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Abstract

Running conventional laboratory experiments (i.e., with a standard student subject pool) is common practice in economic experiments, especially when methodological enquiries are explored. However, the generalization of the results from such experiments to the entire population is a highly controversial issue in the literature. In this study we investigate and measure warm glow motivations behind giving in charitable auctions in a conventional lab experiment and an artefactual field experiment (i.e., lab experiment using subjects from the general population). Using a novel experimental design that allows isolation of warm glow

from contributions motivated by pure altruism, we find that warm glow is only evident in the student population. Our findings cast doubt on the validity of generalizing the conclusions from conventional lab experiments to the general population.

Keywords: warm glow, charitable auctions, lab experiment, WEIRDos

JEL codes: D44, D64, C91

Introduction

Auctions have long been used as fundraising mechanisms for charities with numerous examples of celebrities' personal items being auctioned for charitable purposes. For example, empirical studies on e-bay's charitable auctions report significant charity premiums which are proportional to the share of the revenues donated (Elfenbein and McManus 2007). Stemming from similar observations, the question of what motivates individuals to voluntarily contribute to donations has long occupied the economic literature. Two distinct motives have been identified and studied; warm glow and pure altruism. The term 'warm glow' was first coined by Andreoni (1989) to describe a pure egoist deriving utility (warm glow) from the act of giving, like from any other private good. A pure altruist, on the contrary, is only concerned with the level of provision of a public good, irrespective of the method that this is financed.

Since Andreoni's (1989) first study, there has been ample empirical evidence of satisfaction being generated by the act of giving in real and hypothetical settings. Results from studies examining the degree of crowding out of donors' contributions to charities due to government grants, dispute the long dominant neutrality theory which predicts dollar-for-dollar crowding out of private contributions in the presence of government donations (e.g., Andreoni and Payne 2010; Andreoni 2006; the latter being a detailed review of the relevant literature). Nunes and Schokkaert (2003) have used a list of attitudinal statements to confirm the presence

of warm glow incentives in a contingent valuation study. Furthermore, there is now neural evidence supporting the existence of warm glow motives (Harbaugh, Mayr and Burghart 2007). Harbaugh, Mayr, and Burghart (2007) report certain neural activity taking place in areas known to respond to rewards when a payment to a public good is made. Consistent with the warm glow argument, this brain activation further increases when people make voluntary donations compared to mandatory tax payments. This is an indication that warm glow provides the giver a reward, which is higher than the benefit the giver receives from paying an equivalent amount of taxes.

However, it isn't straightforward to distinguish warm glow incentives from pure altruism in laboratory experiments. Consequently the literature has focused on examining the fund raising properties of different auction mechanisms and on comparing the revenues between charitable and standard auction treatments irrespectively of the donation motivation. What is thus often termed warm glow in charitable auctions, and equivalently dictator and/or public good games, may well be confounded with pure altruism. To our knowledge, Crumpler and Grossman (2008) is the only study that developed a design which successfully isolated and measured warm glow incentives in a modified dictator game where participants were given the opportunity to contribute to a charity of their choice. The novelty of the design was that participants' contributions were crowded out by reduced giving by the proctor, so that the charity would always receive a pre-set amount. Contributions were thus motivated only by warm glow and authors report a significant percentage (approximately 57%) of respondents making positive contributions. Tonin and Vlassopoulos (2011) re-examined the Crumpler and Grossman (2008) conclusion by applying a modified version of their original dictator game to assess whether warm glow measurement is confounded by altruistic feelings towards the experimenter. Authors added another treatment where the experimenter is the recipient of the giving and measured the extent of warm glow for individuals that do not display altruistic

feelings towards the experimenters. Their results suggest that under the Crumpler and Grossman (2008) design an upper bound estimate of warm glow is elicited.

In this article we adopt the Crumpler and Grossman (2008) design to isolate and measure warm glow considerations in an auction that instead of giving revenues to the experimenter (as a standard auction does), donates revenues to a charity of participants' choice. We elicit valuations for homegrown value goods under two treatments; a standard auction and a charitable auction. Bidding behavior is then compared across treatments to examine the existence of a charity premium. We are further interested in investigating whether similar results are obtained between different subject pools. To this respect, we conduct one set of sessions with a standard student pool in what constitutes a *conventional lab experiment* (in Harrison and List's (2004) terminology) and a second set of sessions with a representative sample of consumers (*artefactual field experiment*). Our research thus also opts to contribute to the ongoing debate on the legitimacy of generalizing results from students to the broader population. Using undergraduate students for research purposes is a common practice in economic laboratory experiments due to students' proximity to the experimenter, the low cost required for their participation and the high cognitive skills students exhibit (Feltovich 2011). Especially when it comes to methodological enquiries, it is very common for experimenters to employ students as their guinea-pigs. Falk, Meier and Zehnder (2011) report that for the time period 2004 to 2009, in five field journals, 89% of all subject pools consists of students.

