Testing for Heterogeneity of Preferences in Randomized Experiments: A Satisfaction-Based Approach Applied to Multiplayer Prisoners' Dilemmas.

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Abstract

We use experimental data from the "vote with the wallet" multiplayer prisoner's dilemma to investigate with a finite mixture approach the effect of a responsible purchase on players' satisfaction. We find clear-cut evidence of heterogeneity of preferences with two groups of players that differ significantly in terms of effects of the responsible choice on satisfaction.

Keywords: randomized experiment, multiplayer prisoners' dilemma, mixture models, satisfaction.
JEL Classification: C92, D03, D12, D60, D71

1 Introduction

Heterogeneity of preferences is a research frontier that may contribute to explain behavioral anomalies in experimental games. Erlei (2004) sketches a model with heterogeneous players and documents how his model has higher predictive accuracy than homogeneous preference models when applied to 43 different games. Rotemberg (2008) shows that heterogeneous agents help to explain anomalies observed in ultimatum and dictator games. However, these important contributions do not prove definitively the existence of heterogeneity since we cannot exclude in principle the emergence of models with homogeneous preferences that can explain better the same experimental results. Given the *lex parsimoniae* of the Occam's razor – a strong argument for simplicity in scientific models – the existence of heterogeneous preferences can be supported by demonstrating that heterogeneity actually exists in observed experimental behaviour.

Our contribution pursuits this goal and develops a methodological approach aimed at testing for heterogeneity in three steps: i) collecting information on satisfaction about

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the game and about other players' behaviour in randomised experiments; ii) testing with a mixture model for the presence of significantly different effects of experimental variables on players' satisfaction; iii) validating the identified groups with heterogeneous reactions by testing whether their observed behaviour in the game is actually different. This approach is very general and can be potentially replicated in all experiments.

From a methodological point of view our contribution provides three main innovations in the literature. First, we measure players' satisfaction about the experiment at each round. Second, we apply a finite mixture model (FMM) to satisfaction data to test for heterogeneity. Third, we deal with a game that is original and related to a phenomenon of growing relevance. Due to the widespread diffusion of corporate social responsibility by which corporations retail bundles of private and public goods (Besley and Ghatak, 2007), millions of consumers choose everyday between a conventional product and a product of equivalent quality which is advertised as containing higher environmental and/or social value. The second product generally costs more but its purchase contributes to a public good generating positive externalities on all other consumers. We model such choice as a multiplayer prisoner's dilemma. Even though we make explicit reference to the vote with the wallet problem our results remain valid for the broader class of hybrid provision-PD games where both the classical cooperation and defection strategies require an action (Arce and Sandler, 2005).

2 The Model

Our theoretical benchmark is the Vote-with-the-Wallet game (Becchetti and Salustri, 2015). In its multiplayer version n players choose between a responsible good (good R) and a conventional good (good C). Good R has a higher price than good C but whenever a single player chooses it, a positive externality is generated on all other players. Good C is cheaper and produces no externalities. The game is represented by $\Gamma_{n,a_\theta,b,c} = \left(N, (A^i)_{i\in N}, (U^i)_{i\in N}\right)$ where $N = \{1, \ldots, n\}$ is the set of players, $A^i = \{R, C\}$ is the set of strategies $\forall i \in N$, and the utility of player i is

$$U^i(S^i, S^{-i}) = \begin{cases} \frac{k+1}{n}b + a_\theta - c & \text{if } S^i = R \\ \frac{k}{n}b & \text{if } S^i = C \end{cases}$$

with k being the number of buyers of good R in the sequence of other players' actions S^{-i} and $\theta \in \{L, H\}$ the subject's type.

The three parameters of the game are the positive externality ($b \geq 0$) accruing from the purchase of good R, weighted for the share of buyers of the same good; the social preference ($a_\theta \geq 0$) enjoyed by buyers of good R; and the price differential ($c \geq 0$) between good R and good C. The Nash equilibrium (NE) of $\Gamma_{n,a_\theta,b,c}$ is mutual conventional purchase (*i.e.*, all players choose C) if $a_\theta < c - \frac{1}{n}b$ for each type θ and mutual responsible purchase (*i.e.*, all players choose R) otherwise. If $c - b < a_\theta < c - \frac{1}{n}b$ we have a prisoner's dilemma since the (unique) NE (*i.e.*, mutual conventional purchase) is Pareto dominated by the mutual responsible purchase strategy that yields the highest

payoff for both players.

In order to identify characteristics of players in the game we rely on a mixture model assuming that individuals are heterogeneous in terms of impact of their cooperative choice on satisfaction about the game ($GameSat$) and about other players' behaviour in the game ($OtherSat$).[1] More specifically, we assume the existence of players with low and high social preferences (a_L and a_H, respectively) and model $GameSat$ as resulting from a mixture of two normal distributions, $N(\mu_L(\mathbf{x}), \sigma_L^2)$ and $N(\mu_H(\mathbf{x}), \sigma_H^2)$ for type-L and type-H individuals with individual covariates $\mathbf{x}$, respectively. We assume that the proportion of the type-L population is p_L and the proportion of the type-H population is $p_H = 1 - p_L$, and the density associated with a given value of satisfaction conditional on the individual i being of type θ is

$$f(y_i \mid \theta, \mathbf{x}_i) = \frac{1}{\sigma_\theta}\phi\Big(\frac{y_i - \mu_\theta(\mathbf{x}_i)}{\sigma_\theta}\Big).$$

