*Article*

# Pre-and During Covid-19: Households' Willingness to Pay for Local Organic Food in Italy

**Simona Bigerna, Andrea Marchini*, Silvia Micheli and Paolo Polinori**

Department of Agricultural, Food and Sciences, University of Prugia, Borgo XX Giugno 74, 06121 Perugia, Italy

* Correspondence: andrea.marchini@unipg.it

**Abstract:** Food demand and food supply have been heavily affected by Covid-19 pandemic. To understand changes in households' behavior related to the pandemic, we investigate the willingness to pay for local organic apples pre- and during Covid-19. Besides, we assess whether the changes occurred within the family, estimating also separate models for the two members of the couple. Our findings show that respondents show a positive price premium for local organic apples whose consumption helps reducing the environmental costs associated with food production. The median estimated values during the pandemic range from 34% to 250%. Overall, respondents show a positive mean willingness to pay which increase with the pandemic. The socio-economic variables are the most important in explaining the willingness to pay, while the behavioral variables have more heterogeneous results even if the lifestyle and the request for information through the label are important variables. The pandemic tends to narrow the gaps in preferences between members of the couple. In conclusion, the local and organic dimension is embodied in the short chain in which knowledge and trust in the producer are crucial elements in the consumer's choices.

**Keywords:** Covid-19; Local and organic food; Households' decisions; Contingent valuation; Willingness to pay

## 1. Introduction

Food supply has been heavily affected by Covid-19, stressing, on the one hand, the importance of trust influencing perceived risks and benefits associated with food products, and collaboration among the stakeholders along the supply chain and, on the other hand, teaching us that, to face future emergencies, short value chains represent one possible solution among several food systems (Nguyen and Schmitz, 2022). Cost reductions and scale return have been for long time the rationales for the food supply organizational decisions, often without considering supply chain risk. This has changed in wake of pandemic as consequence of the disruption of the long supply chain (PwC, 2020). The vulnerability of the food sector due to the lockdown effects is emerged (O'Hara and Toussaint, 2021), jointly with the new challenges involving food system and eating habits, such as health, climate change and local dimensions. A new way to face these challenges could be represented by the deployment of the local organic food (LOF) that, through its short supply chain, positively impacts on environmental, socio-economic and nutritional aspects. In the past, the concept of local food (LF)[1] has often been associated with organic production (Campbell et al., 2013) given that the organic food (OF) was initially associated with promoting a close and direct relationship between farmers and consumers, together with the balanced management of natural resources (Gayle et al., 2022).

[1] The LF term is associated as being produced in the locality in which the final product is sold (e.g., Adams and Salois, 2010). Determinants such as taste, high quality and trust in food supply are the key drivers for consuming LF (Feldmann and Hamm, 2015) even if social and altruistic features plays an important role in supporting LF farmers. More in general Arthur and Yamoah (2019) underline the growing relevance of environmental quality attributes in food-related rural enterprise performance.

 doi:10.20944/preprints202305.0037.v1

Several studies, comparing OF and LF (e.g., Meas et al., 2015; Adams and Salois, 2010), have observed that consumers may perceive the "organic" and "local" concepts as partially overlapping (e.g., Campbell et al., 2013). Consequently, OF and LF assume a holistic dimension mainly due to the several overlap characteristics. The Covid-19 has also accelerated the transformation of the society and of people's daily lives with changes to one's eating habits in favor of both more virtuous behaviors and healthy choices. Also, Italians have changed their habits (DOXA, 2020). The deployment of smart-working has allowed for more time to produce and consume food at home, providing households with health benefits, such as fewer calories and higher nutrients. Making actual decisions about food choices in households is complex, and pandemic has stressed it (e.g., Davis, 2021). Thus, it is interesting to investigate to what extent pandemic has affected food decision processes within households.

The aim of this paper is to estimate the WTP for local organic (LO) apples of households pre- and during Covid-19, in order to assess behavioral changes related to the pandemic. A contingent valuation (CV) approach, which is a recognized tool for estimating monetary non-market values, is implemented in order to assess the willingness to pay (WTP) due to environmental and social characteristics associated with LOF. Accordingly, we contribute to the literature investigating the preferences heterogeneity among household members, focusing on health, local development and climate change as the main determinants of respondents' preferences.

The paper is structured as follows. In Section 2, we describe material and methods, and in Section 3, we illustrate the results of the analysis. Finally, in Section 4, we draw conclusions.

## 2. Material and methods

### *2.1. Survey design and data*

The survey approach involves two sequential steps. The first one has been conducted in Perugia in the pre-Covid-19 period, using a face-to-face survey; the second one has been conducted during the Covid-19 pandemic, using an online "face to face" approach. In the first survey, the interviews have been conducted in the two main hypermarkets. Couples[2] were identified randomly as they entered the hypermarkets. We have initially intercepted 350 couples, and the final sample sizes turned out to be 327 couples (resulting in 981 interviews). The partners have been first interviewed separately, and then together, to determine their WTP for LO apples. In the second survey, we have contacted by email the 327 couples, sending them both new questionnaire and links for different online platforms. Participants have been helped to complete the survey first separately and then jointly: 248 couples agreed to complete the questionnaire (around 75%), resulting in 744 interviews. Operatively, the respondents were always asked some preliminary questions to check if they were aware of LOF and then the interviewer has read a brief informative text on LOF. The questionnaire[3] was divided into five sections. The first one refers to standard demographic variables to outline the profile of the respondent. The second investigates specific household's features to get a more accurate picture of the characteristics of each household emerges. The third section refers to the knowledge respondents have about LOF, trust on suppliers and related certification bodies, LO product categories purchased. The fourth section consists of two sub-sections. First, we propose a set of choices to the respondents for each of the three determinants related to the WTP: local economic development, personal health, and climate change mitigation. Respondents were asked to randomly order their preferences for local economic development versus personal health, local economic development versus climate change mitigation, and personal health towards climate change, assigning to each feature of each couple a score in terms of preferences from 0 to 100. Second, we have proposed the WTP-related questions to seek respondents' WTP for LOF, resulting in a final price

[2] Within family we restricted our sample to wife and husband because they are primarily responsible for food shopping.

[3] In order to avoid problems related to misunderstanding and semantic and measurement problems, we have tested a preliminary version of the questionnaire using 15 couples.

 doi:10.20944/preprints202305.0037.v1

for one kilogram of LO apples of 0.8 €, 1 €, 1.3 €, 1.8 €, 2.5 €, 3.5 €, 5 € and 7 €. CV questions regarding WTP for LO apples were asked using a dichotomous choice format. The fifth part of the questionnaire is concerned with individual and household lifestyle and habits. Finally, the questionnaire used in the second survey included a set of new demands to analyze the impact of the Covid-19, and of the associated lockdown, on the households.

