully explained, as was the possible use of the €20 indemnity to make a real purchase. We made it clear that only one of the elicited WTP would be selected randomly at the end of the experiment to determine whether the participant could buy one of the bottles of wine (i.e., performance-based financial incentive).
- Based on the different types of information revealed to the participants, we conducted five successive rounds for WTP elicitation using the BDM procedure, for the four bottles of wine. The four WTP were written down without discussion among participants, and the relevant pages were collected at each round. No information about previously elicited WTP was revealed to participants between rounds.
- Participants were asked to complete an exit questionnaire on related issues including distance between their home and the closest vineyard. The experiment concluded with the random selection of one type of wine and one of the five elicited WTP, which were used to determine whether the participant could ”buy” the bottle of wine. The random price was drawn and purchasing choices were enforced according to the BDM procedure explained in the previous section.

4 Data

4.1 Willingness-to-Pay

Each participant was asked to provide a total of 20 WTP, namely four wines for each of the five rounds of information). Figure 1 presents their distributions according to the type of wine and the level of information provided. It shows that the organic local wine (O-L) attracted the highest WTP (a median around €8) for any level of information. Next were the organic

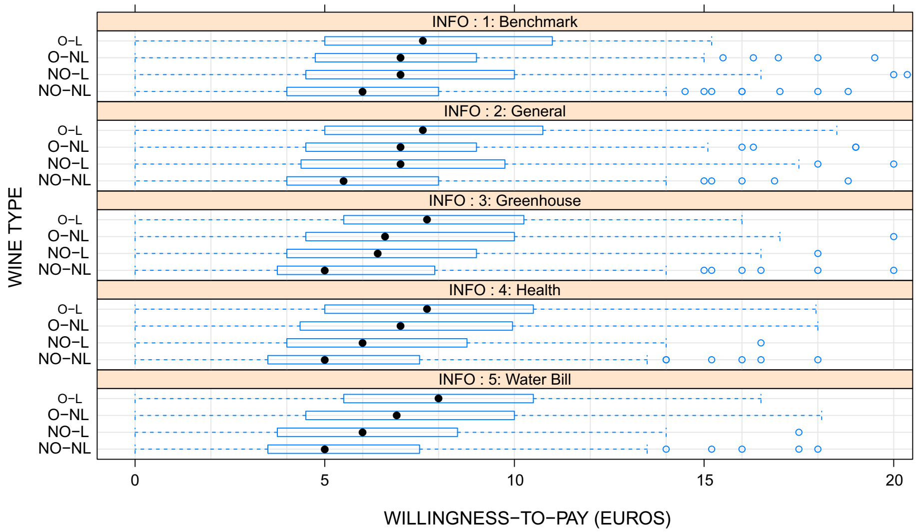

Fig. 1 Distribution of the willingness-to-pay (€/bottle). For the five levels of information (in increasing order from *top* to *bottom panels* in the figure), the points present the median WTP framed with the 25 and the 5 % quantiles. The four types of wines reported are non-organic non-local (NO-NL), non-organic local (NO-L), organic non-local (O-NL) and organic local (O-L)

non-local wine (O-NL), the non-organic local (NO-L) and the non-organic non-local (NO-NL) with respective median values of €7, €6, and €5. In the context of a simple descriptive analysis, this values the attribute organic higher than than the attribute local.

Figure 1 allows an evaluation of the between-wines WTP differences, which increase with the level of information (from the top panel to the bottom panel). The reducing WTP for non-organic wines is more important in absolute values than the increased WTP for organic wines when the additional information is revealed. This illustrates an effect close to classical prospect theory (Kahneman and Tversky 1979), where the impact of a loss of utility is higher than the impact of a symmetric gain. Figure 1 also shows the presence of some potential outliers which need to be controlled for in the econometric approach.

4.2 Summary Statistics

Using the elicited WTP, we can compute global and local organic premiums which are the differences between the WTP for organic and the non-organic wines respectively for non-local (O-NL minus NO-NL) and local (O-L minus NO-L) wines. They are around €2 on average, with some participants presenting negative premiums (see Table 2).

The most important open question is related to the distance between the participants principal dwelling and the closest vineyard (see details in Supplemental Material Figure S5). We asked participants to supply their residential postal addresses, which allowed us to compute some distances using a geographical information system. For each participant, we have three distances, which are tested in the econometric models: perceived distance from a vineyard reported by participants; computed distance from the closest vineyard; and computed distance from the closest vineyard in the local GI *Marsannay*. In addition to the expected positive and significant correlations between them (all > 0.55, see Supplemental Material Figure S5), this comparative exercise shows that the differences between perceived and computed distances

Table 2 Summary statistics on data from the experiment

Variable	N	Mean	SD	Min	Max
WTP for non-organic non-local	555	6.501	5.508	0.000	35.000
WTP for non-organic local	555	6.914	4.411	0.000	28.940
WTP for organic non-local	555	8.531	8.785	0.000	70.500
WTP for organic local	555	9.084	7.457	0.000	65.000
Global organic premium	111	2.030	5.254	−10.000	45.000
Local organic premium	111	2.170	4.719	−8.000	40.000
Perceived distance	111	7.318	2.130	1.609	10.820
Computed distance 1	111	7.489	1.471	3.043	11.270
Computed distance 2	111	7.875	1.447	3.372	11.272
Participant's age	111	44.270	14.357	19	69
Participant's sex	111	1.586	0.493	1	2
Number of child	111	1.550	0.867	1	5
Wine purchases	111	1.721	0.762	1	3
Organic purchases	111	2.054	0.551	1	3
Local purchases	111	3.198	0.669	1	4

WTPs and premiums are in current euros, distances are in kilometers (km). A detailed description of the control variables is provided in Figure S6 in the Supplemental Material

are decreasing with distance. For distances under $\exp(-0.5) = 0.6$ km, the correlations are zero for both perceived and computed distances, and also between computed distances. This absence of significant correlation among low values for distances from *Marsannay* (43 % are less than 2.7 km) is important to statistically separate the differential effects on WTPs. In other words, identification of the differential effects of the distance variables is applied to those participants who live closer to a vineyard.

During the experiment, we posed sequential questions about general individual characteristics (age, sex, number of children and weekly frequencies of organic and local wine purchases); these are presented in the last six rows in Table 2. We also asked about participants' income and time preferences (see Supplemental Material Figure S6). The full socio-demographic statistics of participants are available from the authors upon request.

