Journal of Wine Economics (2023), 1–24
doi:10.1017/jwe.2023.6

ARTICLE

Making wine, selling grapes, or delivering to a cooperative? Determinants of grape allocation

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Abstract

A typical characteristic of the wine supply chain in the Old World is the significant share of cooperatives in wine-making that coexists with investor-owned firms and on-farm wine-makers. This paper analyzes the determinants of whether grape growers deliver their grapes to a cooperative winery of which they are members, sell their grapes to outside wineries, or make their own wine on their farm. Our analysis is based on data from a typical wine-producing area in Northern Italy. The explanatory variables comprise the potential prices linked to the different grape allocations and various farmer and farm characteristics. The high share of farmers delivering their grapes to cooperatives can, to a large extent, be explained by their higher price relative to one of the spot markets. On-farm wine-making is favored by larger farms and more educated farmers.

Keywords: cooperatives; grapes allocation; multinomial logit; nested logit; on-farm wine-making

JEL classifications: C35; D22; Q12; Q13

I. Introduction

The first two technical phases of wine supply chains are grape-growing and winemaking; their organization takes different forms around the world and within each country. Grape growers can sell their grapes to outside wineries that crush them, produce, and possibly age wine. In some cases, the two phases are integrated when grape growers make their own wine on the farm, possibly also buying grapes from other grape growers. Typically, this is the case for high-quality wines, since it allows the control of both the grape-growing and the wine-making phases of the process. A sort of hybrid form is when grape growers deliver their grapes to cooperatives of which they are members. In this case, farmers keep collective control over the process, though *de facto* control is in the hands of the cooperative management.

While the first two forms (farmers selling their grapes to outside wineries and on-farm wine making) are widespread both in the traditional wine-producing countries (the Old World - OW) and in the New World (NW, the more recent producer countries), the share of cooperatives is substantial in the OW, while in the NW it is low, if any. About half of Italy's total grape production is crushed by cooperatives

(Mazzarino and Corsi, 2015; Pomarici et al., 2021); in France, this share is 37% (Alonso Ugaglia, Cardebat, and Jiao, 2019); in Spain, 60% (Albisu et al., 2019); and in Germany, 33% (Bijman et al., 2012). Overall, in Europe, cooperatives currently produce approximately 42% of all European wine (Storchmann, 2018). In contrast, in NW countries the role of the cooperative sector is secondary. In Australia, for example, the previously existing cooperative sector was subsequently absorbed by private businesses (Anderson, 2019). In Chile, the share of cooperatives is only 5%, and in the United States, cooperatives market their grapes but generally do not make any wine (CNIV-Agro-Meter, 2016).

For a cooperative's success, it is crucial that grape growers choose to deliver their grapes to them rather than to alternative outlets. For instance, Mazzarino and Corsi (2015) report the following grape utilization breakdown for Italy in 2012: 49.7% of the national grape production was crushed by cooperatives, 28.1% was processed on-farm by grape growers, and 22.2% was purchased and processed by outside wineries. There is only scant literature on grape-growers' grape utilization determinants. The existing literature mainly focuses on the reasons for vertical integration of supply chains, on the internal functioning of cooperatives and their coexistence with investor-owned firms, and on the determinants of cooperative membership. In order to fill this gap, we employ multinomial logit (MNL) and nested logit (NL) models to analyze the decision-making mechanisms of grape growers. Our empirical analysis is based on grape-growing farms in the Province of Asti in the Piedmont Region (Italy). In this context, cooperative rules make it mandatory for members to deliver their whole production to the cooperative. However, the grape price paid depends on the cooperative's performance and may be different from the market price. Therefore, to emphasize this difference, in the following we will use the term "deliver" rather than the term "sales" for grapes provided by cooperative members.

We find that the high share of farmers delivering their grapes to cooperatives is explained by the high prices the cooperatives can pay to their members and by various socio-economic farmer characteristics. Human capital characteristics are an important determinant also of the choice of making wine from one's grapes. We also find a conceptual ordering of choices, whereby the first decision is whether to sell the grapes on the market or not. If not, the following choice is whether to make wine or to deliver it to a cooperative.

In Section II, we briefly review the literature relevant to our issue. We then present the theoretical and econometric approaches (Sections III and IV). Section V illustrates the data, and Section VI reports our results. Section VII concludes.

II. Literature review

To the best of our knowledge, the only paper on the determinants of grape-growers' relevant choices is Corsi (2003), who only considers the choice of making or not making wine on the farm by grape growers who have a wine-making plant available. Nevertheless, some literature is relevant to this issue, pertaining to different strands. One strand concerns vertical integration and, more generally, the rationale for different organizations of production chains. It mainly refers to the issue of transactional costs (Coase, 1937; Williamson, 1985, 1991) and posits that the organizational form

(contractual vs. hierarchical) is determined by the possibility or impossibility of complete contracts envisaging all possible contingencies and the related transactional costs. The second strand refers to property rights theory (Grossman and Hart, 1986) and considers that the costs to the firm of governing internal exchanges reduce the advantages of hierarchies. Nevertheless, the possibility of integrating the chain by acquiring ownership of downstream industries is rather limited for most grape growers, due to their small economic size. Their only possibilities of vertical integration are the production of wine from their grapes either directly, or indirectly through cooperatives.

There is a large body of literature on cooperatives, but, apart from descriptive works, the theoretical discussion focuses on different issues (Candemir, Duvaleix, and Latruffe, 2021). One of them is how the different governance structures between cooperatives and investor-owned firms affect their economic objectives (Hendrikse and Bijman, 2002; Bontems and Fulton, 2009; Hueth and Marcoul, 2015; Peng, Hendrikse, and Deng, 2018), an issue further complicated when cooperative managers are considered (Fulton and Pohler, 2015; Hueth and Marcoul, 2015). This literature is relevant for understanding the functioning of cooperatives but less so for analyzing grape-growers' choices regarding the destination of their grapes. Another issue considered in the literature is the setting of markets where cooperatives and private investors coexist, and the resulting supply and price levels (Helmberger and Hoos, 1962; Albæk and Schultz, 1998; Pennerstorfer and Weiss, 2013; Liang and Hendrikse, 2016; Carletti et al., 2018). Again, this stream of literature does not analyze grape-growers' decision-making determinants. A more relevant strand of literature for our purpose, mainly concerning developing countries, analyzes the determinants of participation in cooperatives using random utility models, according to which farmers choose the alternative providing the highest utility (Fischer and Qaim, 2012, 2014; Wollni and Zeller, 2007; Bernard and Spielman, 2009; Abebaw and Haile, 2013; Mojo, Fischer, and Degefa, 2016, 2017; Shumeta and D'Haese, 2016; Gyau, Mbugua, and Oduol, 2016; Hao et al., 2018; Wang et al., 2019; Lin et al., 2022). Nevertheless, this literature only considers the dichotomous choice of becoming a cooperative member or not *per se*. In the analyzed cases, this is not typically equivalent to deciding on a marketing outlet for farmers' products, and cooperative membership is not an alternative to other commercial outlets (or other sources of inputs).

