When regulations backfire

MASTER THESIS BEHAVIOURAL ECONOMICS

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Abstract

This article investigates the impact of a regulation on behaviour through several perspectives. It is argued that regulations restricting the decision-maker's choice set can occur to be backfired. A laboratory experiment using economic games was implemented to place the subjects into social dilemmas. The results, even though mitigated, indicated a counter-intuitive impact of the regulation over the game outcomes. Furthermore, the mental process through which individuals take their decisions seems to also be altered through variation in the propensity to make use of certain heuristics.

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1. Chapter I: Introduction

In a revolutionary and very influential economic paper, Gneezy and Rustichini (2000) were the first ones to illustrate the importance of socially acceptable behaviour when agents take decisions. The researchers implemented a natural field experiment which allowed them to observe subjects' natural behaviour. With the partnership of day-care centres, the researchers wanted to see whether the introduction of a fine applicable to parents being late to pick up their children would decrease the proportion of parents late. In contrary to the rational predictions of the subjects' responses, the inclusion of a fine actually increased the proportion of late parents. This surprising result can be explained by the parents' intrinsic motivation to adopt a socially acceptable behaviour (i.e. being on time) in the absence of fine punishing the socially non-acceptable behaviour. Once the fine is implemented, parents feel like they have the right to be late since they "paid" for it, in a way.

Policymakers know the importance of modifying the population's behaviour in order to reach their goals (Bicchieri, 2017). From a societal point of view, there is a legitimate interest to increase people's propensity to adopt a socially acceptable behaviour but little information is available on how to do so. Since the establishment of societies as we know them today, we tend to implement regulations, laws and policies in order to direct people's behaviour into one predefined direction. More recently, policymakers acknowledged the efficiency and importance of nudging people in order to direct their choice into one direction due to the architecture of the environment. For instance, this can be illustrated by the environment architecture of supermarkets in Netherlands. Indeed, as someone enters any supermarket (e.g. Albert Heijn, Jumbo, Dirk, etc.), he will directly be facing the fruits and vegetables section. On the other side, the soda and beer products are usually located in a much more discrete area. Such nudging techniques aim to direct people's choice without restricting the initial choice set of propositions.

In parallel to nudges, most laws and regulations dictate the behaviour which its subjects must follow, without leaving them a choice. As Gneezy et al investigated, the inclusion of a fine (which is a tool to instore a "rule") is taking out people's intrinsic motivation to comply to the socially desired behaviour without getting any reward for it or punishment if they don't.

Therefore, the present paper focuses on the impact of rules and regulations on people's behaviour. It is important to note that the implemented rules aim to increase the socially acceptable behaviour of subjects. The research aims to observe whether the rules implemented affect the outcome in the direction in the expected direction if perfect rationality of subjects is

assumed. In order to observe such differences, economic games such as a Dictator game or a Public Good Game were implemented and distributed to two distinct groups. The first group was forced to contribute a predefined amount to the most socially acceptable outcome (i.e. a forced donation in a Dictator Game) and the second group had a free choice. Additionally, all the subjects were asked to self-report their perceived degree of generosity, cooperativity, etc. after each decision. The reasoning behind it is that subjects will review their expectations of what amount can be considered as "generous" downward when subject to a "minimum donation" rule. Thirdly, half of each group were aware of the identity of their peer when playing the games and the other halves were not. It will be investigated whether knowing the identity of his peer will increase the subject's perceived social obligation to contribute or donate.

The aforementioned specificities lead us to the following research question:

Does the inclusion of a rule, in economic games, impacts subjects' self-esteem and their propensity to adopt a socially acceptable behaviour?

The research paper is structured as follow. Firstly, background knowledge will be referred through the literature review section which will be followed by a brief description and explanation of the hypotheses tested along this study. Secondly, the research's methodology will be described including explanation of the experimental design as well as an extensive description of the variables. Afterwards, the results will be reported and discussed in the fifth and sixth chapters. Finally, the limitations of the research will be enunciated followed by suggestions for further research.

2. Chapter II: Literature review

2.1. Social norms and socially acceptable behaviour

First of all, we need to assess what is meant by socially acceptable behaviour. Giving to others is a more socially acceptable behaviour than keeping everything for himself because it is part of our "social norms". Those social norms are shared by all human beings but can be vary among the cultures. Social norms, which shape the theory of socially acceptable behaviour, can be seen as a common understanding, to all individuals, of a set of actions that can be either permitted, obligatory or forbidden within a society (Ostrom, 2000). Those social norms are generated by the approbation or the disapprobation of the other people forming the society following one's action (Budge & al, 2009).

However, even if social norms are a strong determinant of what is being done today, they can change as time passes by as well as with cultural differences. Several behavioural campaigns were conducted to alter the behaviour of a population, with regards to food choice, alcohol consumption or recycling, and were proofed to be successful (Schultz, 1999 & Thorndike et al, 2016 & Miller, 2016). On top of the social norms, social comparison also plays an essential role in people's action. Indeed, Schultz (2007) showed that it was efficient from a societal point of view to provide, for instance, information on habitant's neighbour's energy consumption in order to nudge them to consume less. However, if those habitants were already having a lower consumption than their neighbours, revealing them this information can have an undesirable effect as they will release their efforts and might increase their consumption as a response (Schultz, 2007).

2.2. Economic Games

Developed by Von Neumann & Morgenstern (1944), economic games were at the root of most social preferences theories such as the famous "Fehr & Schmitt" model (1999). Indeed, economic games are a unique paradigm in the sense that the decisions taken by the subjects do not only influence their own payoff but also impact the payoff of others (Zhao & Smillie, 2015). In this experiment, we will make use of two types of games. The first one is a *social dilemma*, the Public Good game, where subjects can be tempted to act selfishly in the opposite direction than what would be suggested by a social planner aiming for the best social outcome (Dawes, 1980). The second one is a *bargaining game*, the Dictator game, where a fixed payoff must be divided between the players (Kahneman, Knetsch & Thaler, 1986). In both games, rationality

and self-interest of the subject predict that he will not contribute anything to the Public Good game and won't donate anything neither while playing a Dictator game (Ashton & Lee, 2008).

