Do 'locally grown' claims influence artisanal food purchase? Evidence from a natural field experiment

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Abstract

We conducted a natural field experiment in an artisanal sit-down ice-cream shop in Italy to investigate whether consumer choices are affected by information regarding locally grown products. Two aspects of locally grown products are investigated: (i) quality due to *terroir* (i.e., quality with a link to the territory) and (ii) reduced carbon emissions due to short transportation distance. Contrary to the evidence emerging from the majority of the stated-preference literature, our results suggest that consumer behavior is not significantly affected by information regarding quality due to *terroir*. We also find that consumers positively respond to information concerning reduced carbon emissions, although the estimated average WTP is small (10 Euro cents). Finally, we offer a contribution to the literature on sustainable food consumption by documenting a gender gap and a cohort effect and by providing evidence that social pressure, as proxied by the size of the party and the presence of kids at the table, fosters environmentally friendly consumption.

Keywords: natural field experiment, menu labeling, sustainable consumption, local products, carbon emissions.

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1. Introduction

Motivated by the growing evidence emerging from surveys and choice experiment studies that local foods are valued by consumers, we conducted a natural field experiment to investigate whether information regarding locally grown products affects consumer behavior in a naturally occurring setting. The experiment, which took place in an artisanal sit-down ice-cream shop in Italy, focuses on two aspects of locally grown fresh fruits used in the production of ice-cream: quality due to *terroir* (i.e., quality with a link to the territory) and reduced carbon emissions due to short transportation distance. Ice-cream store patrons were randomized into a control group and two treatment groups, one for each of the two aspects of locally grown food under investigation. Consumers in the control group received the standard menu in use in the ice-cream store. Customers in the treatment groups instead received a modified menu with information regarding the two different aspects of locally grown food under scrutiny. We employ a discrete choice random utility framework to model consumer selection of ice-cream cups and obtain willingness to pay (WTP) estimates for information on reduced carbon emissions and quality due to *terroir*. While we find no evidence that people are willing to pay a premium for information on quality due to *terroir*, our study shows that people respond to information regarding reduced carbon emissions by engaging in sustainable consumption.

In the last two decades discrete choice models of food demand have been estimated from different types of data sources including choice experiments, experimental auction, scanner data and, more recently, natural field experiments. Among these different data sources, choice experiments (CE) are the workhorse for investigating consumers' preferences for food products. Whereas the great flexibility of CE certainly contributes to their popularity, concerns have emerged with regard to their external validity (e.g., Lusk and Schroeder 2004; Norwood and Lusk 2011; Ellison, Lusk and Davis 2012).

Indeed, depending on circumstances, CEs can be affected by behavioral biases such as social desirability and hypothetical bias. Social desirability bias, in particular, has been shown to be a potentially severe problem when social dimensions of food choices (such as sustainable consumption) are under scrutiny (Alfnes and Rickertsen 2011). In this case, even when incentive-alignment mechanisms are in place, study participants –who are aware of being observed- might (consciously or subconsciously) misrepresent themselves by behaving in a more socially acceptable manner. Hence, it is expected that WTP estimates for social aspects of food product might be biased upwards. Natural field experiments (NFE) have the potential to overcome this problem (Harrison and List 2004). In our experiment, for instance, ice-cream store patrons were not informed that they were part of a study and were randomly assigned to one of three treatment groups. Hence, by observing ice-cream choices in a real market setting without the potential confounds due to individual awareness of the artificial research setting, we expect our WTP estimates to correspond to real world valuation (Schjøll and Alfnes 2011; Levitt and Lusk 2009).

From a methodological point of view, NFEs present the challenge of identifying with certainty the complete set of alternatives and attributes, leading to potential misspecification of the choice set (Ben-Akiva and Broccara 1995) and to (price) endogeneity problems (Ellison Lusk and Davis 2012). In our experiment not only is the choice set easily identified but also, with a total of about 40 alternatives, has a manageable size. In addition, although to a limited extent, the store owner allowed us to manipulate prices to increase price variation (Fifer 2011). Our choice set presents sufficient attributes variation to allow estimation of a set of alternative specific constants in addition to a set of parameters capturing ice-cream features and treatment information. Therefore, our estimates are immune to the bias arising from potential correlation between the price and unobservable, alternative-specific quality attributes (Petrin and Train 2010).