However, scepticism on the use of students as research surrogates for consumers or adults in general, is rather old (McNemar 1946; Enis, Cox, and Stafford 1972). McNemar's (1946) reference to the "science of sophomores" and Cunningham, Anderson, and Murphy's (1974) article bearing the provocative title "Are students real people?" are indicative. Reservations relate to the fact that students exhibit psychological, social and demographical differences from other segments of the population along with the fact that they are not yet

complete personalities and thus their attitudes are unstable (Harisson and List 2004; Sears, 1986). In measuring social preferences, Levitt and List (2007) argue that human behaviour may be influenced by a number of factors (moral considerations, scrutiny of ones actions by others, context, self-selection and stakes of the game) that may differ between different subject pools in laboratory experiments. On the other hand there are arguments favouring the use of students as experimental subjects when the nature of the research is universal. As stated by Lusk and Shogren (2007, p46): 'A theory is a generalization that should hold for everyone, *including students*'.

After six decades of research the debate is still active. Henrich, Heine, and Norenzayan (2010) call the usual subject pool of experiments as WEIRDos, being an abbreviation of the Western, Educated, Industrialized, Rich and Democratic societies they live in and argue that generalization of the findings relied upon these subjects can be misleading since they are outliers of the rest of humanity. Authors review a broad literature providing evidence of significant variability across human population and argue that universality cannot be claimed not even for fundamental behavioural processes. The arguments developed triggered the release of a special issue in the Behavioral and Brain Sciences journal (vol. 33, Issue 2-3, 2010) accommodating commentaries to the article and replies by the authors. The majority of the commentaries are supportive to the main thesis developed in the target article with authors agreeing on the need for research on culturally diverse, non-weird populations to permit generalization of the findings

A recent strand of the literature investigates whether students participating in experiments behave systematically different from subjects that are drawn from the general population. The evidence is, however, mixed. On the one hand, students have been found to be less cooperative (Burks, Carpenter, and Goette 2009; Carpenter and Seki 2011; Anderson et al. 2010), more inclined to free-ride (Anderson et al. 2010), to exhibit different trust attitudes and

thus contribute less in public good experiments (Gachter, Herrmann, and Thoni 2004), to exhibit less loss aversion when compared to professional traders (Haigh and List 2005) and to be more selfish compared to workers as manifested by extremely decreasing offers in Ultimatum and Dictator games (Carpenter, Burks, and Verhoogen 2004). On the other hand, there are studies failing to find any difference between the social preferences of students and of subjects out of the general population (Falk, Fehr, and Zehnder 2011) or studies that report that differences are contingent to whether the experimental game engages other-regarding preferences or not (Belot, Duch, and Miller 2010).

However, there is limited empirical evidence on the validity of extrapolating the results from auctions with students to the broader population. Among the exceptions, Depositario et al. (2009) found no significant differences in the bidding behaviour between students and the general population, in an auction eliciting WTP for a novel food. A similar result is reported by Lusk (2005) in a meta-analysis of genetically modified food valuation studies. Authors, however, argue that their results should be treated with caution since the relevant literature, is rather limited.

Against this background, we isolate and measure warm glow considerations in charitable auctions and examine the validity of extrapolating results derived from a student pool to the broader population. To our knowledge this is the first study isolating warm glow motives when a charitable auction is administered. Compared to the results from standard auction (control) treatments, we find that the warm glow theory is verified only for the student sample. This finding suggests that generalization of results and conclusions from lab experiments with student pools, to a more general population of interest, merits greater attention.

Experimental Design

The laboratory experiment was conducted in an experimental economics lab in the ... University of ... (Western Developed country; removed for peer review, to be adjusted upon publication) using the z-Tree software (Fischbacher 2007). For the consumer sessions, a random sample of the population of the city of AAA (capital city of the country; removed for peer review, to be adjusted upon publication). Recruitment was undertaken by a professional research company. For the student sessions, subjects were recruited by public announcements from the undergraduate student population of the university. We emphasize that none of the authors was their professor or held any other position at the university at that time.

A variant of the Vickrey auction, a fourth-price sealed-bid auction was used to determine subjects' buying price for the products in auction. The specifics of the nature of the experiment were not mentioned during the recruitment, but we did provide information regarding the provision of stochastic fees. Stochastic fees have been shown to be able to generate samples that are less risk averse than would otherwise have been observed (Harrison et al. 2009).

Our design involved two treatments, namely a standard auction treatment and a charitable auction treatment. Four sessions[1] (two sessions per treatment) were conducted with a total of 61 consumers and two sessions (one session per treatment) with a total of 36 students. Participants were randomly assigned into the treatments. The average duration of a session was about an hour and experiments were conducted in June 2010. Each session included a training phase and an auction phase. In the charitable auction treatment, a charity selection phase preceded the auction. Subjects were given prior instructions on the overall layout of the session and were also reminded the procedures at the beginning of each phase.

Table 1 presents the experimental design and the number of subjects that participated in each treatment. We only used one proctor or monitor (i.e., one of the authors) for all sessions.