5 Econometric Results

5.1 Empirical Models

These original data obtained from the experiment were analysed econometrically with robust M-regressions and clustered standard errors. The M-estimation is a general outliers-robust regression method which preserves sample size (Andersen 2008). It is based on iteratively re-weighted least-squares (IRLS) using an algorithm (see Supplemental Material Section 1.2). We pooled our WTP observations corresponding to participants at different levels of information. As a result, the errors potentially could be correlated within the choices of each participant. We used individual clustering to correct for standard errors, which is comparable to applying a random effects method, but imposes fewer constrains on the structure of the variance-covariance matrix (Wooldridge 2003). Section 1.2 in the Supplemental Material provides more detail on the strategy used to correct for potential correlated non-spherical errors.

Our econometric models include successively three dependent variables: WTP in levels, and global and local organic premiums. The first series of models is estimated on pooled data which vary by participant, information and wine ($N = 2200$); the last two vary only on the participant and information dimensions ($N = 555$). In every case, we estimated three models ”without control variables” (columns 1, 2, and 3 in the regression results tables), and three models ”with control variables” (columns 4, 5 and 6). We use the difference within each set of three models as the variable to model the distance to a vineyard: declared distance to the closest vineyard from models (1) and (4); computed distance to the closest vineyard from models (2) and (5); computed distance to the closest vineyard from the local GI *Marsannay* from models (3) and (6). Tables 3, 4 and 5 provide the coefficients of interest in order to position the results for the secondary control variables which are reported in the Supplementary Material (Tables S1, S2 and S3).

5.2 Willingness-to-Pay

The first models studying the determinants of the WTP in levels, include wine and information dummies, with NO-NL wine (i.e., non-organic, non-local) and absence of information (round #1) as the reference modalities. The four dummies for available information are interacted with a dummy for organic wine to take account of the differential effects of information on the WTP for organic wines (the variable ”DumOrg” is equal to 1 for organic wines and zero for non-organic wines). All the models include dummies for individual income and time preferences; details of these and their distribution are provided in Supplemental Material Figure S6. The main results are presented in Table 3.

In the models without control variables, the R^2 are around 12 %. The inclusion of control variables increases the R^2 to around 26 % (see Supplemental Material Table S1 for detailed results for these secondary control variables). Among the six models, the only significant distance is the computed distance from the closest vineyard, which applies to the models both with and without control variables. The coefficients of the other variables are similarly robust to the specification of distance and the inclusion of control variables (i.e., between specifications). The coefficients of the distances are positive, which means that living close to a vineyard decreases the WTP for wines. We found that this decreasing effect on the WTP was not conditional on whether the wine was local or non-local, organic or non-organic. These results can be understood as related to the short distribution chain for this population, the available social networks, and the presence of least-cost alternatives if wine is purchased directly from a nearby producer. As already mentioned, the distance effects are free of familiarity effects because people living close to vineyards do not buy local wines more frequently than other participants living in the same producing region of Burgundy (see Supplemental Material Figure S3).

For the effect of information relative to the NO-NL wine, we find the WTP for NO-L, on average, is €0.85 higher ($p < 0.001$), for O-NL it is on average €0.8 higher ($p < 0.001$) and for O-L it is on average e 1.8 higher ($p < 0.001$). At the initial level of information, this means that the organic premiums are respectively €0.95 and €0.81 for local and non-local wines, with a significant difference. Providing general information on organic agriculture significantly modifies the WTP, decreasing it by €0.19 WTP for non-organic wines and increasing it by €0.20 for organic wines. These differential effects are observed by comparing the coefficients corresponding to a same level of information with and without DumOrg = 1.

Table 3 Results from regressions about pooled WTPs in levels

	Without control variables			With control variables		
	(1)	(2)	(3)	(4)	(5)	(6)
Declared distance	0.046			0.103		
	(0.125)			(0.149)		
Computed distance 1		0.333**			0.385**	
		(0.151)			(0.168)	
Computed distance 2			0.170			0.213
			(0.160)			(0.206)
WINEMRSN (NO-L)	0.848***	0.843***	0.848***	0.823***	0.823***	0.824***
	(0.165)	(0.165)	(0.165)	(0.158)	(0.158)	(0.158)
WINEVCQB (O-NL)	0.813***	0.816***	0.811***	0.852***	0.856***	0.852***
	(0.106)	(0.106)	(0.106)	(0.112)	(0.112)	(0.111)
WINEMRSB (O-L)	1.792***	1.789***	1.792***	1.773***	1.775***	1.774***
	(0.179)	(0.180)	(0.180)	(0.181)	(0.181)	(0.181)
INFO2: General	−0.199***	−0.199***	−0.200***	−0.193***	−0.193***	−0.194***
	(0.076)	(0.076)	(0.076)	(0.072)	(0.072)	(0.072)
INFO2: General:DumOrg	0.203**	0.201**	0.204**	0.244***	0.244***	0.245***
	(0.086)	(0.088)	(0.086)	(0.083)	(0.083)	(0.083)
INFO3: Greenhouse	−0.509***	−0.509***	−0.510***	−0.499***	−0.497***	−0.499***
	(0.084)	(0.084)	(0.084)	(0.082)	(0.082)	(0.082)
INFO3: Greenhouse:DumOrg	0.672***	0.669***	0.672***	0.645***	0.639***	0.643***
	(0.088)	(0.088)	(0.089)	(0.093)	(0.094)	(0.094)
INFO4: Health	−0.866***	−0.863***	−0.867***	−0.865***	−0.859***	−0.864***
	(0.120)	(0.121)	(0.120)	(0.115)	(0.115)	(0.115)
INFO4: Health:DumOrg	0.994***	0.987***	0.992***	0.988***	0.978***	0.985***
	(0.132)	(0.131)	(0.131)	(0.133)	(0.132)	(0.132)
INFO5: Water Bill	−0.923***	−0.920***	−0.924***	−0.913***	-0.906***	−0.911***
	(0.125)	(0.126)	(0.126)	(0.123)	(0.123)	(0.123)
INFO5: Water Bill:DumOrg	1.038***	1.033***	1.037***	1.040***	1.029***	1.037***
	(0.138)	(0.137)	(0.138)	(0.141)	(0.141)	(0.141)
INCOM(1;2)	0.303	0.359	0.231	−1.460	−1.267	−1.569
	(0.888)	(0.901)	(0.919)	(1.129)	(1.140)	(1.143)
INCOM(2;3)	1.774**	2.056**	1.789*	−0.134	0.166	−0.249
	(0.882)	(0.920)	(0.917)	(1.281)	(1.260)	(1.271)
INCOM(3;4)	1.402	1.486	1.312	−0.627	−0.542	−0.831
	(0.909)	(0.920)	(0.959)	(1.239)	(1.184)	(1.255)
INCOM(4;5)	3.397**	3.434**	3.293**	2.129	2.059	1.867
	(1.476)	(1.496)	(1.500)	(1.554)	(1.547)	(1.573)
INCOM(5;6)	3.190**	3.651**	2.971**	3.748*	4.274**	3.285
	(1.461)	(1.487)	(1.468)	(2.187)	(2.009)	(2.014)
TDISCTMP2	−1.296**	−1.285**	−1.311**	−1.326*	−1.251*	−1.321*
	(0.630)	(0.624)	(0.625)	(0.708)	(0.738)	(0.721)

