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# Trading off between equity and efficiency in dictator and trust games*

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**Abstract**

We investigate how people trade off between equity and efficiency, using variations of tripled dictator and trust games in a lab experiment. Equalizing payoffs reduces the return from the tripled investment in the dictator game. In contrast, in the trust game both equal and maximized payoffs can be achieved, provided that receiver transfers back half of the return from investment. We find that subjects sacrifice efficiency for equity in the dictator game but manage to achieve both in the trust game. Most subjects equalize payoffs when they are placed behind a veil of ignorance about their position in the trust game, regardless of their aversion to risk. They invest less when they pay to obtain their position as investor but do not send back less if they pay to be the receiver. Subjects who modify their investment decision after receiving information about the average investment in their group tend to move closer to the average.

**Key Words:** Trust game, triple dictator game, fairness, efficiency, equity, experiment.

**JEL classification:** C72, C90, D03, D63.

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# 1 Introduction

Self-interest is certainly not the only motivation that drives human behavior when it comes to economic matters. People often sacrifice their own short-term interest to enhance efficiency and fairness in society. For instance, they invest in public goods or joint production to contribute to wealth creation, although they expect a return from such investments. They also want to reach fair deals when they trade or share scarce resources. However, welfare improvement and fairness may be conflictual in some situations, which force individuals to trade-off not only between individual and social welfare, but also to between efficiency and equity.

In this paper we design an experiment to investigate peoples behavior when they face a dilemma between equity and efficiency. Our game is based on variations of the (triple) dictator game (Ashraf et al., 2006) and the trust game (Berg et al. 1995). The triple dictator game exhibits the aforementioned trade-offs between maximizing own payoffs, maximizing total payoffs, and equalizing payoffs. Maximizing own payoffs requires the investor to keep all the endowment. As the money invested is tripled, maximizing total payoffs means that everything is sent to the receiver, which leads to a very unequal outcome. Equal payoffs can be achieved when the investor invests one-third of her endowment. By allowing the receiver to transfer part of the tripled investment back into the so-called trust game, trade-off decisions are shared between players: while the investor still decides upon the total payoff, the receiver is allowed to redistribute anything he receives. As a result, both efficiency and equity can be achieved if the investor trusts and if the receiver is trustworthy. The investor's option of equalizing payoffs by investing one-third of the endowment is still available with no trust needed but at a cost of a lower total payoff.

In order to assess subjects' motivations for efficiency and equity, we run four variants of the two games. The first treatment acts as our benchmark. Subjects play the standard triple dictator game and the standard trust game. They play both games under the strategy method (Selten, 1967). Each subject is asked about her or his complete strategy in both the investor and the receiver position. In the second treatment, subjects play both games under the veil of ignorance: without knowing whether they will be paid as an investor or a receiver, they choose both the investment and the back payment. In this treatment, maximizing the social welfare and equalizing payoffs are no longer conflictual. In the third treatment, subjects can pay to be assigned a position (investor or receiver) before playing each of the two games. Consistent with the fairness theory of responsibility (Fleurbaey, 2008), subjects who manage to get the position they paid for might think that they deserve a higher share of total payoffs. Indeed, obtaining a position at some cost rather than by chance can change subjects' idea of fairness. Equal sharing might no longer be considered as fair. Instead, by gaining a particular position, a subject can justify keeping more for her- or himself on the grounds of fairness. She or he is "responsible" for this position  which was obtained at some cost  and should therefore be rewarded for that. In the fourth treatment, we inform subjects on the average investment made in the benchmark treatment before they play. The average decision might be interpreted as a descriptive social norm that could influence the subject's perception regarding the trade-off between efficiency and equity (see e.g. Ostrom and Walker 1991 in a common-pool resource games). Accordingly, treatment effects assess how institutions may drive individuals' motives towards efficiency and equity.

Alongside those "extrinsic" motives, we also control for more "intrinsic" motives like individual preference towards risk and other regarding preferences. First, we implement the standard risk test (Holt and Laury 2002). Risk aversion might explain why subjects do not invest in trust games, and hence give up on efficiency, to avoid the possibility of not receiving anything in return. Second, like Offerman et al. (1996) and Kanagareman et al. (2009), we rely on the so-called ring" test (Liebrand, 1984) to measure subjects' pro-social behavior.

Our paper contributes to a large body of experiments in economics that study the trade off between efficiency and equity. In an experiment involving one-shot dictator games, Engelmann and Strobel (2004) found evidence that efficiency motives (defined as the surplus maximization) as well as Rawlsian motives for helping the least well-off dominate motives induced by inequity aversion à la Fehr and Schmidt (1999)[1]. In variations of the trust game, Charness and Rabin (2002) observed that few subjects sacrifice total payoffs for equalizing payoffs. Furthermore, subjects choose Pareto-damaging behavior more often when it increases inequality than when it reduces inequality. Cappelen et al. (2007) assess people's ideal of fairness in dictator game

[1]This result was however criticized by Fehr et al. (2006) who claimed that Engelmann and Strobel (2004)'s experiment was biased by a subject pool effect.

experiments preceded by a production phase: the money to be shared relies on investments by both players with heterogeneous returns. They observe a majority of strict egalitarian behaviors, though subjects make trade offs between self-interest and fairness. In an experiment using modified dictator games that vary the subjects' endowments and the prices of giving, Fisman et al. (2007) find a strong correlation between the equity-efficiency trade-offs that subjects make, and their social preferences. Beckman et al. (2002) show evidence that subjects' choices are closer to efficiency when they play behind a veil of ignorance. In their distribution game where a social planner decides the income of two other subjects according to different budgets and prices of equality[2], Hong et al. (2015) find evidence for a wide heterogeneity of preferences for equality and efficiency, although the majority of subjects weakly preferred efficiency over equality.

We depart from the aforementioned literature in two respects. First, this literature is not concerned about how institutions (i.e. rules of the game played in each treatment) can shape differently the expression of preferences for fairness and for efficiency, whereas, according to Bolton and Ockenfels (2004), this question really does still need to be investigated. Our within-subject experiment measures how individual motives for efficiency and equity evolve from one institution to another. To the best of our knowledge, such design has no equivalence in the literature. We chose four institutions that mimic a *laissez-faire* context, a *veil of ignorance* (or social planer) context, a *fee* context and a *social norm* context. While the effects of social norm and veil of ignorance have already been assessed in previous experiments, the fee institution (where individuals can pay a fee to ensure their position) has not been studied yet.[3] Second, in contrast to the aforementioned literature, we combine the triple dictator game with the trust game in a single within-study. Implementing both games offers a richer design to study the efficiency-equity trade-off. The main parameters between the games are moreover kept constant, as in Ashraf et al. (2006) and in Etang et al. (2011). As regards risk and other behaviors, we decided to control them in the experiment as both may be underlying attitudes behind efficiency and equity motives in those games (see e.g. Houser et al., 2010 and Kanagaretman et al., 2009).