3 The Experiment Design

Our experiment consists of 18 sessions, each of them composed by 20 periods. In each session a group of 10 participants chooses every period between good R, which costs 10 ECUs, and good C, which costs 5 ECUs (1 ECU = €0.5). For each buyer of good R, 3 ECUs are given to all participants as monetary equivalent of the positive externality arising from consumption of that good. Each participant receives an initial endowment of 20 ECUs in each period, and during the experiment she sequentially: i) declares how many participants she expects will buy good R; ii) chooses the good to buy; iii) is informed about the number of buyers of good R in that period; iv) declares her satisfaction about the game and the other participants' behaviour on a 0-10 scale for the same period. We implement three different versions of the game: in the *Baseline* version the experiment is performed as described above; in the *Framed* version good R is described as a product that has been awarded by the Italian Competition Authority with a 3-star legality ranking; in the *Conformity* version each player in sessions 7-9 (10-12) is informed about the average number of buyers of good R in sessions 13-15 (16-18) for the respective period. The Conformity version allows us to test for differences between conformity and conditional cooperation. In addition, each version is implemented for ten consecutive periods (either the first 10 or the last 10) with a *Redistribution* mechanism collecting 1 ECU from each buyer of good C and equally sharing what collected among buyers of good R. All details are provided in Appendix B.

[1] $GameSat$ is measured by asking to participants at the end of each period the question "On a scale from 0 to 10, please indicate your level of satisfaction about the experience of the game" and $OtherSat$ by asking the question "On a scale from 0 to 10, please indicate your level of satisfaction about other players' behaviour in the game".

4 Econometric analysis

Our specification is

$$\begin{aligned} GameSat_{i,T} &= \alpha + \beta GoodR_{i,T} + \gamma NRespBuyers_T \\ &\quad + \sum_j \delta_j D.Treatment_j + \sum_k \zeta_k SocioDem_{i,k} + \varepsilon_{i,T} \end{aligned}$$

where $GameSat_{i,T}$ is the average satisfaction about the game measured for each individual i over the 10 periods of treatment T. Our main regressor is $GoodR_{i,T}$, which represents the number of times the i-th individual buys good R over the 10 treatment periods. We also control for the average number of responsible buyers within treatment ($NRespBuyers_T$). $D.Treatment$ are dummies for the following treatment types: Baseline, Redistribution, Frame, Frame and Redistribution, Conformity, Conformity and Redistribution. Socio-demographic characteristics such as age, sex, parental job and education, and yearly income are also included as controls.

We adopt an individual-averaged approach by considering the average of all our variables by individuals over each treatment. Even though this approach reduces our observations to 360, individual averages are more reliable and less subjects to bias or possible measurement errors.

In order to test for heterogeneity in the effect of the responsible purchase on satisfaction about the game between type-L and type-H individuals, we test the following homogeneity hypothesis

$$\begin{aligned} H_0 &: \quad E[GameSat_{i,T} \,|\, i \in L] = E[GameSat_{i,T} \,|\, i \in H] \\ H_A &: \quad E[GameSat_{i,T} \,|\, i \in L] \neq E[GameSat_{i,T} \,|\, i \in H], \end{aligned}$$

where $E[\,\cdot \,|\, i \in \theta]$ is the conditional expected value given i being of type θ, for $\theta \in \{L, H\}$.

4.1 Empirical findings

The distribution of satisfaction about the game does not seem to derive from a unique homogeneous player type (Figure 1). We therefore perform a Finite Mixture two-group regression (FMM) and find that AIC, sample-adjusted BIC and log-likelihood criteria reveal superior goodness of fit than in OLS one-group estimate (Tables 1). In the estimate the choice of the "responsible" product R affects negatively satisfaction about the game for the first group, while it is weakly positive but not significant in the second group. T-stat shows that homogeneity of coefficients across the two groups is rejected (Table 1).

In Figures 2(a)–2(b) we show that the two groups have separate satisfaction distributions with the second group being significantly less satisfied.

When we look at determinants of the responsible choice we find that second group respondents buy significantly more the responsible product (Table 2). The interpretation of our findings is that type-L respondents are non-standard homines economici with utility depending on monetary payoffs of the game and on a low level of social prefer-

ences (*i.e.*, a_L) explaining the (weakly significant) positive effect of responsible choice on satisfaction. The utility of a second group of players can be written as

$$U^i(S^i, S^{-i}) = \begin{cases} \frac{E_L(j)}{n}\beta + a_L - c & \text{if } S^i = R \\ \frac{E_L(j)}{n}\beta & \text{if } S^i = C \end{cases} \quad (1)$$

where j is the number of buyers of good R in S^{-i}, a_L is the social preferences component, and $E_L(j)$ the expectation of type-L player on j.

We as well model first group respondents as "disappointed other-regarding individuals" that is, with higher social preferences (*i.e.*, $a_H > a_L$) and a disappointment effect proportional to the number of non cooperators conditional to the number of their responsible choices. They therefore choose significantly more to buy the responsible product but are at the same time disappointed by the behaviour of other players (Table 3).

