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Isolating Warm Glow in Charitable Auction Giving

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Abstract

We use a novel experimental design to isolate warm glow and measure its extent in an auction that contributes the revenues by highest bidders to a charity. A sample of consumers bid to upgrade an agricultural product from a river basin that is not in good ecological status. Charitable donations are crowded-out, one to one, by a reduction in the experimenters' contribution to the charity allowing warm glow to be isolated. Results suggest that subjects do not bid higher in the charitable auction compared to the standard auction (control) treatment therefore providing no evidence of warm glow motivations behind giving.

Keywords: warm glow, charitable auctions, lab experiment.

JEL codes: D44, D64, C91

1. Introduction

Auctions have long been used as fundraising mechanisms for charities with charitable giving through auctions estimated at \$xxx in 2010 (Elfenbein and McManus, 2007). Given the size of the philanthropy market, much research has been devoted in examining the fund raising properties of different auction mechanisms (see Carpenter et al. 2008 for a review). Nevertheless, little is known about the incentives behind charitable giving although a better understanding of bidders' motives as well as the impact on the revenues of a charity can be important for charities to inform their fundraising strategy.

A particularly important issue that has received little attention in the empirical literature is disentangling warm glow from pure altruistic motives. Bidders with warm glow incentives (pure egoists) will participate in the auction since they derive utility from the act of giving, like from any other private good (Andreoni 1989). A pure altruist, on the contrary, is only concerned with the level of provision of a public good with the aim to increase the benefit for the beneficiaries of the donation, irrespective of the method that this is financed. Gaining insights on the extent of each motivation is important for the charities and non-profit organisations to decide on the most effective donation type. A fixed donation type where a predetermined amount of the total revenues is donated to the charity may be effective with bidders exhibiting warm glow incentives but will raise no extra revenues, compared to a non-charity auction, in the absence of warm glow. Warm glow motivations thus deserve more attention.

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 (see Andreoni (2006) for a detailed review of the relevant literature). Nunes and Schokkaert (2003) confirmed the presence of warm glow incentives behind Willingness to Pay (WTP) in contingent valuation studies using a list of attitudinal statements. Furthermore, there is now neural evidence supporting the existence of warm glow motivations. Harbaugh et al. (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 experiments. 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 or be a mixture of the two. To address this issue, Crumpler and Grossman (2008) developed a novel 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. 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, as refined by Tonin and Vlassopoulos (2011), to isolate and measure warm glow considerations in a charitable auction. We elicit valuations for home-grown value goods under two treatments; a control auction treatment with the experimenter being the recipient of the auction's revenues and a charitable auction treatment that donates the sum of revenues by highest bidders to a charity of participants' choice. The chosen charity received a fixed amount and contributions by auction winners crowded-out one-for-one experimenter's contribution. We then compare the bidding behaviour between treatments to examine the existence of a charity premium that is not confounded with altruistic feeling for the experimenter. Comparing results from the charitable auction to results from the standard auction (control) treatments, we do not find support for the warm glow theory. A similar result is reported by Leszczyc and Rothkopf (2010). Authors apply a series of charity and non-charity auctions to disentangle the motives behind giving and find no significant difference in either bidder entry rates or prices in auctions with fixed donations to charity. Their results thus point against the existence of warm glow preferences. It should however be noted that under the Leszczyc and Rothkopf design, the fixed amount to be donated to the charity is not guaranteed by the experimenters therefore altruists may still have incentive to participate in the fixed donation auction since the donation of the fixed amount is contingent to some revenues being generated in the experiment.

If the empirical finding of no warm glow can be verified by future research, there are important implications for charities with respect to their choice of the donation type. In the absence of warm glow incentives, auctions that donate a high percentage of the ending price to the charity may be more effective as opposed to auctions where a fixed amount of the price is donated as is the case in our experiment.

2. Experimental Design

The laboratory experiment was conducted in an experimental economics lab in Agricultural University of Athens using the z-Tree software (Fischbacher, 2007). A random sample of the population of the city of Athens was drawn. The only requirement was that subjects were responsible for grocery shopping for their household; this resulted in an over-representation of women in our sample since females are primarily responsible for the grocery shopping choices of the household. Recruitment was undertaken by a professional research company.

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 sessions¹ (two sessions per treatment) were

¹In two of the sessions, subjects were given additional information on the higher health risk to which children are exposed, given their longer time span, when

conducted with a total of 61 consumers. 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 Table 2 the number of subjects that participated in each of the auction treatments.