Our study complements existing studies on locally grown products based on laboratory and field CEs providing evidence that consumer indeed value locally grown food products and are willing to pay a premium for them (Darby et al. 2008; James et al. 2009; Onozaka and McFadden 2011 and Hu et al. 2012). By avoiding the pitfall of social desirability bias, our NFE confirm that consumers are willing to pay for socially responsible consumption, specifically reduced carbon emissions, although the premium that people are willing to pay is, on average, small (10 Euro cents, 1.8% of an average ice-cream cup price). However, we cannot confirm that consumers value information on quality due to *terroir*. Additionally, with this application we have the opportunity to contribute to the literature on consumer preference for local grown products used in processed food that is rather limited compared to the literature considering fresh products.

Despite the advantages of NFE with regard to internal (randomization) and external validity (realism), NFE are rarely employed to investigate food purchasing behavior. NFE indeed present some difficulties. First of all, they imply several organizational challenges that limit their viability (i.e., they require a real instead of a laboratory environment, such as grocery stores or restaurants, and require the collaboration of host enterprises). Moreover, in contrast to survey-based CE, NFEs typically allow observing only one choice per subject and therefore require a longer duration to collect sufficient data. Also, most NFEs typically lack participants' screening and individual specific information on socio-covariates. For instance, this is the case for most NFE studies on food choice conducted in recent years in supermarkets and restaurants (e.g., Kiesel and Villa Boas 2010; Schjøll and Alfnes 2011; Sacks et al. 2011).

Given the willingness of the store owner to collaborate in the study, store personnel were trained to record (visible) customer information, such as gender and age class. With almost 10 thousand observations our dataset is sufficiently ample to allow us to separately analyze the behavior of several consumer segments and to test for the effect of social influence on purchase behavior. To the extent of our knowledge, we are the first to document a gender gap (with males reluctant to engage in sustainable consumption) and a cohort effect (with seniors more prone to sustainable consumption compared to mid-age adults) in a natural field experiment.

A naturally occurring setting also offers the opportunity to observe social conditioning affecting real life. Social influence is the 'change in an individual's attitude or behavior that results from the interaction with other individuals or social groups' (Rashotte 2007). When individuals make choices in front of others (e.g., family members, friends, or children) their behavior might be affected by social influence and result in pro-social choices (Levitt and List 2007). A review of the social influence effects in the economics literature can be found in Manski (2000). Surprisingly, only a small literature exists addressing social influence in the area of discrete choice analysis of food demand (e.g., Adamowicz and Swait 2011, p.145) and sustainable consumption (e.g., Salazar et al. 2012). To investigate the presence of social influence, we instructed store personnel to collect information regarding the composition of the party at any given table. We contribute to the literature by providing evidence that social pressure, proxied by the size of the party and by the presence of kids at the table, increases the probability of purchase of the ice-cream cups with reduced carbon emissions and hence plays a role in triggering socially responsible consumption.

Finally, we would like to mention a few important reasons of why we selected -among many interesting aspects related to locally grown foods- quality due to *terroir* and reduced carbon emissions due to short transportation distance. First, both selected aspects have attracted significant attention in the literature and undeniable interest in the policy arena (as explained in more detailed in section 2). Second, as demonstrated by the recent international success of Grom, a large-scale Italian ice-cream maker, quality due to *terroir* has the potential

to play an important role for businesses. Indeed, Grom made a commitment to the use of high-quality ingredients with a link to the territory at the base of its success (The New York Times 2010). Contrary to Grom, small-scale artisanal ice-cream makers rarely make explicit claims regarding the use of high-quality ingredients with a link to the territory, although such ingredients might be used in production. We asked the following question: Would it be desirable for artisanal small-scale ice-cream makers to invest in such quality claims? Our study shows that consumer behavior is not affected by information regarding quality due to *terroir* and hence our results do not support the desirability of investments in such quality claims.