In order to account for the paradox of type-H players we have two possible explanations. The first is that type-H players are other-regarding players with a pre-choice utility as in (1) and a post-choice utility

$$U^i(S^i, S^{-i}) = \begin{cases} \frac{E_H(j)}{n}\beta + \alpha_H - c - \phi(E_H(j) - j) & \text{if } S^i = R \\ \frac{E_H(j)}{n}\beta & \text{if } S^i = C \end{cases}$$

with social preferences a_H and a disappointment effect ϕ proportional to the error in their beliefs $E_H(j) - j$ (*ErrorBeliefs* in Table 1).[2]

The misalignment between pre- and post-choice utility occurs a sufficient number of times such that the number of cooperative choices of other regarding players is higher than that of homines economici (it does not need to occur for 10 periods but at least for a number of periods determining a difference in responsible choices between the two groups). The second is that type-H players are Kantian, that is, they comply to their inner duty of choosing the responsible product irrespective of the disappointment created.

5 Conclusions

Our paper illustrates a novel methodology that can be potentially applied to all experimental papers in order to test directly for the presence of heterogeneity. The methodology consists in collecting information on satisfaction about the game, estimating with a mixture model the determinants of such satisfaction and validating groups in terms of significant behavioral differences in observed choices. By applying it to a multiplayer prisoner's dilemma we find that players belong to two distinct groups that differ in terms of utility generated by the cooperative choice.

[2]Error in beliefs is measured as expectation on the number of buyers of good R minus the true number of buyers of good R.

References

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6 Tables and Figures

Figure 1: Histogram of Satisfaction

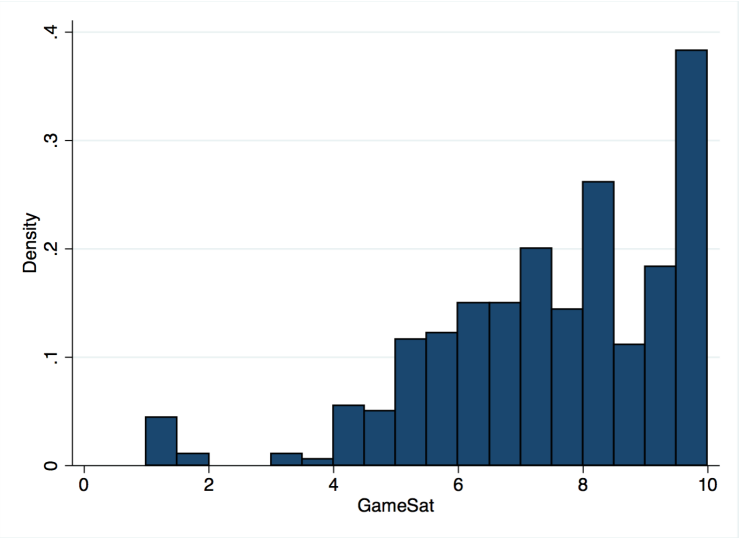
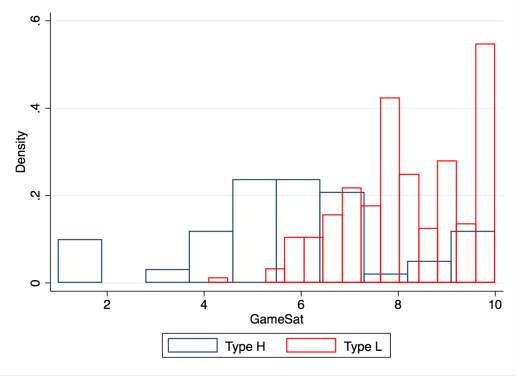
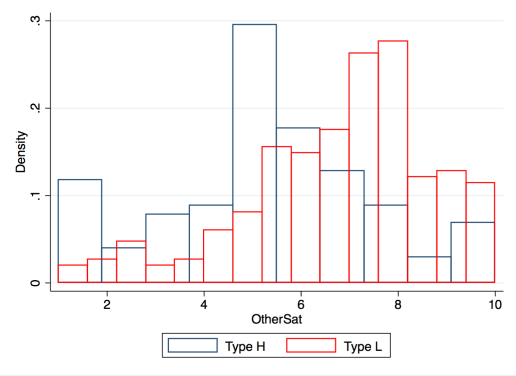


Figure 2: Histogram of Satisfaction by type



(a) GameSat



(b) OtherSat

Table 1: The impact of responsible purchase on satisfaction

Variables	OLS	FMM	
		Type H	Type L
Choice good R	-0.555	-2.128**	1.448*
	(0.519)	(0.894)	(0.797)
No. buyers good R	0.0572	0.274	-0.275
	(0.193)	(0.395)	(0.224)
Treatments	Yes	Yes	Yes
SocioDem	Yes	Yes	Yes
Constant	6.752***	7.406**	5.547***
	(1.614)	(3.045)	(2.134)
σ_θ		1.632	1.076
		(0.173)	(0.181)
p_θ		0.424	0.576
		(0.139)	(0.139)
Observations	360	360	360
R-squared	0.045		
Final class proportions (posterior probabilities)		0.424	0.576
Final class counts (posterior probabilities)		152.487	207.513
No. of subjects (most likely LC membership)		113	247
AIC	1538.833	1481.433	
Ss adjusted BIC	1552.39	1510.690	
Entropy		0.414	
# free parameters		41	
Log likelihood	-750.4163	-699.716	
$E[\text{GameSat}_L] - E[\text{GameSat}_H] \neq 0$		0.0004	
$E[\text{Beliefs}_L] - E[\text{Beliefs}_H] \neq 0$		0.0193	
$E[\text{ErrorBeliefs}_L] - E[\text{ErrorBeliefs}_H] \neq 0$		0.0004	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2: The impact of type on responsible choice (OLS).