However, the outcomes to those games may among every individual. As a result, it provides a variety of social preferences which are reflecting each individual personality. Therefore, several researchers started to propose models to classify subjects' personalities in function of their social preferences. The most famous and important discovery in social psychology was the Five-Factors Model which proposed a taxonomy of individuals' personalities (Costa & McCrae, 1992b; Digman, 1990; Goldberg, 1981). The five factors of the model are the followings: Extraversion (e.g. warmth, positivity), Agreeableness (e.g. trust, altruism), Conscientiousness (e.g. competence, self-discipline), Openness to new experiences (e.g. fantasies, feelings) and Neuroticism (e.g. depression, anxiety). Among those five factors, Agreeableness and Extraversion are the most relevant traits of personality intervening in the decision-making process occurring when participating into economic games (Zhao & Smillie, 2015). On the one hand, agreeableness englobes the tendency of people to care about others' feelings, needs and concerns and is often associated with a high degree of maintenance of relationships (Graziano & Eisenberg, 1997). On the other hand, extraversion relates to an enjoyment and an engagement towards a prosocial behaviour (Ashton, Lee & Paunonen, 2002). Both personality traits are positively correlated to a more socially acceptable behaviour in the outcome distribution of the games.

2.3. Previous studies

Armin Falk and Michael Kosfeld (2006) were among the first ones to observe people's difference in behaviour when subjects are able to impose rules or restrictions in a classical principal-agent problem. They implemented a simple set up were the principal was paying the agent to perform a task. The agent had to choose, in turn, a level of effort to exert, which is costly to him. Standard economic theories predict that, in the absence of restriction, the agent will perform the lowest level of effort possible to exert. However, in practise, the opposite occurs most of the time. It appears that agents are intrinsically motivated to perform the task for the principal and if the principal take initiatives to control the agent, his intrinsic motivation to perform well decreases and he is therefore very likely to perform worse than without being controlled. This phenomenon is exacerbated when agents are subject to a low level of control and the phenomenon is attenuated as the imposed control increases. Since controlling is the principal's choice, the ones who decide to do so are likely to have more pessimistic views of

expected agent's contribution. These pessimistic attitudes are going to send a signal of distrust to the agent which in turn will decrease his intrinsic motivation to perform well.

In parallel, Kessler & Leider (2016) implemented a similar experiment than what Falk & Kosfeld did but this time the imposition of the control is being done differently. In this experiment, the imposition was being done in three different ways. In the first treatment, the principal had to choose, unilaterally and asymmetrically, whether to implement the control or not. In the second treatment, the choice whether to implement a control is randomly given to one player, even before the allocation of the roles. Doing so adds symmetry into the decision-making process as both players have equal chances to have the decisional power but the choice itself is made unilaterally. Lastly, in the third treatment, subjects had to agree whether to impose a control or not, the decision is now made bilaterally and symmetrically. Their results exhibit the relevance of procedural fairness in the implementation of control since only the principals of the first treatment, where the control was imposed unilaterally and asymmetrically, were backfired by the implementation of the control. The control worked best in the case the decision to implement control was made bilaterally.

In the present experiment, the implementation of the control is made arbitrarily. Therefore, the subjects won't perceive any issue concerning procedural fairness since the decision is outside the scope of actions given to the players.

3. Chapter III: Hypotheses

The literature review highlighted the "control-averse behaviour" commonly exhibited by most subjects when being imposed to controls on their actions. However, this control-averse behaviour had been assessed only when the control is imposed by an active player of the game. In the present case, the control setting can be seen as an exogeneous factor outside the scope of actions given to the players. Therefore, we can start wondering whether the inclusion of a control, set externally, also generates a restriction-averse behaviour in subject's decisions. If this is the case, the subject is likely to make a smaller donation or contribution and therefore to adopt a behaviour less socially acceptable than when facing a free choice. This reasoning leads us to the following first hypothesis:

H1: Within an economic game, the inclusion of a regulation will decrease the decrease subject's propensity to adopt a socially acceptable behaviour.

If the subjects actually decrease their propensity to adopt a socially acceptable behaviour, we might wonder whether the subjects are capable of perceiving their behaviour being less socially acceptable than in the absence of control. They might take their decision in both cases to be over a "minimum socially acceptable" but this minimum might have been decreased by the implementation of the control. Indeed, since the control is set externally, by the experimenter, subjects are likely to view their expectations of what is socially acceptable downwards and justify a small donation as generous because it is over the imposed threshold. This reasoning leads us to the following hypothesis:

H2: For the exact same game outcomes, the inclusion of a regulation within an economic game will positively correlate with the subject's self-esteem.

Now that we are looking at the impact of the control, it would be enlightening to observe what decision patterns occur the most when the respondent is subject to a totally free choice. When facing a complex dilemma involving several variables, individuals often make use of simple rules of thumb or heuristics to help them take a decision. For instance, Bernartzi and Thaler (2001) found out that individual investors had the tendency to apply the "1/N" rule, dividing equally their capital between N types of assets. They showed that individuals were sticking to that rule of thumb even if it was leading them to uncoherent preferences. The same is expected to arise in the present experiment. In a Dictator game, the rule of thumb the most likely to be used to divide the endowment would be the same as for the investment strategies and would consist of dividing the endowment equally among the players (the "50-50 rule"). The absence of regulation enhances the usefulness of using this specific heuristic since there is

little information on what is considered acceptable, or not. Therefore, the third hypothesis is stated as:

H3: When facing a totally free choice, subjects will rely more on the "50-50" heuristic, in a Dictator game setting.