[Table 1 around here]

[Table 2 around here]

We used the same proctor (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 3 displays the socioeconomic characteristics of the subjects.

[Table 3 around here]

2.1 The training phase

consuming contaminated agricultural products. The aim of these two sessions was to examine whether subjects respond differently when provided with this extra information. Results of this analysis will be reported elsewhere. 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 4).

After arriving at the lab, subjects were randomly assigned to a computer. A computer-training phase was conducted for subjects 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. This amount ranged between €0.5 and €5. Participation fees were fixed to 20€. 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. A short computerized test regarding the procedure followed. The monitor explained the correct answers afterwards.

Subjects, then, bid in three hypothetical (*practice*) auction rounds for a bag of potato chips. The monitor emphasized that these rounds were hypothetical. A screen displayed subjects' hypothetical earnings after these rounds.

To get fully familiarized with the auction mechanism and procedures, subjects then bid in three real (*practice*) 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. One round was randomly chosen as binding at the end of these rounds. A screen displayed subjects' earnings after these rounds. The training phase, including both hypothetical and real training auction rounds, preceded the actual auction in all treatments. No reference to the charitable giving phase was made during training.

2.2 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 (see Appendix). The charity selected by the majority was revealed only after the auction phase was through. We selected charities with high fundraising performance from all socio-demographic backgrounds to ensure that they are popular among the general public. The most popular environmental charities in Greece were thus included in the charities list.

2.3 The auction phase

This experiment is part of a greater project aiming to value the total economic cost associated with water quality degradation in the Asopos river basin in Greece and inform the implementation of the EU Water Framework Directive. Health risks due to high concentration of heavy metals, mainly Hexavalent Chromium, in the aquifer and surface waters in the area constitute a significant economic cost limiting the ability of farmers to market their products. This cost should be internalised in any policy response aiming full cost-recovery according to the polluters-pay principle that the Directive introduces. This experiment thus also has a strong policy component, that is to elicit consumers WTP to hedge against health risks associated with consumption of agricultural products cultivated in areas ‘not in good ecological status’ (according to the Directive’s terminology) such as the Asopos river basin. This need for the results to feedback in policy design dictated the choice of the product to be auctioned.

In the auction phase subjects were endowed with one kilo of potatoes cultivated at the Asopos river basin district². 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 that resembled the characteristics of the Asopos area (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

² There are no *a priori* reasons to expect results with respect to the presence of warm glow to be sensitive to the choice of the auctioned product.

risks for human health could not be assessed since the epidemiological study in the area of origin was not completed. The text 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 n th-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 n th 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. The socio-economic background of the subjects was elicited in the final phase.

3. Isolation of warm glow incentives and research hypotheses

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

To disentangle motivations behind giving and provide a measure of the extent of warm glow for the charities, we adopted the design proposed by Crumpler and Grossman (2008) as further refined by Tonin and Vlassopoulos (2010). Participants' donations crowded out one-to-one experimenter's contribution keeping the total donation to the charity constant at €30. Subjects were informed 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. Since the amount the charity would receive was present, pure altruism would result in equal contributions between subjects participating in charitable auction sessions and the control group participating in standard auction sessions. Only in the presence of warm glow incentives toward the charity, would subjects in the charitable auction sessions bid higher than the control group.

Formally, drawing and modifying from the original work of Andreoni (1989), the utility function of a pure altruist is $U_{\text{pure altruist}} = u(x_{\text{pure altruist}}, Y)$, with $x_{\text{pure altruist}}$ denoting individual's consumption of the private good x , and Y being the total supply of the public good as follows: $Y = G_{\text{others}} + g_{\text{pure altruist}}$, where G_{others} is the contributions of all other individuals to the public good and $g_{\text{pure altruist}}$ 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: $U_{\text{egoist}} = u(x_{\text{egoist}}, g_{\text{egoist}})$.

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, higher average bids in the charitable auction treatment are evidence of warm glow.