Variables	OLS Choice good R
Previous no. buyers good R	0.104***
	(0.0314)
Type L	-0.132***
	(0.0405)
Treatments	Yes
SocioDem	Yes
Constant	0.165
	(0.240)
Observations	360
R-squared	0.168

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: The effect of type on satisfaction about other players' behaviour

VARIABLES	OLS OtherSat
Choose good R	-1.616***
	(0.461)
No. buyers good R	-0.0665
	(0.167)
Type L	1.313***
	(0.281)
Treatments	Yes
SocioDem	Yes
Constant	8.230***
	(1.580)
Observations	360
R-squared	0.296

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Online Supplementary Material (Not Intended for Pubblication)

Appendix A. Legality Rating

The Legality Rating is an instrument designed to increase the competitiveness of lawful companies by supporting their ethical and honest initiatives. It was approved by the Italian Parliament at the end of 2012.

Two conditions must be met by the enterprises that work in Italy in order to ask for the legality rating

1. Achieving a turnover of at least two million of euros in the year before asking for the legality rating. This value must be ascribed either to the single enterprise, or to the group to which the single enterprise belongs to and whose balance-sheet was duly approved;

2. To be signed up in the registry of businesses for at least two years.

Companies willing to be rated can apply throughout an online form and follow the guidelines published on the AGCM website.

The legality rating ranges from a minimum score of one star to a maximum score of three stars, and it is awarded by the Italian Competition Authority (ICA) on the base of information directly provided by the company and further verified through cross-checks with data owned by the public administration.

"One-star" –Legality Rating

In order to be eligible for the minimum score (*i.e.*, the "one-star"-legality rating) a firm must fulfil the following requirements

1. The entrepreneur and other relevant individuals must not be the recipients of preventive and/or precautionary measures, nor must they be convicted for tax-related crimes. They must not be addressed by judicial sentences for mafia, nor must they be involved with mafia activities of any sort. The firm must not have been submitted to compulsory administration, nor must it have been convicted for administrative wrongdoings.

2. In the 2-year period before applying for the legality rating the firm must not have been convicted for serious crimes related to anti-trust, for breaching the code of consumption, for not respecting norms about safety and security of the working place, or for not complying with the obligations towards employees and collaborators as for remunerations, contributions, insurance responsibilities, and fiscal matters. Moreover, the firm must not have been under scrutiny for declaring less income than what verified, for having experienced revocations of public funds that were not duly paid back by the firm itself, or for not having paid taxes. Likewise,

the enterprise must not have received any sanction by the Italian Anti-Corruption Authority implying the prohibition either to sign contracts with the public administration, or to participate to auctions for public procurement.

3. Eventually, the company must declare to use exclusively traceable payment methods in order to process financial transactions whose value is higher than one thousand euros.

"Two-Stars" and "Three-Stars" – Legality Rating

More requirements are needed for firms to be rated with two or three stars of legality. If at least six of the following accomplishments are met, then a firm will obtain two stars

1. Complying with the Legality Protocol signed by the Ministry of Internal Affairs and the Italian Industrial Federation, with its guidelines for implementation, and with the Protocol signed by the Ministry of Internal Affairs and the Association of Cooperatives together with local prefectures and trade associations;

2. Using traceable payment methods also to process financial transactions whose amounts are lower than the threshold stated by the law;

3. Adopting an organizational framework apt to the conformity control as stated by the law;

4. Adopting processes that grant the Corporate Social Responsibility;

5. Being registered to lists of entities that are not prone to mafia infiltrations;

6. Endorsing the ethical codes of self-regulation that are defined by trade associations;

7. Having in place organizational frameworks to prevent and contrast corruption.

Denunciations of crimes by the entrepreneur and her family and collaborators, if followed by legal penal consequences, shall be hold in high esteem.

Duration of the Legality Rating

The legality rating lasts two years since its release, and it can be renewed upon request.

If one of the minimum prerequisites fails to exist, the ICA will revoke the one-star rating.

If conditions upon which a two-stars or a three-stars rating were awarded stop to be present, the ICA can reduce the legality rating.

The ICA will keep its website up to date with the list of companies awarded with the legality rating, along with effective dates and subsequent suspensions and revocations.

English Webpages about the Legality Rating by AGCM

- http://www.agcm.it/en/newsroom/press-releases/2196-boom-of-requests-to-antitrust-authority-to-obtain-the-rating-of-legality.html
- http://www.group.intesasanpaolo.com/scriptIsir0/si09/contentData/view/Rating_Legalit%C3%A0_eng.pdf?id=CNT-04-000000011635A&ct=application/pdf
- http://www.agcm.it/en/statistics/doc_download/477-annualreport2014presentation.html

Policy Documents Mentioning the Legality Rating by AGCM

- http://ec.europa.eu/competition/ecn/brief/03_2012/it_powers.pdf

Appendix B. General Instructions

General instructions

We wish to welcome you, and thank you for participating to this experiment whose goal is testing the impact of given factors on decision-making.

During the experiment you will have to make decisions in different situations, and you will gain points depending on the overall process of decision-making (i.e. your decisions plus the decisions made by the others).