Table 3 continued

	Without control variables			With control variables		
	(1)	(2)	(3)	(4)	(5)	(6)
TDISCTMP3	−0.809	−0.729	−0.743	−0.436	−0.220	−0.277
	(0.815)	(0.825)	(0.828)	(0.745)	(0.745)	(0.763)
TDISCTMP4	−1.633**	−1.579**	−1.564**	-0.304	-0.285	-0.263
	(0.706)	(0.699)	(0.694)	(0.811)	(0.780)	(0.778)
TDISCTMP5	−1.838***	−1.952***	−1.897***	−1.389*	−1.510*	−1.472*
	(0.680)	(0.663)	(0.682)	(0.811)	(0.791)	(0.818)
Constant	5.640***	3.352**	4.688***	3.486	1.320	2.664
	(1.037)	(1.397)	(1.275)	(3.288)	(3.195)	(3.193)
Observations	2220	2220	2220	2220	2220	2220
R^2	0.120	0.131	0.122	0.267	0.277	0.268
Adjusted R^2	0.111	0.123	0.114	0.254	0.265	0.256

Coefficients are from the last step of IRLS to limit the influence of outliers
Standard errors are clustered by individuals to account for non-spherical residuals
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Providing information on GHG emissions decreases the WTP for non-organic wines by a cumulative average of €0.50 ($p < 0.001$) and increases the WTP for organic wines by a cumulative average of €0.60 ($p < 0.001$). Providing information on health risks decreases the WTP for non-organic wines by €0.86 and increases the WTP for organic wines by €0.98 (with $p < 0.001$ for both). Information on the effects on water bills decrease the WTP for non-organic wines by €0.91 and increases the WTPs for organic wines by €1.03 ($p < 0.001$). In absolute terms the variations based on the level of information provided are comparable to the variations in the wine characteristics (about €1) which in our view indicates a strong information effect. Recall that these values are cumulative not marginal, with the natural order of information going, from the most general to the more particular. The control variables present intuitive effects, in particular that people buying some wines more frequently have a lower WTP (see Table S1 of the Supplemental Material for the detailed resuls).

5.3 Global Organic Premiums

We now focus on the understanding of organic premium coming from WTP differences for the non-local wines. Table 4 presents the results of the econometric models with the global organic premium as the dependent variable, computed on the basis of differences in the WTP between organic and non-organic *Vacqueyras* (non-local) wines.

The estimated coefficients show that, in models (1), (2) and (3) without secondary control variables, only the declared distance is significant. With the inclusion of secondary control variables, all distances are significant. In contrast to the models with the WTP in levels,here, the coefficients of the distances are negative. This result was expected since the organic premiums decrease with the distance to the vineyard: participants living far from a vineyard have a smaller premium for organic wine than those living close to a vineyard. All else being equal, living 1 km distance from a vineyard decreases the global organic premium by

Table 4 Pooled global organic premiums with 5 levels of information

	Without control variables			With control variables		
	(1)	(2)	(3)	(4)	(5)	(6)
Declared distance	−0.175***			−0.177***		
	(0.050)			(0.055)		
Computed distance 1		−0.085			−0.159**	
		(0.072)			(0.074)	
Computed distance 2			−0.070			−0.170**
			(0.071)			(0.079)
INFO2: General	0.234***	0.231***	0.229***	0.245***	0.236***	0.234***
	(0.065)	(0.065)	(0.065)	(0.062)	(0.064)	(0.064)
INFO3: Greenhouse	0.547***	0.542***	0.541***	0.535***	0.542***	0.540***
	(0.082)	(0.081)	(0.082)	(0.077)	(0.080)	(0.081)
INFO4: Health	0.753***	0.747***	0.747***	0.748***	0.754***	0.756***
	(0.102)	(0.102)	(0.102)	(0.096)	(0.102)	(0.102)
INFO5: Water Bill	0.805***	0.803***	0.802***	0.798***	0.808***	0.808***
	(0.103)	(0.104)	(0.104)	(0.100)	(0.105)	(0.105)
INCOM(1;2)	−0.186	−0.301	−0.250	−0.288	−0.434	−0.252
	(0.289)	(0.330)	(0.328)	(0.368)	(0.436)	(0.409)
INCOM(2;3)	0.206	0.184	0.244	0.213	0.077	0.263
	(0.289)	(0.342)	(0.330)	(0.422)	(0.515)	(0.467)
INCOM(3;4)	−0.037	−0.059	−0.002	−0.230	−0.297	−0.097
	(0.300)	(0.350)	(0.332)	(0.413)	(0.492)	(0.456)
INCOM(4;5)	−0.296	−0.373	−0.316	−0.133	−0.258	−0.045
	(0.396)	(0.441)	(0.450)	(0.491)	(0.554)	(0.522)
INCOM(5;6)	−0.998**	-0.472	-0.290	−1.585**	-1.385	-0.877
	(0.461)	(0.472)	(0.440)	(0.674)	(0.844)	(0.764)
TDISCTMP2	−0.452*	−0.568**	−0.554**	-0.060	-0.174	-0.150
	(0.254)	(0.260)	(0.262)	(0.263)	(0.265)	(0.267)
TDISCTMP3	−0.270	−0.426	−0.428	−0.127	−0.272	−0.298
	(0.269)	(0.286)	(0.287)	(0.281)	(0.287)	(0.282)
TDISCTMP4	−0.700***	−0.581**	−0.598**	-0.359	-0.159	-0.250
	(0.256)	(0.267)	(0.263)	(0.263)	(0.272)	(0.274)
TDISCTMP5	−0.897***	−0.963***	−0.965***	−0.510*	-0.542	−0.545*
	(0.258)	(0.283)	(0.278)	(0.309)	(0.340)	(0.330)
Constant	2.509***	1.932***	1.794***	2.142**	1.531*	1.807*
	(0.405)	(0.612)	(0.571)	(0.864)	(0.921)	(1.010)
Observations	555	555	555	555	555	555
R^2	0.092	0.070	0.069	0.169	0.132	0.132
Adjusted R^2	0.069	0.046	0.044	0.121	0.082	0.082