*2.2. Modelling framework*

Consumers may associate some features with LF as with OF, providing a holistic perception of LOF among consumers[4]. According to Johnston et al. (2017), this is one out of three criteria in order to choose between CV and choice experiment technique. Indeed, given that consumers mainly perceive both LF and OF holistically, then *"… attribute framing might be inconsistent with this perspective of the change being valued."* (Johnston et al., 2017, p. 20). Consequently, representing the good into its single attributes could be insufficient in order to capture the comprehensive value that respondents associate to the change proposed. In this case, CV methods such as Open Ended, Single Bounded or Double Bounded Dichotomous Choice format, might be useful employed to evaluate multi-attribute variation, even if results suggest that CV methods tend to give more conservative estimates for the WTP in comparison with others approaches (e.g., Lloyd-Smith et al., 2020; Bateman et al., 2006). Among these methods, we apply the Single Bounded Dichotomous Choice (SBDC). It is both more desirable from theoretical point of view and incentive compatible, showing the advantages of including cognitive simplicity for respondents and reducing incentives for strategic behavior (Carson et al., 1999). However, the SBDC approach has some limitations both in terms of statistical efficiency and limited information provided in relation to respondents' true WTP (e.g., Hanemann et al., 1991). Thus, a rule of theoretical decision that favors one of the contingent dichotomous valuation formats is not reached.

To ensure statistical reliability of the WTP estimation, at least 600 and 400 samples are needed for the single-bounded and double-bounded method, respectively (Le and Aramaki, 2019). Furthermore, for a medium sample size of 250-400, both single- and double-bounded models perform well in estimating WTP, meaning that the minor efficiency associated to this method can be mitigated (Longo et al., 2015). It has been recently suggested that the single- and double-bound CVM models yield similarly efficient point estimates when the sample size is large and when the former is informed by a pre-test conducted on a small population (e.g., Rodríguez et al., 2006; Calia and Strazzera, 2000). Referring to the intra-household preferences, we have analyzed both differences in household member preferences and the way member preferences are aggregate, testing whether the common preference model approach can be rejected. The utility function (U) of each *nth* respondent [husband (h), wife (w)] by purchasing food that embody environmental attributes ($z_{nj}$) is a function of the indirect utility (V):

$$U_{nj} = V(p_j, I_n, z_{nj}; \beta_j) \ , \tag{1}$$

$p_j$ is the price of the *jth* food, $I_n$ is the income[5] of each *nth* respondent and $\beta_j$ is a vector of parameters to be estimated. The *structural probit model* as a latent variable model is:

$$y_{nj}^{*} = \beta_j z_{nj} + \varepsilon_n \ , \tag{2}$$

[4] Scholars have investigated several types of relationships among local and organic characteristics. Gracia et al. (2014), focusing on eggs, found that local and organic claims are complements even if preferences for organic and locally produced food vary among consumers (James et al., 2009). This underlines the existence of heterogeneity in consumer preference and WTP for different attributes across product local and organic products (Hu et al., 2009).

[5] Apples are a low-cost commodity; thus, it is not reasonable to think that the marginal utility of income might varies with the income of respondents. According to Haab and McConnell (2002, pp. 46-47), we have expressed the income in categories, allowing coefficients to vary by income categories.

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 2 May 2023 doi:10.20944/preprints202305.0037.v1

where $y_{nj} = 1$ if $y_{nj}^* \geq 0$ or the disturbance, $\varepsilon_n \geq -\beta_j z_{nj}$, and 0 otherwise. The purchasing decision of the *jth* food for which the *nth* respondent expresses WTP is given by:

$$p[V_n^* = k_i] = \frac{e^{\lambda_n} \lambda_n^k}{k_i!} \tag{3}$$

where $\lambda_n = e^{\beta_j z_{nj} + \varepsilon_n}$ is a function of $\beta_j$ and $z_{nj}$. We have estimated the models taking into account the order of preferences stated by respondents, to assess whether there are statistically significant differences in terms of WTP, in relation to the impacts of the three features considered in this paper. We implement the Seemingly Unrelated Regression - SUR estimator (Zellner, 1962) to take into account for possible correlation between the wives and husbands' responses, given that they buy food for the family. The null hypotheses, following the approach put forward by Marcucci et al. (2011), are the following:

$$H_0^1: \beta_j^{Hs} = \beta_j^{Ws} \text{et } \beta_j^{Hj} = \beta_j^{Wj}. \tag{4}$$

where $H$ and $W$ are husband and wife respectively, and $s$ and $j$ are single and joint interview, respectively.

The null hypotheses tested to identify the family member with the highest relative influence are:

$$H_0^2: \beta_j^{Hs} = \beta_j^{Hj} \text{et } \beta_j^{Ws} = \beta_j^{Wj}. \tag{5}$$

These tests have been performed to calculate the WTP bias implied by each null.

Finally, we test the common preference model formulating the null hypothesis (4) for income variable. According to common preference model, households should respond only to changes in aggregate household income.

## 3. Results

The aim of this paper is to understand to what extent the Covid-19 has changed households' preferences, investigating each member of the couple and analyzing preferences toward LOF. To take into account consumers with different purchasing habits and socio-economic characteristics, we have conducted the survey both in the weekend and during the weekdays in two hypermarkets.

This form of consumer survey method has some disadvantages, e.g., they may be affected by self-selection problems, which can be mitigated by making the reliability of this method close to the reliability of the other ones. Details are provided in the supplementary materials.

### *3.1. Descriptive analysis*

Descriptive statistics at the individual levels, with husbands and wives interviewed separately are listed in Table 1 for both surveys. From the statistics relative to the sample, the distribution of household size (*fam*) shows that three persons household is the more representative type of family. Both the partners have a high educational level (*educ*), about 15% of the sample have a degree.

The rate of respondents living in municipalities with less than 10,000 inhabitants (*mun10*) is around 70%. Five income classes were created with the first and the upper classes labeled as low income and high income, respectively. Average partner income ranks in the third class, i.e., 28,000 € - 55,000 € (the Italian average household income in 2019 is 31,641 €, Istat 2020). On average, their households' monthly spending in fruits and vegetables (*purcfv*) is around 100 €. They are quite

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 2 May 2023 doi:10.20944/preprints202305.0037.v1

interested in reading labels (*lab*) of food products. They live in Umbria region (*resy1*) since several years, around 30 years on average, and about 30% of the wives' sample shopping in farmer markets over the past five years (*farmkt1*), versus around 25% of the husbands, while values increase both for wives and husbands in the second survey (*farmkt2*).