To further preclude experimenter bias, subjects were informed that the correspondence between the id number of their computer and their identity would remain unknown to the experimenter and to the other participants at every stage.

Table 2 displays the socioeconomic characteristics of the subjects.

[Table 1 here]

[Table 2 here]

The training phase

After arriving at the lab, subjects were randomly assigned to a computer. A computer-training phase was conducted for subjects in the consumer sessions that did not have previous experience with computers. An interactive PowerPoint application was used to familiarize subjects with the mouse and keyboard.

To control for potential monetary endowment effects, subjects were told that in addition to their participation fee, a random amount of money was going to be assigned to each one of them. For consumers this amount ranged between €0.5 and €5 and for students between €0.5 and €3. Participation fees were fixed to 20€ for consumers and 15€ for students[2]. Different fees intended to approximate what is a standard compensation fee for these subjects' pools given their income and the opportunity costs they faced for participation. Everyone then received a random draw determining their individual-specific extra fee. We emphasized to the subjects that the endowment they received was private information and that they should not communicate this information to other subjects in the lab. All transactions were completed at the end of the experiment.

Subjects initially watched a short PowerPoint presentation to familiarize them with the auction and procedures. The presentation included a short explanation of the fourth-price auction, along with a numerical example demonstrating why it is in subjects' best interest not

to deviate from bidding their true value for the good under evaluation. Subjects then took a short computerized test regarding the procedure. The monitor explained the correct answers afterwards.

Subjects, then, bid in three practice *hypothetical* auction rounds for a bag of potato chips. The monitor emphasized that these rounds were hypothetical and that one binding round would be randomly chosen at the end of these rounds. A screen displayed subjects' hypothetical earnings after these rounds.

After getting fully familiarized with the auction mechanism and procedures, subjects bid in three *real* auction rounds for a chocolate bar. The monitor emphasized that these rounds were now real and that the highest bidders would actually pay for the products. Again, one round was randomly chosen as binding at the end of these rounds. A screen displayed subjects' earnings after these rounds. Between rounds the only available information was whether the subject was one of the highest bidders or not.

The charity organization selection phase

This phase was only applied in the charitable auction treatment sessions (see Table 1). Subjects in this treatment were asked to select their favorite organization from a list of six non-government organizations (NGOs) with the understanding that the NGO selected by most subjects in the session will be donated an amount of €30 by the proctor. Subjects were told that deposit verification will be sent to everyone's mail address. The donation amount was specified to 30€ since usually this is what most NGOs request for annual membership. All charities were environmental NGOs and a short description from each NGOs website was provided to subjects (all experimental instructions, supplemental material and information provided to subjects are available at https://sites.google.com/site/warmglowweirdos/). The

charity selected by the majority was revealed only after the auction phase was through. The selection of the charities was made on the basis that these are equally popular among students and adult population.

The auction phase

In the auction phase subjects were endowed with one kilo of potatoes from a very specific location of the country. The region was *never* revealed to subjects and was called with the generic name "region A". Potatoes were packed in paper bags and were labeled "Potatoes from region A".

A leaflet was then distributed to subjects that described the environmental profile of region A (see Appendix). In brief, the leaflet mentioned that the initial potatoes endowment from region A is of unknown quality due to extensive pollution of the groundwater but the risks for human health could not be assessed since the epidemiological study in the area of origin was not completed. The description accurately described region A and in fact epidemiologists and agronomists that study the environmental health effects of this specific region were advised about the content of the leaflet (see Appendix).

Subjects were then asked to bid to exchange a kilo of potatoes from region A with a kilo of potatoes from region B. A second leaflet was subsequently distributed to subjects (prior to the actual auction) with a description of the environmental profile of region B (see Appendix). In brief, the leaflet described region B as being in a good ecological status (in the terminology of the European Water Framework Directive) and explained that this characterization implies that, among others, agricultural products are safe for human health. We made sure that potatoes from the two regions are of the same variety to avoid differences in appearance characteristics. Potatoes were packed in a similar paper bag and were labeled "Potatoes from region B". Both potatoes are available at the market for sale but the origin was

not revealed to subjects to avoid regional affiliation effects. The label was the only visible difference between the two products.

To elicit subjects' WTP, a 4th price Vickrey auction was employed. Vickrey auctions are demand revealing, that is, each bidder has a dominant strategy to submit a bid that truthfully reflects her value for the good. Lusk and Shogren (2007) provide a theoretical analysis of the Vickrey auction and similar uniform nth-price auctions such as the 4th price auction adopted in this study. Considering the size of the session groups and the likelihood of disengaging some of the participants due to small number of winners, the 4th price auction was regarded as a compromise between a 2nd price auction and an nth random price auction for engaging off-margin bidders. This variant of the Vickrey auction guaranteed that at least three subjects would exchange their initial endowments. The relatively high number of winners is expected to engage all bidders in auction procedure. Fourth-price Vickrey auctions are commonly applied in the literature (e.g., Umberger and Feuz 2004). Subjects participated in five consecutive rounds and were told that at the end one round would be randomly chosen as binding. Between rounds subjects could only observe if they were one of the highest bidders of the previous round or not.