Similarly to the reasoning leading to the third hypothesis, it can be instructive to observe people's behaviour when facing the choice of an amount to steal while playing at the framed Dictator game. More specifically, it can be interesting to observe whether the inclusion of the regulation, preventing the decision-maker to steal the entirety of the endowment, could encourage him to steal. Indeed, the inclusion of the rule might subconsciously change people's attitude towards stealing and direct them in that direction. In parallel, the participants offered a free choice might feel bad about the act of stealing and therefore refuse to do so. Following this intuition, the fourth hypothesis is:

H4: When playing at the framed Dictator game, the inclusion of a control will increase subject's propensity to steal.

Lastly, half of the respondents, equally spread among the treatments, were made aware of the identity of their peer. Previous studies showed that anonymity is negatively correlated with socially acceptable behaviours (Burnham, 2003). Indeed, people will be more cautious when they can clearly be identified than when they are able to act "in the shade". Therefore, the last hypothesis can be stated as:

H5: Being aware of the identity of his/her peer will increase socially acceptable behaviours.

4. Chapter IV: Methodology

4.1. Participants

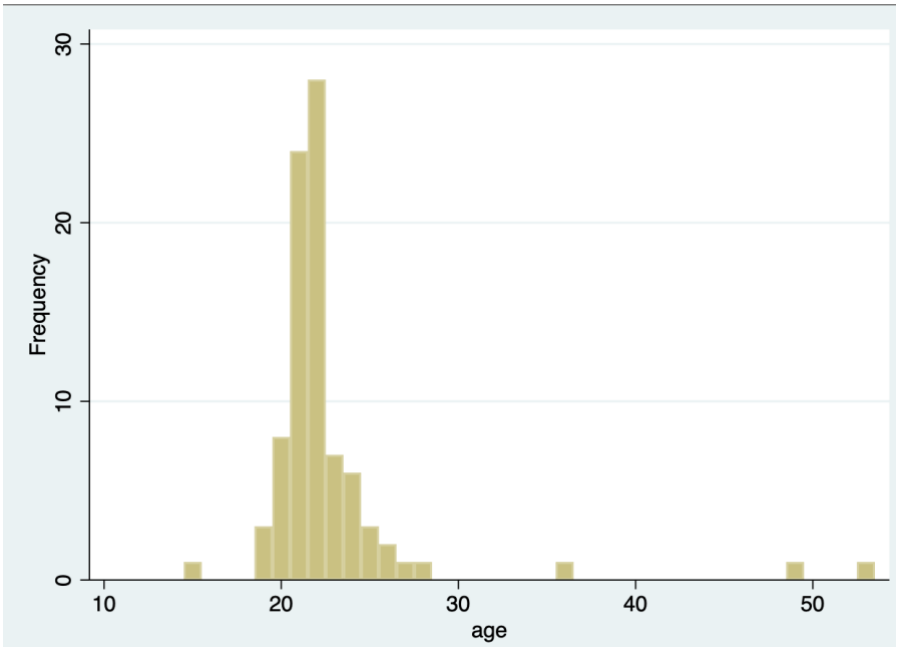
The first step of the methodology section consists of providing further details over the composition of the sample, in terms of their demographics, in order to assess what fraction of the population is observed. The following table displays the descriptive statistics of the sample through their nationalities, genders and levels of education.

Variable	Category	Frequency	Percent	Cumulative percentage
Nationality	Albanian	1	1.15%	1.15%
	Australian	1	1.15%	2.30%
	Austrian	1	1.15%	3.45%
	Belgian	66	75.86%	79.31%
	Bulgarian	2	2.30%	81.61%
	Dutch	3	3.45%	85.06%
	French	3	3.45%	88.51%
	German	1	1.15%	89.66%
	Hungarian	1	1.15%	90.80%
	Italian	2	2.30%	93.10%
	Mongolian	1	1.15%	94.25%
	Portuguese	1	1.15%	95.40%
	Russian	1	1.15%	96.55%
	Sudanese	2	2.30%	98.85%
	Vietnamese	1	1.15%	100%
Sex	Male	59	67.82%	67.82%
	Female	28	32.18%	100 %
Education	High school	14	16.09%	16.09%
	Bachelor Degree	49	56.32%	72.41%
	Master Degree or PhD	24	27.59%	100%
Total		87	100%	100%

In the present experiment, the sample is mainly composed with Belgian students. Indeed, at least three fourth of the sample is Belgian, the last quarter of the sample contains 14 different nationalities and can therefore be considered as an international population. Gender-wise, the sample is dominated by male individuals, as it can be seen in the upper table, since the female dummy takes the value 1 for only 32.2% of the observations. That leaves us with 59 male observations which account for 67.8% of the sample.

Another available and important demographic characteristic to discuss is the level of education of the subjects. The upper table exhibits the respective frequencies of three distinct levels of education. The first level englobes subjects whose highest diploma obtained is the high school diploma. Fourteen observations correspond to that level of education which account for 16% of the sample. The second level concerns subjects that obtained a Bachelor degree and accounts for the highest fraction of the population since 56.3% of the population (49 observations) self-assigned to that level. The third level of education is dedicated to the subjects which achieved a Master degree or even a PhD. The latter level was selected 24 times accounting for 27.6% of the sample observed.

Next, the distribution of the participants' respective age is displayed through the following histogram:



Most of the participants are issued from their early twenties (mean = 22.72) and the distribution of the ages is therefore highly skewed to the right. In total, the distribution of ages ranges between 15 years old as its minimum and 53 years old as its maximum.