**Table 1.** Descriptive statistics.

| Variables[a] | | | | First survey (1) -327 couples- | | | | Second survey (2) -248 couples- | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | wife (w) | | husband (h) | | wife (w) | | husband (h) | |
| **Acronym** [c] | Type | Description | Unit | mean | S.D. | mean | S.D. | mean | S.D. | mean | S.D. |
| | | LHS | | | | | | | | | |
| resp[k]_[z]s | dummy | responses: Pr(Yes=1) | # | 0.526 | 0.499 | 0.563 | 0.497 | 0.665 | 0.473 | 0.605 | 0.490 |
| resp[k]_[z]j | | | # | 0.532 | 0.500 | 0.602 | 0.490 | 0.673 | 0.470 | 0.657 | 0.476 |
| | | RHS[d] | | | | | | | | | |
| bid_LO[k] | cont. | bid | euro (€) | 2.866 | 2.052 | 2.866 | 2.052 | 2.823 | 2.169 | 2.823 | 2.169 |
| fam[k] | cont. | household components | nr. | 3.333 | 1.244 | 3.333 | 1.244 | 3.508 | 1.260 | 3.508 | 1.260 |
| educ[k]_[z] | cont. | years of education | nr. | 15.245 | 3.114 | 14.520 | 3.446 | 15.258 | 3.314 | 14.855 | 3.385 |
| socac[k]_[z] | dummy | social activities (1=yes) | # | 0.697 | 0.460 | 0.621 | 0.486 | 0.706 | 0.457 | 0.637 | 0.457 |
| income[k] | scale | income level (1-8; 8=max) | # | 4.183 | 1.684 | 4.183 | 1.684 | 4.556 | 1.581 | 4.556 | 1.581 |
| purcfv[k] | scale | monthly expenditure in fruit vegetables (1-5; 5=max) | # | 3.003 | 0.805 | 3.003 | 0.805 | 3.100 | 0.811 | 3.100 | 0.811 |
| lab[k]_[z] | scale | interested in reading labels (1-10; 10=max) | # | 5.287 | 3.170 | 4.544 | 3.199 | 5.501 | 3.003 | 4.427 | 3.163 |
| resy[k]_[z] | cont. | families' years of residence (ancestors included) | nr. | 31.471 | 14.889 | 33.113 | 17.464 | 31.471 | 14.889 | 33.113 | 17.464 |
| farmkt[k]_[z] | dummy | shop at farmers' market (1 = yes) | # | 0.269 | 0.444 | 0.248 | 0.432 | 0.314 | 0.465 | 0.278 | 0.449 |
| age[k]_[z] | cont. | age of respondents | nr. | 48.535 | 12.483 | 50.771 | 14.478 | 48.535 | 12.483 | 50.771 | 14.478 |
| mun[k] | dummy | municipality < 10.000 res. (1 = yes) | # | 0.324 | 0.469 | 0.324 | 0.469 | 0.359 | 0.481 | 0.359 | 0.481 |
| orlochea[k]_[z]s | cont. | order: local development vs. healthy food | % | 46.300 | 22.810 | 46.330 | 21.564 | 43.548 | 22.359 | 46.129 | 21.865 |
| orlochea[k]_[z]j | | | | 46.300 | 22.810 | 45.780 | 21.463 | 43.548 | 22.359 | 46.129 | 21.865 |
| orloccli[k]_[z]s | cont. | order: local development vs. climate change | % | 61.957 | 22.081 | 38.226 | 20.632 | 59.556 | 23.209 | 38.992 | 21.412 |
| orloccli[k]_[z]j | | | | 61.957 | 22.081 | 38.226 | 20.632 | 58.831 | 23.496 | 38.992 | 21.412 |
| orheacli[k]_[z]s | cont. | order: healthy food vs. climate change | % | 43.150 | 17.814 | 38.840 | 17.440 | 65.968 | 17.993 | 61.290 | 17.678 |
| orheacli[k]_[z]j | | | | 43.150 | 17.814 | 38.840 | 17.440 | 65.968 | 17.993 | 61.290 | 17.678 |
| leis_var2_[z][b] | scale | family income variation (from -6 to +6) | # | | | | | 3.085 | 1.189 | 2.923 | 1.196 |
| incomf_var2[b] | scale | reduction in income (10 - 50 or more) | # | | | | | 0.319 | 1.316 | 0.319 | 1.316 |
| covid2_[z][b] | ordinal | infections among household members (0-3; 3=max) | # | | | | | 0.544 | 0.850 | 0.464 | 0.725 |
| hmfd2_[z][b] | dummy | increasing in home-produced meals (1=yes) | # | | | | | 0.452 | 0.500 | 0.391 | 0.489 |

[a] *Each variable can refer to single (s) (wife (w) and husband (h)) or jointly (j) interview and (except variables[b]) to the 1st or 2nd survey.*

[c] *In the manuscript the acronym used is var[k]_[z][x] where k refers to the survey (k =1, 2) z refers to the member of the couple (z = h, w) and x refers to the type of the interview (x = j, s). For example, resp1_hj refers to the responses of the husband to the jointly interview in the first survey; age2_w refers to wife age in the second survey.*

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 2 May 2023 doi:10.20944/preprints202305.0037.v1

*(d) Of course, many RHS variables might do not change referring to s or j interview and/or to w or h and/or to 1st or 2nd survey. In these cases, possible irrelevant subscripts are omitted.*

The average age of interviewees (*age*) was 48 for wives and 51 for husbands; about 70% of wives and 63% of husbands have a membership in environmental and/or cultural associations (*socac*). Descriptive statistics of the sample remotely interviewed are quite similar to the previous ones. Three persons household is still the more representative one, and a higher level of education is confirmed among respondents, as well as a higher percentage of respondents living in municipalities with less than 10,000 inhabitants. The income distribution changes in the second sample, with the average income that is a little bit lower. Consumption behaviors do not change in terms of participation in buying groups, while the expenditure in fruits and vegetable is noticeable increased over time. On the monthly basis, the amount has increased from 100 € to 130 €, interest in reading labels is confirmed at the same level, the same occurs for the memberships in environmental associations both for wives and husbands. In the second sample, respondents exhibit a higher number of the year of residence in Umbria Region (*resy2*), and they are younger if compared with the previous one. Indeed, the average age of interviewees (*age*) was 43 for wives and 50 for husbands. It is confirmed that about a third of the respondents sided with the democratic part, even if such percentage have slightly decreased in the second survey.

Focusing on the specific demands of the second questionnaire, the reduction in income for the households is estimated to be around 30%.

With regard to the involvement of interviewees in Covid-19 events (*covid2*), with regard to women, about 87 registered an infection among their relatives, which required hospitalization in only 53 cases and in about 10 cases it resulted in the death of the relative.

In the case of men, although the number of infections is almost the same, i.e. 85, hospital admissions are 22, and deaths among relatives amount to 4. According to *incomf_var2*, 10% of the sample states a moderate loss of household's income, while 7% of the sample declares a significant loss. Around 58% of the sample did not register appreciable changes in family income, while 20% recorded a significant increase in their income.

On average, the sample in the second survey has a significant increase in family income. In the case of leisure (*leis_var2*), the variation is similar in the two members of the couple, even if the wives recorded a slight increase compared to that of the husbands. Finally, a similar result is obtained in relation to the production of domestic food (*hmfd2*) during the period of the lockdown. Again, as expected, wives are more involved in this practice, although the difference with husbands is not particularly marked. As for free time, this increases for both, and more consistently for women. For both, the pandemic and the lockdown have led to an increase in the production of homemade food.

The orderings of respondents towards local economic development, personal health and climate change are listed in Table 2 for both the samples and for each couple of comparison. In both the first and second surveys, both wives and husbands prefer health to local development, and, in the second survey, this preference is even more pronounced. Besides, husbands prefer climate change to local economic development, while wives prefer local economic development to climate change, and this happens in both surveys. Finally, both wives and husbands prefer climate change to health, but in the second survey the result is reversed and they prefer health to climate change. The heterogeneity in both surveys exists only when comparing local economic development and climate change, meaning that the pandemic has changed the preferences of husbands and wives, shifting them from climate change to health.