The socio-economic background of the subjects was elicited in the final phase. Experimental instructions are available at: https://sites.google.com/site/warmglowweirdos/.

Isolation of warm glow incentives and research hypotheses

In the charitable auction sessions, subjects were additionally informed that the revenues from the highest bidders would be donated to the charity selected by the session's majority on their behalf and a deposit receipt would be mailed to the address of the highest bidders.

To disentangle motives behind donations in the charity treatment we followed the design proposed by Crumpler and Grossman (2008). We crowded out participants donation by reduced giving by the proctor, so as to keep the total contribution to the charity constant at €30. Subjects were told that the charity would receive neither more nor less than €30 and that the monitor would add to the contributions by the highest bidders that much, so that the total amount would always sum to €30. Only respondents with warm glow incentives, purchasing moral satisfaction from the act of giving itself, had thus incentive to contribute higher in the charitable auction sessions. Since the amount the charity would be receiving was preset (fixed), pure altruists, deriving utility from increases in provision of public goods, had no incentive to raise their contribution when a charitable session was employed[3].

Formally, drawing and modifying from the original work of Andreoni (1989), the utility function of a pure altruist is $U_{pure\,altruist} = u(x_{pure\,altruist}, Y)$, with $x_{pure\,altruist}$ denoting individuals consumption of the private good x and Y being the total supply of the public good as follows: $Y = G_{others} + g_{purealtruist}$, where G_{others} is the contributions of all other individuals to the public good and $g_{purealtruist}$ is pure altruist's own contribution to the public good. A pure altruist would thus donate to a charity in order to raise the total contributions and subsequently the level of provision of the public good. On the other hand, an individual holding pure warm glow incentives cares only for her contribution irrespectively of the level of the public good provision: $U_{egoist} = u(x_{egoist}, g_{egoist})$.

If the total contribution to public good Y is fixed, and thus the amount of the public good to be provided is not sensitive to individual's contribution, a pure altruist will contribute nothing. Therefore, in this context, pure altruists should not alter their bidding behaviour in the charitable auction treatment for an upgrade from their endowment[4]. If, however, average bids are higher when a charitable auction treatment is employed, this is evidence of warm glow i.e., people derive utility from their contribution irrespective of the level of provision of the public

good. Thus, the main advantage of this design is its ability to isolate and measure warm glow incentives.

We therefore examine whether bids in the charitable auction treatment (where revenues by highest bidders are donated to the charity) are higher than bids in the standard (control) auction procedure (where revenues are collected by the experimenter to provide the good). Higher WTP estimates in the charitable auction treatment would be evidence of warm glow motives[5]. We also explore whether results are consistent across subject pools (consumers vs. students). This is in essence an external validity test of whether it is possible to extrapolate results from students to the entire adult population.

To check respondents understanding of the donation mechanism we asked three test questions, two before the auction took place and one at the demographic collection phase. The exact questions were:

"Suppose the highest bidders pay in TOTAL 6€ to exchange their endowed product:

1. How much money will the HIGHEST BIDDERS donate to the selected NGO?
2. How much money will be donated in TOTAL (that is, by US the EXPERIMENTERS and the HIGHEST BIDDERS)?"

"Suppose the highest bidders pay in TOTAL 8€ to exchange their endowed product:

3. How much money in TOTAL (that is, by US the EXPERIMENTERS and the HIGHEST BIDDERS) would the NGO receive?"

Subjects that failed to answer two or more questions were dropped from the subsequent analysis which resulted in dismissing observations from two individuals[6].

Experimental Results

We first provide a descriptive analysis of our data and proceed with the econometric investigation of our treatment variables' effect on bidding behavior for the two subject pools.

Descriptive analysis

Simple statistics can help illuminate our research questions. Figure 1 shows mean and median bids across rounds, by subject pool and treatments. Solid lines refer to the auctions that purported in isolating warm glow (i.e., the charitable auctions) and dashed lines refer to the standard auction treatment. Raw data draw a completely different picture for the bidding behaviour of each subject pool. The student pool reconfirms what is widely reported in the literature: warm glow is evident and subjects derive utility just from the act of giving. Even though subjects were aware that their contribution was crowded out by reduced giving by the proctor they tend to bid on average twice as much as the control group in every round. A Wilcoxon/Mann-Whitney test confirms that differences in bids between charitable and standard auction treatments are statistically significantly different for the student subject pool in each of the five rounds at the 5% level.

The consumer subject pool is, however, at complete odds. The warm glow turns "cold" with consumers bidding on average less than the control group, a difference which becomes as large as €0.3 in round five. A Wilcoxon/Mann-Whitney test shows that differences in bids between charitable and standard auction treatments are not statistically significantly different for the consumer subject pool at the 5% level (in each of the five rounds).