Tonin and Vlassopoulos (2010) found that altruistic feelings resulting from reciprocity, pure altruism, or warm glow towards the experimenter, is a confounding factor of warm glow measurement under the Crumpler and Grossman (2008) design. The level of warm glow is thus likely to be overestimated. To provide a lower bound of warm glow, Tonin and Vlassopoulos (2010) measured warm glow only for those individuals (unreciprocals) that were giving positively in the charity treatment but made no donation when the experimenter was the recipient of the money in the dictator game (control treatment). By having a control treatment with the experimenter being the recipient of the auction's revenues (standard auction procedure), we follow a similar approach. We expect experimenter biases, resulting

from individuals being willing to reduce the financial burden on the experimenter, to be equal in the control and charitable treatments and thus to cancel out when differences in bidding between treatments are examined³. This is so since subjects' behaviour has identical impact on experimenter's cost in both treatments. In control sessions, subjects' giving reduces the financial cost on the experimenter which in this case is payment of the participation fees. Similarly, in the charitable auction subjects' giving reduces experimenter's cost, now being the sum of participation fees and fixed contribution to the charity.

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?”

³ It should be noted that by examining the difference in giving between standard and charitable treatments, apart from components of giving due to reciprocity and altruism toward the experimenter, the component of giving due to warm glow for the experimenter will also be removed. Therefore, a lower bound of the total warm glow, or only the warm glow toward the charities, is being isolated and measured with our design.

Subjects that failed to answer two or more questions were dropped from the subsequent analysis which resulted in dismissing observations from two individuals⁴.

4. 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.

4.1 Descriptive analysis

We first investigate whether charitable auctions resulted in increased numbers of bidders entering the auction procedure. In the presence of warm glow incentives one would expect more bidders engaging in the auction. Comparing the percentage of zero bidders among charitable and no-charitable auctions the null of no difference cannot be rejected (P-value). We then turn our attention to the mean bids in charitable and non-charitable auctions.

⁴ Since no interaction was allowed between individuals, having a confused subject 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 her from the analysis.

Fig. 1 shows mean and median bids across rounds, by treatment. 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. Contrary to predictions of the warm glow theory, raw data suggest that when subjects are aware that their contribution is crowded out by reduced giving by the proctor they tend to bid on average less than the control group. A Wilcoxon/Mann-Whitney test shows that differences in bids between charitable and standard auction treatments are not significantly different for the consumer subject pool at the 5% level.

[Figure 1 around here]

4.2 Econometric analysis

To account for the panel nature of our data, we estimate random effects regression models. Given that subjects submitted only 16 zero bids out of 295 bids in total (59 subjects x 5 rounds), censoring is not likely to be an issue with our data. We therefore didn't pursue estimating a censored regression model. Variables in the regression function are explained in Table 3. We estimate models with and without demographics and we find that results remain robust. In addition to the treatment variables, in the demographics model we assume bidding behaviour to be affected by 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. We also include round dummies in the regression to account for learning effects.

[Table 4 around here]

Regression coefficients confirm the main findings of the unconditional analysis. Subjects in the charitable auction sessions bid on average €0.25 less than subjects in the standard auctions, reinforcing the picture of figure 1. Note that the coefficient is not significant (p-value=0.106). Results therefore do not provide evidence in support of the warm glow theory.

Bidders receive no additional utility from the act of giving. Our result thus suggests that auction with a fixed donation to a charity aiming to appeal to warm glow bidders may not be an efficient mechanism in raising additional funds.

Other effects in Table 4 are not substantial in terms of economic significance with the exception of the risk from region B dummy (*NotDangerB*). As expected, subjects that perceived region B as posing no health risk bid more to exchange their endowed products.

From a policy perspective, results suggest that subjects are willing to pay to upgrade their agricultural endowment and hedge against potential health risks due to heavy metal contamination. Our result confirms earlier studies reporting significant premiums for food safety (Hayes et al., 1995; Mørkbak et al., 2010; Carlsson et al., 2007; Chang and Lusk, 2009; Loureiro and Umberger, 2007; Burton et al., 2001; Enneking et al., 2004 among many others) and in particular for products with certified heavy metal concentrations within the public health safety standards (Rozan et al., 2004). We observe that 86% of subjects perceive health risks entailed in the consumption of potatoes from region A (Table 3). Mean bid is 60 cents per kilo of potatoes. This in turn suggests that there is a real cost for agriculture in areas not in good ecological status which justifies the adoption of compensation schemes according to the polluter pays principle as the Water Framework Directive suggests.