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 2 May 2023 doi:10.20944/preprints202305.0037.v1

**Table 2.** Descriptive statistics -ordering choices.

| Variables | First survey [1] | | | | Second survey [2] | | | |
|---|---|---|---|---|---|---|---|---|
| | wife [w] | | husband [h] | | wife [w] | | husband [h] | |
| | s | j | s | j | s | j | s | j |
| orlochea* | | | | | | | | |
| *Local < 50%* | ***0.50*** | ***0.50*** | ***0.46*** | ***0.47*** | **0.54** | **0.53** | **0.48** | **0.48** |
| *Local = 50% (Healthy = 50%)* | *0.13* | *0.13* | *0.20* | *0.20* | 0.13 | 0.13 | 0.18 | 0.18 |
| *Local > 50%* | *0.37* | *0.37* | *0.34* | *0.33* | 0.33 | 0.34 | 0.35 | 0.35 |
| orloccli** | | | | | | | | |
| *Local < 50%* | *0.20* | *0.20* | ***0.65*** | ***0.65*** | 0.25 | 0.26 | **0.63** | **0.63** |
| *Local = 50% (Climate = 50%)* | *0.13* | *0.13* | *0.14* | *0.14* | 0.13 | 0.13 | 0.13 | 0.13 |
| *Local > 50%* | ***0.67*** | ***0.67*** | *0.22* | *0.22* | **0.62** | **0.61** | 0.24 | 0.24 |
| orheacli*** | | | | | | | | |
| *Healthy < 50%* | ***0.56*** | ***0.56*** | ***0.64*** | ***0.64*** | 0.15 | 0.15 | 0.14 | 0.14 |
| *Healthy = 50% (Climate = 50%)* | *0.25* | *0.25* | *0.22* | *0.22* | 0.13 | 0.13 | 0.23 | 0.23 |
| *Healthy > 50%* | *0.19* | *0.19* | *0.13* | *0.13* | **0.72** | **0.72** | **0.63** | **0.63** |

**Local development vs. Healthy food; **Local development vs. Climate change; ***Healthy food vs. Climate change*

Distributions of separate and joint responses to WTP questions for LO apples are reported in Table 3. Results indicate that *"yes"* responses decrease as the price bid goes up in all the distributions obtained. In the pre Covid-19 period, respondents state a positive WTP for LO apples whose consumption helps reducing the environmental costs associated with food production.

**Table 3.** WTP distributions (a) first survey, (b) second survey.

| (a) | hs | | | | hj | | | | ws | | | | Wj | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WTP | No | Yes | P(Yes) | Cum | No | Yes | P(Yes) | Cum | No | Yes | P(Yes) | Cum | No | Yes | P(Yes) | Cum |
| 0.8 | 4 | 37 | 90.24% | 0.20 | 1 | 40 | 97.56% | 0.20 | 9 | 32 | 78.05% | 0.19 | 6 | 35 | 85.37% | 0.20 |
| 1 | 12 | 29 | 70.73% | 0.36 | 8 | 33 | 80.49% | 0.37 | 9 | 32 | 78.05% | 0.37 | 7 | 34 | 82.93% | 0.40 |
| 1.3 | 10 | 31 | 75.61% | 0.53 | 9 | 32 | 78.05% | 0.53 | 16 | 25 | 60.98% | 0.52 | 11 | 30 | 73.17% | 0.57 |
| 1.8 | 17 | 23 | 57.50% | 0.65 | 13 | 27 | 67.50% | 0.67 | 12 | 28 | 70.00% | 0.68 | 10 | 30 | 75.00% | 0.74 |
| 2.5 | 15 | 26 | 63.41% | 0.79 | 15 | 26 | 63.41% | 0.80 | 19 | 22 | 53.66% | 0.81 | 18 | 23 | 56.10% | 0.87 |
| 3.5 | 20 | 21 | 51.22% | 0.91 | 18 | 23 | 56.10% | 0.92 | 30 | 11 | 26.83% | 0.87 | 31 | 10 | 24.39% | 0.93 |
| 5 | 28 | 13 | 31.71% | 0.98 | 29 | 12 | 29.27% | 0.98 | 24 | 17 | 41.46% | 0.97 | 33 | 8 | 19.51% | 0.98 |
| 7 | 37 | 4 | 9.76% | 1.00 | 37 | 4 | 9.76% | 1.00 | 36 | 5 | 12.20% | 1.00 | 37 | 4 | 9.76% | 1.00 |

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 2 May 2023 doi:10.20944/preprints202305.0037.v1

| (b) WTP | No | Yes | P(Yes) | Cum | No | Yes | P(Yes) | Cum | No | Yes | P(Yes) | Cum | No | Yes | P(Yes) | Cum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.8 | 4 | 33 | 89.19 % | 0.22 | 1 | 36 | 97.30 % | 0.22 | 6 | 31 | 83.78 % | 0.19 | 3 | 34 | 91.89 % | 0.20 |
| 1 | 10 | 27 | 72.97 % | 0.40 | 6 | 31 | 83.78 % | 0.41 | 5 | 32 | 86.49 % | 0.38 | 3 | 34 | 91.89 % | 0.41 |
| 1.3 | 7 | 25 | 78.13 % | 0.57 | 6 | 26 | 81.25 % | 0.57 | 8 | 24 | 75.00 % | 0.53 | 5 | 27 | 84.38 % | 0.57 |
| 1.8 | 11 | 20 | 64.52 % | 0.70 | 7 | 24 | 77.42 % | 0.72 | 4 | 27 | 87.10 % | 0.69 | 2 | 29 | 93.55 % | 0.74 |
| 2.5 | 8 | 18 | 69.23 % | 0.82 | 6 | 20 | 76.92 % | 0.84 | 5 | 21 | 80.77 % | 0.82 | 4 | 22 | 84.62 % | 0.87 |
| 3.5 | 6 | 10 | 62.50 % | 0.89 | 5 | 11 | 68.75 % | 0.91 | 6 | 10 | 62.50 % | 0.88 | 7 | 9 | 56.25 % | 0.93 |
| 5 | 21 | 13 | 38.24 % | 0.97 | 22 | 12 | 35.29 % | 0.98 | 17 | 17 | 50.00 % | 0.98 | 26 | 8 | 23.53 % | 0.98 |
| 7 | 31 | 4 | 11.43 % | 1.00 | 32 | 3 | 8.57% | 1.00 | 32 | 3 | 8.57% | 1.00 | 31 | 4 | 11.43 % | 1.00 |

*hs = husband single; ws = wife single; hj = husband joint; wj = wife joint*

In the case of husbands interviewed separately, the percentage of acceptance is quite high when the price per kilogram is 0.8 € (90.0%), up to 9.8% willing to pay a 7 € price for LO apples. However, in joint interviews, both husbands' responses and wives are quite different from their individual interviews, i.e., for husbands it emerges a significant increase of those willing to pay in the range 0.8€ up to 3.50€, while for wives it ranges from 0.8€ to 2.50€. Specifically, in the case of wives interviewed separately, 78.1% of wives are willing to pay 0.8 € up to 1 €, and up to 4.9% willing to pay a price per kilogram of 7 € on LO apples for 12% of the sample. As shown in Table 3, pandemic has also heavily affected *"yes/no"* responses' distributions, increasing the percentages of *yes* for each bid. Furthermore, it is also confirmed that *"yes"* responses decrease as the price bid goes up. The differences in husbands' and wives' behaviors tend to disappear comparing the case in which they are interviewed separately and jointly. Another change is that the WTP of wives tends to level off higher than the WTP reported by husbands.