Coefficients are from the last step of IRLS to limit the influence of outliers
Standard errors are clustered by individuals to account for non-spherical residuals
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 5 Pooled local organic premiums with 5 levels of information

	Without control variables			With control variables		
	(1)	(2)	(3)	(4)	(5)	(6)
Declared distance	−0.216***			−0.199***		
	(0.050)			(0.056)		
Computed distance 1		−0.083			−0.096	
		(0.082)			(0.076)	
Computed distance 2			−0.064			−0.106
			(0.078)			(0.085)
INFO2: General	0.281***	0.273***	0.271***	0.266***	0.262***	0.258***
	(0.071)	(0.070)	(0.070)	(0.070)	(0.069)	(0.068)
INFO3: Greenhouse	0.598***	0.585***	0.583***	0.530***	0.530***	0.527***
	(0.082)	(0.080)	(0.080)	(0.077)	(0.077)	(0.076)
INFO4: Health	0.807***	0.795***	0.793***	0.768***	0.766***	0.764***
	(0.108)	(0.108)	(0.108)	(0.105)	(0.106)	(0.105)
INFO5: Water bill	0.876***	0.867***	0.865***	0.851***	0.853***	0.850***
	(0.107)	(0.107)	(0.107)	(0.107)	(0.108)	(0.107)
INCOM(1;2)	−0.037	−0.135	−0.090	−0.062	−0.158	−0.058
	(0.278)	(0.332)	(0.326)	(0.344)	(0.428)	(0.402)
INCOM(2;3)	0.351	0.379	0.435	0.622	0.651	0.743
	(0.278)	(0.351)	(0.337)	(0.399)	(0.499)	(0.459)
INCOM(3;4)	0.097	0.116	0.166	0.365	0.374	0.482
	(0.303)	(0.375)	(0.355)	(0.412)	(0.481)	(0.452)
INCOM(4;5)	−0.136	−0.196	−0.147	0.142	0.039	0.157
	(0.433)	(0.490)	(0.493)	(0.530)	(0.578)	(0.544)
INCOM(5;6)	−0.793**	−0.070	0.105	−0.169	0.359	0.634
	(0.389)	(0.435)	(0.386)	(0.571)	(0.668)	(0.607)
TDISCTMP2	−0.215	−0.339	−0.325	−0.139	−0.231	−0.213
	(0.286)	(0.292)	(0.292)	(0.283)	(0.292)	(0.290)
TDISCTMP3	−0.163	−0.341	−0.342	−0.132	−0.297	−0.313
	(0.286)	(0.304)	(0.300)	(0.270)	(0.276)	(0.270)
TDISCTMP4	−0.923***	−0.742***	−0.756***	−0.848***	−0.607**	−0.668**
	(0.243)	(0.276)	(0.282)	(0.262)	(0.287)	(0.295)
TDISCTMP5	−1.083***	−1.167***	−1.170***	−1.081***	−1.097***	−1.094***
	(0.270)	(0.298)	(0.294)	(0.281)	(0.297)	(0.295)
Constant	2.844***	1.918***	1.747***	5.652***	4.322***	4.505***
	(0.422)	(0.712)	(0.653)	(0.823)	(0.968)	(1.032)
Observations	555	555	555	555	555	555
R^2	0.114	0.080	0.078	0.192	0.169	0.169
Adjusted R^2	0.091	0.056	0.054	0.146	0.121	0.121

Coefficients are from the last step of IRLS to limit the influence of outliers
Standard errors are clustered by individuals to account for non-spherical residuals
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

€0.34.[7] The results show also that providing information has a significant and positive effect on the global organic premium. The general information on organic agriculture implies an increase in the organic premiums, even in the case of the regressions for global premiums. This indicates that participants are inclined to change their preferences in light of certain information.

5.4 Local Organic Premiums

The results for local organic premiums (computed on the basis of differences in the WTP between the organic and non-organic *Marsannay*, that is the local wine), are presented in Table 5. Compared to the previous results for global organic premiums, a first difference is that only the perceived distance is significant although it has the same negative sign. The fact that, overall, distance to a vineyard is less significant for local than for global premiums is intriguing. Although there is a significant declining effect of distance on the organic premium, it is no stronger for the local than for the global premium. The declining effect of distance would appear to be a preference parameter shared by people living close to a vineyard, rather than a proper internalization of the negative effect of non-organic wine production on welfare. This result can also be considered in relation to the results of the WTP regressions in Table 3 where only the computed distance 1 is significant. The elements that explain the potential gains from living close to a vineyard are monetary (commuting distance, producer prices, etc.) and are well evaluated by participants. Conversely, the elements that explain the potential losses from non-organic wine production for those living close to a vineyard are mainly non-monetary (health, cultural, etc.) This might explain why the computed distance is significant in the first regressions and the perceived distance is significant in the second regressions.

This explanation is reinforced by the results of a small marginal effect of distance on organic premiums (both global and local) in the presence of information on the effect on water bills (see Fig. 2). This information was disclosed in round # 5 to represent a monetary harm affecting those living close to a vineyard area, in contrast to non-monetary, climate or health outcomes. The results in Table 5 show also that information on the effects of non-organic agriculture on the environment, health and water bills has a significant and positive effect on the local organic premium. In addition, we found a cumulative effect of information that was slightly higher for local compared to global premiums. As expected, these differences are increasing with the level of information, which becomes more locally-oriented.