5. Conclusions

Understanding the motives behind charitable auction giving is crucial for marketers and policy makers alike, especially since donations are increasingly rising over the last decades (Konow, 2010). Pure altruism and warm glow have been identified as the two intrinsic drivers. However, disentangling them and measuring their extent is often problematic, albeit significant to inform the design of effective fund raising strategies. This study contributes to the literature studying the underlying motives for giving using a novel experimental design that allows warm glow to be isolated and measured. We compare bidding behaviour in a standard auction and a charitable auction where the sum of revenues from the higher bidders is donated to an environmental charity of the subjects' choice. Donations are crowded-out one-for-one by reduced giving by the proctor. Under this design, only in the presence of warm glow motives, i.e., subjects deriving utility from the act of giving *per se*, should bids in the charitable auction be higher. We use a fourth price auction mechanism with a sample of consumers bidding to upgrade an initial endowment of potentially unsafe agricultural products.

Results do not support the presence of warm glow motives behind charitable giving. Subjects were not bidding more in an auction that contributed the sum of revenues by highest bidders to a charity compared to a control group that was bidding in a standard auction. Therefore, evidence in this study contradicts results in Crumpler and Grossman (2008) and Tonin and Vlassopoulos (2010) who, employing the same design, find significant warm glow in dictator games. The extent to which this can be attributed to the different mechanism (auction vs dictator game) or the use of subjects from the general population instead of students is a question for further investigation.

Leszczyc and Rothkopf (2010) report a similar result of no difference in the amount raised in a non-charity auction and in an auction where a fixed amount was donated to a charity. This evidence seems to point against the use of charity actions that keep the amount of donation constant. However, the nature of our experiment does not allow us to make any judgement as to whether an ascending auction where a percentage of the total revenues is donated is more effective.

It should also be noted that the existing empirical evidence is limited and there is clearly scope for more investigation before firm conclusions can be claimed. Future research should investigate whether our result is contingent to the nature of the auctioned good and the relative small stakes compared to subjects' income that the experiment involved, the proposed charities or the properties of the auction mechanism.

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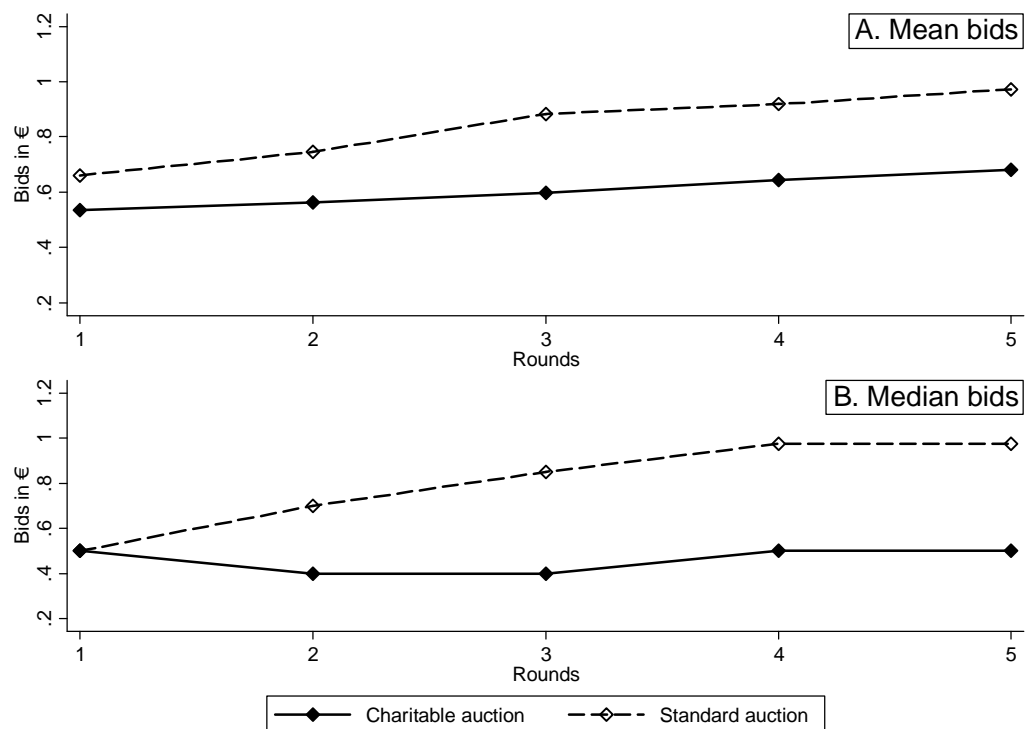
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7. Figure captions

Figure 1. Mean and median bids across rounds



8. Tables

Table 1. Experimental design

| Phase | Product | Rounds | Number of real binding transactions |
|-----------------|-------------------------------|---------------|--|
| Practice | Bag of potato chips | 3 | None |
| Practice | Bar of chocolate | 3 | 1 |
| Auction | Bag of potatoes from region B | 5 | 1 |

Table 2. Number of Subjects by Session in the Auction Phase

| | <i>Session 1</i> | <i>Session 2</i> |
|---|------------------|------------------|
| <i>Charitable auction Treatment</i> | 15 ^a | 14 ^a |
| <i>Non-charity (standard auction) Treatment</i> | 16 | 16 |

^aTwo subjects (one per session) were dropped from all subsequent analysis.