We find evidence that people are efficient and egalitarian when they act behind the veil of

[2]This price of equality is an inefficiency measure for player B's ability relative to A's, in converting allocations into his or her own income.

[3]As Chavas and Coggins (2003) point out, equity (and efficiency) should also relate to conditions resulting from circumstances over which individuals can be held responsible.

ignorance. They sacrifice efficiency for equity if both cannot be achieved. Whether they get their position in the game by chance or not matters: those who paid to be an investor keep more money, while those who paid to be a receiver send back less. Knowing the average of investments played in the experiment matters to only half of the subjects: they tend to move their investment decisions closer to this average. these changes do not however affect the degree of efficiency and equity.

The paper proceeds as follows. We introduce the game and the theoretical hypotheses in Section 2. Section 3 describes the experiment. The results are analyzed in Section 4. Section 5 concludes.

## 2 Games, Treatments and Hypotheses

### 2.1 Games

The investor $I$ decides to invest $x$ euros of her 8 euro endowment. The investment of $x$ euros is multiplied by 3 and assigned to the receiver $R$. In the *triple dictator game* (DG), $I$ simply keeps $8-x$. In the *trust game* (TG), $R$ can transfer back to the $I$ part of the $3x$ euros produced through a non-negative transfer $t \leq 3x$. Consequently, the monetary payoffs with the investment $x$ and the transfer $t$ are $8-x+t$ for $I$ and $3x-t$ for $R$. The transfer $t$ divides up the total welfare defined as the sum of payoffs: $8-x+t+3x-t = 8+2x$.

The two games, DG and TG, differ in terms of efficiency and equity. In both games the sum of payoffs is maximized by investing all the $x = 8$ units. This is always inequitable in the DG: player $R$ obtains all and $I$ nothing. The back payment $t$ allows the efficient strategy $x = 8$ to be compatible with equity. Equal payoffs are achieved if $R$ transfers back half of the surplus created, 24, which is $t = 12$.

The games have several natural solutions with different properties in terms of efficiency and equity. In the DG, three investment strategies emerge naturally. First, investing nothing $x = 0$ is the *selfish* strategy: while it maximizes $I$'s payoff, it minimizes $R$'s payoff. It is also the least efficient as it minimizes the sum of payoffs. Second, $x = 8$ is the *efficient* strategy as it maximizes the sum of payoffs. This outcome is also unequal but this time it is $R$ who obtains all and $I$ nothing. Finally, $x = 2$ is the *egalitarian* strategy. Each subject obtains $8-x = 3x = 6$ and the total payoff is higher than with the selfish strategy $x = 0$ but lower than with the all-investment strategy $x = 8$. Those three investment strategies are also quite natural in the TG. The selfish strategy $x = 0$ is the sub-game perfect Nash equilibrium of the TG. As in the DG, it is inefficient since it minimizes total welfare. The efficient strategy $x = 8$ maximizes the sum of payoffs, like in the DG. But this time the back payment $t$ of the TG allows the efficient strategy to be compatible with an equal split of payoffs. Equal payoffs can be achieved if $R$ transfers back half of the surplus created (that is, $t = 12$). Finally, the intermediate strategy of investing $x = 2$ euros still equalizes payoffs without any need for transfers. However, it remains inefficient compared to the all-investment strategy.

The transfer strategy $t$ of the trust game depends on investment $x$. Let us denote by $t(x)$ the transfer scheme contingent on investment $x$. We focus on two solutions for the transfer scheme: the selfish and the egalitarian. The selfish transfer $t^N(x) = 0$ for every $x$ is the strategy played in the sub-game perfect equilibrium of the TG. If players behave non-cooperatively, player $R$ does not give anything back, regardless of the investment. The egalitarian transfer scheme $t^E(x)$ is set such that $8 - x + t^E(x) = 3x - t^E(x)$ provided that $t(x) \geq 0$. When the latter non-negative constraint is binding, transfer is set to zero, as payoffs cannot be equalized. The egalitarian transfer scheme is thus defined as follows: $t^E(x) = 0$ if $x \leq 2$ and $t^E(x) = 2x - 4$. Each player thus obtains 12 euros. Efficiency and equality of payoffs can be achieved by investing $x = 8$ euros efficiently and sharing player $R$'s payoff equally with a transfer back of $t^E(8) = 12$.

## 2.2 Treatments

Each subject plays the DG and TG under four treatments. In the first treatment, subjects play each of the two games (called Basic" for the DG and "Basic-t" for the TG) under the strategy method. Each subject is asked about her investment strategy $x$ in each game and about a transfer scheme $t(x)$ for every investment level $x$ in the TG. Binding roles ($I$ or $R$) are attributed randomly at the end of the experiment. In the second treatment, the two games are played behind the veil of ignorance (Veil" and Veil-t"). Each subject acts as a social planner and decides on both the investment and the transfer without knowing what her or his role will be. At the end of the experiment an additional draw randomly chooses which of the two players will be the social planner. In the third treatment ("Fee" and "Fee-t"), subjects have the possibility to pay a fee of 2 euros in order to increase their chance of obtaining their preferred role (either investor or receiver). A subject who paid for a particular position is certain to be attributed that position if the other subject she or he is matched with has not paid for the same position. If both subjects paid and asked for the same position, this position would be assigned randomly with equal probability. The same goes if neither of them was willing to pay the fee for a position. In the fourth treatment (Info and Info-t), subjects replay Basic and Basic-t after having been informed about the average investment and transfer chosen initially.

### 2.3 Hypotheses

In both games (DG and TG), the sum of payoffs is maximized by investing $x = 8$. This is always unequal in the DG: $R$ obtains all and $I$ nothing. The only way to be egalitarian in the DG is to invest $x = 2$ and thus to opt for an inefficient outcome. Efficiency and equity are compatible in the TG as $R$ can share the surplus through the back payment. This reasoning leads to our first hypothesis stated below.

**Hypothesis 1** *Investing $x = 2$ is more often played in the DG than in the TG and investing $x = 8$ is more often played in the TG than in the DG.*

Under the veil of ignorance treatments (Veil and Veil-t), subjects are put in the shoes of both players. They control all decisions, and thus adopt their preferred solution when solving the equity versus efficiency trade-off. A Rawlsian or risk-averse decision maker would choose the maximin strategy consisting in maximizing the payoff of the player in the worst position, $I$ or $R$. He or she would therefore go for the egalitarian choice $x = 2$ in the DG, and the efficient and egalitarian choices $x = 8$ and $t = 12$ in the TG. We therefore expect subjects to be more egalitarian in both problems and to invest efficiently in the TG.