Lastly, the following figure highlights how the two treatments are distributed among the population:

		RuleTreatment		
		1	0	TOTAL
KnowTreatment	1	20	23	43
	0	23	21	44
	TOTAL	43	44	87

The treatment groups (Ruletreatment & Knowtreatment) contain both 43 observations, inter-crossed with each other, whereas the control groups contain both 44 observations. To be more accurate, 21 subjects are part of neither of the two treatments, 23 subjects are part of one treatment but are not included in the other treatment simultaneously and 20 subjects are part of both treatments. The discrepancies between the groups are due to the abstention rate of participants in the final phase of the experiment.

4.2. Experimental Design

4.2.1. Development of the experiment

The experiment was structured as follow. Subjects were paired to play four different economic games. They competed to earn W$, the currency of the game, taking the value of 1€ for every 100W$ earned. At the start of the experiment, subjects were made aware of all the rules and information relative to the experiment required to know for a good understanding of the experiment (Figure 1 in the Appendix). Afterwards, the subjects were able to start the experiment with the first game. It is worth noting that the word "peer" was always used in order to place the decision maker into a neutral context. The use of other qualificative adjectives such as "partner" or "opponent" could have led to biased results due to the Framing Effect.

4.2.1.1. First game: Dictator Game

The first game was a Dictator game. Every subject had to divide 100W$ between his peer and himself. The measurements were made using a Likert scale going from 0 to 100, allowing the respondent to move a slider to select his desired donation. The treatment group was forced to give at least 5W$ which was translated by the same Likert scale but ranging from 5 to 100. In the questionnaire, the forced donation was justified as aiming to increase fairness. Theories of common rationality predict that the average donation with the restriction to give at least 5 must be higher than when allowing people to make donations between 0 and 5. Indeed, this is expected to arise because only people who were planning to donate less than 5W$ would experience a "positive" change in behaviour. Furthermore, the restriction is expected to have no effect on subjects which intended to give more than 5W$ in the absence of rule. Once the decision was taken, subjects had to self-report, on a Likert scale, their perceived level of generosity in function of their donation. The null hypothesis is that, on average, for the same

donation, subjects should feel the same level of self-reported generosity between the control and the treatment group. Figure 2 and 3, in the appendix, display the questionnaire structure relative to the Dictator game for a participant part of the treatment group.

4.2.1.2. Second Game: Public Good Game

The second game was a Public Good game. Every subject had to divide 100W$ between a private and a public investment. The private investment was equivalent to instantly cash out the amount and the public investment (which is the sum of both players investments) observed a 50% increase before being evenly redistributed between the two players. The players had to manually report their allocation decision for the two cases (private and public) of which the sum had to add up to 100. The treatment group was forced to contribute at least 5W$ within the public investment whereas the control group had a free choice. The forced contribution of 5W$ was justified at the aim of encouraging cooperativity between the players. Similarly to the dictator game, perfect rationality predicts that the average contribution to the public investment must be higher for the treatment group since only subjects which intended to contribute less than 5W$ in the public investment would observe an alteration of their behaviour. In parallel to what was do for the dictator game, the follow-up question aimed to measure, on a Likert scale, their self-reported cooperativity in relative to their contribution to the public investment. The null is that, on average, subjects should feel the same level of self-reported cooperativity between the control and the treatment group. Figure 4 and 5, in the appendix, display the questionnaire's questions relative to the Public Good game faced by participants within the ruletreatment group.

4.2.1.3. Third Game: Framed Dictator Game

The fourth game is another Dictator game but, this time, framed differently. Instead of asking the subjects to report the donation they are willing to make, they were asked in this game how much they are willing to "steal" from their peer as those were being offered 100W$ by the experimenter. The core decision is the same in both games: the subjects had to divide 100W$ between themselves and their peer. However, in the first game the 100W$ were given to the decision-maker which he had to decide how much he is willing to donate to his peer and in the fourth game, the 100W$ were given to the peer but allowing the decision-maker to take a fraction of it for himself. The treatment group were not allowed to steal more than 90W$ stated to be in order to prevent an unfair distribution. Once again, classical theories of rationality

predict that the treatment group should, on average, steal less than the control group since only the subjects which would have steal more than 90W$ should observe an alteration in their behaviour. We will see to which extent does this relation hold, or not, or in the other way around. Lastly, the subjects were also asked to report their perceived degree of kindness concerning their decision on the amount to "steal". Furthermore, this game is likely to illustrate a component of the "Framing Effect". Therefore, it is very likely that the decision-maker's payoff will be much higher under the first classical Dictator game than under the framed Dictator game due to the emotional barrier associated to stealing. Figure 6 and 7 exhibit the questionnaire structure for the subjects included in the treatment group relative to the framed Dictator game setting.

4.2.2. Randomization & Distribution

The subjects were contacted through social medias using the researcher's own social network. Therefore, the sample of subjects is mainly constituted by students. Those students form a heterogeneous sample of subjects from different faculties and nationalities but dominated by young male Belgian students. The subjects were contacted in the month of April 2020 to solicit their participation to the experiment. The ones who accepted to take part into the experiment (96 potential subjects) were encoded into a basic program of group randomisation. Before executing the group randomisation, it was arbitrarily decided that out of the 48 groups formed by the program, the first 24 groups would be part of the Control group (free choice) and every odd group number would be included in the second treatment and therefore will be acknowledged of the identity of their peer. By doing so, randomisation was maximised and the bias for self-selection within a treatment can be excluded. Once the groups were formed, every subject was contacted individually with the same message thanking them for taking part into the experiment and eventually including the identity of their peer in case the subject was part of the second treatment.

4.3. Measures

4.3.1. Dependent variables

The regressions relative to the first hypothesis use "donation", "contribution" and "theft" as its main dependent variables. Those variables will report respectively the value of the donations reported by the subjects, while playing the Dictator game, the value of the contributions to the

public investment reported by the subjects, while playing the Public Good game and the value of the thefts while playing at the framed Dictator game.