A further stream of literature, which is close to our methodological approach, deals with the determinants of farmers' choices of market outlets or processing of their agricultural products, both in developing and developed countries (e.g., Fafchamps and Hill, 2005; Shilpi and Umali-Deininger, 2008; Takeshima and Winter-Nelson, 2012; Abdulai and Birachi, 2009; Arinloye et al., 2015; Corsi, Novelli, and Pettenati, 2018; Negi et al., 2018; Pham, Theuvsen, and Otter, 2019; among others). This literature assumes that the choice is determined by the comparison of the benefits (in terms of utility or income) stemming from the different alternatives, and assesses the determinants using various econometric techniques, generally logit or probit models. Most of these papers deal with dichotomous choices (adopting or not a marketing channel, processing or not the agricultural product). In the few cases when choices are multiple, no hierarchy of the choices is envisaged. One

exception is Hao et al. (2018), who condition the choice of the marketing channel on cooperative membership.

III. Theoretical approach

To illustrate the theoretical framework, it is useful to present the context of our empirical exercise. The three choices grape growers have concerning their product, namely making wine on the farm, selling the grapes to an outside winery, or delivering them to a cooperative winery of which they are members, are mutually exclusive. In the Italian context, it is generally mandatory for members of cooperative wineries to deliver their whole production to the cooperative. Normally, on-farm wine-makers crash their whole production, so this choice is again an alternative to the other two.

For farmers selling their grapes to an outside winery, no further cost is incurred except for transportation. The price depends on the grape market. In the regional situation we analyzed, in some cases, grapes are sold based on long-term, sometimes informal, contracts to wine-makers who are particularly interested in the quality of the grapes and trying to ensure a secure and high-quality raw product. Another possibility is selling to industrial wine-makers who collect grapes mainly based on their price with little or no fidelity to particular grape growers.[1] Of course, prices vary at the farm level due to the specific variety and quality.

For grape growers making their own wine on the farm, this choice implies an investment in wine-making facilities—a largely sunk cost—plus operating costs and often wine marketing costs. Operating costs comprise costs for inputs other than grapes and labor costs. Normally, in wine technology, both input and labor costs are a linear function of production. Though, since most farms are family farms, the labor costs of household members are opportunity costs if they have employment opportunities off the farm, or subjective costs if such opportunities do not exist or if on-farm and off-farm labor are not perfect substitutes in utility. The wine is either bottled and sold under the farm's label or, more rarely, sold in bulk to bottlers. The revenue depends on yields and on wine price, which is subject to a large variation based on varieties and specific quality. Nevertheless, in the area of investigation, no icon wines are produced, so the price variation is smaller than in the more prestigious Langhe area.

A third group is represented by cooperative members. In the local situation, this is a long-term choice because, generally, it is not possible to enter and exit a cooperative yearly since internal rules typically discourage exits through some constraint or penalty. The obligation to deliver the whole production to the cooperative is easily controlled by knowing the members' vine areas and, hence, production. Cooperative membership is open to anybody who wishes to join, and the cooperatives accept the delivery of any quantity of grapes from their members. The cooperatives pay their members the price resulting from the sales minus the processing and marketing costs. Generally, this is done by making a down payment at the moment of delivery;

[1]The former is mainly the case for wine-makers who have their own vineyards but also buy and process grapes from other producers. Industrial wine-makers are generally less interested in high quality since most of them produce large quantities of wine destined for supermarket chains. Unfortunately, there is no available information, neither on the informal contracts nor even on the share of the different typologies of sales.

the balance is paid when the cooperative accounts are completed. Prices paid to members are typically differentiated by the quality of the grapes. No costs are implied for the members except for a fee when joining the cooperative and transportation costs. Members' revenues, therefore, depend on the technical and marketing efficiency of the cooperative.[2]

To analyze grape-growers' choices concerning the destination of their grapes theoretically, assume no choice has yet been made. Then grape growers are assumed to choose the grape destination that provides the highest expected utility, which includes both utility stemming from income and utility stemming from the psychic benefit of the particular choice. We assume that grape-growing costs and grape yields are identical for all three choices and that the transaction costs of each choice are reflected in the relevant prices. Differences in delivery costs between the three choices are considered negligible. Hence, income comparisons can be based on revenues, net of processing and marketing costs in the case of wine.

The expected overall utility of choice "sell the grapes" (choice G) is:

$$\mathrm{U(G)} = \mathrm{E}[\mathrm{U}(p_{gm}y - c_p - c_t) + \mathrm{U}(\mathrm{s}G(H))], \tag{1}$$

where y is grape production; p_{gm} denotes the market price of grapes; c_p and c_t are production and transportation costs. U(sG) is the subjective utility from a particular choice (e.g., users' appreciation of the quality of the grapes; lack of confidence in their personal winemaking skills; risk aversion toward the investments in wine-making), a function of personal and household characteristics H.

The expected overall utility of choice "making wine" (choice W) is:

$$\mathrm{U(W)} = \mathrm{E}[\mathrm{U}(p_w a y - c_p - c_w(y, p_i, l) - c_t) + \mathrm{U}(\mathrm{s}W(H))], \tag{2}$$

where y is grape production; a denotes the transformation coefficient of grapes into wine (usually 0.7 in weight); p_w is the wine price; c_w are wine-making and marketing costs, function of the quantity, input prices $p_{i,}$ and labor unitary cost l (either market wage or subjective labor cost); U(sW) is the expected subjective utility from the choice of wine-making (e.g., pride of being a wine-maker; wine quality appreciation by consumers; risk-loving attitudes), again a function of personal and household characteristics H.

The expected overall utility of choice "delivering to a cooperative" (choice C) is:

$$\mathrm{U(C)} = \mathrm{E}[\mathrm{U}(p_{gc}y - c_p - c_t) + \mathrm{U}(\mathrm{s}C(H))], \tag{3}$$

where y is the grape production; p_{gc} is the grape price paid by the cooperative to its members; c_p and c_t are production and transportation costs; and U(sC) is the subjective utility from the specific choice (e.g., psychic benefits from the participation in a collective endeavor, risk attitudes toward engaging in a long-term commitment), again a function of personal and household characteristics H.

[2]Cooperatives sometimes also buy grapes from non-members, but in this case, they do not pay the price reserved for members, but the market price for the grapes. Grape growers selling their grapes to a cooperative of which they are not members therefore belong to the group who sells grapes on the market.