Eventually one round will be drawn randomly from the rounds you took part in, and you will receive money for the points you gained in that round (with the exchange of 2 points =1 euro).

On your participation you receive a bonus of 2.50 euros which will add up to your gains from the experiment.

Your choices and answers will be handled anonymously (i.e. with *no reference to your identity*).

Your identity and the one of other participants will never be disclosed, neither before nor after the completion of the experiment and the fulfilment of our research.

Each session lasts approximatively one hour. You are kindly asked to work alone and in silence.

Once again, thank you for cooperating with us!

1st STAGE

Table 4: A3.1

	Payoff	
Your choice	Product A	Product B
Participation bonus	5 points	5 points
Endowment	20 points	20 points
Cost	−10 points	−5 points
Benefit (from the choice of other participants)	+3 points for each participant choosing product A	+3 points for each participant choosing product A

Table 5: A3.2

	When you buy A				When you buy B			
How many players choose good A	Endowment	Cost	Benefit	TOTAL	Endowment	Cost	Benefit	TOTAL
			$3 \times n =$				$3 \times n =$	
10	20	-10	30	40	-	-	-	-
9	20	-10	27	37	20	-5	27	42
8	20	-10	24	34	20	-5	24	39
7	20	-10	21	31	20	-5	21	36
6	20	-10	18	28	20	-5	18	33
5	20	-10	15	25	20	-5	15	30
4	20	-10	12	22	20	-5	12	27
3	20	-10	9	19	20	-5	9	24
2	20	-10	6	16	20	-5	6	21
1	20	-10	3	13	20	-5	3	18
0	-	-	-	-	20	-5	0	15

General instructions (as before)

1st STAGE

General instructions (as before) – Session 7,8,9

1st STAGE

Product A is a product or service provided by an enterprise awarded with the "3-stars legality rating". This rating can be conferred by the Italian Competition Authority (i.e. Autoritá Garante della Concorrenza e del Mercato, "Authority" from now on) upon request of a company. In order to be signalled with the 3-stars rating a company must *have in place organizational frameworks to prevent and fight of corruption.*[3]

Specifically, conditions for 3-stars rating are stated by the Authority as follows: 1. the entrepreneur must not be involved in lawsuit for mafia, tax-evasion, antitrust behaviours, unfair practices towards employees and customers, and bad administration (minimum accomplishments to be 1-star rated); 2. the enterprise mush accomplish ministerial codes of conduct, employ trackable paying methods, adopt organisational frameworks liable

[3]Please find a detailed description of this initiative in the leaflet. In our experiment we refer specifically to the highest legality rating – so called "3-stars rating" – releasable by the Authority, as opposed to the absence of legality rating. The actual legality rating envisages the possibility of 1 (minimum), 2, or 3 (maximum) stars depending on how many and which conditions are matched by the enterprises that ask for it.

Table 6: A3.3

	Payoff	
Your choice	Product A	Product B
Participation bonus	5 points	5 points
Endowment	20 points	20 points
Cost	−10 points	−5 points
Benefit (from the choice of other participants)	+3 points for each participant choosing product A	+3 points for each participant choosing product A
Redistribution effect	The share of the total points withdrawn from the buyers of B equally distributed among the buyers of A	-1 point

to the legal conformity control, endorse processes that guarantee the *Corporate Social Responsibility*, be listed among enterprises that are not tied to mafia, and adhere to existing ethical codes of conduct, *have in place organizational frameworks to prevent and fight of corruption.*

Product A costs 10 points. By buying product A you gain 3 points directly, and you will gain 3 points for each player who purchases product A too.

Product B is a product or service provided by an enterprise which is not awarded with the legality rating issued by the Authority (i.e. either the company did not enquire for the rating, or it asked for the rating but did not obtain it).

Product B costs 5 points. By buying product B you do not gain any point directly, but you will still gain 3 points for each player who purchases product A.

Table 7: A3.4

	When you buy A					When you buy B				
How many players choose good A	Endowment	Cost	Benefit	Redistribution	TOTAL	Endowment	Cost	Benefit	Redistribution	TOTAL
			$3 \times n =$					$3 \times n =$		
10	20	-10	30	-	40.0	-	-	-	-	-
9	20	-10	27	0.1	37.1	20	-5	27	-1	41.0
8	20	-10	24	0.3	34.3	20	-5	24	-1	38.0
7	20	-10	21	0.4	31.4	20	-5	21	-1	35.0
6	20	-10	18	0.7	28.7	20	-5	18	-1	32.0
5	20	-10	15	1.0	26.0	20	-5	15	-1	29.0
4	20	-10	12	1.5	23.5	20	-5	12	-1	26.0
3	20	-10	9	2.3	21.3	20	-5	9	-1	23.0
2	20	-10	6	4.0	20.0	20	-5	6	-1	20.0
1	20	-10	3	9.0	22.0	20	-5	3	-1	17.0
0	-	-	-	-	-	20	-5	0	-1	14.0

2nd STAGE – Session 7,8,9

Product A is a product or service provided by an enterprise awarded with the "3-stars legality rating". This rating can be conferred by the Italian Competition Authority (i.e. Autoritá Garante della Concorrenza e del Mercato, "Authority" from now on) upon request of a company. In order to be signalled with the 3-stars rating a company must have in place *organizational frameworks to prevent and fight of corruption.*[4]