**Hypothesis 2** *Investing $x = 2$ is more often played in Veil than in Basic, and investing $x = 8$ and transferring $t = 12$ is more often played in Veil-t than in Basic-t.*

Under the fee treatments (Fee and Fee-t), subjects who think they deserve their position in the game are less likely to be egalitarian. They are more inclined to misuse their position (or to be rewarded for obtaining it) and thus to keep a higher share of welfare by investing less or transferring less.

**Hypothesis 3** *$I$ invests less and $R$ transfers back less in Fee and Fee-t than in Basic and Basic-t.*

Under the Info treatments (Info and Info-t), information about average investment may be perceived as a descriptive norm for own decisions. If subjects are influenced by the norm, they should revise their investment decisions in Info and Info-t closer to the average observed in Basic and Basic-t.

**Hypothesis 4** *Depending on their investment decisions in Basic and Basic-t, subjects invest in Info and Info-t at a level that is closer to the average.*

Subjects who care about others are more inclined to invest and to transfer. This is true for all treatments except the two veil treatments. In Veil and Veil-t, selfish motives and efficiency motives are aligned. By investing $x = 8$, the subject maximizes both the sum of payoffs and her own expected payoff. The individual outcome is nevertheless uncertain in Veil, and selfish subjects who are prone to risk aversion may therefore finally opt for the maximin strategy ($x = 2$).

**Hypothesis 5** *Except in Veil-t, pro-social subjects invest more and transfer more.*

Each unit that is not invested is a gain that is certain for $I$. In the TG, $I$ could expect higher payoff by investing if she trusts $R$ and if $R$ is trustworthy. Risk averse subjects are more inclined to forego a higher payoff that is uncertain, for a lower payoff that is certain. Again, Veil-t avoids this trade-off: the social planner can maximize the sum of payoffs by investing 8 and ensure that a maximal minimum payoff, equal to the surplus, is distributed.

**Hypothesis 6** *Except in Veil-t, risk-averse subjects invest less in the TG.*

## 3 Experimental design and procedure

The experiment was divided into three parts: the two games (DG and TG), the risk aversion test, and the ring test. It was conducted using a within-study procedure: each subject was involved in each part successively. To avoid an order effect, the three parts were sorted differently in every experimental session (see Table 5 in appendix A for the precise orderings). All parts of the experiment involved a monetary incentive and were computerized. Subjects did not know their payoff for each part of the experiment until it was over. They had no information feedback from one part to another. The main part of the experiment consisted of the two games played successfully in the different treatments detailed previously. DG was played first, then TG.[4] Participants always started with Basic and Basic-t and then successively Veil, Veil-t, Fee, Fee-t, Info and Info-t. In order to control risk preference, subjects performed the Holt and Laury risk test designed to make inferences about risk preferences under various payment conditions (Holt and Laury 2002). As for social preferences, subjects performed the "ring test" (Liebrand, 1984), designed to measure individuals' value orientations along a spectrum ranging from altruistic to aggressive.

We conducted 12 experimental sessions with a total of 180 subjects. Subjects were undergraduates from different universities and engineering schools, with no background in game theory. The experiment proceeded as follows. As they arrived in the laboratory, subjects received a personal code both to preserve their anonymity and to log into the software dedicated to the experiment. Subjects were told that they would be paid in cash at the end of the experiment. In our experiment, the average payoff was about 30 euros, including a participation fee of 5 euros. Each experimental session lasted about 2 hours. Instructions were given at the beginning of each part and were read out loud to ensure that everyone received the same information. Subjects could see the instructions on their own computer screens while the facilitators read them out. Their understanding of the instructions was checked using a simple quiz and then by running through the corrections with the group as a whole. At the beginning of the experiment, subjects were told that the session would be divided into several parts and that all those parts were to involve a monetary incentive. They were also told that the payoffs they would get for each part were independent from one another, and that they would be given the amount of these payoffs, and would receive them, only at the end of the experiment. When the games (DG or TG) started, subjects were also told that the game would be played in different versions, and that one version would be drawn randomly and individually for the payoff. Subjects played each part of the ex-

[4]We keep this same order of the games throughout the experiment. According to the existing literature, we simply expect that subjects will transfer more money in the TG than in DG. This result seems robust to different designs, as observed by Cox (2004) and Etang et al. (2011) in a between-subjects design, and by Ashraf et al. (2006) in a within-subjects design with a different order between the two games. Another reason why we keep this order is that varying the order of the games themselves would have required a huge number of sessions and subjects. Finally, it is easier to explain the DG first to the subjects.

periment successively. When the experiment was over, the binding treatment and game (Basic, Basic-t, Veil, etc.) and the role assigned in DG or TG (either the investor or the receiver were randomly drawn.[5]), the attribution of the planner's role in the veil treatments (when required) and, finally, the binding decision in the Holt and Laury test. Draws, results of the three parts, and the corresponding monetary payoffs were displayed on their screen. Lastly, subjects filled in a form for the Accounting Department of the University. They were called one at a time by the experiment facilitator into a separate room where they privately received their payoff in cash, before leaving the laboratory.

# 4 Experimental results

## 4.1 Data analysis

Full tables of average investment $x$ and transfer $t$ along with non-parametric tests are also available in the Appendix. Proportions of individuals according to their natural strategies (non-cooperative $x = 0$, egalitarian $x = 2$ and efficient $x = 8$ for investors $I$ and egalitarian $t(x) = t^E(x) = 3x/2$ and non cooperative $t = 0$ for receivers $R$) are represented in Figures 1 and 2.

[5]For the fee treatments, we took into account the possible payment of the €2. The desired position was automatically attributed if one participant paid the fee. €2 was then deducted from her total payoff. When none or both subjects paid the fee, the position was randomly drawn

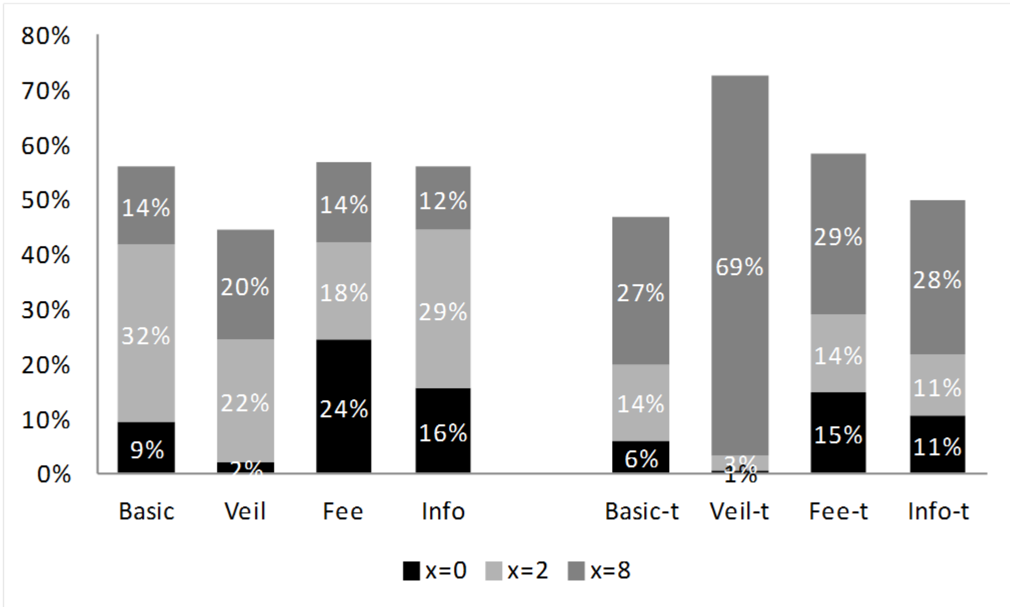


Figure 1: Proportion of non-cooperative, egalitarian and efficient investment strategies