The last set of econometric estimations is for the effects of the interactions between the distance and information effects on both global and local premiums. For the specifications including the control variables, the results for the six models including distance variables, and global and local organic premiums are presented in Table S4 in the Supplemental Material. To ease interpretation, Fig. 2 shows the marginal effects of distance associated with each level of information computed from the regressions in Table S4 in the Supplemental Material. Figure 2 shows that, for declared distance, the distance-information effects are always negative and significant. Also, this negative cross effect is greater in absolute value for information on health compared to information on water bills (WTP decreases if the externality is monetarized). However, for computed distances, the interaction effect is significant only for global premiums and starting from information # 3 on GHG emissions (global information).

[7] Because the distances are a maximum of 50 km among our sample and our variables are in log metres, we can say that a remoteness of 1 km (2 %) decrease the premiums by $2 \times .17 =$ €0.34.

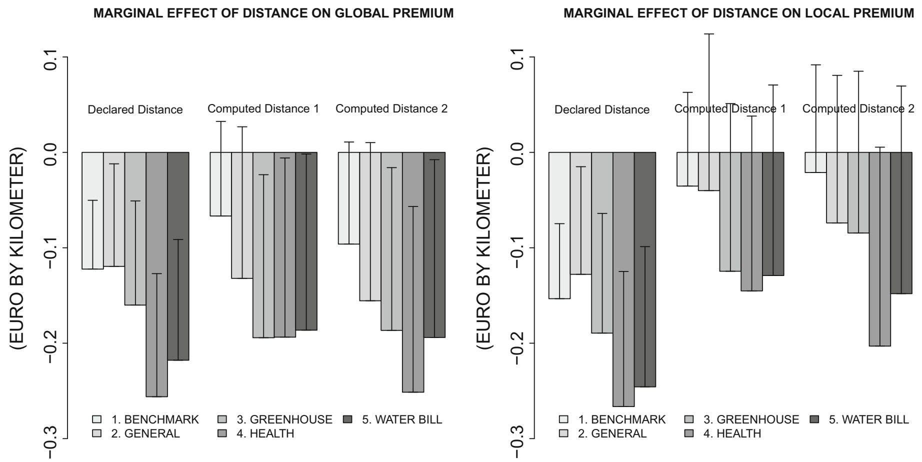

Fig. 2 Marginal effects of interactions between distance and information. We report here the marginal effects computed from the regression results in Table S4 in the Supplemental Material. The model contains some interactions between the effect of distance and among of information, which induces non-constant effects. The standard errors are computed using clusters of participants

6 Policy Simulations

6.1 General Principle

In this section, we investigate the relevance of regulatory intervention by public authorities. Regulation has a welfare effect if agents change their purchasing decisions (buying or refraining from buying) related to one unit of product which is relevant according to welfare theory.[8]

Some researchers favour experimental methods to determine the value of various regulatory instruments that rely on observing how the non-hypothetical WTP changes with the provision of information (as in the previous section). Regulatory intervention under a Marshallian welfare approximation with only WTP elicited from a lab experiment is tested in Disdier et al. (2013), Huffman et al. (2007), Lusk et al. (2005), Lusk and Marette (2010), Roosen and Marette (2011), Rousu et al. (2007). In our case, we use the econometric model to generate the predicted WTP related to the explanatory variables for each participant. Using the predicted WTP including declared distance to a vineyard smooths idiosyncracies and extremes in the WTP. In a partial-equilibrium context, the Marshallian welfare approximation consists of comparing the predicted WTP to a given equilibrium market price at which the product can be sold, leading to simulated product choices. The surpluses for each participant are inferred by comparing the predicted STP with an exogenously given market price. The effect of ignorance is taken into account, since it corrects for a non-informed WTP when the consumer purchases the good without additional information and, thus, receives a benefit or a risk without fully valuing it in his/her WTP estimation. This effect of ignorance accounts for the difference between WTP with full information (# 5) and WTP without information

[8] Note that with a classical demand that is decreasing with price, the welfare variation linked to the internalization of a non-internalized characteristics depends on the changed quantity which depends on the direct price elasticity. When demand is very inelastic, the welfare variation is very low even if the non internalized parameter is relatively large.

(# 1). Full mathematical details of our policy simulations are provided in the Supplemental Material Section 2.

We consider two tools allowing internalization of the cumulative information revealed in rounds # 2 to # 5. We assume that consumers are imperfectly informed about non organic/organic wine production despite the label/logo on the product. In policy configuration # A, public intervention consists of the imposition of a per-unit tax on the regular product. In policy configuration # B, public intervention consists of enforcement of a mandatory standard imposing organic production on all producers. Because it is impossible, in practice, to convey complete information to consumers due to the number of different labels and consumers' imperfect recall (Roosen and Marette 2011), configurations # A and # B are the only tools available to modify behaviours.[9] However, we also provide details of the hypothetical configurations under perfect information, where intervention would consist of an intensive consumer information campaign on the impact of non-organic wines and their production, and organic alternatives.

The methodology described in this section is simple and it should be remembered that translation of the results to a wider policy context would require some recognition of real supply and demand in the market [see Roosen and Marette (2011) who use an alternative methodology]. To fully fit the specific context of wine, some extensions are needed. Rousu et al. (2007) suggest the possibility of extrapolating the demand/surplus from the N participants in the experiment to the overall population, of size M, of Burgundy or France. This would involve multiplying the welfare variations in this paper by the ratio M/N. However, the limitation of this extrapolation is the poor representativeness of the participants in the experiment compared to the French population. Alternatively, the supply side could/should be developed to take account of producers' profits along with retailers' strategies and profits. Despite these limitations, the simple methodology described in this section is useful for understanding and quantifying the impact of a policy aimed at reducing externalities.