Specifically, conditions for 3-stars rating are stated by the Authority as follows: 1. the entrepreneur must not be involved in lawsuit for mafia, tax-evasion, antitrust behaviours, unfair practices towards employees and customers, and bad administration (minimum accomplishments to be 1-star rated); 2. the enterprise mush accomplish ministerial codes of conduct, employ trackable paying methods, adopt organisational frameworks liable to the legal conformity control, endorse processes that guarantee the *Corporate Social Responsibility*, be listed among enterprises that are not tied to mafia, and adhere to existing ethical codes of conduct, *have in place organizational frameworks to prevent and fight of corruption.*

Product A costs 10 points. By buying product A you gain 3 points directly, and

[4]Please find a detailed description of this initiative in the leaflet. In our experiment we refer specifically to the highest legality rating – so called "3-stars rating" – releasable by the Authority, as opposed to the absence of legality rating. The actual legality rating envisages the possibility of 1 (minimum), 2, or 3 (maximum) stars depending on how many and which conditions are matched by the enterprises that ask for it.

Table 8: A3.5

	Payoff	
Your choice	Product A	Product B
Participation bonus	5 points	5 points
Endowment	20 points	20 points
Cost	−10 points	−5 points
Benefit (from the choice of other participants)	+3 points for each participant choosing product A	+3 points for each participant choosing product A
Redistribution effect	The share of the total points withdrawn from the buyers of B equally distributed among the buyers of A	-1 point

you will gain 3 points for each player who purchases product A too.

Product B is a product or service provided by an enterprise which is not awarded with the legality rating issued by the Authority (i.e. either the company did not enquire for the rating, or it asked for the rating but did not obtain it).

Product B costs 5 points. By buying product B you do not gain any point directly, but you will still gain 3 points for each player who purchases product A.

This time participants who purchase product B are curtailed of 1 point to be invested in a fund that will be eventually redistributed in equal shares among players who purchased product A.

Table 9: A3.6

	When you buy A					When you buy B				
How many players choose good A	Endowment	Cost	Benefit	Redistribution	TOTAL	Endowment	Cost	Benefit	Redistribution	TOTAL
			$3 \times n =$					$3 \times n =$		
10	20	-10	30	-	40.0	-	-	-	-	-
9	20	-10	27	0.1	37.1	20	-5	27	-1	41.0
8	20	-10	24	0.3	34.3	20	-5	24	-1	38.0
7	20	-10	21	0.4	31.4	20	-5	21	-1	35.0
6	20	-10	18	0.7	28.7	20	-5	18	-1	32.0
5	20	-10	15	1.0	26.0	20	-5	15	-1	29.0
4	20	-10	12	1.5	23.5	20	-5	12	-1	26.0
3	20	-10	9	2.3	21.3	20	-5	9	-1	23.0
2	20	-10	6	4.0	20.0	20	-5	6	-1	20.0
1	20	-10	3	9.0	22.0	20	-5	3	-1	17.0
0	-	-	-	-	-	20	-5	0	-1	14.0

General instructions (as before) – Session 10,11,12

1st STAGE

Product A is a product or service provided by an enterprise awarded with the "3-stars legality rating". This rating can be conferred by the Italian Competition Authority (i.e. Autorità Garante della Concorrenza e del Mercato, "Authority" from now on) upon request of a company. In order to be signalled with the 3-stars rating a company must have in place organizational frameworks to prevent and fight of corruption.[5]

Specifically, conditions for 3-stars rating are stated by the Authority as follows: 1. the entrepreneur must not be involved in lawsuit for mafia, tax-evasion, antitrust behaviours, unfair practices towards employees and customers, and bad administration (minimum accomplishments to be 1-star rated); 2. the enterprise mush accomplish ministerial codes of conduct, employ trackable paying methods, adopt organisational frameworks liable to the legal conformity control, endorse processes that guarantee the *Corporate Social Responsibility*, be listed among enterprises that are not tied to mafia, and adhere to existing ethical codes of conduct, *have in place organizational frameworks to prevent and*

[5]Please find a detailed description of this initiative in the leaflet. In our experiment we refer specifically to the highest legality rating – so called "3-stars rating" – releasable by the Authority, as opposed to the absence of legality rating. The actual legality rating envisages the possibility of 1 (minimum), 2, or 3 (maximum) stars depending on how many and which conditions are matched by the enterprises that ask for it.

Table 10: A3.7

	Payoff	
Your choice	Product A	Product B
Participation bonus	5 points	5 points
Endowment	20 points	20 points
Cost	−10 points	−5 points
Benefit (from the choice of other participants)	+3 points for each participant choosing product A	+3 points for each participant choosing product A

fight of corruption.

Product A costs 10 points. By buying product A you gain 3 points directly, and you will gain 3 points for each player who purchases product A too.

Product B is a product or service provided by an enterprise which is not awarded with the legality rating issued by the Authority (i.e. either the company did not enquire for the rating, or it asked for the rating but did not obtain it).

Product B costs 5 points. By buying product B you do not gain any point directly, but you will still gain 3 points for each player who purchases product A.

This time participants who purchase product B are curtailed of 1 point to be invested in a fund that will be eventually redistributed in equal shares among players who purchased product A.