In the DG games we observe that the egalitarian strategy $x = 2$ is more frequently played and chosen than in the TG games, which gives some preliminary evidence to **Hypothesis 1**. As expected in **Hypothesis 2**, the efficient strategy $x = 8$ is more frequently played in the TG games than in the DG games, and is highly dominant in the Veil-t treatment. The non-cooperative strategy $x = 0$ is the most frequently played one in the Fee treatments, which is consistent with **Hypothesis 3**.

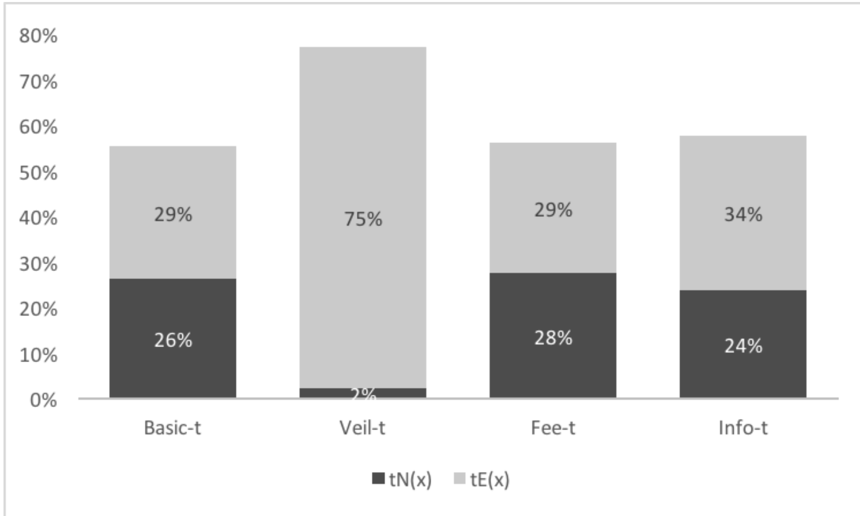


Figure 2: Proportion of egalitarian and non-cooperative back payments

We observe that the option to make a payment back to the investor has an effect on the subjects' decisions to invest. We can see from Figure 2 that the proportion of subjects who invested efficiently increased far more significantly for the Basic treatment than for the other ones: it often more than doubled. On the other hand, fewer subjects opted for the 2 euro investment as it was then no longer the only way of achieving equal payoffs. Both results are consistent with **Hypothesis 2**.[6]

In order to test our hypotheses, we performed three econometric analyses: one is dedicated to the investment levels $x$ (Table 1), one to the transfer levels $t$ (Table 2) and the last one focuses exclusively on the fee treatments (Table 3). For each analysis, we consider social preferences and risk attitudes as control regressors. Social preferences and risk attitudes are measured with respectively the ring test and the Holt and Laury test. Specific data from these two tests are reported in our companion paper Garapin et al. (2015). In this study, we use as our risk attitude variable the number of safe choices made by each subject in the lotteries of the Holt and Laury's test, and as our social preference variable the angle of the social value vector in the "circle" of the ring test[7]

[6]Based on the Wilcoxon sign rank test, we reject the null hypothesis that there is no difference in the distribution of investment decisions between the DG games and the TG games.

[7]For these analyses, we kept 141 individuals that all performed the three parts of the experiment (risk test, social value test, the two games). The remaining subjects were withdrawn from the analysis because they made

## 4.2 Dictator and Trust games

The first econometric analysis (Table 1) makes use of the structure of our data by performing linear mixed effects and mixed effects Logit models to consider individual heterogeneity and repeated observations for each subject. Providing 6 distinct models, we consider the level of investment $x$ (Model I), the dummy $Y$ ($Y$=1 if $x$=[0; 2; 8] and if $x > 3$, $Y$=0, else) as an dependent variable (Models II to VI); we also look at the DG and TG level of investment separately (Model IV). In the analysis, the variable of reference is Basic-t (Basic in Model IV without transfer).[8]

inconsistent choices either in the risk test or in the ring test (25 subjects) and because of a computer bug in the ring test during one session (14 subjects). Note that the different parts of the experiments (RT, RA and DG-TG) were sorted differently in every experimental session to control order effects. We therefore also estimated the same regression models with variables controlling order effects. Our results are robust to order effect and we have qualitatively similar results with both estimations.

[8]As subjects take in total 8 investment decisions (8 treatments), we thus obtain 141 $\times$ 8=1128 observations, except for the analysis limited to the treatments without one type of game only, DG or TG (141 $\times$ 4=564 observations).

Table 1: Regression results: Investment.