6.2 Predicting WTP

To perform the welfare analysis, we consider a baseline scenario in which the four wines are sold without additional regulation. To convert the WTP to demand curves, we assume that each participant will make a choice related to the largest difference between his/her WTP and the market price. This choice is inferred because the "real" choice is not observed in the lab. Consumer i can choose between five purchasing outcomes: the non-local non-organic wine at price $P(k = \text{NL-NO})$, the local non-organic wine at price $P(\text{L-NO})$, the non-local organic wine at price $P(\text{NL-O})$, the local organic at price $P(\text{L-O})$ or none of those. Purchasing decisions are determined by considering the predicted WTP for the different products, $\widehat{\text{WTP}}_{it}(\text{NL-NO})$, $\widehat{\text{WTP}}_{it}(\text{L-NO})$, $\widehat{\text{WTP}}_{it}(\text{NL-O})$, $\widehat{\text{WTP}}_{it}(\text{L-O})$ and the timing of information $t = \{1, 5\}$. Such predicted WTPs come from our econometric models using individual characteristics as predictors and dummy variables related to $t = 1$ and $t = 5$ for the information. Our calculations use the prices observed for the bottles, namely the non-organic *Vacqueyras* at price $P(\text{NL-NO}) = €13$, the non-organic *Marsannay* at price $P(\text{L-NO}) = €8$, the organic *Vacqueyras* at price $P(\text{NL-O}) = €14$, the organic *Marsannay* at price $P(\text{L-O}) = €10.5$ (see Table 1). The welfare estimations focus on the differences

[9] Field experiments show that imperfect recall, lack of time before purchasing and confusion about complex information characterize many consumers in the supermarket. This makes an information campaign relatively inefficient in a real purchasing context, even though the lab experiment shows a real interest and WTP. The lab context, in eliciting well-informed, thoughtful preferences, is useful for computing an optimal per-unit tax (see Marette et al. 2011).

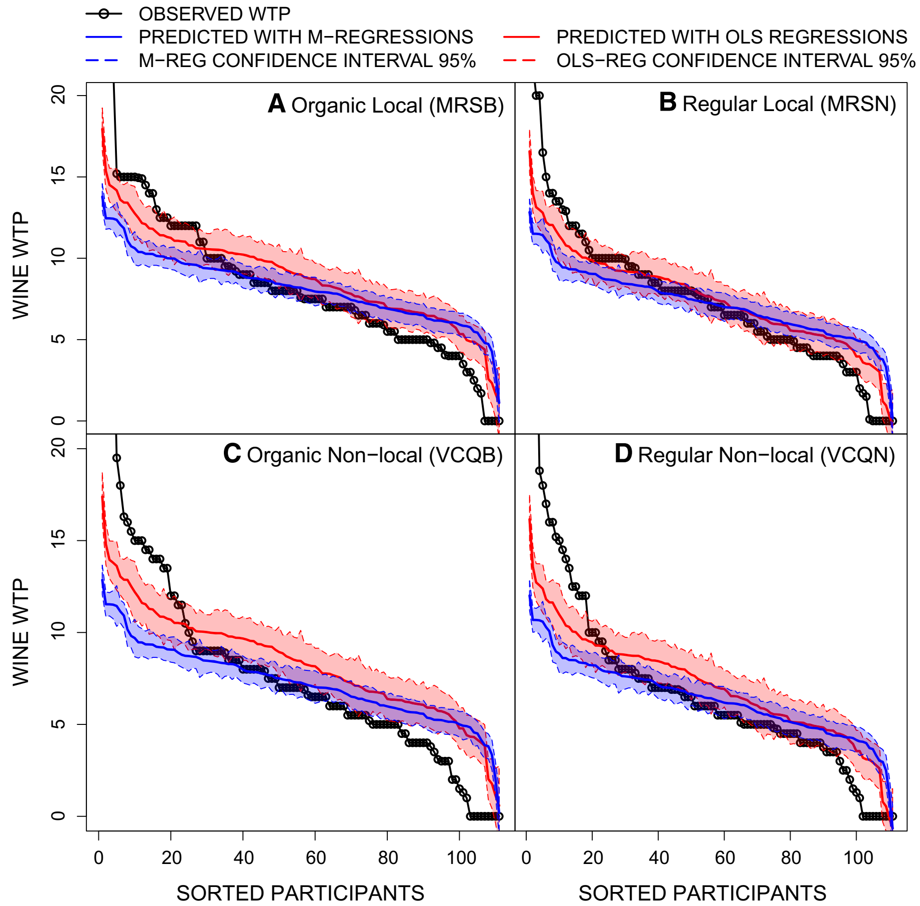

Fig. 3 Observed and predicted demand functions for the four wines (in €). The results for the information # 1 are presented here, the results for information # 5 are available in Supplemental Material

between the use of the elicited WTP directly observed in the lab and the use of the predicted WTP by the M-regressions which smooths outliers with extreme values. Again, the precise methodology for analysing regulation and welfare variations is provided Section 2 in the Supplementary Material.

Figure 3 presents the ordered WTP for the four wines with information # 1. The cumulative number of participants (equivalent to 1 purchased bottle per participant) is represented on the X-axis and the ordered WTP (in €) corresponding to the cumulative number of participants is represented on the Y-axis (in decreasing order). The black solid curve is the elicited WTP directly observed in the lab, the blue curve is WTP predicted by classical Ordinary Least Squares (OLS) estimation, and the red curve is WTP predicted by the robust model (4) in Table 3. The respective dashed curves represent the WTP with a 95 % confidence interval. For ease of presentation, Fig. 3 abstracts from two observations regarding the elicited WTP directly observed in the lab and higher than €20. Note that in all the curves, the WTP is ordered, which means that a given number on the X-axis indicates the WTP ranking related to each curve and not a specific participant. The predicted value for a given participant can vary widely compared to the elicited WTP observed in the lab, which changes the participants' ranking based on the WTP ranking among the curves. Figure S6 in the Supplemental Material reports the same ordered curves with information # 5.

The left sides of each panel in Fig. 3 show that, for relatively high-values of WTP, the elicited WTP directly observed in the lab is significantly higher than the WTP predicted by OLS and the robust M-regressions in model (4). The OLS curves are also higher than the model (4) curves in the left panels. The differences between the OLS and robust M-regressions are more significant for organic than for non-organic wines, and show more extreme preferences for the former. OLS predictions are generally less precise than robust M-regressions since the confidence intervals are bigger. The middle sections of each panel in Fig. 3 show that the predicted WTP fits well with the elicited WTP. Other bottles of wine and WTP after full revelation of information at round # 5 are characterized by similar patterns to those in Fig. 3. The different curves are relatively close, although the WTP predictions sometimes drastically reallocate participants' WTP because the econometric methodology smooths idiosyncratic values. For the four products in rounds # 1 and # 5, the average WTP predicted by OLS is very close to the observed WTP, while the average WTP in model (4) is 10 % lower than the observed WTP.