The regressions relative to the second hypothesis, use “generosity”, “cooperativity” and “kindness” as the three dependent variables. Those variables will incorporate the self-reported values of generosity, cooperativity and kindness, using a Likert scale measurement ranging from 0 to 100. The self-reported measures of generosity, cooperativity and kindness were collected after the Dictator game, Public Good game and the framed Dictator game respectively.

The regression relative to the third hypothesis uses “half” as the dependent variable. The variable “half” is a binary variable taking the value 1 if the subject divided the endowment equally between the players when playing the Dictator game and 0 otherwise.

The regression relative to the fourth hypothesis uses “NOstealing” as the dependant variable. The variable “NOstealing” is also a binary variable taking the value 1 if the subject refused to steal anything from his/her peer when playing the framed Dictator game and 0 otherwise.

The last regression aiming to address the fifth hypothesis will use the same dependent variables as the ones relative to the first hypothesis; “donation”, “contribution” and “theft”.

4.3.2. Explanatory variables

For all first four hypotheses, the main explanatory variable will be the binary variable “ruletreatment” which will take the value 1 if the individual was part of the treatment group and so subject to a rule restricting his/her choice and 0 otherwise. For the fifth hypothesis however, the main explanatory variable will be the binary variable “knowtreatment” which will take the value 1 if the subject was part of the second treatment group implying that he was aware of who his peer was and 0 otherwise.

4.3.3. Controls

On top of the explanatory variables such as “ruletreatment” or “knowtreatment”, several controls will be included in the regressions in order to minimise confounding effects consequent to other demographic characteristics. Those controls will always be referred as “controls” within the models. They include age and sex and the level of education achieved by

the subject. However, the controls will not account for the nationality of the subjects due to the poor diversity of nationalities and absolute dominance (>75%) of the Belgian nationality.

Furthermore, additional controls will be necessary for specific models. First, when analysing the second hypothesis, the actual donation, contribution, theft is definitely influencing the self-reported generosity, cooperativity and kindness respectively. Therefore, it will be essential to control for those when modelling the second hypothesis. Second, when modelling the third hypothesis concerning subjects' propensity to share the endowment equally, it might be suitable to control for the variable "know" as well since knowing the identity of your peer might increase subjects' perceived obligation to share in an equal way. The same hold for the next hypothesis on the propensity to steal. Indeed, since the two players know each other's identity, it might decrease subject's probability to steal a fraction of what belongs to his peer knowing that they are both able to identify each other.

4.4. Statistical analysis

The following sections will aim to introduce the models which will be used to estimate the impact of the treatments on the games' outcomes.

4.4.1. Regression Analysis

The first regression will aim to observe the effect and magnitude of the treatments on the games' outputs. By doing so, we will be able to observe the result of both the first and fifth hypotheses. The hypotheses will be address using typical OLS regressions. The models proposed to estimate the impact of the control is as follow:

$$donation = \beta_0 + \beta_1 * ruletreatment + \beta_2 * knowtreatment + \beta_y * controls$$

$$contribution = \beta_0 + \beta_1 * ruletreatment + \beta_2 * knowtreatment + \beta_y * controls$$

$$theft = \beta_0 + \beta_1 * ruletreatment + \beta_2 * knowtreatment + \beta_y * controls$$

Similarly, the models needed to analyse the second hypothesis will also stand as OLS regressions but this time regressing the self-esteem measures (self-reported level of generosity, cooperativity and kindness) of the subjects. The models consist of the followings:

$$generosity = \beta_0 + \beta_1 * ruletreatment + \beta_2 * donation + \beta_y * controls$$

$$cooperativity = \beta_0 + \beta_1 * ruletreatment + \beta_2 * contribution + \beta_y * controls$$

$$kindness = \beta_0 + \beta_1 * ruletreatment + \beta_2 * theft + \beta_y * controls$$

The third hypothesis is regressing a binary variable. In order to regress a binary variable as a dependant variable, it is wise to make use of a logit or a probit model as it insures a better reliability of the coefficient estimate (after computing for the marginal effects). Moreover, a linear relationship, as depicted by the classical OLS model, is less likely to represent a realistic relationship between the variables in comparison to the nonlinear design of the probability curve depicted by the logit or probit models. Indeed, those models account for the natural limit of probability values (prob $\in$ [0,1]) which is violated under the OLS design. Therefore, the usage of a simple OLS model is prevented which leaves us the choice between a probit or a logit model. It is often suggested to use a logit model for the simplicity it offers relative to the probit model. (Guo Chen & Hiroki Tsurumi, 2010) For those reasons, we will implement a logit regression model allowing us to estimate the probability for the subject to share the endowment of the Dictator game equally among the players. The model stands as follow

$$P(half) = \beta_0 + \beta_1 * rule + \beta_2 * know + \beta_y * controls$$

Similarly, the next model, aiming to observe subject's probability to steal from his peer, will also be structured as a logit model, ideal to regress a binary variable. The model will estimate the probability for a subject to refuse to steal from his peer and is stated as follow:

$$P(NOstealing) = \beta_0 + \beta_1 * rule + \beta_2 * know + \beta_y * controls$$

4.4.2. Nonparametric statistical tests

On top of the regression analysis described above, several nonparametric statistical tests can be realised to propose another angle of analysis on the issue at hand. Mann-Whitney U tests will be conducted for the first, the second and the fifth hypothesis. A Mann Whitney U is suitable to be used because it aims to observe differences between two independent samples compared to each other. The test ranks the observations, then compute the sum of the ranks and compare whether it statistically differs from the expected sum of ranks which assumes that there are absolutely no differences between the two groups. Concerning the first hypothesis, it is analysed whether the two samples donate similar amount on average. For the second hypothesis, it is analysed whether the two samples report equivalent self-reported measures of generosity, cooperativity and kindness. For the fifth hypothesis, the analysis observes if the subjects that know their peer, compared to the subjects that don't, make the relatively similar donations.