Table 3 Socio-economic characteristics of the sample and variables description

| Variable | Variable description | Mean | SD |
|----------------------------|--|-------------|-----------|
| <i>Bid</i> | Bid to exchange product | 0.604 | 0.589 |
| <i>Charity</i> | Dummy, 1=Subject participated in the charitable auction | 0.458 | 0.502 |
| <i>HealthRisk</i> | Dummy, 1=Subject received additional health risk information regarding children | 0.492 | 0.504 |
| <i>TotFee</i> | Total money endowment (in euros) | 22.805 | 1.531 |
| <i>T_i</i> | Dummy, 1=Round <i>i</i> where <i>i</i> =1 to 5 | 0.2 | 0.4 |
| <i>Age</i> | Subject's age | 41.508 | 9.839 |
| <i>Gender</i> | Dummy, 1=male | 0.305 | 0.464 |
| <i>Income</i> | Dummy, 1=Subject's household economic position is above average | 0.475 | 0.504 |
| <i>Kids</i> | Dummy, 1=Subject has kids under 18 years old | 0.339 | 0.477 |
| <i>Educ</i> | Dummy, 1=Subject has a university diploma | 0.610 | 0.492 |
| <i>DangerA^a</i> | Dummy, 1=Subject perceives consumption of agricultural products from region A as being dangerous to her health | 0.864 | 0.345 |

| | | | |
|--|---|-------|-------|
| <i>NotDangerB^a</i> | Dummy, 1=Subject perceives consumption of agricultural products from region B not being dangerous to her health | 0.830 | 0.378 |
| <i>PotatoConsumption₁^b</i> | Dummy, 1=Subject consumes potatoes 1-2 times/month or less | 0.153 | 0.363 |
| <i>PotatoConsumption₂</i> | Dummy, 1=Subject consumes potatoes 1 time/week | 0.186 | 0.393 |
| <i>PotatoConsumption₃</i> | Dummy, 1=Subject consumes potatoes 2-3 times/week | 0.441 | 0.501 |
| <i>PotatoConsumption₄</i> | Dummy, 1=Subject consumes potatoes 4-5 times/week or more often | 0.220 | 0.418 |

^aThese were measured on 7-point Likert scales and were dummy coded for the analysis

^bExcluded from estimations to avoid perfect multi-collinearity

Table 4 Results from Random Effects Regression Model

| | Coef. | Std.Error |
|----------------------|--------------|------------------|
| <i>Constant</i> | 1.769 | 1.267 |
| <i>Charity</i> | -0.251 | 0.155 |
| <i>HealthRisk</i> | -0.208 | 0.148 |
| <i>TotFee</i> | -0.073 | 0.050 |
| <i>T₂</i> | 0.058* | 0.033 |
| <i>T₃</i> | 0.149*** | 0.033 |
| <i>T₄</i> | 0.189*** | 0.033 |

| | | |
|---------------------------------------|----------|-------|
| <i>T</i> ₅ | 0.236*** | 0.033 |
| <i>Age</i> | 0.005 | 0.008 |
| <i>Gender</i> | -0.094 | 0.171 |
| <i>Income</i> ₂ | 0.235 | 0.146 |
| <i>Educ</i> ₂ | 0.007 | 0.155 |
| <i>Kids</i> | -0.068 | 0.168 |
| <i>DangerA</i> | 0.079 | 0.236 |
| <i>NotDangerB</i> | 0.436** | 0.209 |
| <i>PotatoConsumption</i> ₂ | 0.392 | 0.275 |
| <i>PotatoConsumption</i> ₃ | -0.170 | 0.241 |
| <i>PotatoConsumption</i> ₄ | -0.004 | 0.251 |
| R-squared | | 0.278 |

Note: ***, **, * denote significance at 1%, 5%, 10% level respectively

9. Appendix

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 interior 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.

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 Greece 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 Greece 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 Greece 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 people, unions, or industries, towards initiatives that will 'green' their city.

5. WWF

WWF Greece 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 Greece, 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.