6.3 Welfare Variations

The rows in Table 6 present the sums of the welfare variations with either elicited or predicted values, from models (4), (5) and (6) in Table 3. Recall that these three models correspond

Table 6 Sum of welfare variation for different regulatory tools

	Configuration # A Tax t*	Configuration # B Mandatory standard	Hypothetical configuration Information campaign
Elicited WTP	t* = 1.01		
Without weights	15.88	8.08	48.93
With weights	46.29	15.20	10.85
Predicted WTP with model (4) and OLS	t* = 0.63		
Without weights	40.22	40.22	41.08
With weights	36.18	36.18	36.95
Predicted WTP with model (4) of Table 3	t* = 0.89		
Without weights	8.05	7.60	8.05
With weights	7.08	6.67	7.08
Predicted WTP with model (5) of Table 3	t* = 0.83		
Without weights	7.92	7.27	7.92
With weights	6.57	5.97	6.57
Predicted WTP with model (6) of Table 3	t* = 0.73		
Without weights	7.79	7.43	7.79
With weights	6.68	6.25	6.68

Values are in € and the results are from the complete sample of 111 participants to different computed and measured values of the distance between the vineyard and the participant's homes. To allow comparison, Table 3 also presents the predicted values related to the OLS estimation, similar to model (4). For the different configurations, we give the simple sum of the welfare variations, and the weighted sum using the weights from the last stage of the M-regression.

The standard and the tax solutions lead to significantly different welfare variations. The tax leads to a higher welfare variation compared to a mandatory standard. The main reason for this is that the standard destroys product diversity by eliminating non-organic products, which harms many consumers who do not give an additional value to organic products. As expected, providing consumers with full information via a campaign has the highest impact in terms of welfare. However, as already emphasized, a campaign leading to complete information is impossible to implement in practice. Due to the limitations linked to campaigns, the analysis suggests the use of an alternative regulatory tool such as a per-unit tax or a mandatory standard.

For the welfare variations with predicted WTP from models (4), (5) and (6), the tax leads to the same variations as the information campaign. In the case of this predicted WTP, there is no demand for the non-organic non-local wine, and the information campaign or the tax similarly reduces demand for the non-organic local wine. Using the same instruments, the welfare variations are generally lower for predicted WTP than elicited WTP directly observed in the lab. The OLS shows that the econometric estimation leads to more similar results for the information campaign, and to higher variations for the tax and standard solutions. Table 6 shows that the surplus variations based on direct use of the elicited WTP observed in the lab seem overestimated compared to the predicted WTP related to the M-regressions via models (4), (5) and (6). Considering the M-regression is an efficient way to reduce upward biases in WTP linked to lab elicitation. Smoothing extreme values in a consistent manner, allows more rigorous welfare estimations. Since robust M-regressions limit the impact of influential outliers, the welfare variations using predicted WTP are lower than the corresponding welfare variations using the elicited WTP observed directly in the lab.

Ultimately, since the results under models (4), (5) and (6) are very close, considering the perceived or real distances to the vineyards seems to have a small impact on welfare variations. Although the socially optimal instrument represented by a tax is relatively invariant across types of WTP, the welfare variations differ across the types of WTP considered. This is an important issue since, in real situations, careful comparison must be made by the regulator of these welfare gains and estimates of the administrative costs and the sunk costs for firms. If the regulator decides to select a tax when the welfare variation in Table 3 is higher than the administrative costs, a welfare variation equal to 15.88 (elicited WTP) or 8.05 (predicted in model (4)) could lead to a different conclusion. When the value of the administrative costs is between 8.05 and 15.88, then consideration of the elicited WTP suggests imposition of a tax, while model (4) would suggest no tax, which is a more reliable outcome because outliers are smoothed. This is important if welfare variations are extrapolated to the whole population, since the weight of outliers needs to be downplayed.

7 Conclusion

Regulatory authorities face intense pressure to act in relation to sensitive issues such as reducing pesticides use and carbon emissions. Experimental results provide a useful basis to predict consumers' reactions to pesticide issues and locally produced food. Our experiment conducted in Burgundy shows the complex impact of various parameters on the WTP. The econometric analysis reveals that (1) there is a positive and significant organic premium associated with local and non-local wines, (2) providing additional information on the externalities of agricultural practices increases the organic premium, and (3) distance to a vineyard is a significant determinant of the organic premium. Our results shed some light on the complex effects that need to be considered when defining an efficient environmental policy.

The fact that the organic premium decreases with the distance between the participant's home and a vineyard would seems to indicate that the motivation linked to improving the immediate environment does matter. The consumer's motivation goes beyond organic and local consumption being simply a consumption fad, since our experiment shows that the declared distance is significant for explaining the WTP. The closer the participant lives to a vineyard, the greater her/his concerns about the link between pesticide residues, health, and air and water quality. Also, the influence of declared distance on the local organic premium is higher (in absolute value) than the effect on the global organic premium, which means that the motivation linked to the direct environment is more important than the motivation linked to the ”warm glow” effect, and concern for the environment generally. Our results also show that knowledge and information are important for explaining the choice of organic and local foods, and that socio-demographic variables have an impact on people's attitudes and beliefs and, therefore, on their buying behaviour.

Our welfare estimate for the definition of a regulatory policy shows a social preference for the rate of tax on conventional wines. We showed that the WTP predicted by the robust M-regressions can be used to estimate welfare variations related to various regulatory instruments. The welfare variation obtained using this econometric model is preferable since outliers are smoothed, but it does not provide definitive conclusions. Since robust M-regressions limit the impact of influential outliers, the welfare variations using the predicted WTP are lower than the welfare variations using the elicited WTP observed directly in the lab. This is important when the welfare variations are extrapolated to the whole populations when the weight of outliers needs to be downplayed.

The distance between participants' dwellings and a vineyard was found to be important for improving the quality of the econometric estimation of WTP, and it would be useful to conduct more research on this aspect. For example, the present study hints at real estate taxation integrating environmental characteristics. The significant effects of distance suggest that a property tax might depend on improvements to the environmental quality of the vineyard. If a policy enforcing reduced use of pesticides leads to an improvement in the local environment, people living close to a vineyard would contribute more financially to this policy compared to people located farther from a vineyard. Since our study does not provide definitive results, more work is required on the effects of such a policy. Despite the limitations inherent in lab experiments, this methodology positively contributes to the public debate on how best to promote an efficient policy to encourage consumption of organic wine. Various regulatory scenarios can be tested ex ante, and the methodology used here renders lab experiments useful for policy analysis, which is an important challenge for experimental economics.