Since the quantity of grapes is the same and the quantity of wine is a fixed ratio of the quantity of grapes, the most relevant variables for the economic benefit are the prices fetched in the three choices and wine-making and marketing costs. Variable wine-making input costs are assumed to linearly depend on observable characteristics of wine-making farms, with an unobservable random component. Family labor costs can depend on the opportunity cost of labor and, hence, on farmers' observable personal characteristics determining the potential wage and on an unobservable random component. In addition to these, if labor cost is subjective, either because of the different utility of on-farm and off-farm labor or because no off-farm employment opportunity is available, it also depends on personal and household characteristics. The subjective components of utility for the different choices are also assumed to depend linearly on personal and household characteristics, plus a random component.

In summary, choice j is made (j = wine, grapes, co-op) if:

$$U_j[I(p_j, F, H), H] + \varepsilon_j > U_k[I(p_k, F, H), H] + \varepsilon_k \forall\, k \neq j, \tag{4}$$

where income I is a function of p_j (p_k), the relevant price from choice $j(k)$; of F, a vector of farm characteristics; of H, a vector of farmer's and household's characteristics; personal and household characteristics H also determines the psychic benefits of the different choices; ε is the random component.

Ideally, to analyze these choices, one would like to have panel data allowing one to identify the choices as they are made. Unfortunately, such data are not available, in part because some decisions were made a long time ago, which would require data for a very long time span. Hence, our analysis will be based on cross-sectional data under the implicit assumption that the choices are affected by the explanatory variables in their values at the time of observation (except for prices, which were included with their lagged values).

IV. Econometric approaches

For the empirical analysis of the determinants of the three choices, a first possibility is adopting a MNL model:

$$\text{Prob(choice is j)} = \frac{e^{\beta_j X_i + \gamma_j Z_{ij}}}{\sum_j^J e^{\beta_j X_i + \gamma_j Z_{ij}}}, \tag{5}$$

where X_i are individual-specific explanatory variables; Z_{ij} are choice-specific explanatory variables; and β and γ are parameters to be estimated. Due to identification restrictions, only the relative probabilities across choices can be estimated. The MNL model assumes identical and independent extreme value distributions of the error terms in the utility functions of the different choices and implies the independence of the irrelevant alternatives (IIA) property, whereby the ratio between the probability of two choices is independent of the remaining probabilities. A Hausmann-McFadden test can be used to verify the appropriateness of IIA in the specific case.

The MNL model places the different choices "on the same ground." An alternative model is Nested Logit (NL), whereby the choices are grouped into so-called nests so that the IIA property holds within nests but the variance is allowed to differ across nests. In practical terms, this allows considering that there is some conceptual ordering of the choices, so that in our case, for example, a first choice is whether to sell the grapes to an outside winery or not and, if not, whether to become a cooperative member and deliver them to the cooperative or make wine from them. In statistical terms, this approach would imply that some choices have some unobservable determinants in common, so that a tree can be envisaged, with "branches" and "twigs" (Greene, 2012). In our case of three choices, a nest can comprise two choices belonging to the same branch, while the third branch provides just one choice. Namely, there are three possibilities that will be tested econometrically. The first choice is either: (1) selling the grapes to an outside winery or not; (2) making wine from one's grapes or not; or (3) becoming a member of a cooperative and delivering one's grapes to it or not. If the first choice is not adopted, the next choice is between the remaining alternatives. A priori, there can be considerations favoring each alternative choice structure. The NL model allows for testing this empirically.

If the J choices are divided into L nests, and the (individual and choice-specific) attributes of choice j in nest l are $C_{j|l}$ and those of nest l are N_l, the probability of choosing a specific twig j in branch l is (Greene, 2012):

$$Prob(twig\ j,\ \ branch\ l) = \frac{e^{\beta C_{j|l}+\gamma N_l}}{\sum_{l=1}^{L}\sum_{j=1}^{J_l} e^{\beta C_{j|l}+\gamma N_l}} \tag{6}$$

from which it can be shown that

$$Prob(j|l) = \frac{e^{\beta C_{j|l}}}{\sum_{j=1}^{Jl} e^{\beta C_{j|l}}} \tag{7}$$

and

$$Prob(l) = \frac{e^{\gamma_j N_l+\tau_i I_l}}{\sum_{l=1}^{L} e^{\gamma_j N_l+\tau_i I_l}}, \tag{8}$$

where $I_l = ln\left(\sum_{j=1}^{J_l} e^{\beta C_{j|l}}\right)$, the Inclusive Value for the lth branch, is a function of the underlying correlation between the unobserved components for pairs of alternatives in the nest (the lower the Inclusive Value, the higher the correlation). For the model to be consistent with utility maximization, the Inclusive Value must be bound between 0 and 1.

V. Data

We chose to run our analysis in the Province of Asti in the Piedmont Region, northwest of Italy, where grapes are grown almost entirely on hilly terrain. This province has a good number of cooperative and industrial wineries, together with numerous farms making their own wines. Unlike other wine areas in Piedmont like Langhe, where icon wines are produced, the Asti province presents less heterogeneity in grape quality, wine refining, and aging techniques. Wine or grape prices are less variable across areas and over time, making them a good example for analyzing grape-growers' choices.

The data for farm and farmer characteristics were drawn from the last available official Agricultural Census, in 2010. Of the original individual records in the Province of Asti of farms with vines of any type (5,339 farms), only family farms with at least 60% of the Utilized Agricultural Area (UAA) devoted to vines[3] were retained (3,606 farms). Furthermore, we excluded farms where more than 40% of the vine area was covered by varieties for which prices were not available or by Moscato vines. Moscato grapes need some industrial processing for winemaking that is not usually performed on the farms; hence, their destination is almost predetermined. After finally dropping farms with incomplete records, a total of 2,927 farms were retained.

The classification of farms into the three outlets was based on the responses to Census questionnaire questions, which revealed the destination of grapes to cooperatives or others, as well as the production of wine.[4]

Among farm characteristics, we included: the total vine area, which can affect economies of scale and hence average costs for wine-making; the share of the UAA devoted to grapes, as an index of specialization; and the share of vine area fit for appellation wines over the total vine area, as an index of quality that might affect the wine-making choice.[5] Information on operators' characteristics provided by the Agricultural Census includes age, gender, and education levels. Education levels were transformed into education years, so as to have a discrete variable. A dichotomous variable further indicates if the respective high school or university specialized in agricultural studies. These variables are proxies for the technical and marketing skills of the operators assumed to affect wine and grape quality and/or prices at the farm level, relative to average prices. Nevertheless, they also measure the level of human capital, affecting the potential wage that might be earned on the labor market, which raises the opportunity cost of a farmer's labor. In addition, they may affect

[3]This somewhat arbitrary percentage was taken to avoid farms where grape-growing was secondary. We were interested in the choices of professional grape growers.