The remainder of the paper is organized as follows. Section 2 briefly illustrates the two dimensions of local food under investigation, section 3 describe the experimental design. Section 4 includes the model and data analysis. Section 5 presents the results and finally section 6 concludes.

2. Locally grown food

Locally grown foods are enjoying growing popularity among consumers. USDA statistics show that local foods play a small but increasingly important role in food markets with strongly growing direct sales from farmers to consumers over the last decade (Martinez et al. 2010). Several different reasons contribute to the popularity of local foods. Locally grown products are typically perceived to be of higher quality compared to other food products (Gracia et al. 2012 and the references therein). The higher perceived quality can be attributed to several factors such as freshness and the reputation of the territory in which local foods are produced. With regard to this latter aspect, local products share important similarities with geographical indications and meet consumer taste for *terroir*.

Local products have also attracted the interests of policy makers. Indeed, local products have the potential to foster local development by supporting small farmers and local communities. For instance, local food can contribute to tourism development by enhancing visitors' experience with the region's culture and heritage (Sims 2009). Local foods have also prominently entered the debate on climate change and sustainable food consumption specifically in relationship to the concept of "food miles" (i.e., reduced carbon emissions due to short transportation distances).

The concept of "food miles" has been criticized as being a poor indicator of the global environmental impact of food production (Edwards-Jones et al 2008). For instance, with regard to fruit and vegetables GHGs emissions from transportation are relatively small compared to the emissions at the production stage (Weber and Matthews 2008). Nevertheless, it remains true that for given production technology and equivalent environmental conditions, reducing the transportation distance travelled by food may contribute to environmental aims. In this regard, the European Union Commission has committed to produce a report on the desirability of introducing a 'local farming labeling system' that explicitly considers the possibility of local products to reduce carbon emissions (Reg. 1151/2012 Art. 55).

3. The natural experiment design

In the summer of 2012, we conducted a natural field experiment in an artisanal sit-down ice-cream shop in Trentino, Italy. The ice-cream shop is located in a village on the Southern range of the Alps, a summer destination for Italian tourists interested in outdoor recreation. In the ice-cream shop in which the experiment took place, the menu includes 23 different ice-cream cups, some of which offer variations in terms of cup-size and flavor, giving rise to a

total of 43 possible alternatives in the 4.00 to 8.50 € price range. In addition, the menu includes several 'kids cups' and a 'party cup' that serves an entire party at a price of 18.00 €. Three of the ice-cream cups (the raspberry cup, the soft fruits cup and the apple cup) are produced with locally grown fresh fruit and are suitable for our treatments on quality due to *terroir* and reduced carbon emissions from transportation. During a 4 week period preceding the experiment, store personnel recorded the frequency of purchase of each ice-cream cup. Collectively, the three treated ice-cream cups represented about 12% of the sales, a sufficiently large share to run our treatments.

A total of three menu treatments were used: a control menu, a 'quality due to *terroir'* and a 'reduced carbon emissions' menu. The standard menu includes a picture, the name and the price of each of the ice-cream cups. It does not include any information regarding the provenance of the ingredients (see figure 1). In the two information treatments, customers received a modified menu that looks identical to the standard menu except for the information added to the treated ice-cream cups. The added information is as follows. In the 'quality due to *terroir'* menu, the following information concerning the apple cup was added: "*Made with fresh fruit from Val di Non, Trentino, area characterized by environmental conditions leading to excellent quality*." The same sentence, indicating *Sant'Orsola, Trentino*, as production area was added to the raspberry and soft fruits cups. The geographical areas in question, *Val di Non* for apples and *Sant'Orsola* for soft fruits are well-known areas with a reputation for the production of high quality agricultural products.[2] Both areas are located less than 50 miles from the shop where the experiment took place. In the reduced-carbon-emissions menu, the three ice-cream cups made with locally grown fruits were described as: *Only 0.03 kg of CO_2 emitted by transporting 1 kg of fresh fruit*.[3]

Upon seating at a table, a party was randomly assigned to one of the three possible menu treatments (so that all people at a given table received identical menus). All three menus were in use at any time during the experiment to control for preference changes over time (Ellison, Lusk and Davis 2012). The control tables saw the standard menu in use prior to the experiment. Store personnel were instructed not to reveal to customers that an experiment was ongoing.