Moreover, concerning the third and the fourth hypothesis, we propose to conduct a "Fischer exact test" since those hypotheses rely on an interaction between two binary variables. On the one hand, the third hypothesis aims to see whether players subjects to a control are less likely to share the endowment equally when participating to a Dictator game. On the other hand, the fourth hypothesis aims to observe differences in the propensity of stealing between the players subject to the regulation and the players benefitting from a free choice.

4.5. Replicability, reliability and validity

The experiment conducted was based on classical economic games. The experiment consists of three different economic games, each one of them aiming to place the decision-maker into a social dilemma. The setup of the experiment is therefore simple and straightforward which make it replicable without much difficulties. Furthermore, the players' decisions were matched and the earnings were computed after completion of the experiment. As a result, a real-time interaction between the peers was not necessary and it also allows for the participants to respond at their preferred convenience. The appendix section provides visual supports for the experimental setup implemented in the present research.

Nonetheless, the reliability of the results can be a concern in the sense that some variables are highly subjective and therefore can lead to substantial discrepancies between the observations of different populations. Such subjective variables englobe the self-reported measures of generosity, cooperativity and kindness and can be highly correlated by cultural differences (J. Henrich et al, 2001). As a consequence, differences in these measurements could arise if the experiment is settled using a culturally different sample.

Despite the fact that the measurements can be discussed, the validity of the research does not appear to be a major concern. Indeed, the main explanatory variable observed in this study is the "ruletreatment" variable and, as mentioned previously, the subjects are allocated to the treatment on a random basis. Therefore, it is unlikely that a third variable could influence the outcomes of the economic games through the rule treatment main explanatory variable.

To conclude, the experiment setting is relatively easy to replicate and the validity of the results should not be a concern in the case at hand. However, the reliability of the results could be a source of bias if the present results are not replicable on an essentially different population.

5. Chapter V : Data Analysis

5.1. The treatments' impact on the games' outcomes

In the first place, the main focus will be to describe how and to which extent do the two treatments impact the outcomes of the economic games. As a result, this first section will aim to investigate further the first and fifth hypotheses stated in Chapter III.

5.1.1. Regression Analysis relative to the First Hypothesis

In this first section of the Data Analysis Chapter, we investigate whether the first hypothesis can be supported by statistical evidences. The first hypothesis was stated as "*Within an economic game, the inclusion of a regulation will decrease the decrease subject's propensity to adopt a socially acceptable behaviour".* The following Table exhibits the results of the OLS regression described in section 4.4.1. using donation, contribution and theft as their main dependent variables.

	Variable	Coefficient	Standard Error	t value	p value
Donation	ruletreatment	-4.39	3.81	-1.15	0.253
	knowtreatment	2.68	3.80	0.71	0.482
	age	0.13	0.39	0.33	0.745
	educ	-1.38	2.92	-0.47	0.638
	female	0.99	4.09	0.24	0.810
	constant	45.17	10.66	4.24	0.000
Contribution	ruletreatment	-5.24	5.77	-0.91	0.367
	knowtreatment	2.63	5.75	0.46	0.648
	age	0.35	0.59	0.59	0.558
	educ	-7.39	4.42	-1.67	0.098
	female	2.18	6.18	0.35	0.725
	constant	71.90	16.14	4.45	0.000
Theft	ruletreatment	-0.68	5.69	-0.12	0.905
	knowtreatment	2.47	5.67	0.43	0.665
	age	0.38	0.58	-0.66	0.513
	educ	2.25	4.36	0.52	0.607
	female	-7.96	6.10	-1.30	0.196
	constant	31.38	15.93	1.97	0.052

In the first specification, none of the variables reveal to be significant to estimate the donation of a subject as their p-values exceed all the 0.1 threshold. However, it is worth having a look at the estimated magnitude of the ruletreatment effect since it has the lowest p-value of

all variables. The coefficient of the ruletreatment variable is -4.4 which indicates that subjects part of the ruletreatment group give on average 4.4 W$ less to their peer compared to the subjects which benefit from a free choice. Since the average donation is 44.6, the inclusion of the rule accounts for around 10% decrease in donation from the subjects.

The second regression analyses the contributions to the public investment and guides us towards similar conclusions. The coefficient estimate for the ruletreatment (-5.24) is also negative and is estimated to have an even greater effect than over the donations. However, its volatility is also higher which makes the prediction more uncertain and less reliable. Overall, subjects tend to contribute 5.24W$ less into the public investment compared to the subjects part of the control group.

The last regression, aims to estimate the theft realized by the decision-maker in function of his inclusion into the ruletreatment group. This regression gives the most insignificant and counter intuitive results. Indeed, it appears that being part of the ruletreatment is this time decreasing the amount stolen but only by 0.68 W$ which is very low. Furthermore, the p-value associated with this coefficient estimate is extremely high (0.905) compared to the p-values associated with the ruletreatment coefficients in the other two specifications (0.253 & 0.367). As a consequence, we can conclude that the ruletreatment's impact can be seen as null when applied to the framed Dictator game.

Statistical Support:

Three Mann Whitney U tests (N=87) had been ran to observe discrepancies between the games' outcomes and the inclusion of the subject within the rule treatment or not.

The null hypothesis of the test is that the donation is similar among the two groups (treatment and non-treatment) and the test resulted in a z-value of 1.641 corresponding to a p-value of 0.1. This result means that we can reject the null hypothesis and recognise that there are substantial differences between the donations operated by the two groups. However, we cannot be too confident about the rejection of the null since it can only be done at the 10% confidence level, due to the p-value of 0.1. This observation indicates that the distribution of donation of the "ruletreatment" group is shifted to the left in comparison to the distribution of the control group. In other words, this suggests that the subjects facing the regulation are indeed making an inferior donation.