[4]Grape growers owning a wine-making plant can choose nevertheless to sell their grapes rather than crush them, since the wine-making equipment, once invested, becomes a sunk cost. These are nevertheless classified as selling their grapes, since this is their actual behavior. We are grateful to the referee for clarifying this point.

[5]Further farm variables that were available in the Census data but that we did not include were the farm having carried out agro-tourism and the farm doing bookkeeping and/or using Information and Communication Technologies. They were discarded because of the possibility of reverse causality (e.g., agro-tourism increases the possibility of directly selling wine on the farm at good prices, but making wine also raises the profitability of doing agro-tourism).

individual preferences toward a particular choice. Hence, we do not have precise expectations of their signs. We also included dichotomous variables indicating whether the operator had an off-farm job but mainly worked on a farm ("Secondary part-time") or if he/she had an off-farm job as his/her main occupation ("Principal part-time"). Farm characteristics, together with household characteristics, might influence subjective labor costs. Hence, choosing variables relating to farm and household characteristics seems appropriate. The labor burden of household members (the ratio of adult household members to vine area) is expected to increase the negative utility of work and discourage further use of family labor in wine-making. This variable and the number of children of different ages (under 6 and 6–13 years old) were also included to check if household characteristics affect production choices, as indicators of non-separability between production and individual utility maximization choices (Singh, Squire, and Strauss, 1986).[6]

The other relevant explanatory variables concerned prices for wine and grapes and prices paid by cooperatives to their members. Prices actually received by each farm for making a particular choice were not available, and in any case, the potential price for an alternative choice to the one actually made would not be observable. Our strategy was, therefore, to estimate the potential price each farm could fetch when making the different choices. Of course, actual prices also differ by grape quality. Unfortunately, there is no information on the quality of grapes from individual farms except for the grape variety. We then wanted to obtain the potential price that a specific farm could obtain when selling the grapes, making wine, or delivering the grapes to a cooperative, conditional on its mix of varieties. To reduce the variability due to harvest effects, all prices were taken as averages of the 2008 and 2009 harvests, that is, the two years before the Agricultural Census. Taking backward-lagged prices also reduces the risk of endogeneity, whereby the destination choices affect the relevant prices.[7] As all Piedmont wines are basically made from single grape varieties, grape and wine prices can be compared. With regard to the sale of the grapes on the market, the provincial prices from the weekly or fortnightly price lists of the Asti Chamber of Commerce were used. Listed grape prices only included the main varieties cultivated in the Province, namely Barbera, Freisa, Grignolino, Brachetto, Dolcetto, Cortese, and Chardonnay. We took the average of the prices between the beginning and the end of the harvest[8] and averaged it between 2008 and 2009. We obtained the potential price of each farm for wine grapes sold on the market as the average of the provincial prices of the different varieties obtained as noted previously, weighted by the relevant vine areas of the different varieties in that farm.

[6]Family farms whose objective function is the utility maximization of the household behave as profit-maximizing firms if household characteristics do not influence production choices. This is true in particular if production is not self-consumed and if household members can work off-farm and are indifferent to working on- vs. off-farm. In the opposite case, production decisions (e.g., supply levels) are affected by individual or household variables (Singh, Squire, and Strauss, 1986).

[7]We are grateful to the referee for drawing our attention to this issue.

[8]Wineries often directly purchase grapes from farms based on long-term, sometimes informal, contracts. Unfortunately, there is no information on these contracts or the relevant prices. Therefore, the Chamber of Commerce prices are often only indicative, and actual prices paid to producers are subject to individual variation. We assume this variation is included in the random component of the models.

In the case of the cooperatives' provisions, the average prices paid by the local cooperatives for each variety were directly asked by cooperative managers.[9] In this case, when average prices paid differed according to the different qualities of the grapes, prices were also calculated as a weighted average of the different qualities in each cooperative. In 2008–2009, in the Asti province, 13 cooperative wineries were active, but only from 9 of them could we obtain data on the prices paid to their members. The 9 cooperatives overall stated they harvested grapes from 54 of the 118 municipalities in the province, representing 79.4% of the total vineyard area in the province. The potential cooperative price for wine grapes on each individual farm was calculated as the average of the prices of the different varieties paid by the closest cooperative,[10] weighted by the relevant vine areas of the different varieties on that farm.

Wine prices were also drawn from the Chamber of Commerce price lists in 2008 and 2009. Since grape varieties can potentially produce different wines, the calculation of wine prices was more complex than the one for grape prices. Selling prices may vary by quality, location (depending on the boundaries of the appellations), level of refinement, and the expected aging potential (e.g., the "Riserva" quality has a different compulsory level of aging). Therefore, we calculated an average provincial price weighted by the quantities produced in those years for each type of wine and as the mean of the different monthly prices of 2008 and 2009. The potential wine price for each farm was then calculated as the weighted mean of the provincial wine prices, the weight given by the shares of vine areas dedicated to the different varieties originating the specific wines.

The descriptive statistics of the variables, for the total and the three choices, are presented in Table 1. The table also reports the test results for the differences in group averages. Of the total number of farms in the sample, 41% took their grapes to a cooperative (Cooperative group, C), 39% sold their grapes on the market (Grape group, G), and 20% made wine (Wine group, W). The average vine area was 2.77 hectares and did not differ much in absolute terms across groups, though in statistical terms the average was significantly different between C and G. The average share of vines over the UAA, overall equal to 77%, was significantly different across choices, with the lowest in the W group and the largest in the C group. The shares of vine area for appellation wines[11] over total vine area (57% of the total) were also significantly different across groups, with W at the lowest level and C at the largest. There are only small differences in the operator mean age, which is about 58 years for the full sample. The share of male operators (73%) is not significantly different across groups. The education level is slightly but significantly lower for C relative to W and G, and the same applies to agricultural education. Part-time off-farm jobs as the principal occupation concerned a little less than 10 percent of operators, more for C than for W. Secondary part-time employment

[9]We are grateful to the cooperative managers for providing their proprietary price data.

[10]In most cases, the farms adhering to a cooperative winery are members of the closest one, both because of lower transportation costs and because cooperative wineries generally tend to specialize in the production of PDO wines that characterize their procurement area.

[11]In Piedmont there exists no PGI wine, all appellations are PDOs.