Table 11: A3.8

	When you buy A				When you buy B			
How many players choose good A	Endowment	Cost	Benefit	TOTAL	Endowment	Cost	Benefit	TOTAL
			$3 \times n =$				$3 \times n =$	
10	20	-10	30	40	-	-	-	-
9	20	-10	27	37	20	-5	27	42
8	20	-10	24	34	20	-5	24	39
7	20	-10	21	31	20	-5	21	36
6	20	-10	18	28	20	-5	18	33
5	20	-10	15	25	20	-5	15	30
4	20	-10	12	22	20	-5	12	27
3	20	-10	9	19	20	-5	9	24
2	20	-10	6	16	20	-5	6	21
1	20	-10	3	13	20	-5	3	18
0	-	-	-	-	20	-5	0	15

2nd STAGE

Product A is a product or service provided by an enterprise awarded with the "3-stars legality rating". This rating can be conferred by the Italian Competition Authority (i.e. Autorità Garante della Concorrenza e del Mercato, "Authority" from now on) upon request of a company. In order to be signalled with the 3-stars rating a company must have in place organizational frameworks to prevent and fight of corruption.[6]

Specifically, conditions for 3-stars rating are stated by the Authority as follows: 1. the entrepreneur must not be involved in lawsuit for mafia, tax-evasion, antitrust behaviours, unfair practices towards employees and customers, and bad administration (minimum accomplishments to be 1-star rated); 2. the enterprise mush accomplish ministerial codes of conduct, employ trackable paying methods, adopt organisational frameworks liable to the legal conformity control, endorse processes that guarantee the *Corporate Social Responsibility*, be listed among enterprises that are not tied to mafia, and adhere to existing ethical codes of conduct, *have in place organizational frameworks to prevent and fight of corruption.*

Product A costs 10 points. By buying product A you gain 3 points directly, and you will gain 3 points for each player who purchases product A too.

[6]Please find a detailed description of this initiative in the leaflet. In our experiment we refer specifically to the highest legality rating – so called "3-stars rating" – releasable by the Authority, as opposed to the absence of legality rating. The actual legality rating envisages the possibility of 1 (minimum), 2, or 3 (maximum) stars depending on how many and which conditions are matched by the enterprises that ask for it.

Table 12: A3.9

	Payoff	
Your choice	Product A	Product B
Participation bonus	5 points	5 points
Endowment	20 points	20 points
Cost	−10 points	−5 points
Benefit (from the choice of other participants)	+3 points for each participant choosing product A	+3 points for each participant choosing product A

Product B is a product or service provided by an enterprise which is not awarded with the legality rating issued by the Authority (i.e. either the company did not enquire for the rating, or it asked for the rating but did not obtain it).

Product B costs 5 points. By buying product B you do not gain any point directly, but you will still gain 3 points for each player who purchases product A.

Table 13: A3.10

	When you buy A				When you buy B			
How many players choose good A	Endowment	Cost	Benefit	TOTAL	Endowment	Cost	Benefit	TOTAL
			$3 \times n =$				$3 \times n =$	
10	20	-10	30	40	-	-	-	-
9	20	-10	27	37	20	-5	27	42
8	20	-10	24	34	20	-5	24	39
7	20	-10	21	31	20	-5	21	36
6	20	-10	18	28	20	-5	18	33
5	20	-10	15	25	20	-5	15	30
4	20	-10	12	22	20	-5	12	27
3	20	-10	9	19	20	-5	9	24
2	20	-10	6	16	20	-5	6	21
1	20	-10	3	13	20	-5	3	18
0	-	-	-	-	20	-5	0	15

The same guidelines and frame of sessions 7, 8, and 9 are administered during sessions 13, 14, and 15 along with the information about the average outcome about product A during sessions 7, 8, and 9.

The same guidelines and frame of sessions 10, 11, and 12 are administered during sessions 16, 17, and 18 along with the information about the average outcome about Product A during sessions 10, 11, and 12.

The information about previous sessions is provided to control for conformist-type of behaviours.

Table 14: A3.11

	Payoff	
Your choice	Product A	Product B
Participation bonus	5 points	5 points
Endowment	20 points	20 points
Cost	-10 points	-5 points
Benefit (from the choice of other participants)	$+3$ points for each participant choosing product A	$+3$ points for each participant choosing product A
Redistribution effect	The share of the total points withdrawn from the buyers of B equally distributed among the buyers of A	-1 point

Table 15: A3.12

	When you buy A					When you buy B				
How many players choose good A	Endowment	Cost	Benefit	Redistribution	TOTAL	Endowment	Cost	Benefit	Redistribution	TOTAL
			$3 \times n =$					$3 \times n =$		
10	20	-10	30	-	40.0	-	-	-	-	-
9	20	-10	27	0.1	37.1	20	-5	27	-1	41.0
8	20	-10	24	0.3	34.3	20	-5	24	-1	38.0
7	20	-10	21	0.4	31.4	20	-5	21	-1	35.0
6	20	-10	18	0.7	28.7	20	-5	18	-1	32.0
5	20	-10	15	1.0	26.0	20	-5	15	-1	29.0
4	20	-10	12	1.5	23.5	20	-5	12	-1	26.0
3	20	-10	9	2.3	21.3	20	-5	9	-1	23.0
2	20	-10	6	4.0	20.0	20	-5	6	-1	20.0
1	20	-10	3	9.0	22.0	20	-5	3	-1	17.0
0	-	-	-	-	-	20	-5	0	-1	14.0