Similarly, the same test was performed for the Public Good game testing also whether the contribution to the public investment is equal among the two groups. The test results in a

z-value of 1.13 corresponding to a p-value of 0.257 which is too high to reject the null hypothesis at any confidence level. However, the test indicates that the subjects facing the regulation seemingly contribute less relative to the subjects benefitting from a free choice. Nevertheless, this is just a tendency which cannot be proven right as the p-value is too large (=0.257).

Lastly, the same procedure is replicated in order test the null hypothesis stating that the distribution of the thefts is similar among both groups. The Mann Whitney U test reports a z-value of -0.144 and a corresponding p-value of 0.88. Therefore, as remarked in the regression analysis, we are unable to reject the null hypothesis and it can be concluded that, over the framed Dictator game, the rule treatment has little or no impact on the amount stolen by the subjects.

5.1.2. Regression Analysis relative to the Fifth Hypothesis

The statistical material required to investigate the fifth hypothesis is essentially the same as the tables provided in section 5.1.1. A copy of those tables is provided below:

	Variable	Coefficient	Standard Error	t value	p value
Donation	ruletreatment	-4.39	3.81	-1.15	0.253
	knowtreatment	2.68	3.80	0.71	0.482
	age	0.13	0.39	0.33	0.745
	educ: Bachelor	-6.05	5.40	-1.12	0.266
	educ: Master	-4.01	5.96	-0.67	0.503
	female	0.99	4.09	0.24	0.810
	constant	45.17	10.66	4.24	0.000
Contribution	ruletreatment	-5.24	5.77	-0.91	0.367
	knowtreatment	2.63	5.75	0.46	0.648
	age	0.35	0.59	0.59	0.558
	educ: Bachelor	-1.78	8.19	-0.22	0.829
	educ: Master	-13.27	9.04	-1.47	0.146
	female	2.18	6.18	0.35	0.725
	constant	71.90	16.14	4.45	0.000
Theft	ruletreatment	-0.68	5.69	-0.12	0.905
	knowtreatment	2.47	5.67	0.43	0.665
	age	0.38	0.58	-0.66	0.513
	educ: Bachelor	8.49	8.08	1.05	0.296
	educ: Master	6.18	8.92	0.69	0.491
	female	-7.96	6.10	-1.30	0.196
	constant	31.38	15.93	1.97	0.052

In the first specification, it is analysed whether knowing the identity of its peer affects the realised donation. coefficient indicates a positive relationship between the donation and the fact that the subject knows the identity of his peer. The coefficient estimate equals 2.68, implying that the subjects who knew the identity of their peers increased their donation by 2.68W$, on average. However, the coefficient estimate is insignificant as its associated p-value equals 0.482.

The second specification, observing discrepancies between the two groups over the contributions made to the public investment, also exhibits a positive coefficient for the ruletreatment variable. It seems to indicate a positive relationship between the treatment and the contributions to the public investment. The magnitude of the effect is very consistent to what was observed in the first specification as the coefficient estimate equals 2.63. However, once again, the difference between the groups is not big enough to confirm a significant impact of the treatment.

Lastly, the knowtreatment is also positively correlated with the theft realised by the subjects. Indeed, as the coefficient estimate is equal to 2.47, the subjects that knew the identity of their peer realised a 2.47W$ bigger theft, on average. However, due to its high variance, this effect cannot be proven to be statistically significant.

Statistical Support:

Similarly to what was done to examine the first hypothesis, three Mann Whitney U tests (N=87) are being performed to observe discrepancies between the subjects that knew the identity of their opponent and the ones that did not. All three tests reveal that both groups have very similar distributions of donations, contributions and thefts independently of whether they know the identity of their peer or not. Indeed, their respective z-values equal -0.227, -0.509, -0.720 and their p-values equal 0.82, 0.61 and 0.47. These high p-values highlight the insignificance, in the present experimental setting, of the "knowtreatment" binary variable when deciding the amount to donate, contribute or steal.

5.1.3. Conclusion of the First and Fifth Hypotheses

The first and fifth hypotheses investigated whether the fact of being subject to a regulation or to be informed of the peer player's identity can impact the outcomes of several economic games. It was shown that the knowtreatment has poor predictive power on the games' outcomes and failed to indicate a sufficient impact to reject the null hypothesis. However, the

ruletreatment reveals to be more reliable to predict subjects' behaviour. Indeed, the Mann Whitney U test indicated the possibility of a shifted distribution of donation to the left for the subjects included in the ruletreatment group. It appears that the participants which were taking their decision without restrictions are donating on average 4.4W$ (i.e. 10% of the donation) more than the participants subject to the regulation. The effect of the ruletreatment seems to be even stronger concerning the contribution made while playing the Public Good game but this effect is also more uncertain and therefore less significant. Lastly, the framed Dictator game indicated no particular impact of the ruletreatment on the average theft realised.

5.2. The secondary impact of the ruletreatment on the self-esteem

In the hypotheses' description, it was mentioned that the inclusion of a regulation might impact and change the subject's perception of what is fair to donate, contribute or steal. The second hypothesis states that: if the ruletreatment decreases the subject's perception of fairness requirements, he will experience a consequent increase in his self-esteem. As a result, for the exact same donation, contribution or theft, a subject issued from the treatment group is likely to report a higher measure of generosity, cooperativity or kindness, in comparison with someone who wasn't facing a regulation.