The experiment ran a total of 8 weeks. Prior to the experiment, we trained store personnel for a period of 4 weeks. Associated to each ice-cream purchase, we required store personnel to record customer's gender, age class as well as party size and the presence of kids at the table. During the last 4 weeks of the experiment, we manipulated the prices of selected ice-cream cups on all three menus to increase price variation. Because of the reluctance of the store owner to increase prices, we limited the price manipulations to a 50 Euro cents discount. In each of the weeks from the 5th to the 8th, a discount was applied to two different ice-cream cups. Discounted ice-cream cups were selected to represent a variety of ice-cream cup types (w/ and w/o fresh fruit, w/ and w/o alcohol etc.) and based on the frequency of purchase as recorded during the 4 week training period preceding the experiment (to guarantee a non-trivial share of observations subjects to a price discount). Table 1 summarizes the ice-cream cups subject to discount. Ice-cream cup prices ranged from 4.00 to 8.50 Euro.

Table 1. Ice-cream cups subject to price discount

[2] For example, *Val di Non* is the first geographical area in the European Union that received a *Protected Designation of Origin* in the category fresh fruits (apples).

[3] We calculated the amount of CO_2 emissions due to transportation using the *Food Carbon Emissions Calculator* (CleanMetrix).

Ice-cream cup	Experiment weeks with discount	Purchases in the 4 week training period	
		#	% of total purchases
Cavareno	5th	54	1.51
Fragole	5th	160	4.46
Affogato all'Amarena	6th	151	4.21
Roen	6th	287	8.01
Frutti di Bosco(Soft Fruits Cup)	7th	219	6.11
Yogurt	7th	141	3.93
Affogato al Cioccolato	8th	287	8.01
Banana Split	8th	99	2.76

Figure 1. The control menu

4. Model and data analysis

Customers' choices are modeled using a random utility-based discrete choice model. At a given store visit, a customer, i, faces 43 alternatives (42 different ice-cream cups and the *other-than-ice-cream-cup* option[4]) and is randomly assigned to menu type m, where m = {no information, 'quality due to *terroir*' and 'reduced carbon emissions'}. The utility of customer i faced with menu type m from alternative j at time t is specified as $U_{ijt}^{m} = V_{ijt}^{m} + \varepsilon_{ijt}^{m}$, where V_{ijt}^{m} is the systemic portion of the utility function and ε_{ijt}^{m} is distributed i.i.d. extreme value over individuals, alternatives, time and menu treatment. V_{ijt}^{m} is assumed to depend upon the attributes of the ice-cream cups and the information treatment received and takes the following form:

[4] Observation of customers who did not order an ice-cream (but for example a drink) where classified in this category.

$$V_{ijt}^{m} = \alpha^{m} \mathrm{D}_{ijt}^{m} + \alpha_{P} \mathrm{Price}_{jt} + \alpha_{DF} \mathrm{DairyFlavor}_{j} + \alpha_{FF} \mathrm{FruitFlavor}_{j} + \ldots$$
$$\ldots + \alpha_{F} \mathrm{FreshFruit}_{j} + \alpha_{A} \mathrm{Alcohol}_{j} + \alpha_{PC} \mathrm{WhippedCream}_{j} + \alpha_{OT} \mathrm{OtherToppings}_{j} + \ldots$$
$$\ldots + \alpha_{CS} \mathrm{CupSize}_{j} + \alpha_{CT} \mathrm{CupType}_{j} + \sum_{j} \alpha_{ASC_j} \mathrm{ASC}_{j}$$