Table 1. Descriptive statistics of the variables by choice

	Wine		Grapes		Cooperatives		Total	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Grape price	28.50[a]	13.67	28.50[a]	15.41	30.26[b]	17.09	29.22	15.82
Wine price	48.75[a,b]	25.32	47.63[a]	25.89	51.35[b]	29.02	49.38	27.15
Cooperative price	26.80[a]	16.12	28.40[a]	18.15	34.68[b]	21.82	30.65	19.67
Vine area (ha)	2.58[a,b]	4.07	2.98[a]	3.91	2.66[b]	3.25	2.77	3.69
Share vine/UAA	0.490[a]	0.334	0.556[b]	0.334	0.611[c]	0.312	0.565	0.328
Share appellations/vine area	0.489[a]	0.468	0.758[b]	0.388	0.921[c]	0.219	0.770	0.384
Organic (1 = yes)	0.031[a]	0.172	0.019[a]	0.138	0.008	0.086	0.017	0.129
Operator's age	58.6[a]	14.5	56.8[a,b]	14.7	58.5[b]	14.7	57.9	14.7
Operator's gender (1 = male)	0.759[a]	0.428	0.732[a]	0.443	0.723[a]	0.447	0.734	0.442
Education years	8.6[a]	3.8	8.7[a]	3.7	8.2[b]	3.4	8.5	3.6
Agricultural education (1 = yes)	0.083[a]	0.276	0.067[a]	0.250	0.029[b]	0.169	0.055	0.228
Principal part-time (1 = yes)	0.075[a]	0.263	0.092[a,b]	0.289	0.111[b]	0.314	0.096	0.295
Secondary part-time (1 = yes)	0.070[a]	0.255	0.071[a]	0.256	0.053[a]	0.223	0.063	0.243
Foreigner operator (1 = yes)	0.015[a]	0.123	0.011[a,b]	0.103	0.004[b]	0.065	0.009	0.094
HH labor intensity (n./ha vin.)	2.50[a]	3.74	1.87[b]	3.24	1.76[b]	2.79	1.95	3.19
# children <= 5	0.039[a]	0.234	0.057[a]	0.287	0.050[a]	0.254	0.051	0.264
# children 6–13	0.092[a]	0.362	0.110[a]	0.374	0.099[a]	0.360	0.102	0.366
Number of observations	589		1,131		1,197		2,917	
% Observations	20.2		38.8		41.0		100	

Note: Same superscript letters a, b, and c indicate not significant mean differences at the 5% level between the relevant means.

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concerned 6.3 percent of the farms, with no significant difference across groups. Only 0.9 percent of the operators were foreigners, a share higher for W than for G, probably reflecting investments in wine farms by foreign personalities. The labor intensity (overall 1.95 household members per hectare) was significantly higher for W (2.50) than for G (1.87) and C (1.76). There were no significant differences in the average number of children, which was very low anyway (0.05 and 0.10 for the two age groups).

The most interesting data concern prices. The average price received by cooperative members, as calculated earlier, is significantly higher than what would be received by farmers who sell their grapes or make wine. On the contrary, the average price received by wine-makers is not significantly different from the one potentially received by the farmers that sell grapes to other market outlets.

VI. Results

Table 2 presents the results of the MNL model, taking as a reference the choice of the Cooperative. The model is overall highly significant. The parameters are not directly interpretable, except for the significance and the signs, and it is more convenient to examine the marginal effects and the elasticities, either calculated at the mean values of the variables (Table 3) or as marginal effects and elasticities averaged over individuals (Table A1 in the Appendix).

Starting with own prices, all relevant parameters are significant. Nevertheless, there are some important differences. The marginal effects may not seem strong in absolute terms (Table 3), as a one-euro increase in the relevant price, *ceteris paribus*, results in a 2 percent increase in the probability of selling the grapes to an outside winery (G), a 0.6 percent increase for making wine (W), and a 0.5 percent increase for delivering to cooperatives (C).[12] Nevertheless, the relevant probabilities are elastic for W (1.76) and for G (1.35), while the probability of the C choice is price-inelastic (0.42). As to cross-prices, the G choice is more sensitive to the wine price (elasticity –0.97) than to the cooperative price (–0.39). The W choice is negatively affected by the grape price (elasticity –1.53) but not by the cooperative price, which is not significant. Consistently, the C choice is affected by the grape price (elasticity –0.80) but not by the wine price.

Among farm characteristics, vineyard area size has a positive, albeit modest, effect on the probability of choosing wine-making, since one more hectare increases the probability of this choice by only 0.8 percent. The corresponding value for the C choice is negative, –1.2 percent. The effect on G choice is not significant. Therefore, it seems that some economies of scale exist for on-farm wine-making, while smaller farms tend to resort to cooperatives. Farm specialization in vine growing, as measured by the share of vine area over total UAA, positively affects the cooperative choice: every 10 percent increase in the share increases the probability of the cooperative choice by about 5 percent. It negatively and significantly reduces the probability of selling the grapes and, somewhat surprisingly, of making wine,

[12]These results are evaluated at the mean values of the variables, but they are consistent with the ones calculated as averages of the individual marginal effects and elasticities (Table A1).

Table 2. MNL estimated parameters

	Grapes		Wine	
	Coeff.	St. err.	Coeff.	St. err.
Constant	1.327***	0.353	0.681	0.450
Grape price	0.074***	0.017	−0.025*	0.015
Wine price	−0.025**	0.010	0.030***	0.008
Cooperative price	−0.027***	0.005	−0.014**	0.007
Vine area (ha)	0.040**	0.016	0.078***	0.019
Share vine/UAA	−0.351**	0.147	−0.322*	0.192
Share appellations/vine area	−1.575***	0.173	−3.360***	0.197
Organic (1= yes)	0.785*	0.410	1.201***	0.452
Operator's age	−0.004	0.004	0.003	0.005
Operator's gender (1 = male)	0.026	0.100	0.218	0.134
Education years	0.022	0.015	0.055***	0.020
Agricultural education (1 = yes)	0.684***	0.227	0.968***	0.266
Principal part-time (1 = yes)	−0.306*	0.159	−0.699***	0.224
Secondary part-time (1 = yes)	0.125	0.187	0.056	0.239
Foreigner operator (1 = yes)	1.192**	0.551	1.832***	0.597
HH labor intensity (n./ha vin.)	−0.017	0.017	−0.014	0.020
# children <= 5	0.009	0.165	−0.162	0.237
# children 6–13	−0.024	0.122	−0.088	0.164
Log-likelihood	−2733.628			
Chi squared [34]	692.97***			
McFadden pseudo R-squared	0.112			
Number of observations	2,917			

Note: *, **, *** indicate significance at the 90%, 95%, and 99% level, respectively.

by −1.3 and −3.7 percent for a 10 percent increase in the share, respectively. The share of vines fit for appellation wines over the total vine area has a positive effect on the probability of the C choice and a negative one on both the G and W choices. Finally, the farm being organic discourages participation in cooperatives by 21.6 percent and encourages wine-making by 11.5 percent, while it has no significant effect on the choice of selling the grapes.