### *3.2. Econometric results*

Regressions, reported in Tables 4 and 5 have been run for husbands interviewed separately, wives interviewed separately, husbands and wives interviewed jointly. Both first and second surveys are included. All the estimates of the bivariate probit model show that the likelihood-ratio tests for rho = 0 (correlation coefficient between the residuals of each of the two models) for the joint models are always highly significant. So, we can reject the null hypothesis that the decisions among household members are correlated. Consequently, each of the four models in Eq. (2) should not be estimated using separate univariate probit models. In the first survey, examining the results for the variables affecting respondents' WTP, they have the same effect both for the husbands and wives when they were interviewed separately and jointly.

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 2 May 2023 doi:10.20944/preprints202305.0037.v1

**Table 4.** Seemingly unrelated probit model - 1st survey.

| Single Interview | | | Joint interview | | |
|---|---|---|---|---|---|
| husband | | | husband | | |
| bidLo1 | -0.341 | *** | bidLo1 | -0.523 | *** |
| | (0.072) | | | (0.105) | |
| income1 | 0.171 | * | income1 | 0.339 | *** |
| | (0.094) | | | (0.114) | |
| mun1 | 0.325 | | mun1 | 0.443 | |
| | (0.245) | | | (0.316) | |
| fam1 | 0.316 | *** | fam1 | 0.664 | *** |
| | (0.114) | | | (0.159) | |
| resy1_h | 0.009 | | resy1_h | 0.030 | *** |
| | (0.007) | | | (0.009) | |
| age1_h | 0.017 | * | age1_h | 0.005 | |
| | (0.009) | | | (0.011) | |
| edu1_h | 0.118 | *** | edu1_h | 0.113 | ** |
| | (0.037) | | | (0.045) | |
| lab1_h | 0.088 | ** | lab1_h | 0.167 | *** |
| | (0.037) | | | (0.049) | |
| famrkt1_h | 1.163 | *** | famrkt1_h | 1.424 | *** |
| | (0.352) | | | (0.473) | |
| socac1_h | 0.935 | *** | socac1_h | 0.345 | |
| | (0.244) | | | (0.326) | |
| orlochea1_hs | 0.011 | * | orlochea1_hj | 0.003 | |
| | (0.005) | | | (0.006) | |
| orloccli1_hs | 0.016 | ** | orloccli1_hj | 0.024 | *** |
| | (0.006) | | | (0.008) | |
| orheacli1_hs | -0.011 | * | orheacli1_hj | -0.019 | ** |
| | (0.006) | | | (0.008) | |
| purcfv1 | 0.401 | ** | purcfv1 | 0.332 | |
| | (0.192) | | | (0.233) | |
| _cons | -6.740 | *** | _cons | -6.978 | *** |
| | (1.198) | | | (1.473) | |
| wife | | | wife | | |
| bidLo1 | -0.269 | *** | bidLo1 | -0.689 | *** |
| | (0.068) | | | (0.105) | |
| income1 | 0.272 | *** | income1 | 0.401 | *** |
| | (0.086) | | | (0.112) | |
| mun1 | 0.887 | *** | mun1 | 0.735 | ** |
| | (0.264) | | | (0.320) | |
| fam1 | 0.449 | *** | fam1 | 0.444 | *** |

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 2 May 2023 doi:10.20944/preprints202305.0037.v1

| | | | | | |
|---|---|---|---|---|---|
| | (0.116) | | | (0.133) | |
| resy1_w | 0.029 | *** | resy1_w | 0.027 | *** |
| | (0.008) | | | (0.010) | |
| age1_w | -0.011 | | age1_w | -0.006 | |
| | (0.009) | | | (0.012) | |
| edu1_w | -0.007 | | edu1_w | 0.108 | ** |
| | (0.042) | | | (0.051) | |
| lab1_w | 0.069 | * | lab1_w | 0.107 | ** |
| | (0.037) | | | (0.049) | |
| famrkt1_w | 0.805 | *** | famrkt1_w | 0.819 | ** |
| | (0.313) | | | (0.381) | |
| socac1_w | 0.467 | * | socac1_w | 0.146 | |
| | (0.245) | | | (0.308) | |
| orlochea1_ws | -0.011 | ** | orlochea1_wj | -0.014 | ** |
| | (0.005) | | | (0.006) | |
| orloccli1_ws | 0.001 | | orloccli1_wj | -0.003 | |
| | (0.005) | | | (0.006) | |
| orheacli1_ws | 0.048 | *** | orheacli1_wj | 0.033 | *** |
| | (0.008) | | | (0.009) | |
| purcfv1 | 0.195 | | purcfv1 | 0.752 | *** |
| | (0.167) | | | (0.228) | |
| _cons | -5.417 | *** | _cons | -7.342 | *** |
| | (1.194) | | | (1.660) | |
| rho | -10.368 | | rho | -0.111 | |
| | (36.040) | | | (0.333) | |
| obs. | 327 | | obs. | 327 | |
| Wald $^2_{(28)}$ | 178.34 | | Wald $^2_{(28)}$ | 143.4 | |
| LL | -144.79 | | LL | -112.397 | |
| LR $^2_{(1)}$ rho | 25.409 | | LR $^2_{(1)}$ rho | 0.109 | |

*Figures in brackets are standard errors. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively. LHS: 1=Yes; 0=No*

The decision to buy LO apples is negatively affected by the variables price, as suggested by the economic theory and literature. Focusing on the socio-economic features of the households, it emerges that *fam1* has a significant positive effect on the WTP for both the husbands and the wives. These relationships (*fam2*) do not change with the pandemic crisis. The number of household members is positively correlated with stated household WTP and this result is consistent with some literature (e.g., Nwofoke et al., 2017)[6]. Besides, the WTP for LO apples is positively and highly significantly influenced by *income1* in all the models considered. Looking at the differences between the two periods, the variable *income2* confirms its significance, with the pandemic enhancing this

[6] However, there are studies that instead show a low effect of this variable on preferences or spending on environmental quality (e.g., Ghalwash, 2008).