[Figure 1 here]

Econometric analysis

To account for the panel nature of our data, we estimated a random effects regression model for each subject pool, as well as for the pooled sample[7]. Variables in the regression functions are

explained in Table 2. We assume bidding behavior to be affected by the treatment variables, the respondents' socio-demographic characteristics, the perceived health risks associated with consumption of potatoes from areas A and B respectively, as well as potato consumption habits. Round dummies are also included in the regression to account for learning effects. Formally:

$$Bid_{it} = \begin{pmatrix} b_0 + b_1 Charity_{it} + b_2 HealthRisk_{it} + b_3 TotFee_{it} + b_4 T_{2,it} + b_5 T_{3,it} + b_6 T_{4,it} + b_7 T_{5,it} \\ + b_8 Age_{it} + b_9 Gender_{it} + b_{10} Income_{2,it} + b_{11} Kids_{it} + b_{12} Educ_{2,it} + b_{13} DangerA_{it} \\ + b_{14} NotDangerB_{it} + b_{15} PotatoConsumption_{2,it} + b_{16} PotatoConsumption_{3,it} \\ + b_{17} PotatoConsumption_{4,it} \end{pmatrix} + e_{it} + u_i \quad (1)$$

Equation (1) was estimated for each subsample (students, consumers) separately. We also estimated a pooled sample regression in which equation (1) was augmented with a dummy for sample type (*student*s) and its interaction with the charity dummy (*charity* x *students*)[8]. Table 3 displays regression coefficients from the three specifications (students, consumers, pooled sample). Note that the coefficients and standard errors of the interacted variables in the pooled model (*students*, *charity*) take into consideration the coefficient of the interaction term, following similar procedures to Drichoutis and Nayga (2011)[9].

[Table 3 here]

Regression coefficients confirm the main findings of the unconditional analysis. Students bid on average €0.44 more in the charitable auction compared to the standard auction which is a clear evidence of warm glow. On the other hand, consumers in the charitable auction sessions bid on average €0.25 less than consumers in the standard auctions, reinforcing the picture of figure 1. Note that the coefficient is marginally not significant (p-value=0.106).

The pooled model reconfirms inferences drawn from the two subsamples. Students that participated in the charitable auctions bid on average €0.44 more than students that participated

in the standard auction sessions. This corresponds to the difference between the red solid and red dashed lines in figure 1. On the other hand, consumers that participated in the charitable auctions bid on average €0.29 less than consumers that participated in the standard auctions. This corresponds to the difference between the blue solid and blue dashed lines of figure 1.

Furthermore, results in Table 3 show that consumers increased bids across rounds by as much as 23 cents in round 5. Student subjects did increase their bids as well but by a lower amount of money. Gender differences are also evident. Male students bid up to €0.24 less than female students which is a common finding in WTP studies and particular in auctions. The difference is, however, not significant for the consumer subject pool and the pooled model. Income has an economic and statistical significant effect as well. Subjects from households with a self-evaluated economic position above average, bid higher by as much as €0.18 in the pooled model.

As expected subjects that perceived consumption of agricultural products from region A to pose a high health risk bid more to exchange their endowed products with potatoes from region B. Similarly, subjects that perceived region B as posing no health risk bid 0.38€ (pooled sample) to 0.43€ (consumer sample) more. Consumption habits of potatoes also have an effect on bidding behavior, with subjects consuming potatoes more frequently bidding more to upgrade their endowment with potatoes from region B. Other effects in Table 3 are not substantial in terms of economic significance.

Conclusions

Student pools are widely used as experimental subjects in laboratory applications. After six decades of research in experimental economics, the question on their representativeness and consequently on the extent to which results derived from studies with students generalize to the

entire adult population is still open, triggering hot debates. This study uses a novel experimental design to isolate and examine warm glow motives in charitable auctions and offers an external validity test of the possibility to extrapolate results from student pools. We find that student subjects drawn from a university population and consumer subjects drawn from the general population behaved in a completely opposite direction. The student pool verified the presence of warm glow motives behind charitable giving. Students were bidding more in an auction that contributed the sum of revenues by highest bidders to a charity, than a control group that was bidding in a standard auction. This was so, even though subjects knew that their contribution was crowded out by reduced giving by the proctor. Oddly, the consumer subject pool was bidding less than the control group. Although previous evidence, based on experiments invoking other-regarding considerations, suggests that students are generally more selfish and much less generous than subjects from the general population (Belot, Duch, and Miller 2010; Carpenter, Connolly, and Myers 2008; Anderson et al. 2010), results from our study indicate that students may well exhibit stronger warm glow incentives.