where $\mathrm{D}_{ijt}^{m} = \{\mathrm{D}_{ijt}^{GI}, \mathrm{D}_{ijt}^{CO_2}\}$ are dummy variables indentifying treated ice-cream cups in the 'quality due to *terroir*' (GI) and the 'reduced carbon emissions' (CO_2) menus respectively. The two dummy variables capture the effect of the information treatment on the utility, and hence on the frequency of purchase, of the treated ice-cream cups. We hypothesize that $\mathrm{D}_{ijt}^{GI} > 0$ and $\mathrm{D}_{ijt}^{CO_2} > 0$, i.e., that the utility and frequency of purchase of the treated ice-cream cups increases when customers learn about the 'local' qualities of the treated ice-cream cups.

The remaining variables included in the model capture the price and the other features of the ice-cream cups: the main flavor of the ice-cream (i.e., fruit-based, dairy-based or mixed flavors), whether the ice-cream cup includes additional ingredients besides ice-cream (alcoholic content, fresh fruits, whipped cream and 'other toppings') and the cup size and type (i.e., flute shape or bowl). Finally, alternative specific constants (ASC) are included for each specialty ice-cream cup.[5]

5. Results

5.1 The sample characteristics

During the 8 weeks of the experiment, 9,865 observations were collected.[6] Table 2 summarizes the characteristics of the sample. About 33% and 32% of the customers received the 'quality due to *terroir*' and the 'reduced carbon emissions' menus respectively. Males represent about 48% of the sample. Young adults, mid-age adults and seniors represent respectively 32%, 60% and 8% of the sample. The average party size is equal to 4.1 people. On average, kids are present at 23.5% of the tables.[7]

The three sub-samples (control and information treatments) are statistically equivalent with regard to gender and age class, while they differ with regard to the presence of kids and party size. Specifically, the presence of kids is more likely and parties are more numerous in the control group compared to the two treatments.[8]

[5] There are other possible specifications of the utility function that can be considered. For example, one could have let the ASCs to be menu dependent to test whether consumers' utility from a given ice-cream cup is affected by the information treatment. Such a specification nevertheless is much less parsimonious (in terms of the parameters to be estimated) than the one we described in section 4.

[6] These observations exclude the 'kids cups' and the 'party cup'.

[7] We instructed store personnel to classify as a table with kids, parties with at least one member guessed to be 14 years old or younger.

[8] Note that the differences in the presence of kids and party size across samples do not prevent us from drawing meaningful conclusions regarding the effect of social influence on WTP. Indeed, in spite of an over-representation of kids and large parties in the control group, we find a significantly higher WTP for reduced emissions in the presence of kids and for large parties.

Table 2. Sample characteristics

Treatments	Obs.	Gender (Male)	Age <30	Age 30-60	Age >60	Party Size		Kids at Table
	#	%	%	%	%	Mean	Std	%
GI	3,216	47.0	31.9	60.2	7.9	3.8	1.9	23.0
CO_2	3,126	47.7	32.4	58.4	9.1	3.9	1.8	21.2
Control	3,223	48.3	32.5	60.4	7.1	4.5	2.9	26.1
Total	**9,865**	**47.7**	**32.3**	**59.7**	**8.0**	**4.1**	**2.3**	**23.5**

5.2. Experiment results

Table 3 presents conditional logit estimates of the model described in section 4. Several of the explanatory variables are statistically significant and display an intuitive sign. In particular, the price coefficient is negative and statistically significant at the 1% confidence level. Most of the variables capturing the presence of additional ingredients are positive (with the exception of the 'Other Toppings') and statistically significant. Consumers show a preference for flute shape cups over bowls, whereas the cup-size coefficient is small and statistically insignificant. The majority of the ASCs are also statistically significant.

With regard to the dummy variables identifying the information treatments, we find mixed results. While no statistically significant effect is found in the case of the quality due to *terroir* treatment, the reduced carbon emissions treatment has a positive and statistically significant effect.