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 2 May 2023 doi:10.20944/preprints202305.0037.v1

relationship. With reference to the geographic location of the family (residents in a municipality with less than 10,000 inhabitants), it emerges that only the *mun1* variable is positively significant only for wives. Focusing on the individual features of the households, the educational level variable as WTP predictor is a finding that should be expected, as it emerges from the literature. Indeed, both *pre-* (*edu1_h*; *edu1_w*) and Covid-19 (*edu2_h*; *edu2_w*) results are in accordance with previous studies, suggesting that those who are more likely to mitigate climate change through changes in consumption behavior are, on average, individuals with higher education compared to the rest of the population (e.g., Lo, 2016). Respondents living in the Umbria region for longer than others (*resy_h; resy_w*) are more willing to pay for LO apples. This result was expected because LO food focuses also on the link to the territory, the cooperation among local producers and consumers, and the willingness to support both local producers and community. The *age* variable does not show a clear and significant relationship with the WTP for LO apples. A weak relation exists only for husbands interviewed separately. Focusing on the behavioral features, it emerges that the *purcfv1* variable is a statistically significant driver of consumer WTP for LO food. In particular, the higher is the monthly expenditure for fruits and vegetables, which are products typically purchased as local or organic, the higher is the WTP for LO apples. The increase of the demand for healthier food due to pandemic crisis has enhanced this relationship for wives, as confirmed by the magnitude of the estimate parameters. For husbands, the *purcfv1_h* variable is significant only in few models. When investigating the role of *lab*, within the first sample (*lab1_h*; *lab1_w*), the respondent who generally reads information about specific food-product attributes is more willing to pay for LO apples. Thus, consumer behavior of becoming aware of the fact that a food product contains specific attributes, such as environmental ones, start having an impact on the consumption decision. According to our results, LO food labels can positively affect consumers WTP and then their purchasing decision. Of course, the required support toward the short value chains development, identified as an objective to combat the effects of the pandemic, has reinforced the impact of this determinant on the WTP.

**Table 5.** Seemingly unrelated probit model - 2nd survey.

| Single interview | | | Joint interview | | |
|---|---|---|---|---|---|
| husband | | | husband | | |
| bidLo2 | -0.465 | *** | bidLo2 | -0.782 | *** |
| | (0.117) | | | (0.259) | |
| income2 | 0.488 | *** | income2 | 0.947 | *** |
| | (0.167) | | | (0.313) | |
| incomf_var2 | 0.377 | ** | incomf_var2 | 1.274 | *** |
| | (0.183) | | | (0.431) | |
| mun2 | 0.267 | | mun2 | 0.459 | |
| | (0.383) | | | (0.615) | |
| fam2 | 0.133 | | fam2 | 0.918 | ** |
| | (0.166) | | | (0.363) | |
| resy2_h | 0.025 | ** | resy2_h | 0.086 | *** |
| | (0.010) | | | (0.027) | |
| age2_h | 0.016 | | age2_h | -0.015 | |
| | (0.012) | | | (0.022) | |
| edu2_h | 0.157 | *** | edu2_h | 0.238 | ** |
| | (0.057) | | | (0.116) | |
| lab2_h | 0.067 | | lab2_h | 0.211 | ** |
| | (0.052) | | | (0.097) | |

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 2 May 2023 doi:10.20944/preprints202305.0037.v1

| | | | | | |
|---|---|---|---|---|---|
| famrkt2_h | 1.682 | *** | famrkt2_h | 2.021 | ** |
| | (0.565) | | | (0.966) | |
| socac2_h | 1.658 | *** | socac2_h | 1.367 | * |
| | (0.472) | | | (0.731) | |
| orlochea2_hs | -0.016 | * | orlochea2_hj | -0.029 | ** |
| | (0.009) | | | (0.014) | |
| orloccli2_hs | 0.038 | *** | orloccli2_hj | 0.055 | *** |
| | (0.010) | | | (0.018) | |
| orheacli2_hs | 0.018 | * | orheacli2_hj | 0.034 | ** |
| | (0.010) | | | (0.017) | |
| purcfv2 | 0.272 | | purcfv2 | 0.210 | |
| | (0.285) | | | (0.610) | |
| leis_var2_h | -0.228 | | leis_var2_h | 0.281 | |
| | (0.163) | | | (0.343) | |
| covid2_h | 0.097 | | covid2_h | 0.730 | * |
| | (0.274) | | | (0.440) | |
| hmfd2_h | 1.171 | *** | hmfd2_h | 1.323 | ** |
| | (0.413) | | | (0.660) | |
| _cons | -9.138 | *** | _cons | -16.551 | *** |
| | (2.127) | | | (5.534) | |
| wife | | | Wife | | |
| bidLo2 | -0.260 | *** | bidLo2 | -1.046 | *** |
| | (0.083) | | | (0.384) | |
| incomf2 | 0.157 | | incomf2 | 1.154 | ** |
| | (0.132) | | | (0.486) | |
| incomf_var2 | 0.385 | ** | incomf_var2 | 0.053 | |
| | (0.168) | | | (0.376) | |
| mun2 | 0.519 | | mun2 | 1.631 | * |
| | (0.334) | | | (0.947) | |
| fam2 | 0.814 | *** | fam_2 | 1.128 | * |
| | (0.261) | | | (0.592) | |
| resy2_w | 0.015 | | resy2_w | 0.060 | ** |
| | (0.010) | | | (0.030) | |
| age2_w | -0.007 | | age2_w | -0.035 | |
| | (0.011) | | | (0.031) | |
| edu2_w | 0.094 | * | edu2_w | 0.132 | |
| | (0.057) | | | (0.167) | |
| lab2_w | 0.012 | | lab2_w | 0.051 | |
| | (0.057) | | | (0.119) | |
| famrkt2_w | 0.487 | | famrkt2_w | 2.343 | ** |
| | (0.376) | | | (1.074) | |

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 2 May 2023 doi:10.20944/preprints202305.0037.v1

| | | | | | |
|---|---|---|---|---|---|
| socac2_w | 0.801 | ** | socac2_w | 2.396 | ** |
| | (0.332) | | | (1.141) | |
| orlochea2_ws | -0.012 | * | orlochea2_wj | -0.035 | * |
| | (0.006) | | | (0.018) | |
| orloccli2_ws | 0.012 | * | orloccli2_wj | 0.029 | * |
| | (0.006) | | | (0.016) | |
| orheacli2_ws | 0.031 | *** | orheacli2_wj | 0.040 | * |
| | (0.010) | | | (0.022) | |
| purcfv2 | 0.262 | | purcfv2 | 1.781 | ** |
| | (0.233) | | | (0.701) | |
| leis_var2_w | -0.519 | ** | leis_var2_w | -0.295 | |
| | (0.231) | | | (0.402) | |
| covid2_w | -0.218 | | covid2_w | -0.017 | |
| | (0.190) | | | (0.424) | |
| hmfd2_w | 0.308 | | hmfd2_w | -2.809 | ** |
| | (0.357) | | | (1.144) | |
| _cons | -6.040 | *** | _cons | -15.920 | ** |
| | (2.045) | | | (6.486) | |
| rho | -0.466 | | Rho | -128.133 | |
| | (0.286) | | | (958.71) | |
| obs. | 248 | | obs. | 248 | |
| Wald $^{2}_{(36)}$ | 95.89 | | Wald $^{2}_{(36)}$ | 40.89 | |
| LL | -91.011 | | LL | -36.483 | |
| LR $^{2}_{(1)}$ rho | 2.168 | | LR $^{2}_{(1)}$ rho | 2.499 | |

*Figures in brackets are standard errors. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively. LHS: 1=Yes; 0=No*

Both in the two surveys, the *farmkt* variable is significant for husbands and wives, meaning that individuals who shop in farmer markets perceive protection of the environment as highly important, and they are more likely to be associated with positive WTP for LO apples that are environmentally friendly. The *socac* positively affect respondents' WTP for LO apples, and this result arises in both surveys. The positive relation between being member of environmental or cultural associations and LO food may indicate a particular attention to the development of the territory in terms of work and support of small businesses. Finally, controlling for dichotomous choice set, estimated parameters partially confirm previous descriptive results. In the first survey, the most preferred determinant of husbands is always local economic development, affecting positively husbands' WTP, while climate change is preferred over health.