As to the operator's characteristics, age is never significant, and gender is only weakly significant for the choice of making wine, for which the operator being male increases the probability by 3 percent. Education years are significant for the cooperative and wine choices, but their effect is tiny, with a −0.7 and +0.6

Table 3. Marginal effects and elasticities at the mean values of the variables (MNL)

	Grapes			Wine			Cooperative		
	Marg. eff.	Elasticity	Z statistic	Marg. eff.	Elasticity	Z statistic	Marg. eff.	Elasticity	Z statistic
Grape price	0.020***	1.351	4.96	−0.009***	−1.533	−4.20	−0.011***	−0.801	−3.20
Wine price	−0.009***	−0.974	−3.53	0.006***	1.763	5.06	0.002	0.279	1.13
Cooperative price	−0.005***	−0.386	−5.07	0.000	0.003	0.02	0.005***	0.426	5.18
Vine area (ha)	0.004	0.025	1.17	0.008***	0.130	3.57	−0.012***	−0.086	−3.40
Share vine/UAA	−0.061*	−0.080	−1.91	−0.020	−0.064	−0.80	0.082**	0.118	2.47
Share appellations/vine area	−0.130***	−0.230	−3.88	−0.369***	−1.606	−16.22	0.498***	0.983	13.14
Organic	0.101	0.004	1.24	0.115**	0.011	2.28	−0.216**	−0.009	−2.31
Operator's age	−0.001	−0.149	−1.31	0.001	0.213	0.99	0.000	0.068	0.53
Operator's gender (1 = male)	−0.010	−0.017	−0.47	0.030*	0.124	1.70	−0.020	−0.037	−0.86
Education years	0.001	0.020	0.30	0.006**	0.306	2.41	−0.007**	−0.161	−2.14
Agricultural education (1 = yes)	0.009**	0.012	2.01	0.089***	0.027	2.79	−0.182***	−0.026	−3.55
Principal part-time	−0.021	−0.005	−0.61	−0.079***	−0.043	−2.67	0.100***	0.025	2.75
Secondary part-time	0.026	0.004	0.66	−0.001	0.000	−0.04	−0.025	−0.004	−0.59
Foreigner operator (1 = yes)	0.152	0.003	1.38	0.176***	0.009	2.63	−0.328***	−0.007	−2.64
HH labor intensity (n./ha vin.)	−0.003	−0.014	−0.87	−0.001	−0.008	−0.30	0.004	0.019	0.99
# children <= 5	0.015	0.002	0.40	−0.024	−0.007	−0.77	0.010	0.001	0.26
# children 6–13	0.001	0.000	0.03	−0.011	−0.006	−0.51	0.010	0.003	0.37

Note: *, **, *** indicate significance at the 90%, 95%, and 99% level, respectively.

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percent variation in the relevant probabilities for a one-year increase in education. More relevant are the effects of agricultural education. If the operator had an agricultural education, the probability of the wine choice increases by 8.9 percent, the one of cooperative decreases by –18.2 percent, while the effect, though statistically significant, is almost nil (0.9 percent) for the choice of selling the grapes. Overall, these results indicate that a higher and specific education favors on-farm wine-making, which indeed requires additional skills relative to grape-growing.

The operator having a principal off-farm occupation is more conducive to the cooperative choice (+10 percent) and less conducive to wine-making (–7.9 percent), but not significant for the choice of selling the grapes. Off-farm occupation as a secondary activity does not significantly affect any choice. Finally, if the operator is a foreigner, the probability of the cooperative choice decreases by 32.8 percent, and it increases by 17.6 percent for the wine choice; again, it is not significant for the choice of selling the grapes.

Finally, no variable related to the household turns out to be significant, neither the ratio of household members to farm size (an indicator of labor burden), nor the number of children of different ages. This suggests that household characteristics do not influence production choices, with the implication that while consumption and labor allocation choices are influenced by farm production and income, the reverse is not true, so that the cost of family labor is exogenous and the farm behaves as a profit-maximizing firm (Singh, Squire, and Strauss, 1986). It is interesting to note that a similar analysis in the same region on data from the 1990 Agricultural Census (Corsi, 2003) brought an opposite result since several household characteristics were significant in determining the choice of making wine on the farm. This difference illustrates the transformation process of the wine sector, whereby market factors assume greater relevance relative to subjective ones.

As already indicated, MNL assumes the Independence of IIA property, according to which the ratio between two alternatives is independent of the remaining alternatives. This assumption has been tested with the Hausman test, which could not reject the IIA property. Nevertheless, we also estimated a NL model that allows for different correlations across alternatives so as to understand whether there is some conceptual hierarchy between the three choices.

Three nested choice structures are possible: (1) the first choice is whether to sell the grapes and, if not, whether to make wine or to bring the grapes to a cooperative; (2) the first choice is whether to make wine or not and, if not, whether to sell the grapes or to bring them to a cooperative; (3) the first choice is whether to become a member of a cooperative or not and, if not, whether to make wine or to sell the grapes. We estimated NL models for all structures. The results of structures (2) and (3) were not acceptable since the Inclusive Value was higher than 1, which is inconsistent with utility maximization. Only model (1) showed an acceptable Inclusive Value of 0.344.

The estimated parameters of the NL model are presented in Table 4, in which the reference choice is the cooperative one. For the choice of selling the grapes, own price is significant and positive, while cooperative and wine prices are significant and

Table 4. NL estimated parameters

	Grapes		Wine	
	Coeff.	St. err.	Coeff.	St. err.
Constant	−0.422	0.480	0.253	0.259
Grape price	0.075***	0.014	−0.009	0.009
Wine price	−0.030***	0.009	0.011	0.009
Cooperative price	−0.0245***	0.004	−0.005	0.004
Vine area (ha)	0.021	0.015	0.026	0.020
Share vine/UAA	−0.287	0.133	−0.097	0.100
Share appellations/vine area	−0.477	0.477	−1.187	0.891
Organic (1 = yes)	0.379	0.378	0.455	0.372
Operator's age	−0.004	0.003	0.001	0.002
Operator's gender (1 = male)	−0.017	0.092	0.073	0.073
Education years	0.009	0.014	0.020	0.017
Agricultural education (1 = yes)	0.409**	0.231	0.371	0.289
Secondary part-time	0.080	0.166	−0.020	0.096
Principal part-time	−0.180	0.157	−0.270	0.216
Foreigner operator (1 = yes)	0.719	0.476	0.661	0.539
HH labor intensity (n./ha vin.)	−0.017	0.013	−0.009	0.010
# children <= 5	0.059	0.016	−0.032	0.099
# children 6–13	0.005	0.114	−0.009	0.058
Inclusive value	0.344***	0.256		
Log-likelihood	−2731.3			
Chi squared [34]	697.6***			
McFadden pseudo R-squared	0.113			
Number of observations	2,917			

Note: *, **, *** indicate significance at the 90%, 95%, and 99% level, respectively.