We were surprised by the negative result concerning the quality due to *terroir* treatment. In fact, the majority of studies (see the meta-analysis of Deselnicu et al. 2011) provide evidence that consumers are willing to pay a price premium for food products with *terroir* information. Our result instead suggests that ice-cream store patrons do not value *terroir* information. To what extent our negative result is generalizable to other ice-cream stores and/or other products is an open question. It is plausible that sensory quality might be taken for granted in an artisanal ice-cream shop such as the one considered in our experiment and that the same holds true for other artisanal shops.

With regard to the carbon emissions treatment, we yield a positive and statistically significant result suggesting that consumers are willing to pay for products with reduced carbon emissions. Specifically, we calculate an average premium of 10 Euro cents for the ice-cream cups with reduced carbon emissions. This result is encouraging because it provides evidence in a naturally occurring setting of consumer willingness to pay for carbon emission reduction, although the size of the estimated premium is quite modest (1.8% of an average ice-cream cup price of 5.5 Euro).[9] This result also suggests that consumers are more likely to make sustainable consumption choices when the relevant information is made available.[10]

[9] This result is in line with other studies considering sustainable food consumption. In a different context, Loureiro McCluskey and Mittelhammer (2002) find a 5% premium for eco-labeled apples.

[10] To check for robustness, we run two alternative model specifications. In the first specification, we added a dummy variable identifying the ice-cream cups subject to the price discount. In the second specification, we included the undiscounted price (instead of the discounted price) and a dummy identifying the ice-cream cups subject to the price discount. For both specifications, we yield qualitatively and quantitatively similar results to those presented in table 3.

Table 3. Conditional Logit model of ice-cream cup choice

Explanatory variables	Mean	Std Err	WTP in Euro
Information treatments			
GI	-0.023	0.081	-0.01
CO_2	0.161**	0.079	0.10
Ice-cream cup attributes			
Price	-1.683***	0.047	
Fruit Flavor[a]	0.814***	0.171	0.97
Dairy Flavor[a]	3.240***	0.156	3.85
Fresh Fruit[a]	0.440**	0.216	0.52
Alcohol[a]	0.891***	0.089	1.06
Whipped Cream[a]	0.044**	0.021	0.05
Other Toppings[a]	-0.312**	0.137	-0.37
Cup Type[a]	-0.348**	0.149	-0.41
Cup Size (cubic cm)	-0.002	0.005	0.00
Alternative specific constants			
Yogurt	2.556***	0.673	3.04
Affogato al Cioccolato	2.338***	0.477	1.39
Affogato all'Amarena	1.481**	0.479	0.88
Eiskaffee	2.193***	0.477	1.30
Affogato allo Zabaione	-1.284***	0.362	-0.76
Fragole	2.299***	0.437	1.37
Frutti di Bosco[c]	2.863***	0.434	1.70
Cereali	2.800***	0.294	1.66
Roen	4.521***	0.281	2.69
Regola	-0.473	0.521	-0.28
Amaretto	1.049**	0.327	0.62
Cavareno	1.289***	0.337	0.77
Pralinata	0.771**	0.330	0.46
Lamponi Caldi[c]	1.825***	0.436	1.08
Melinda[c]	2.522***	0.435	1.50
Ananas	0.969	0.645	0.58
Macedonia	3.328***	0.462	1.98
Banana Al Grand Marnier	4.371***	0.455	2.60
Other[b]	-0.915**	0.399	-0.54
Log-likelihood	-28360.6		
Number of observations	9,865		

[a] Effects coded dummies.

[b] Includes specialty cups with less than 30 orders (i.e., < 0.3% of total purchases). These cups are Vodka, Ubriaca, Cherry and Banana Split.

[c] Ice-cream cups subject to the information treatments.

As mentioned earlier, all three menus were simultaneously in use during the 8 weeks in which the experiment ran. This allows us to rule out the possibility that changes in preferences over time (e.g., for example one could expect fruit flavors to be preferred in sunnier and hotter days in the mid of the summer and cream flavors to be preferred toward the end of the season) which could lead to difference in ordering patterns across treatments. Nevertheless, as in Ellison, Lusk and Davis (2012), this design has the potential weakness that repeated customers may be assigned to different menus in successive store visits with the effect of reducing differences across treatments over time.