The present study therefore shows that inferences drawn from a student population are not automatically transferable to the general population, even when a methodological issue is explored. Students and non-student pools differ in a variety of social, economic and demographic dimensions that are likely to influence their experimental behaviour as substantial accumulated evidence from experimental studies suggests. Economists, however, use subjects drawn from the student population to study a myriad of economic inquiries e.g., the WTP-WTA gap (Plott and Zeiler 2005; Isoni, Loomes, and Sugden 2010), self-selection bias (Eckel and Grossman 2000; Cleave, Nikiforakis and Slonim 2010), information effects (Healy 2009), hypothetical bias (Carlsson and Martinsson 2001; Spencer, Swallow and Miller 1998), initial endowment effects (Corrigan and Rousu 2006) and warm glow itself (Crumpler and Grossman 2008; Isaac, Pevnitskaya and Salmon 2010). Whether different subject pools can lead every

economic experiment to different inferences is not a generalization we want or can make. We further recognize that consumers from western and developed societies, like those participated in our experiments, can be as weird as students and therefore claims of universality of our results are not intended. The results from this study do urge, in agreement with the concerns raised by Henrich, Heine, and Norenzayan (2010), for validation of the results drawn from WEIRDos using representative and diverse samples before firm conclusions are drawn.

Finally, we acknowledge that under this design, as Crumpler and Grossman (2008) admit, warm glow incentives may be confounded with subjects' willingness/unwillingness to reduce the financial pressure to the proctor. Investigating this issue, Tonin and Vlassopoulos (2011) report that under the Crumpler and Grossman (2008) design an upper bound estimate of the warm glow is elicited. Since we cannot rule out the possibility of experimenter effects influencing our results we adopt a similar restrained interpretation of our measurements on the extent of warm glow. We further acknowledge that in the event that different subject pools are unevenly affected by experimenter effects, if at all, this may well have influenced our results. This is, however, true for all experiments comparing treatment effects between different populations. We finally contend that any motivation by students to reciprocate to the experimenter would be mitigated by the fact that the proctor (one of the authors) was not their professor.

Footnotes

1. In two of the consumer sessions, subjects were given additional information on the higher health risk to which children are exposed, given their longer time span, when consuming contaminated agricultural products. The aim of these two sessions was to further examine whether consumers respond differently when provided with this extra information. Results of this analysis will be reported elsewhere. Although it is out of

the scope of this article, a dummy variable indicating whether additional information was provided to respondents is included in the econometric analysis to control for potential information effects (see table 3).

2. Endowing both pools with the same compensation would have resulted in students receiving a higher, relative to their income, initial amount compared to consumers and consequently being more inclined to reciprocate to the experimenter. However, to control for the potential effects of this variation in the show-up fees between the two subject pools, a variable is included in the econometric analysis.
3. Although individuals bid for a homegrown value good, revenues to be donated to the charity exhibit characteristics of a public good.
4. Warm glow is a component of the total economic value people attach to a good and therefore the demand-revealing properties of the fourth-price Vickrey auction are not affected when a charitable auction is applied.
5. Although we frame our hypothesis as an examination of whether subjects experience warm glow from donating to a charity we are not excluding the probability of cold-glow, i.e., subjects biding less if the revenue is to be donated to charity.
6. Since no interaction was allowed between individuals, having two confused subjects in a session is not expected to have affected the bidding behaviour of the other subjects or bias the results of the session when excluding them from the analysis. From the point of incentive compatibility of the auction bidders should submit a bid equal to their true value even if other subjects don't.
7. Subjects submitted only 28 zero bids out of 475 bids in total (95 subjects x 5 rounds), indicating that censoring is not likely to be an issue with our data, thus we didn't pursue estimating a censored regression model.

8. A likelihood ratio test indicates that the model with the interaction term fits the data significantly better than the model without the interaction term ($LR\chi^2 = 11.99$, p-value=0.00). We fitted the model with maximum likelihood to be able to perform the test. Result tables present standard GLS regressions.
9. For the *Student* variable this would be:

$$\frac{\partial Bid}{\partial Student} = b_2 + b_3 Charity \tag{2}$$

Expression (2)**Error! Reference source not found.** can then be evaluated as:

$$\left.\frac{\partial Bid}{\partial Student}\right|_{Charity=1} = b_2 + b_3 \quad \text{and} \quad \left.\frac{\partial Bid}{\partial Student}\right|_{Charity=0} = b_2 \tag{3}$$

Similarly for the *Charity* variable we have:

$$\left.\frac{\partial Bid}{\partial Charity}\right|_{Student=1} = b_1 + b_3 \quad \text{and} \quad \left.\frac{\partial Bid}{\partial Charity}\right|_{Student=0} = b_1 \tag{4}$$