| Variables | (I) Amount invested | (II) Invest $x = 0$ | (III) Invest $x = 2$ | (IV Dictator Game) Invest x=2 | (IV Trust Game) Invest x= 2 | (V) Invest $x = 8$ | (VI) Invest $x > 3$ |
|---|---|---|---|---|---|---|---|
| Social preference | 0.035*** | -0.022** | -0.014** | -0.012 | -0.014* | 0.048*** | 0.029*** |
| | (0.005) | (0.009) | (0.006) | (0.007) | (0.007) | (0.008) | (0.007) |
| Risk attitude | -0.114 | 0.069 | 0.176 | 0.138 | 0.268* | 0.032 | -0.188 |
| | (0.108) | (0.187) | (0.128) | (0.147) | (0.154) | (0.141) | (0.135) |
| Basic-t | Ref | Ref | Ref | - | Ref | Ref | Ref |
| | Ref | Ref | Ref | - | Ref | Ref | Ref |
| Basic | -1.127*** | 0.610 | 1.309*** | Ref | - | -1.392*** | -1.463*** |
| | (0.216) | (0.556) | (0.357) | Ref | - | (0.407) | (0.326) |
| Info-t | -0.035 | 1.002* | -0.523 | - | -0.478 | 0.240 | 0.226 |
| | (0.216) | (0.545) | (0.421) | - | (0.403) | (0.346) | (0.336) |
| Info | -1.432*** | 1.762*** | 1.358*** | 0.052 | - | -1.928*** | -1.608*** |
| | (0.216) | (0.528) | (0.357) | (0.325) | - | (0.435) | (0.226) |
| Veil-t | 2.368*** | -3.312*** | -2.421*** | - | -2.270*** | 3.144*** | 3.455*** |
| | (0.216) | (1.179) | (0.676) | - | (0.658) | (0.361) | (0.607) |
| Veil | -0.148 | -1.591** | 0.895** | -0.451 | - | -0.691* | 4E-15 |
| | (0.216) | (0.723) | (0.364) | (0.337) | - | (0.375) | (0.332) |
| Fee-t | -0.148 | 1.665*** | -0.244 | - | -0.222 | 0.354 | -0.216 |
| | (0.216) | (0.530) | (0.404) | - | (0.385) | (0.344) | (0.329) |
| Fee | -1.375*** | 2.725*** | 0.421 | -0.966*** | - | -1.294*** | -1.656*** |
| | (0.216) | (0.514) | (0.376) | (0.353) | - | (0.402) | (0.327) |
| Constant | 4.758*** | -4.092*** | -3.332*** | -1.828* | -3.604*** | -2.455** | 2.181** |
| | (0.7751) | (1.332) | (0.911) | (1.019) | (1.096) | (0.990) | (0.948) |
| Observations | 1128 | 1128 | 1128 | 564 | 564 | 1128 | 1128 |

For significance of the parameters based on p-values, we respectively used ***, ** and * for 1%, 5% and 10% significance levels. Standard errors in brackets.

Results are consistent with **Hypothesis 1**: When comparing the basic dictator game and trust game, investing $x = 2$ is more often played in Basic than in Basic-t (Model III) and investing $x = 8$ is played significantly less often (Model V). Investors are more cooperative in Basic-t with a significantly higher level of investment (Model I) and a significantly higher rate of $x > 3$ (Model V and VI). There is however no difference in the rate of non-cooperative solutions $x = 0$ (Model II). These findings remain true for all treatments (Figure 1).

## 4.3 Veil treatment

In the second econometric analysis (Table 2), we run an econometric analysis for the transfer schedule $t(x)$ performed in the TG. We consider two random effects Logit models. Model VII estimates the probability of behaving non-cooperatively by setting a dummy for non-cooperative transfer schedule $t(x) = t^N(x) = 0$, and Model VIII explains the probability of choosing the egalitarian transfer with a dummy $y = 1$ for $t(x) = t^E(x) = 3x/2$ plus or minus up to 15%.[9]

Table 2: Regression results. Transfers in TG

| Variables | (VII) Transfer $= t^N(x)$ | (VIII) Transfer $= t^E(x) + / - 15\%$ |
|---|---|---|
| Social preference | 0.0009 | 0.003 |
| | (0.011) | (0.006) |
| Risk attitude | 0.061 | -0.159 |
| | (0.215) | (0.118) |
| Amount received | -0.784*** | 0.904*** |
| | (0.035) | (0.037) |
| Basic-t | Ref | Ref |
| | Ref | Ref |
| Info-t | 0.180 | -0.265* |
| | (0.145) | (0.143) |
| Veil-t | -5.214*** | 2.462*** |
| | (0.882) | (0.304) |
| Fee-t | 0.468*** | -0.328** |
| | (0.145) | (0.143) |
| Constant | 1.781 | -5.720*** |
| | (1.465) | (0.831) |
| Observations | 3524 | 3524 |

For significance of the parameters based on p-values, we respectively used ***, ** and * for 1%, 5% and 10% significance levels. Standard errors in brackets.

The evidence is mixed regarding **Hypothesis 2**. On the one hand, the efficient solution $x = 8$ with equalizing transfer $t^E(x) = 3x/2$ is highly dominant in the trust game behind the veil of ignorance (Figures 1 and 2). Subjects are significantly more likely to invest $x = 8$ and to transfer $t^E(x)$ in Veil-t compared to Basic-t (respectively Model V and VIII). More generally, subjects are more cooperative behind the veil of ignorance: they are less likely to invest $x = 0$ and to transfer $t = 0$ than in Basic-t (respectively Model II and VII). As a result, the level of investment is greater in Veil-t than in Basic-t (Model I).

On the other hand, contrary to what was expected, the subjects are not more likely to choose $x = 2$ in the dictator game behind the veil of ignorance (Figure 1 and Model IV). However, in this treatment, we observe more efficient behaviors ($x = 8$) than non-cooperative ones ($x = 0$) (Figure 1).

[9]Recall that we used the strategy method in the experiment: each subject had to give an amount to transfer back for every investment. Here we have considered only the subjects' transfers to a positive investment received: the subject takes 8 decisions in every treatment with transfer except in Veil-t where he takes only one decision. Thus we obtain 141*8*3+141=3524 observations. Models VII and VIII were also estimated without the variable 'amount received". Results are qualitatively the same.

### 4.4 Fee treatment

As for the third econometric analysis (Table 3), six other random effects Logit models focus on the impact of the fee on the levels of investment $x$ and transfer $t$. Models IX and XI respectively regress the amount invested in Fee and Fee-t, depending on whether the subject paid to get her favorite position (either $I$ or $R$) or not ($Neutral$). Models X and XII do the same but consider investment in Basic and Basic-t in order to see whether those who paid for a position behaved differently when the fee was not available. We also analyze the transfers in Fee-t and Basic-t by regressing the return ratio defined as the share of welfare transferred back (transfer divided by tripled investment received) on the same variables (Models XIII and XIV).[10] We add our usual control variables (risk attitudes and social preferences) as well as the investment as a control variable for the transfer in TG.

Table 3: Regression results. Fee treatments

| Variables | (IX) Amount invested Fee Dictator Game | (X) Amount invested Basic Dictator Game | (XI) Amount invested Fee-t Trust Game | (XII) Amount invested Basic-t Trust Game | (XIII) Returned ratio Fee-t Trust Game | (XIV) Returned ratio Basic-t Trust Game |
|---|---|---|---|---|---|---|
| Social preference | 0.027*** | 0.036*** | 0.020** | 0.039*** | 0.0006 | 0.0005 |
| | (0.008) | (0.007552) | (0.009) | (0.008) | (0.0005) | (0.0004) |
| Risk attitude | -0.244 | -0.164 | -0.416** | -0.043 | -0.003 | -0.013 |
| | (0.149) | (0.1330) | (0.168) | (0.151) | (0.009) | (0.008) |
| Amount received | - | - | - | - | 0.041*** | 0.044*** |
| | - | - | - | - | (0.001) | (0.001) |
| Investor | -3.642*** | - 1.165** | -2.650*** | -1.528** | 0.002 | -0.084** |
| | (0.577) | (0.551) | (0.737) | (0.662) | (0.041) | (0.038) |
| Receiver | Ref | Ref | Ref | Ref | Ref | Ref |
| | Ref | Ref | Ref | Ref | Ref | Ref |
| Neutral | -0.864* | 0.428 | 0.286 | 0.137 | 0.074** | 0.005 |
| | (0.472) | (0.451) | (0.543) | (0.489) | (0.030) | (0.028) |
| Constant | 5.548*** | 4.005*** | 7.748*** | 4.392*** | -0.033 | 0.092 |
| | (1.049) | (1.003) | (1.175) | (1.056) | (0.066) | (0.061) |
| Observations | 141 | 141 | 141 | 141 | 1128 | 1128 |

For significance of the parameters based on p-values, we respectively used ***, ** and * for 1%, 5% and 10% significance levels. Standard errors in brackets.