5.3. Taste variation based on consumer segmentation and social influence

Thus far our analysis has revealed that information on reduced carbon emissions spur consumers to engage in sustainable consumption. Specifically, we have found that, on average, consumers are willing to pay a small premium of 10 Euro cents for the ice-cream cups with reduced carbon emissions. In this section, we investigate which groups of consumers are willing to engage in sustainable consumption and, in what follows, we present results for different consumer segments.

The existing literature has investigated the effect of socio-demographic variables on the consumption of environmentally friendly and socially responsible products without identifying a clear profile of the 'sustainable consumer.' To compare estimates across consumer groups, we re-estimated the model presented in section 4 after partitioning the sample in gender and age groups: young adults (<30 years old), adults (30-60 years old) and seniors (>60 years old). Table 4 summarizes the main results. We find a significant positive coefficient for the reduced carbon emission dummy in the female, young adults and seniors sub-samples. The coefficient for males and mid-age adults instead is not statistically different from zero. Table 6 reports corresponding WTP estimates. We find a significant average carbon emissions premium equal to 19 Euro cents for females (3.5% of average price), 29 Euro cents for seniors (5.3% of average price, the highest premium we find across all considered sub-samples) and 16 Euro cents (2.9% of average price) for young adults. Table 6 also reports p-values for several one-sided tests of equality of the WTP across sub-samples: females vs. males, young adults vs. mid-age adults, and seniors vs. mid-age adults. The results confirm the presence of a gender gap with females willing to pay more than men. Also, we find some evidence of a cohort effect. Seniors are willing to pay significantly more than mid-age adults (p-value is 0.08). Finally, we are not able to reject the hypothesis of equal WTP between young adults and mid-age adults (p-value=0.10).

Table 4. Carbon emission and *terroir* information premiums (WTP) by consumer sub-samples

Gender	**Female**		**Male**	
	Mean	*StdErr*	*Mean*	*StdErr*
GI	0.065	0.113	-0.114	0.116
CO_2	0.342***	0.109	-0.043	0.115
Price	-1.768**	0.066	-1.597***	0.066
Log-L	-14,582.8		-13,742.3	
Obs.	5162		4703	

Age	**<30**		**[30, 60]**		**>60**	
	Mean	*StdErr*	*Mean*	*StdErr*	*Mean*	*StdErr*
GI	0.112	0.148	-0.106	0.103	0.121	0.291
CO_2	0.282*	0.144	0.053	0.101	0.476*	0.269
Price	-1.762***	0.089	-1.650***	0.059	-1.670***	0.155
Log-L	-8,591.2		-17,294.9		-2,280.3	
Obs.	3185		5889		791	

When choosing an ice-cream cup, customers interact with the other people sitting at the same table. If social influence plays a role in this context, we expect ice-cream choices to respond to such interactions. In particular, we expect that the presence of other diners at the table might exert social pressure to opt for the environmentally friendly ice-cream cups. To test this hypothesis we consider two proxies of social pressure obtained exploiting the information regarding the size of the party and the presence of kids at the table. Under the hypotheses that, *ceteris paribus*, social pressure to engage in the 'right behavior' increases with (i) the number of people at the table and (ii) in the presence of kids at the table, we split the sample in small (i.e., 4 or fewer people) and large parties (i.e., 5 or more people) and in parties with kids and without kids.[11]

Table 5 reports finding for each of the four sub-samples and table 6 reports the corresponding WTP. We find that people in large parties are more likely to engage in sustainable behavior and display an average carbon emissions premium equal to 16 Euro cents (2.9% of average price). To the contrary, the average premium in small parties is not statistically significantly different from zero. Likewise, we find a positive and significant effect of the reduced carbon emissions variable and an average premium of 19 Euro cents (3.5% of average price) when kids are present at the table, and an insignificant effect when kids are not present at the table. As shown in table 6, we are able to reject the hypothesis of equal WTP between parties with and parties without kids (p-value= 0.09). To the contrary, we are not able to reject the hypothesis of equal WTP between small and large parties.