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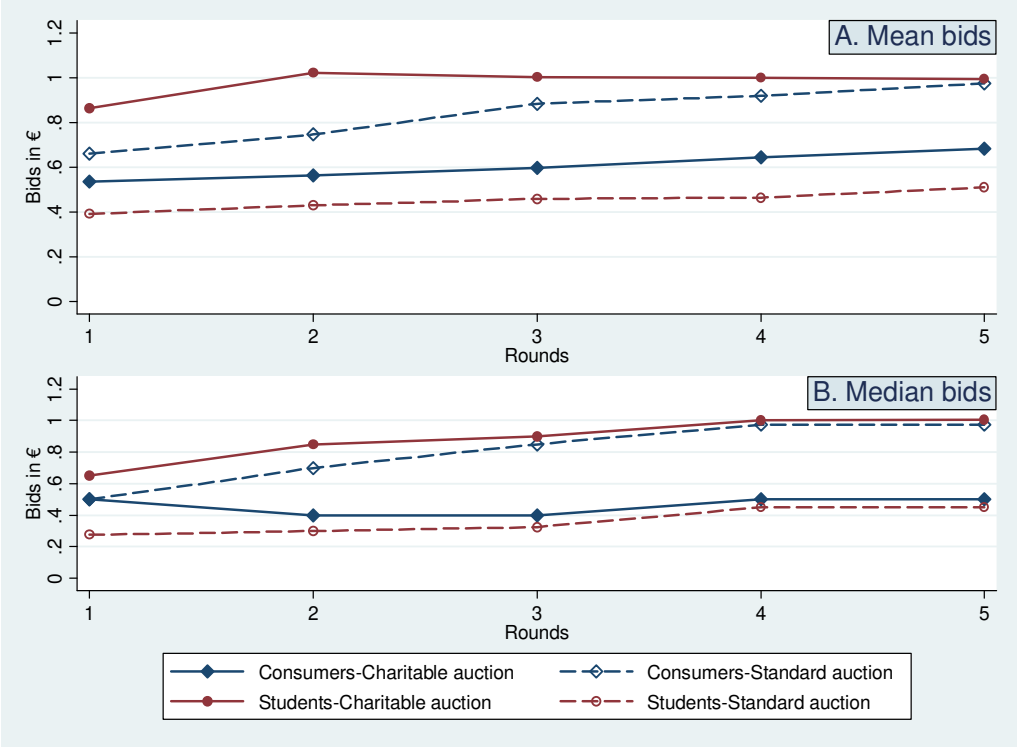
Figures

Figure 1. Mean and median bids across rounds



Tables

Table 1. Experimental Design and Number of Subjects by Session

	Students	***Consumers***
Charitable auction Treatment	18	29[a]
Non-charity (standard auction) Treatment	18	32[b]

[a]15 in the first session and 14 in the second session since two charitable treatments were ran with consumers. Two subjects (one per session) were dropped from all subsequent analysis.

[b]16 in the first session and 16 in the second session since two non-charitable treatments were ran with consumers.

Table 2. Variables Description

Variable	Variable description	Students		Consumers	
		Mean	**SD**	**Mean**	**SD**
Bid	Bid to exchange product	0.626	0.628	0.604	0.589
Charity	Dummy, 1=Subject participated in the charitable auction	0.500	0.507	0.458	0.502
Students[a]	Dummy, 1=Subject is student	Mean: 0.379 SD: 0.488			
HealthRisk	Dummy, 1=Subject received additional health risk information regarding children	-	-	0.492	0.504
TotFee	Total money endowment (in euros)	16.917	0.806	22.805	1.531
T_i	Dummy, 1=Round *i* where *i*=1 to 5	0.2	0.4	0.2	0.4
Age	Subject's age	20.972	1.665	41.508	9.839
Gender	Dummy, 1=male	0.389	0.494	0.305	0.464
Income	Dummy, 1=Subject's household economic position is above average	0.361	0.487	0.475	0.504
Kids	Dummy, 1=Subject has kids under 18 years old	-	-	0.339	0.477
Educ	Dummy, 1= subject is 4th year student or higher (for the student subject pool)	0.306	0.467	-	-
	Dummy, 1=Subject has a university diploma[b] (for the consumers subject pool)	-	-	0.610	0.492

DangerA[c]	Dummy, 1=Subject perceives consumption of agricultural products from region A as being dangerous to her health	0.611	0.494	0.864	0.345
NotDangerB[c]	Dummy, 1=Subject perceives consumption of agricultural products from region B not being dangerous to her health	0.805	0.401	0.830	0.378
PotatoConsumption$_1$[d]	Dummy, 1=Subject consumes potatoes 1-2 times/month or less	0.083	0.280	0.153	0.363
PotatoConsumption$_2$	Dummy, 1=Subject consumes potatoes 1 time/week	0.222	0.421	0.186	0.393
PotatoConsumption$_3$	Dummy, 1=Subject consumes potatoes 2-3 times/week	0.527	0.506	0.441	0.501
PotatoConsumption$_4$	Dummy, 1=Subject consumes potatoes 4-5 times/week or more often	0.166	0.378	0.220	0.418

[a] Only applicable to the pooled model.

[b]This is the definition used in the pooled model as well.