Results are consistent with **Hypothesis 3**. Fees induce less cooperation. Non-cooperative solutions $x = 0$ are more frequent in Fee compared to Basic, and in Fee-t compared to Basic-t.

[10]Models XIII and XIV were also estimated without the variable "amount received". Results are qualitatively the same.

Proportions (Figure 1) are significantly different according to a Fisher exact test (respectively $p$=0.007 and $p$=0.06). The subjects are moreover significantly more likely to invest $x = 0$ in Fee and in Fee-t (see Model II). As for the level of transfers in the TG, the subjects in Fee-t are more likely to transfer $t^N(x) = 0$ and less likely to transfer $t^E(x) = 3x/2$ evenly (Models VII and VIII).

We now distinguish individuals according to whether they are willing to pay the fee and, if they are, whether they are willing to pay to be an investor or a receiver. In the DG, 47% of our subjects were not prepared to pay a fee, 23% were willing to pay to get the investor position, and 30% were willing to pay to get the receiver position. The latter proportion is rather surprising as $R$ is completely passive. In the TG, 55% of our subjects were not ready to pay a fee, 23% were willing to pay to be $I$ and 27% were willing to pay to be $R$. Although the $R$ position is apparently more appealing in the TG, this distribution is surprisingly close to the one in the DG.

Subjects willing to pay to be $I$ are significantly less cooperative: they invest less in Fee (Model IX) and Fee-t (Model XI), consistently with H3. Significantly, they are also less cooperative by investing less in Basic (Model X) and Basic-t (Model XII) and by transferring less in Basic-t (Model XIV). These results are consistent with previous research on trust games based on individuals willingness to pay to avoid being vulnerable to the target of trust (McEvily et al., 2012). Subjects willing to pay to be $R$ are also less cooperative: they transfer less than subjects unwilling to pay in Fee-t (Model XIII).

### 4.5 Info treatment

In Table 4 below we report the number of subjects who increase, decrease or leave unchanged their investment in the info treatment compared to the basic treatment, while investing below, above or at the same level as the average of their group in the basic treatment.

Results overall are consistent with **Hypothesis 4**. Although a slight majority did not change their investment level when informed about the average investment, subjects who did change move towards the average investment (Table 4). In Info and Info-t, only 47% of investment decisions have been revised between Basic and Basic-t, and Info and Info-t. This share is remarkably the same for the DG and the TG. Among those players, 78% of the subjects in the DG who invested less than average in Basic invest more in Info. Similarly, 82% of the subjects who invested more

| Dictator Game | Overall | $x_{basic} < \bar{x}_{basic}$ | $x_{basic} = \bar{x}_{basic}$ | $x_{basic} > \bar{x}_{basic}$ |
|---|---|---|---|---|
| $x_{info} < x_{basic}$ | 42 | 8 | 10 | 24 |
| $x_{info} = x_{basic}$ | 96 | 41 | 24 | 31 |
| $x_{info} > x_{basic}$ | 42 | 29 | 8 | 5 |
| **Trust Game** | **Overall** | $x_{basic} < \bar{x}_{basic}$ | $x_{basic} = \bar{x}_{basic}$ | $x_{basic} > \bar{x}_{basic}$ |
| $x_{info} < x_{basic}$ | 43 | 11 | 8 | 24 |
| $x_{info} = x_{basic}$ | 96 | 33 | 17 | 46 |
| $x_{info} > x_{basic}$ | 41 | 30 | 5 | 6 |

Table 4: Investment decision in Info relative to investment and average investment in Basic.

than average in Basic have reduced investment in Info. A similar feature is observed in the TG with an increase of investment for 73% of the subjects who invested less than average in Basic-t, and a decrease for 80% of those who invested more.

### 4.6 Risk and Social Preferences

Results are mixed regarding **Hypothesis 5** and inconsistent with **Hypothesis 6**. Whereas social preferences (according to the ring test) induce more investment, they do not affect transfers. Other-regarding preferences allow higher investment (Model I), lower rates of $x = 0$ (Model II) and higher rates of $x = 8$ (Model V) and $x > 3$ (Model VI). These results are in line with Kanagaretnam et al. (2009). On the other hand, coefficients associated with transfers in the TG are not significantly different from zero. The probability of transferring nothing ($t^N(x)$) or the probability of equalizing shares ($t^E(x)$) are not impacted by social preferences (respectively Models VII and VIII).

As in Houser et al. (2010), risk attitudes (according to the Holt and Laury test) are neither correlated with the level of investment nor with the level of transfer. No coefficient related to risk attitude is significant beyond the 95% threshold. It is so for all treatments including Veil and Veil-t. Risk aversion does seem to determine a subject's investment when they can be in both positions with equal probability. This suggests that they don't see the veil of ignorance treatment as a lottery for which they can choose the payoffs for the two events of being $I$ or $R$.

They might rather have chosen their ideal strategy for both the DG and TG being in the shoes of both players.

### 4.7 Efficiency-Equity trade-off

We end the analysis of our data by assessing the levels of efficiency and equity for each treatment. To do so, we relate investment level to profit equity. In Figure 3, each treatment is presented according to its degree of efficiency (x-axis) and equity (y-axis). Efficiency is quantified by the investment share ($x/8$). As for equity, we compute an equity index $E$ such as:

$$E = 2 \times \frac{Min(\pi_I; \pi_R)}{\pi_I + \pi_R} \text{ with } 0 \leq E \leq 1$$

where $\pi_I$ and $\pi_R$ are respectively the investor's and receiver's payoffs. If $E$=0 the share is perfectly unequal and if $E$=1 the share is perfectly equal.