negative. The values of these parameters are sensibly similar to those of the MNL model. Though, some other estimated parameters that were significant in the MNL model (the share appellations/vine area; organic; foreigner operator) are not so in the NL. None of the estimated parameters of the NL model for wine is significant. Nevertheless, NL parameters are not directly interpretable, and it is more informative to examine the marginal effects (Table 5). The estimates of the marginal effects are sensibly similar to the ones of the MNL as to their signs and their significance. The order of magnitude of the parameter values is also consistent between the MNL and the NL models, and most parameters are equal up to the second or

Table 5. Marginal effects and elasticities at the mean values of the variables (NL)

	Grapes			Wine			Cooperative		
	Marg. eff.	Elasticity	Z statistic	Marg. eff.	Elasticity	Z statistic	Marg. eff.	Elasticity	Z statistic
Grape price	0.018***	1.433	5.44	−0.009***	−1.425	−4.60	−0.009***	−0.615	−3.66
Wine price	−0.007***	−1.030	−3.89	0.006***	1.718	5.30	0.002	0.105	1.31
Cooperative price	−0.005***	−0.439	−5.23	0.0003	−0.054	0.34	0.005***	0.422	5.85
Vine area (ha)	0.003	0.020	0.96	0.006***	0.112	2.71	−0.009***	−0.097	−3.28
Share vine/UAA	−0.058**	−0.087	−1.96	−0.006	−0.049	−0.29	0.065**	0.113	2.32
Share appellations/vine area	−0.015	−0.038	−0.35	−0.324***	−1.697	−17.37	0.339***	0.943	7.69
Organic (1 = yes)	0.051	0.003	0.68	0.109**	0.007	2.26	−0.160**	−0.011	−2.21
Operator's age	−0.001	−0.172	−1.39	0.0006	0.197	0.99	0.0005	0.062	0.68
Operator's gender (1 = male)	−0.009	−0.018	−0.47	0.023*	0.114	1.48	−0.014	−0.040	−0.71
Education years	0.0006	0.015	0.19	0.005**	0.321	2.12	−0.006**	−0.178	−2.04
Agricultural education (1 = yes)	0.065*	0.010	1.51	0.080***	0.024	2.82	−0.145***	−0.029	−3.59
Secondary part-time (1 = yes)	0.020	0.003	0.54	−0.012	−0.004	−0.43	−0.007	0.000	−0.21
Principal part-time (1 = yes)	−0.0199	−0.005	−0.59	−0.006**	0.059	−2.56	0.088***	−0.023	2.82
Foreigner operator (1 = yes)	0.113	0.003	1.19	0.144**	0.011	2.23	−0.258***	−0.006	−2.68
HH labor intensity (n./ha vin.)	−0.003	−0.018	−1.13	−0.001	−0.024	−0.57	0.004	0.025	1.57
# children <= 5	0.016	0.002	0.45	−0.014	−0.005	−0.50	−0.001	0.0003	−0.05
# children 6–13	0.001	−0.000	0.07	−0.003	−0.002	−0.17	0.011	0.0005	0.05

Note: *, **, *** indicate significance at the 90%, 95%, and 99% level, respectively.

https://doi.org/10.1017/jwe.2023.6 Published online by Cambridge University Press

third decimal place.[13] Therefore, the comments on the results of the MNL model on the effects of the different explanatory variables also apply here, and we do not repeat them.

VII. Discussion

These results show some evidence for a hierarchy of decisions on the destination of grapes. A first choice is whether to sell the grapes to an outside winery, and if not, a second choice is whether to make wine or deliver the grapes to a cooperative. Both the wine-making and the cooperative choice, even if they can be reversed, imply long-term commitments. For wine-making, the investment in wine-making plants is to a large extent non-recoverable if the operator decides to stop it, so the choice is necessarily a long-term one. Similarly, participation in a cooperative generally implies a long-term commitment since their rules compel members to deliver their whole production to the cooperative, and it is not allowed to decide year by year whether to participate in the cooperative or to directly sell the grapes to outside wineries. The structure of the NL therefore suggests a first division between a choice of "free hands" (selling the grapes to outside wineries) that leaves all options open and choices that, on the contrary, imply a long-term commitment, be it the choice of making wine or of adhering to a cooperative. The estimates of the parameters of the NL model are almost the same as those of the MNL model. This could then suggest that the division between the "free hands" choice and the other ones is mainly driven by unobservable idiosyncratic factors, such as the personal willingness to long-term commit oneself to a particular choice, which is in turn probably linked to propensity or aversion to risk. Such unobservable variables can emerge when the model accommodates the choice structure. All other relevant determinants are also relevant in the MNL model, in which the structure of the choices is not constrained. Therefore, for all choices, the own- and cross-price coefficients exhibit the expected sign. The choices of selling grapes and making wine are apparently more sensitive to their respective own prices since their elasticities are higher than the one for delivering to cooperatives, which might indicate that the cooperative choice is more stable than the other ones. This can be due to constraints on exiting membership and/or the fact that risk-averse farmers appreciate the risk reduction resulting from cooperatives purchasing any amount of members' produce. Some operators' characteristics also affect the choice, as more educated, organic, and foreign operators are more likely to make wine and less likely to be cooperative members. Cooperative members have rather small farms and work more off the farm, both conditions that, when opposed, discourage on-farm wine-making.

A somewhat unexpected result is that the specialization in appellation grapes, as represented by the share of vine areas fit for appellation wines over the total vine area, increases the probability of cooperative deliveries. A priori, one would expect that more valuable grapes would encourage own wine-making. This result suggests

[13]The only exception to the consistency of results is the marginal effect of the share of appellations/vine area for the choice of the grapes, which is strongly significant and equal to –0.130 in the MNL model and is not significant and smaller (–0.015) in the NL model.

that cooperatives attract higher-quality grape producers if quality is represented by appellation grapes. There is both theoretical and empirical literature on the effect of cooperatives on quality. Some theoretical papers (Hart and Moore, 1996; Zago, 1999) predict that in the presence of quality heterogeneity and democratic rules, the "median member" will dictate the required quality level. This would imply some path dependency; if high-quality producers prevail, they tend to impose further quality-enhancing rules. Another reason for high-quality producers to join a cooperative is to ensure risk-averse farmers against quality risk (Saitone and Sexton, 2009; Mérel, Saitone, and Secton, 2015). Papers dealing with endogenous quality choices (Hoffmann, 2005; Pennersdorfer and Weiss, 2013) argue that the quality level of a cooperative can be higher or lower than that of an investor-owned firm, depending on the structure of costs and the volume of sales. The results of the empirical investigations are mixed; for example, Pennersdorfer and Weiss (2013) find that on the Austrian wine market, wines produced by cooperatives tend to be of significantly lower quality, while Schamel, Santos-Arteaga, and Cliquet (2015) find the opposite result for cooperatives in the Alto Adige and Trentino regions of Northern Italy. Our results suggest a conclusion similar to the latter, possibly as a result of the common practice in the area to pay for members' grapes according to their quality. Payment by quality has been shown to increase small cooperatives' performances (Barry and Rousselière, 2022). Also, the obligation of cooperative members to deliver their whole production to the cooperative prevents free-riding practices like selling the best grapes on the market and delivering low-quality ones to the cooperative. All these conditions are consistent with the characteristics that might have been crucial for some successful cooperative wineries, according to the reports of their managing directors (Aiassa et al., 2018; Storchmann, 2018; Schamel, 2018).