Focusing on wives, results show that the most preferred determinant is health that positively affect WTP with respect to climate change mitigation and local economic development variants, which are not significant when compared to each other. Overall, wives' WTP mainly refer to healthy factors, while husbands' WTP main determinants refer to local economic development. These results confirm the heterogeneity existing within the sampled households. This type of preferences and this type of heterogeneity are confirmed in the jointly interviews.

Focusing on the Covid-19 results (Table 5), healthiness of food gains in importance as WTP determinant within the households. Indeed, wives confirm the importance of this determinant, while

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 2 May 2023 doi:10.20944/preprints202305.0037.v1

husbands change their determinants getting closer to wives' preferences. Husbands WTP for LOF is positively affected by the healthiness, whatever the alternative is. For both the partners, local development, over climate changes, positively affects their WTP, highlighting the major attention posed on the importance of reconnecting LOF production and consumption. Summarizing, Covid-19 has enhanced the importance of the healthiness of food and of the local development, which became the first two WTP determinants towards LOF for both the members of the couple. With reference to the specific variables added in the second survey, it is noted that, the change in family income (*incomf_var2*) has a positive effect on the WTP for LO apples, confirming the positive impact of income on the WTP. The increase in free time (*leis_var2*) linked to the lockdown period appears to be of little significance on the WTP, and with an uncertain relationship. The only significant model is found for the wives interviewed individually, in which the reaction is negative, suggesting that the increase in free time acts in a reduction of the WTP for LO apples. Regarding the involvement in the pandemic (*covid2*), the relationship with the WTP is uncertain and scarcely significant. Only for husbands interviewed jointly, a weakly significant positive relationship emerges. The variable domestic food production (*hmfd2*) behaves differently for the two members of the couple. In the case of husbands, it is positively related to the WTP fort LO apples in a highly significant way, while for wives it is significant only in jointly interviews in a negative way. Although it is generally reported that women have healthier eating habits than men, food choices do not always follow the typical gender pattern (Bove et al., 2003), being also conditioned by interpersonal relationships.

### *3.3. Households' behavior and WTP for LO apples*

To investigate whether husbands and wives behave significantly different from each other, we have tested for equivalence of coefficients obtained in the regressions that have been included in supplementary materials. Estimation results underline that we can reject the equivalence of the coefficients, mainly in the case of single interviews, with reference to *resy1*, *age1*, and *edu1*. In the case of joint interviews, the equivalence cannot be rejected for any of the socio-economic and individual variables. However, the parameters relating to the ordering of purchase determinants are systematically different, confirming the data in Table 2. Moving on to the joint interviews, the hypothesis of equivalence cannot be rejected for almost all the parameters, for both members of the couple, with the exception of *bidLo1*. Households' income parameters highlights that we cannot reject null hypothesis, thus confirming that common model does not arise in our sample. Results are confirmed by tests we have conducted on the estimations with reference to the second survey. Given that the estimated parameters are less heterogeneous, mean equivalence of coefficients for several variables for husbands and wives could not be rejected both for separate and joint interviews. In the second survey, a less heterogeneous behavior within the couple arises. Indeed, husbands' parameters are statically different for both husbands and wives, only for the *bidLo2* and *hmfd2* parameters. Using the estimated parameters, it is also possible to calculate the mean and median WTPs per 1 kg of LO apples reported in Table 6.

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 2 May 2023 doi:10.20944/preprints202305.0037.v1

**Table 6.** WTP computation.

| Welfare | Separate Interview (1st) | | | | Joint Interview (1st) | | | | Separate Interview (2nd) | | | | Joint Interview (2nd) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| measures | ws | | hs | | wj | | hj | | ws | | hs | | wj | | Hj | |
| mean WTP | 1.168 | *** | 1.438 | *** | 1.023 | *** | 1.549 | *** | 3.464 | *** | 1.581 | *** | 2.663 | *** | 2.151 | *** |
| | (0.146) | | (0.154) | | (0.075) | | (0.147) | | (0.712) | | (0.189) | | (0.282) | | (0.287) | |
| median WTP | 0.675 | *** | 1.336 | *** | 0.906 | *** | 0.852 | *** | 2.466 | *** | 1.339 | *** | 1.927 | *** | 1.660 | *** |
| | (0.310) | | (0.382) | | (0.141) | | (0.173) | | (0.723) | | (0.402) | | (0.390) | | (0.572) | |

**, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively. Values are expressed in euro (€).*

It turns out that the mean value ranges from 1 € to 3.50 €, while the median value, which is noticeable more robust, lies between around 0.70 € and 2.50 €. While in the first survey husbands always show higher WTP than wives, in the second survey this relationship is reversed in that wives show higher WTP than husbands. Given that the average price of a conventional apple is around one € per kilogram, this means that, if we consider the average WTP, the price premium ranges from 2% to 55% in the first survey, and from 58% to 350% in the second survey. In the case of the median, in the first survey the WTP is found quite close to the reference price, with the exception of the WTP of the husbands interviewed separately who exhibit a price premium of around 30%. In the second survey, the price premium increases significantly in a range from 34% to 250%. Overall, therefore, the pandemic event seems to have considerably increased the price premium that households are willing to pay for LO apples. This result is consistent with the change in preferences relating to the order, in which it emerges that in the second survey, the healthiness of food becomes the most important determinant for the purchase of LO apples for both members of the couple. According to our findings, from a policy perspective, the mean WTP values obtained from the CV approach could be used to develop policies to encourage LO agriculture, considering LO farming as a viable option for sustainable development (FAO, 2020).

## 4. Conclusions

The comparison of the results of two separate surveys allow to evaluate changes in the behavior in term of WTP of LO food, assessing the Covid-19consequences. In particular, using cohabitant couples, we have focused on differences between preferences when individuals are interviewed separately and jointly, pre- and during Covid-19. To this aim, we have estimated consumers' WTP for LO apples. This study has been conducted in the city of Perugia, located in the Umbria region. Following the literature, we have elicited individual and intrahousehold decisions about food choices using a CV approach. Respondents show a positive price premium for LO apples whose consumption helps reducing the environmental costs associated with food production. The median estimated values range from 34% to 250%. Overall, respondents show a positive mean WTP which increase with the pandemic. We highlight the importance of interviewing household members separately, given that individuals within the same household can have divergent preference and objectives. In our study, wives and husbands have the opportunity to change their responses when interviewed jointly. We find that wives' value LO apples slightly more than husbands do, and this difference in valuation is driven by differences in preferences. We show that husbands change their choices after the joint interview, with WTP higher in joint than separate interviews. It emerges that the individual

 doi:10.20944/preprints202305.0037.v1

level of education affects the WTP in joint interviews, with wives' and husbands' responses moving closer. The higher level of education of the partner act as a positive spillover within the couple, and consequently have an impact on LO food choice. Finally, our study, analyzing dissimilarities between individual and joint preferences, allows the members of the household to develop reflections on their daily consumption practices. Interactions within the household can affect lifestyle changes in terms of food consumption, which will then have to be translated into responsible choices, both at political and socio-economic levels, consisting in promoting forms of agricultural production that respect the environment.