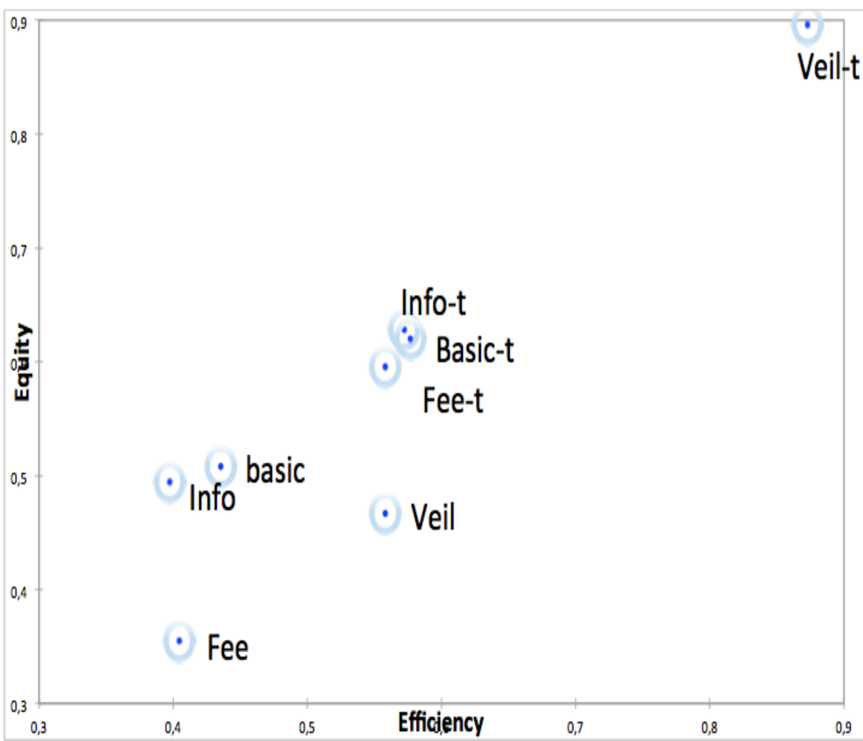


Figure 3: Classification of the treatments according indexes of efficiency and equity.

Regarding efficiency, treatments can be gathered into three groups according the Dwass-Steel-Critchlow-Fligner test of multiple comparison. With the exception of the two veil treatments,

treatments stemming from the same game (either the DG or the TG) are grouped together. Unsurprisingly, TG are more efficient than DG. Although it is a dictator game, Veil is included in the second tier with the TG. As for Veil-t, the efficiency index is remarkably close to 1. This high degree of efficiency is consistent with Hypothesis 2.

Regarding equity, payoffs in the TG are also less unequal. Fee is the most unequal treatment of all, which is in line with Hypothesis 3. Veil is the second treatment in terms of inequity and, inconsistently with Hypothesis 4, does not perform better than Basic. On the other side of the spectrum, Veil-t is remarkably equitable with an index close to 1. These observations are confirmed when computing Gini coefficients in Appendix C.

Regarding both efficiency and equity at the same time, DG are in the left-bottom of the graph showing that subjects perform poorly in both dimensions. Performances are improved in the TG although subjects achieve only 60% of both the efficiency and equity index on average for Basic-t, Fee-t and Info-t. Information neither improves nor deteriorates efficiency and equity: Info and Info-t are very much comparable with respectively Basic and Basic-t. Again, Veil-t stands out by performing remarkably well as both indexes are close to one on average.

# 5 Conclusion

This paper tests several hypotheses on the motivations for efficiency and equity in economic decisions. To do so, we ran a laboratory experiment with variations of the triple dictator game and the trust game. We design a study to track the behavior of the same subjects during the variations of these games.

Our first hypothesis is that subjects sacrifice efficiency (defined as total payoff) for equity in the dictator game, where the only egalitarian outcome is inefficient (when the investor invests two units). In the trust game, efficiency and equity are both achievable if the investor trusts the receiver and if the receiver is trustworthy. Subjects seem to follow that path as investors are less likely to invest two units and more likely to invest all units (and thus reach higher efficiency in the trust game than in the dictator game).

Our second hypothesis is that subjects express a preference for equity when they act behind the veil of ignorance. They are therefore likely to equalize payoffs as much as possible in the veil treatments for both games. The evidence is mixed. In the dictator game where subjects had to choose between being egalitarian or efficient, neither of the two strategies prevailed. Subjects expressed preferences for both. One might think that risk aversion might explain preferences for equality of payoff rather than for the extremely unequal efficient outcome. Yet we found that risk attitude measurement using the Holt and Laury test does not determine the choice between the two strategies. In contrast, in the trust game most of the subjects behaved as expected by selecting the efficient and egalitarian solution. This is remarkable as, with the strategy method played in this experiment, the egalitarian solution is defined not by a single value for transfer but rather by a transfer for every level of investment. It turns out that three-quarters of the subjects picked exactly this transfer scheme.

Our third hypothesis is that subjects who pay to get a specific position are less cooperative because they may think that they deserve a higher share of welfare when they get their position by paying rather than by chance. We find support for this: subjects willing to pay to be the investor invest less in the dictator game and the trust game and subjects willing to pay to be the receiver transfer less in the trust game. Interestingly, subjects willing to pay are also less cooperative in the other treatments. This suggests another explanation: a selection bias. The fee treatment allows the less cooperative subjects to self-select themselves to be an investor. We therefore obtain less investment not only because subjects consider that they deserve their position but also because those who contribute less are more likely to pay to be an investor.

Our fourth hypothesis is that, once subjects get to know the average investment of their group, they modify their investment decision to bring it closer to this average. Our result provides weak qualitative support for this: while the majority of subjects did not change their investment decision from the basic treatment to the info treatment, those who did changed their investment in the predicted direction. Changes did not however affect the overall degree of efficiency and equity.

Social preferences and risk attitudes were elicited with respectively the ring test and the Holt and Laury test, and used as control regressors. Our last two hypotheses concern the impact of these two "intrinsic" motives. In our fifth hypothesis, we expect altruistic subjects to be more cooperative. This is verified for the investors but not for the receivers who do not transfer back more in the trust game. Our last hypothesis is that risk attitude might explain low investment in the trust game due to the unwillingness of risk averse subjects to rely on the receivers trustworthiness. We found that risk attitude determines neither the level of investment in the two games, nor transfer in the trust game.

By putting our subjects in the shoes of both players in the veil of ignorance treatment, we are able to measure their ideal decision when solving the efficiency-equity trade-off in the dictator game. We observed a heterogeneity of ideal decisions. Although some sacrificed efficiency for equity, and others equity for efficiency, many others compromised by investing more than 2 but not all units. In contrast, when it comes to the fairness ideal measured with the transfer from the trust game (in which efficiency is compatible with equity), most subjects converge to a single ideal: egalitarianism. In the fee treatment, we wanted to investigate whether paying to get one position (either investor or receiver) acts to the detriment of both efficiency and equity concerns. It turns out to be true but for another reason than the one we expected: subjects that are less cooperative tend to pay to get their preferred position. In the information treatment we investigated whether knowing the average investment affects people's choice like a social norm. It seems not to be the case for a majority of subjects. Those who did change do nevertheless tend to follow the norm.