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References

Adams DC, Salois MJ (2010) Local versus organic: a turn in consumer preferences and willingness-to-pay. Renew Agric Food Syst 25:331–341

Aertsens J, Verbeke W, Mondelaers K, Van Huylenbroeck G (2009) Personal determinants of organic food consumption: a review. Br Food J 111:1140–1167

Andersen R (2008) Modern methods for robust regression, series: quantitative applications in the social sciences. SAGE Publications

Bazoche P, Combris P, Giraud-Héraud E, Pinto AS, Bunte F, Tsakiridou E (2014) Willingness to pay for pesticide reduction in the EU: nothing but organic? Eur Rev Agric Econ 41(1):87–109. doi:10.1093/erae/jbt011

Becker GM, Degroot MH, Marschak J (1964) Measuring utility by a single-response sequential method. Behav Sci 9:226–232

Bernard JC, Bernard DJ (2009) What is it about organic milk? An experimental analysis. Am J Agric Econ 91:826–836

Bockstael NE (1996) Modeling economics and ecology: the importance of a spatial perspective. Am J Agric Econ 78:1168–1180

Bohm P, Lindén J, Sonnegård J (1997) Eliciting reservation prices: Becker–Degroot–Marschak mechanisms vs markets. Econ J 107:1079–1089

Born B, Purcell M (2006) Avoiding the local trap scale and food systems in planning research. J Plan Educ Res 26:195–207

Carpio CE, Isengildina-Massa O (2009) Consumer willingness-to-pay for locally grown products: the case of South Carolina. Agribusiness 25:412–426

Chattopadhyay S (1999) Estimating the demand for air quality: new evidence based on the Chicago housing market. Land Econ 75(1):22–38

Costanigro M, Kroll S, Thilmany D, Bunning M (2013) Is it love for local/organic or hate for conventional? Asymmetric effects of information and taste on label preferences in an experimental auction. Food Qual Prefer 31:94–105

Denver S, Jensen JD (2014) Consumer preferences for organically and locally produced apples. Food Qual Prefer 31:129–134

Disdier A-C, Marette S, Millet G (2013) Are consumers concerned about palm oil? Food Policy 43:180–189

Feldmann C, Hamm U (2015) Consumers' perceptions and preferences for local food: a review. Food Qual Prefer 40(Part A):152–164

Gracia A, Barreiro-Hurleé J, Galán BL (2014) Are local and organic claims complements or substitutes? A consumer preferences study for eggs. J Agric Econ 65(1):49–67

Griskevicius V, Tybur JM, Van den Bergh B (2010) Going green to be seen: status, reputation, and conspicuous conservation. J Pers Soc Psychol 98:392

Harrison GW, List JA (2004) Field experiments. J Econ Lit 42(4):1009–1055

Hu W, Batte MT, Woods T, Ernst S (2012) Consumer preferences for local production and other value-added label claims for a processed food product. Eur Rev Agric Econ 39:489–510

Huffman WE, Rousu M, Shogren JF, Tegene A (2007) The effects of prior beliefs and learning on consumers' acceptance of genetically modified foods. J Econ Behav Organ 63:193–206

Hughner RS, McDonagh P, Prothero A, Shultz CJ, Stanton J (2007) Who are organic food consumers? A compilation and review of why people purchase organic food. J Consum Behav 6:94–110

Kahneman D, Tversky A (1979) Prospect theory: an analysis of decision under risk. Econometrica 47:263–292

Levitt SD, List JA (2007) What do laboratory experiments measuring social preferences reveal about the real world? J Econ Perspect 21(2):153–174

Li MM, Brown HJ (1980) Micro-neighborhood externalities and hedonic housing prices. Land Econ 125–141

Lusk JL, Marette S (2010) Welfare effects of food labels and bans with alternative willingness-to-pay measures. Appl Econ Perspect Policy 32(2):319–337. doi:10.1093/aepp/ppp013

Lusk JL, House LO, Valli C, Jaeger SR, Moore M, Morrow B, Traill WB (2005) Consumer welfare effects of introducing and labeling genetically modified food. Econ Lett 88:382–388

Marette S, Roosen J, Blanchemanche S (2011) The combination of lab and field experiments for benefit–cost analysis. J Benefit Cost Anal 2:1–36

Meas T, Hu W, Batte MT, Woods TA, Ernst S (2015) Substitutes or complements? Consumer preference for local and organic food attributes. Am J Agric Econ 97(4):1044–1071

Morris C, Buller H (2003) The local food sector: a preliminary assessment of its form and impact in Gloucestershire. Br Food J 105:559–566

Naspetti S, Bodini A (2008) Consumer perception of local and organic products: substitution or complementary goods? Int J Interdiscip Soc Sci 3:111–122

Onozaka Y, McFadden DT (2011) Does local labeling complement or compete with other sustainable labels? A conjoint analysis of direct and joint values for fresh produce claim. Am J Agric Econ 93:693–706
Pearson D, Henryks J, Jones H (2011) Organic food: What we know (and do not know) about consumers. Renew Agric Food Syst 26:171–177
Roosen J, Marette S (2011) Making the "right" choice based on experiments: regulatory decisions for food and health. Eur Rev Agric Econ 38:361–381
Rousu M, Huffman W, Shogren J, Tegene A (2007) Effects and value of verifiable information in a controversial market: evidence from lab auctions of genetically modified food. Econ Inq 45:409–432
Smed S (2012) Information and consumer perception of the "organic" attribute in fresh fruits and vegetables. Agric Econ 43:33–48
Thilmany D, Bond CA, Bond JK (2008) Going local: exploring consumer behavior and motivations for direct food purchases. Am J Agric Econ 90:1303–1309
Wooldridge JM (2003) Cluster-sample methods in applied econometrics. Am Econ Rev 93:133–138
Zanoli R, Scarpa R, Napolitano F, Piasentier E, Naspetti S, Bruschi V (2013) Organic label as an identifier of environmentally related quality: a consumer choice experiment on beef in Italy. Renew Agric Food Syst 28:70–79