VIII. Conclusions

In this paper, we analyzed the determinants of grape-growers' choice of the destination of their grapes in a typical wine-producing area of Northern Italy. We examined the characteristics of farms and operators who (a) chose to sell their grapes to a professional winery or to the spot market, (b) vinified their own grapes on the farm, or (c) became members of a cooperative to which they delivered the grapes to be crushed and processed.

There is evidence that the high share of farmers delivering their grapes to cooperatives can be explained to a large extent by the higher average price that cooperatives pay to their members relative to the spot market. This, after all, was the main objective for the creation of cooperatives, in order to defend grape growers from the strong bargaining power that grape wholesalers and wineries had in the past (Tortia, Valentinov, and Iliopoulos, 2013). Cooperatives, in particular, are fit for small farms, which are often run by pluriactive and less educated farmers. They also have apparently educated their members to grow grapes fit for appellation wines, which is a precondition for the cooperative being competitive and able to pay good prices to their members. For this purpose, the institutional setting (payment by grape quality level and obligation to deliver the whole production to the cooperative) is arguably crucial. Wine-making, by contrast, is chosen by a minority, though a

substantial one (20%) of farmers. Larger farm sizes and better-educated operators are, along with favorable prices, the main determinants of their choice.

A general observation is that all these explanatory variables have a quite large variation. In addition, the price variables, as explained, are average proxies and do not consider the individual actual value. Hence, a part of the choice is to be attributed to individual, unobservable characteristics. Individual psychological characteristics are probably at the origin of the main repartition detected by the NL model, that is, the one between a choice leaving free-hands (selling the grapes) and the one implying long-term commitments (wine-making and cooperative membership). The following division between the two latter choices is dictated by the variables previously indicated, with small farms and pluriactivity directing toward cooperatives, and larger farms and higher skills toward wine-making.

While our results shed some light on the determinants of the structure of the wine supply chain, drawing policy implications is difficult. Whether favoring cooperatives or not is by policymakers mainly seen as an equity issue. It is often considered a means to allow small farms to continue their grape-growing activity in territories without significant employment alternatives for farmers and where vineyards are part of a traditional scenic landscape. The literature also discusses efficiency issues related to the presence of cooperatives, with mixed conclusions. Regardless, if it is assumed that favoring cooperatives is desirable, our results suggest that an important factor affecting farmers' choices to deliver their grapes to cooperatives is the price they pay to their members. This choice is price-inelastic, which suggests that membership does not strongly react to price variations. This, in turn, is based on the fact that cooperatives promote grape quality among their members, resulting in consistent economic performance and the ability to counteract the oligopolistic power of wholesalers and wineries. There is a sort of path dependency in this process. In addition, though undoubtedly supported by the policies favoring cooperatives (they enjoy favorable fiscal treatments and receive investment subsidies) and by their internal rules (members' obligation to bring their whole production to the cooperative), cooperatives rely to a large extent on the existence and continuity of the social capital favoring their creation and the loyalty of cooperative membership. And, notoriously, creating social capital on purpose is difficult.

This paper has some limitations. The most relevant, though unavoidable because of data availability, is the non-dynamic nature of our analysis. Some choices (wine-making and cooperative membership) are long-term ones and can only be reversed at some cost. A long-term, dynamic analysis would probably be more informative on the decision-making process. If panel data on grape destination choices are not available, direct surveys among grape growers asking the reasons for their choice at the moment it was made could shed more light on this point. A second important limitation concerns the price variables. The prices we draw on are not actual prices. They are based on average prices fetched for grapes or wines in the Province or the average price paid by local cooperatives. They, therefore, disregard any effect of the idiosyncratic characteristics of grapes or wines. Direct surveys among grape growers in the three groups on actual fetched prices and objective characteristics of the grapes could allow a more in-depth understanding of the mechanisms behind the market setting. These points are left for further research.

Acknowledgments. The authors thank the editor, Karl Storchmann, and an anonymous reviewer for their constructive and helpful comments. The authors are also grateful to the cooperative managers who provided their price data.

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Cite this article: Corsi, A., Mazzarino, S., and Frontuto, V. (2023). Making wine, selling grapes, or delivering to a cooperative? Determinants of grape allocation. *Journal of Wine Economics*, 1–24. https://doi.org/10.1017/jwe.2023.6

Appendix

Table A1. Marginal effects and probabilities averaged over the observations (MNL)

	Marginal effects averaged over individuals			Averages of individual elasticities of probabilities		
	Grapes	Wine	Cooperative	Grapes	Wine	Cooperative
Grape price	0.019	−0.009	−0.010	1.482	−1.402	−0.669
Wine price	−0.008	0.006	0.002	−1.080	1.657	0.173
Cooperative price	−0.005	0.000	0.005	−0.445	−0.056	0.366
Vine area (ha)	0.003	0.007	−0.010	0.024	0.129	−0.087
Share vine/UAA area	−0.055	−0.016	0.071	−0.091	−0.075	0.108
Share appellations/vine	−0.095	−0.328	0.422	−0.419	−1.794	0.795
Organic (1 = yes)	0.085	0.099	−0.185	0.000	0.007	−0.013
Operator's age	−0.001	0.001	0.000	−0.164	0.198	0.053
Operator's gender (1 = male)	−0.011	0.027	−0.016	−0.022	0.119	−0.041
Education years	0.001	0.006	−0.006	0.013	0.299	−0.167
Agricultural education (1 = yes)	0.081	0.076	−0.156	0.004	0.019	−0.034
Principal part-time (1 = yes)	−0.015	−0.070	0.085	−0.008	−0.046	0.021
Secondary part-time (1 = yes)	0.024	−0.002	−0.022	0.004	−0.001	−0.004
Foreigner operator (1 = yes)	0.129	0.152	−0.281	0.000	0.006	−0.011
HH labor intensity (n./ha vin.)	−0.003	−0.001	0.003	−0.014	−0.008	0.019
# children <= 5	0.015	−0.023	0.008	0.002	−0.007	0.001
# children 6–13	0.002	−0.010	0.009	0.000	−0.006	0.003

https://doi.org/10.1017/jwe.2023.6 Published online by Cambridge University Press