# Appendix

## A Timing of experiment sessions

| Order | Nb of Sessions | Nb of observations |
|---|---|---|
| RT-RA-DG-TG | 3 | 38 |
| RA-TG-DG-RT | 2 | 28 |
| DG-TG-RT-RA | 2 | 22 |
| DG-TG-RA-RT | 2 | 32 |
| RA-RT-DG-TG | 2 | 32 |
| DG-TG-RA-RT | 2 | 28 |
| Total | 13 | 180 |

Table 5: Experiment sessions with the order of its different parts (RT: ring test, RA: risk aversion test, DG: dictator game, TG: trust game)

# B Descriptive statistics and non parametric tests

Table 6: Average transfers and returns in TG and DG

| Treatments | Basic | Basic-t | Veil | Veil-t | Fee | Fee-t | Info | Info-t |
|---|---|---|---|---|---|---|---|---|
| Average investment | 3.433 | 4.628 | 4.456 | 6.872 | 3.256 | 4.394 | 3.256 | 4.544 |
| | (2.493 ) | (2.619) | (2.270) | (1.900) | (2.777) | (2.876) | (2.447) | (2.700) |
| Average returned ratio | - | 0.319 | - | 0.467 | - | 0.286 | - | 0.284 |
| | - | (0.251) | - | (0.154) | - | (0.250) | - | (0.231) |
| Average returned amount | - | 4.173 | - | 9.906 | - | 3.867 | - | 3.943 |
| | - | (2.784) | - | (4.205) | - | (2.925) | - | (2.564) |
| Average return for I=1 | - | 0.505 | - | - | - | 0.418 | - | 0.380 |
| | - | (0.737) | - | - | - | (0.695) | - | (0.705) |
| Average return for I=2 | - | 1.114 | - | 1.400 | - | 0.837 | - | 0.799 |
| | - | (1.464) | - | (1.497) | - | (1.325) | - | (1.280) |
| Average return for I=3 | - | 2.125 | - | 3.400 | - | 1.908 | - | 1.804 |
| | - | (1.920) | - | (2.154) | - | (1.890) | - | (1.627) |
| Average return for I=4 | - | 3.277 | - | 5.125 | - | 3.065 | - | 3.098 |
| | - | (2.531) | - | (2.260) | - | (2.557) | - | (2.375) |
| Average return for I=5 | - | 4.674 | - | 6.667 | - | 4.353 | - | 4.397 |
| | - | (3.281) | - | (3.266) | - | (3.402) | - | (3.025) |
| Average return for I=6 | - | 5.995 | - | 6.900 | - | 5.533 | - | 5.745 |
| | - | (3.906) | - | (1.758) | - | (4.112) | - | (3.691) |
| Average return for I=7 | - | 7.163 | - | 9.500 | - | 6.864 | - | 7.185 |
| | - | (4.637) | - | (5.408) | - | (4.981) | - | (4.532) |
| Average return for I=8 | - | 8.717 | - | 11.946 | - | 8.201 | - | 8.364 |
| | - | (5.579) | - | (2.534) | - | (5.974) | - | (5.135) |

Standard errors are in brackets. For Veil-t the average transfers are computed according to the number of subjects who decide on a given pair investment/transfer.

Table 7: Multiple comparison between investment in different treatments

| Treatments | Basic | Basic-t | Veil | Veil-t | Fee | Fee-t | Info | Info-t |
|---|---|---|---|---|---|---|---|---|
| Basic | 1 | 0.000 | 0.000 | 0.000 | 0.367 | 0.000 | 0.463 | 0.000 |
| Basic-t | | 1 | 0.431 | 0.000 | 0.000 | 0.171 | 0.000 | 0.386 |
| Veil | | | 1 | 0.000 | 0.000 | 0.954 | 0.000 | 0.614 |
| Veil-t | | | | 1 | 0.000 | 0.000 | 0.000 | 0.000 |
| Fee | | | | | 1 | 0.000 | 0.921 | 0.000 |
| Fee-t | | | | | | 1 | 0.000 | 0.231 |
| Info | | | | | | | 1 | 0.000 |
| Info-t | | | | | | | | 1 |

WSR p-values for 95/

Table 8: Multiple comparison between average returned amounts in different treatments

| Treatments | Basic-t | Veil-t | Fee-t | Info-t |
|---|---|---|---|---|
| Basic-t | 1 | 0.000 | 0.008 | 0.002 |
| Veil-t | | 1 | 0.000 | 0.000 |
| Fee-t | | | 1 | 0.448 |
| Info-t | | | | 1 |

WSR p-values for 95

# C Gini Coefficient

We compute the Gini Coefficient for all treatments. The Gini coefficient is the ratio of the area between the line of perfect equality and the observed Lorenz curve, to the area between the line of perfect equality and the line of perfect inequality. The value of the Gini coefficient varies from 0 (perfect equality) to 1 (maximal inequality). The closer to 0 the Gini coefficient is, the more equitable the treatment will be. In order to get more robust standard deviations from the original data samples, we use the bootstrapping technique based on random sampling with replacement. Results are represented in Figure 4.

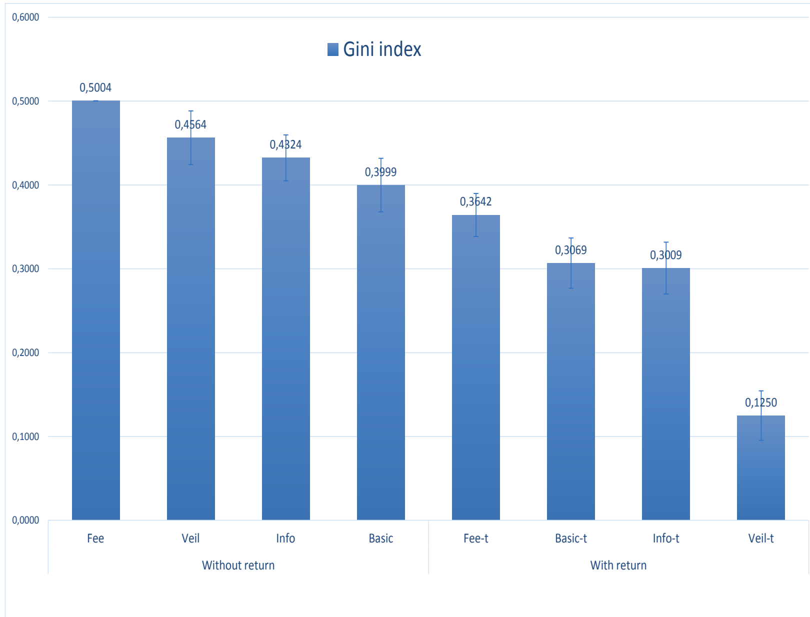


Figure 4: Classification of the treatments according to the Gini coefficient

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