Table 16: A3.13

	Payoff	
Your choice	Product A	Product B
Participation bonus	5 points	5 points
Endowment	20 points	20 points
Cost	-10 points	-5 points
Benefit (from the choice of other participants)	$+3$ points for each participant choosing product A	$+3$ points for each participant choosing product A
Redistribution effect	The share of the total points withdrawn from the buyers of B equally distributed among the buyers of A	-1 point

Table 17: A3.14

	When you buy A					When you buy B				
How many players choose good A	Endowment	Cost	Benefit	Redistribution	TOTAL	Endowment	Cost	Benefit	Redistribution	TOTAL
			$3 \times n =$					$3 \times n =$		
10	20	-10	30	-	40.0	-	-	-	-	-
9	20	-10	27	0.1	37.1	20	-5	27	-1	41.0
8	20	-10	24	0.3	34.3	20	-5	24	-1	38.0
7	20	-10	21	0.4	31.4	20	-5	21	-1	35.0
6	20	-10	18	0.7	28.7	20	-5	18	-1	32.0
5	20	-10	15	1.0	26.0	20	-5	15	-1	29.0
4	20	-10	12	1.5	23.5	20	-5	12	-1	26.0
3	20	-10	9	2.3	21.3	20	-5	9	-1	23.0
2	20	-10	6	4.0	20.0	20	-5	6	-1	20.0
1	20	-10	3	9.0	22.0	20	-5	3	-1	17.0
0	-	-	-	-	-	20	-5	0	-1	14.0

Table 18: A3.15

	Payoff	
Your choice	Product A	Product B
Participation bonus	5 points	5 points
Endowment	20 points	20 points
Cost	−10 points	−5 points
Benefit (from the choice of other participants)	+3 points for each participant choosing product A	+3 points for each participant choosing product A

Table 19: A3.16

	When you buy A				When you buy B			
How many players choose good A	Endowment	Cost	Benefit	TOTAL	Endowment	Cost	Benefit	TOTAL
			$3 \times n =$				$3 \times n =$	
10	20	-10	30	40	-	-	-	-
9	20	-10	27	37	20	-5	27	42
8	20	-10	24	34	20	-5	24	39
7	20	-10	21	31	20	-5	21	36
6	20	-10	18	28	20	-5	18	33
5	20	-10	15	25	20	-5	15	30
4	20	-10	12	22	20	-5	12	27
3	20	-10	9	19	20	-5	9	24
2	20	-10	6	16	20	-5	6	21
1	20	-10	3	13	20	-5	3	18
0	-	-	-	-	20	-5	0	15

Appendix C. Questionnaire

1. Gender
    - Male
    - Female
2. Age
    - ..... years
3. District of residence
4. Housing condition:
    a. Live alone
    b. Live with family
    c. Live with other (not related) people
5. Father's education
    - Primary School
    - Middle School
    - Upper Intermediate/High school
    - University degree
    - Other
6. Mother's education
    - Primary School
    - Middle School
    - Upper Intermediate/High school
    - University degree
    - Other
7. Father's professional status
    - Self-employed
    - Clerk
    - Manual worker
    - Executive
    - Retired
    - Homemaker

- Student
- Entrepreneur
- Unemployed
- Other

8. Mother's professional status

   - Self-employed
   - Clerk
   - Manual worker
   - Executive
   - Retired
   - Homemaker
   - Student
   - Entrepreneur
   - Unemployed
   - Other

9. How many people are there in your household (including yourself)?

   We would like to recall you that these data will only serve statistical purposes, that information will be handled anonymously and it shall never be disclosed at disaggregated level

10. Please, mark the class to which your annual household income (net) in 2015 belongs to

    - up to 15.000
    - 15.001 – 25.000
    - 25.001 – 35.000
    - 35.001 – 50.000
    - 50.001 – 90.000
    - higher than 90.000

11. On a scale from 0 to 10, please indicate your level of satisfaction with the experience of having undergone this experiment:

    Not satisfied at all =0 Completely satisfied =10
    0 1 2 3 4 5 6 7 8 9 10

12. On a scale from 0 to 10, please indicate your level of satisfaction about the behaviour of the players who participate in your same game:

    Not satisfied at all = 0 Completely satisfied = 10
    0 1 2 3 4 5 6 7 8 9 10

13. On a scale from 0 to 10, please indicate your level of satisfaction about your own behaviour in the game:

    Not satisfied at all = 0 Completely satisfied = 10 0 1 2 3 4 5 6 7 8 9 10

14. On a scale from 0 to 10, how would you rate the overall trustworthiness of others?

    None = 0 Complete = 10
    0 1 2 3 4 5 6 7 8 9 10

15. On a scale from 0 to 10, how would you rate your overall satisfaction with life?

    Not satisfied at all = 0 Completely satisfied = 10
    0 1 2 3 4 5 6 7 8 9 10

16. On a scale from 0 to 10, how would you rate your satisfaction about your financial situation?

    Not satisfied at all = 0 Completely satisfied = 10
    0 1 2 3 4 5 6 7 8 9 10

17. Please tick the box that mostly represent your political orientation:
    Extreme LEFT Extreme RIGHT

18. Have you got an account on Facebook?

    - Yes
    - No

19. If you have an account on Facebook, how many friends do you have approximately on your account?

20. Have you got an account on Twitter?

    - Yes
    - No

21. If you have an account on Twitter, how many people do you follow?

22. If you have an account on Twitter, by how many people are followed by?