Finally, the 'quality due to *terroir*' variable is not statistically significant in any of the considered sub-samples.

[11] Several considerations suggest that 4 is a reasonable threshold to split the sample between small and large parties. First, as reported in table 2, the mean party size in the sample in about 4 people. Given an average number of 1.6 children per family in Northern Italy, parties larger than 4 are more likely to include members of at least two different families (e.g., the desire to "look good" is arguably stronger in front of non-family than family members).

Table 5. Carbon emission and *terroir* information premiums (WTP) by social pressure variables

Party Size[a]	**Large parties**		**Small parties**	
	Mean	*StdErr*	*Mean*	*StdErr*
GI	0.024	0.149	-0.047	0.096
CO_2	0.304**	0.141	0.096	0.095
Price	-1.880***	0.095	-1.611***	0.054
Log-L	-8,389.1		-19,900.0	
Obs.	3,039		6,826	

Kids at Table	**Yes**		**No**	
	Mean	*StdErr*	*Mean*	*StdErr*
GI	-0.050	0.182	-0.028	0.091
CO_2	0.387**	0.171	0.090	0.089
Price	-2.058***	0.118	-1.597***	0.051
Log-L	-6,162.4		-22,097.3	
Obs.	2,320		7,545	

[a] Large parties are defines as parties with 5 or more people at the table. Small parties have 4 or fewer people at the table.

Table 6. Willingness to pay for reduced carbon emissions

		WTP (Euro cents)	**WTP p-value**[a]	**Δ-WTP p-value**[a,b]
Gender	Female	**0.19*** **	0.00	**0.01*** **
	Male	-0.03	0.64	
Cohort effect	<30	**0.16** **	0.02	0.10
	[30, 60]	0.03	0.30	
	>60	**0.29** **	0.04	**0.08***
Party	Large	**0.19** **	0.01	0.14
	Small	0.06	0.16	
Kids	Yes	**0.16** **	0.01	**0.09***
	No	0.06	0.16	

[a] p-values are determined via parametric bootstrapping (Freedman and Peters 1984).
[b] p-values are determined using the combinatorial re-sampling approach described by Poe, Giraud and Loomis (2005). p-values refer to several one-sided tests of equality of the WTP across sub-samples: females vs. males, young adults vs. mid-age adults, seniors vs. mid-age adults, large (more than 4 people) vs. small parties (4 or fewer people), and Parties with kids vs. parties without kids.

6. Conclusions

Motivated by the growing evidence emerging from surveys and choice experiment studies that local aspects of food products are valued by consumers, we conducted a natural field experiment in an artisanal sit-down ice-cream shop to investigate whether information regarding two aspects of local products affects purchase behavior. The two aspects that we considered are quality due to *terroir* and reduced carbon emissions due to short transportation distance. An advantage of our study over surveys and choice experiment studies is that

customers are unaware that their behavior is under observation. For this reason our results are not subject to hypothetical and social desirability bias.

Within the context of locally grown fruits used in the production of artisanal ice-cream, our findings suggest that customer behavior is affected by information regarding reduced carbon emissions but not by information regarding quality due to *terroir*. The fact that people are not responsive to quality information related to *terroir* is quite surprising and is in contrast to the growing role attributed to geographical indications in food markets. Whether this negative result is specific to the empirical context remains an open question. Future research is needed to shed light on the role of information on quality due to *terroir* and on the potential of such information to generating returns to quality.

With regard to the reduced carbon emissions information treatment, we find evidence that people are willing to engage in sustainable consumption, although the average premium that people are willing to pay for ice-cream cups with reduced carbon emissions is small (10 Euro cents). In addition, our analysis of different consumer segments suggests that female, seniors and young adults display higher than average premiums, with seniors presenting the highest premium across the considered sub-samples (29 Euro cents). Finally, we find positive evidence of social pressure on sustainable consumption.

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