Food demand and food supply have been heavily affected by pandemic. On the supply side, it emerges the importance of trust and collaboration among the stakeholders along the supply chain, confirming that the short value chains, such as the local systems production, could be a viable solution to face future crisis. On the demand side, changes in households' consumption have occurred, mainly in terms of food consumption and the revolutionized daily routine. The pandemic has underlined LOF relevance both in terms of health benefits and resilience of supply food chain. Thus, public institutions should account for all these benefits, thus enhancing LOF production. Especially in Italy, given the abundance of local production, public strategies should spur the quality of food with a high added value, not only in terms of the environment and the landscape of the place of production, but also in terms of health for producers and consumers.

Our results stress the effect of the pandemic which has consolidated some values, thus underlying the importance of the purchase of LOF products that can guarantee and reassure consumers because of their safety, quality, and security of supply. However, an interesting question could be: "Once the pandemic will be behind us, what will happen to LOF suppliers?" This is an important observation to reflect on, given that the price premium that consumers are willing to pay to LO apples has increased long during the pandemic, albeit positive already in the pre-pandemic phase.

**References**

Adams, D.C., Salois, M.J., 2010. Local versus organic: A turn in consumer preferences and willingness-to-pay. Renew. Agric. Food Syst. 25, 331–34.

Arthur, I. K., Yamoah, F.A., 2019. Understanding the role of environmental quality attributes in food-related rural enterprise competitiveness. Journal of environmental management, 247, 152-160.

Bateman, I.J., Cole, M.A., Georgiou, S., Hadley, D.J., 2006. Comparing contingent valuation and contingent ranking: A case study considering the benefits of urban river water quality improvements. J. Environ. Manag. 79, 221-231.

Bove, C.F., Sobal, J., Rauschenbach, B.S., 2003. Food choices among newly married couples: convergence, conflict, individualism, and projects. Appetite, 40(1), 25-41.

Calia, P., Strazzera, E., 2000. Bias and efficiency of single versus double bound models for contingent valuation studies: A Monte Carlo analysis. Appl. Econ. 32(10), 1329-1336.

Campbell, B.L., Mhlanga, S., Lesschaeve, I., 2013. Perception versus reality: Canadian consumer views of local and organic. Can. J. Agric. Econ. 61, 531–558.

Carson, R.T., Groves, R., Machina, M., 1999. Incentive and Informational Properties of Preferences Questions. Oslo, Norway: Plenary Address, European Association Environ. Resour. Economists (EAERE).

Davis, G., 2021. The many ways COVID-19 affects households: Consumption, time, and health outcomes. Rev. Econ. Househ. 1-9.

DOXA, 2020. Percezione, atteggiamenti e abitudini: gli italiani all'epoca del Covid-19. Available on-line at (only in Italian): https://www.bva-doxa.com/percezione-atteggiamenti-e-abitudini-gli-italiani-allepoca-del-covid-19/ (accessed 10 September 2020).

FAO, 2020. COVID-19 and the risk to food supply chains: How to respond? FAO, Rome.

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

Gayle, P.G., Wang, J., Fang, S., 2022. The Organic food price premium and its susceptibility to news media coverage: evidence from the US milk industry. Appl. Econ. 1-20.

 doi:10.20944/preprints202305.0037.v1

Ghalwash, T.M., 2008. Demand for environmental quality: an empirical analysis of consumer behavior in Sweden. Environ. Resour. Econ. 41(1), 71-87.

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

Haab, T.C., McConnell, K.E., 2002. Valuing environmental and natural resources: the econometrics of non-market valuation. Edward Elgar Publishing, Northampton.

Hanemann, M., Loomis, J., Kanninen, B., 1991. Statistical efficiency of double-bounded dichotomous choice contingent valuation. Am. J. Agric. Econ. 73(4), 1255-1263.

Hu, W., Woods, T., Bastin, S., 2009. Consumer acceptance and willingness to pay for blueberry products with nonconventional attributes. J. Agric. Appl. Econ. 41(1), 47-60.

Istat, 2020. Condizioni di vita, reddito e carico fiscale delle famiglie, Anno 2019. Statistiche-Report. ISTAT – Roma.

James, J.S., Rickard, B.J., Rossman, W.J., 2009. Product differentiation and market segmentation in applesauce: Using a choice experiment to assess the value of organic, local, and nutrition attributes. Agric. Resour. Econ. Rev. 38(3), 357-370.

Johnston, R.J. Boyle, K.J, Adamowicz, W., Bennett, J., Brouwer, R., Cameron, T.A., Hanemann, W.M., Hanley, N., Ryan, M., Scarpa, R., Tourangeau, R., Christian A. Vossler, C.A., 2017. Contemporary guidance for stated preference studies. J. Ass. Environ. Resour. Econ. 4, 319-405.

Le, T.T.P., Aramaki, 2019. Factors affecting households' willingness to pay for improved wastewater services in Ho Chi Minh City, Vietnam. J. Water Environ. Technol. 17(3), 163-173.

Lloyd-Smith, P., Zawojska, E., Adamowicz, W., 2020. Moving beyond the contingent valuation versus choice experiment debate: Presentation effects in stated preference. Land Econ. 96, 1-24.

Lo, A.Y., 2016. National income and environmental concern: Observations from 35 countries. Public Underst. Sci. 25, 873-890.

Longo, A., Hoyos, D., Markandya, A., 2015. Sequence effects in the valuation of multiple environmental programs using the contingent valuation method. Land Econ. 91(1), 20-35.

Marcucci, E., Stathopoulos, A., Rotaris, L., Danielis, R., 2011. Comparing single and joint preferences: a choice experiment on residential location in three-member households. Environ. Plan. A. 43, 1209-1225.

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

Nguyen, L., Schmitz, A., 2022. The welfare impacts of Covid-19 on the US salmon sector. Appl. Econ. 1-17.

Nwofoke, C., Onyenekwe, S.C., Agbo, F.U., 2017. Willingness to pay (WTP) for an improved environmental quality in Ebonyi State, Nigeria. J. Environ. Prot. 8(02), 131.

O'Hara, S., Toussaint, E.C., 2021. Food access in crisis: Food security and COVID-19. Ecol. Econ. 180, 106859.

PwC, 2020. COVID-19: Operations and supply chain disruption. https://www.pwc.com/us/en/library/covid-19/supply-chain.html (last accessed: 10.05.2021).

Rodríguez, L.C., Pascual, U., Niemeyer, H.M., 2006. Local identification and valuation of ecosystem goods and services from Opuntia scrublands of Ayacucho, Peru. Ecol. Econ. 57(1), 30-44.

Zellner, A., 1962. An efficient method of estimating seemingly unrelated regression equations and tests for aggregation bias. J. Am. Stat. Ass. 57, 348-368.