[c]These were measured on 7-point Likert scales and were dummy coded for the analysis

[d]Excluded from estimations to avoid perfect multi-collinearity

Table 3. Results from Random Effects Regression Models

		Pooled sample		Consumer subject pool		Student subject pool	
		Coef.	**Std.Error**	**Coef.**	**Std.Error**	**Coef.**	**Std.Error**
Constant		2.329**	1.087	1.769	1.267	4.677**	1.854
Charity	*Student=1*	0.443**	0.172	-0.251	0.155	0.441***	0.138
	Student=0	-0.297**	0.139				
Students	*Charity=1*	-0.157	0.357	-	-	-	-
	Charity=0	-0.897**	0.372				
HealthRisk		-0.148	0.137	-0.208	0.148	-	-
TotFee		-0.098**	0.042	-0.073	0.050	-0.207**	0.098
T_2		0.074***	0.027	0.058*	0.033	0.098**	0.046
T_3		0.131***	0.027	0.149***	0.033	0.103**	0.046
T_4		0.157***	0.027	0.189***	0.033	0.104**	0.046
T_5		0.194***	0.027	0.236***	0.033	0.125***	0.046
Age		0.003	0.007	0.005	0.008	-0.083	0.060
Gender		-0.159	0.113	-0.094	0.171	-0.243*	0.146
$Income_2$		0.182*	0.107	0.235	0.146	0.033	0.146
$Educ_2$		-0.037	0.142	0.007	0.155	0.216	0.209
Kids		-	-	-0.068	0.168	-	-
DangerA		0.238*	0.137	0.079	0.236	0.404***	0.137
NotDangerB		0.388***	0.143	0.436**	0.209	0.429**	0.174
$PotatoConsumption._2$		0.386**	0.195	0.392	0.275	0.512*	0.277

PotatoConsumption$_3$	-0.024	0.176	-0.170	0.241	0.356	0.243
PotatoConsumption$_4$	0.126	0.192	-0.004	0.251	0.656**	0.303
R-squared	0.288		0.278		0.550	

Note: ***, **, * = Significance at 1%, 5%, 10% level respectively.

This table presents several conditional marginal effects. For example, "*Charity*, *Student*=1" refers to the effect of *Charity conditional* on *Student* taking the value of 1. In other words, "*Charity, Student* =1" captures the difference between the charitable and non-charitable auction treatments for the student subject pool. Likewise, "*Student*, *Charity*=1" refers to the difference between the student and consumer subject pool in the charitable auction treatments.

Appendix

A. Environmental Health Risk information

Environmental profile of region A

Region A is characterized by intensive industrial activity, with many of the industries not fulfilling the safety standards, and intensive agricultural activity. Underground water analysis has revealed the presence of heavy metals, such as chromium and nickel, which **may** have contaminated plants through irrigation. The severity of these substances for human health depends on the **degree** and the **duration** of the **exposure**. However, an epidemiological study assessing accurately the risks for human health from the consumption of agricultural products from region A, **has not been performed yet**. In addition, with respect to potatoes heavy metals tend to accumulate in the skin of potatoes and not in the interion that is commonly consumed.

Environmental profile of region B

Region B is classified as in **good ecological** status, according to the European Water Framework Directive. The good ecological status guarantees that pollution loads are **minor** such that there is no risk for human health and aquatic life. The agricultural sector follows **good agricultural and environmental practices** and there is no industrial activity in the area. Measurements in potatoes from the area revealed that the accumulation in heavy metals is far below the international safety levels.

B. Environmental Organizations

1. ARCTUROS

ARCTUROS is an Environmental, Non Governmental, non profit organization that was founded in 1992 for the protection and management of wildlife and natural environment. To achieve its goals the organization is undertaking field activities, conducting scientific research, awareness campaigns, environmental training, promoting volunteerism for the protection of wildlife and the empowerment of biodiversity and sustainability in [country removed for peer review]and abroad.

2. MOM

MOM, is a non-profit non-governmental organisation (NGO) the Study and Protection of the Monk Seal that is supported by more than 6,500 members in [removed for peer review] and internationally. Its activities target the conservation of the critically endangered marine mammal, the Mediterranean Monk Seal Monachus monachus and its marine and coastal habitats.

3. PELAGOS

The Pelagos Cetacean Research Institute is a scientific, non-profit and non-governmental organization that works for the development of cetacean research aiming at the conservation of dolphins, whales, seals and their natural habitat in [country removed for peer review]and the Mediterranean Sea.

4. Plant-a-Tree.gr

Plant-a-Tree.gr is a young company that provides tree planting and envisages the raising of environmental awareness of [removed for peer review], being people, unions, or industries, towards initiatives that will 'green' their city.

5. WWF

WWF [country removed for peer review] is part of the international WWF family, which consists of 50 National Organizations and works for the protection of the environment in more than 100 countries. WWF's mission is to conserve the rich biodiversity of [country removed for peer review], to prevent and eventually to reverse environmental degradation, seeking the harmonious coexistence of humans with nature.

6. MEDITERRANEAN SOS Network

MEDITERRANEAN SOS Network is an environmental and social Non-Governmental Organisation (NGO) of non-profit character. The Network is active since 1990 for the protection of the natural and cultural wealth of the Mediterranean, paying particular attention to the protection of coasts and the sea and their sustainable management, the protection of bio-diversity, sustainable management of energy, water resources and waste, protection of global climate and last but not least diminishing the nuclear threat.