Regression Analysis relative to the Second Hypothesis:

The results of the regression relative to the second hypothesis are presented below. It regresses the subjects' self-reported level of generosity in function of his inclusion, or not, into the treatment group. In addition to the usual controls, it is essential to control for the donation, contribution and theft realised (within their respective models) in order to deliver unbiased results for the coefficient estimate of the treatment. Indeed, the donation, contribution and theft executed in the first place are definitely influencing the subject's self-reported level of generosity, cooperativity and kindness respectively. The table on the next page displays the regression results relative the second hypothesis:

	Variable	Coefficient	Standard Error	t value	p value
Generosity	ruletreatment	-2.48	4.53	-0.55	0.586
	donation	0.61	0.13	4.70	0.000
	age	0.71	0.45	1.58	0.119
	female	9.06	4.82	1.88	0.064
	educ: Bachelor	6.32	6.38	0.99	0.325
	educ: Master	6.48	7.07	0.92	0.362
	constant	6.55	13.30	0.49	0.624
Cooperativity	ruletreatment	-2.15	3.74	-0.57	0.568
	public	0.55	0.07	7.68	0.000
	age	0.23	0.37	0.60	0.547
	female	-0.31	3.99	-0.08	0.938
	educ: Bachelor	-3.02	5.23	-0.58	0.565
	educ: Master	2.92	5.89	0.50	0.621
	constant	25.95	11.10	2.34	0.022
Kindness	ruletreatment	4.00	6.17	0.65	0.518
	steal	-0.65	0.12	-5.39	0.000
	age	1.24	0.62	2.00	0.049
	female	8.77	6.68	1.31	0.193
	educ: Bachelor	-1.55	8.78	-0.18	0.860
	educ: Master	-10.11	9.72	-1.04	0.302
	constant	58.95	16.63	3.54	0.001

The first table displays the result of the OLS regression running the self-reported level of generosity in function of the ruletreatment, donation and the controls. There appear to be a negative relationship between the ruletreatment and the self-reported measure of generosity (coefficient = -2.48). This finding would imply that, even after controlling for the exercised donation, the subjects issued from the ruletreatment group feel on average 2.48 percentage points less generous than the subjects of the control group. This finding goes against the predictions made by the second hypothesis. Once again, due to a standard deviation almost twice as big as its coefficient, the ruletreatment variable is statistically insignificant.

The second table describes the same OLS but regressing this time the self-reported level of cooperativity in function of the ruletreatment, the public investment and the controls. The results are similar to the previous OLS, there seem to be a negative relationship between being part of the ruletreatment and the self-reported measure of cooperativity (coefficient = 2.15), however insignificant.

Lastly, the final table reports the third regression analysis aiming to observe differences between the two groups over their self-reported level of kindness, after playing the framed Dictator game. There appear to be this time a positive relationship between observations part

of the ruletreatment and their perceived level of kindness. The coefficient (4.0) is bigger, in absolute value, and the standard deviation (6.17) is bigger as well which therefore leads us an insignificant impact of the ruletreatment on subjects perceived kindness.

Before concluding, it is worth having a look at the controls. In the first and third table, it seems that women are likely to feel much more generous and more kind than men, even after controlling for their executed donation and theft. In addition, subjects seem to feel more generous and more kind as their age increases as well. Both effects are significant (or almost) and reveal substantial discrepancies between the subjects' self-reported level of generosity and kindness in function of their personal demographics.

Statistical Support:

Similarly to what had been done for the first and fifth hypotheses, three different Mann Whitney U tests (N=87) are run, aiming to observe the distribution of the self-reported levels of generosity, cooperativity and kindness among the two groups of participants. It appears that the distribution of the self-esteem measures is shifted in the opposite direction than expected by the second hypothesis, which indicates that the subjects part of the "ruletreatment" group had on average an inferior level of self-esteem. Concerning the first game, the self-reported generosity level is associated with a low z-value of 0.733 corresponding to a high p-value of 0.46, the result is not statistically significant. Similar analysis can be overtaken when looking at the next self-esteem measure, cooperativity. However, as mentioned for the previous measure, the difference in distribution is too small to witness a significant impact with this test.

Lastly, with regards to the third measure of self-esteem, the opposite is observable. Indeed, as the sum of ranks for the observations part of the treatment is superior to what was expected (2000 to 1892, respectively), it seems that the subjects included into the treatment group felt more kind than the subjects issued from the other group. Yet, the test reports a z-value of -0.93 and a p-value of 0.35 which fail to indicate a significant difference between the groups.

5.3. Subject's propensity to divide the endowment equally

In the following section, it is investigated whether the treatment influence the decision-maker to make use, or not, of a certain heuristic mechanism to help his decision-making process. More precisely, it will be analysed whether the subjects issued from the control group make comparatively more use of the rule of thumb, implying an equal division of the endowment, while playing at the Dictator game. In order to observe the distribution of subjects sharing the

endowment equally between the two groups, two different analysis will be operated: a logit regression analysis and a Fischer-exact test.

Regression Analysis relative to the Third Hypothesis:

The following table exhibits the results of the logit regression relative to the subjects' propensity to share the endowment equally when playing the Dictator game.

	Variable	Coefficient	Standard Error	z value	p value
P(Half)	ruletreatment	-0.97	0.48	-2.01	0.045
	knowtreatment	-0.38	0.46	-0.82	0.414
	age	0.16	0.13	1.28	0.201
	educ: Bachelor	-0.14	0.69	-0.21	0.835
	educ: Master	-0.31	0.80	-0.39	0.698
	female	-0.08	0.50	-0.16	0.877
	constant	-2.07	2.55	-0.81	0.416

The upper results table highlights the clear substantial impact of being part of the treatment group on the probability to divide the endowment equally. The effect is statistically significant at the 5% confidence level with a p-value which equals 0.045. However, nothing else can be interpreted using the coefficient of the logit regression, the marginals effects need to be computed in order to get a better idea of the effect's magnitude. Those marginal effects are computed in table below:

	Variable	Coefficient	Standard Error	z value	p value
P(Half) Marginal Effects	ruletreatment	-0.21	0.10	-2.21	0.027
	knowtreatment	-0.08	0.10	-0.83	0.407
	age	0.04	0.03	1.32	0.188
	educ: Bachelor	-0.03	0.15	-0.21	0.833
	educ: Master	-0.07	0.17	-0.39	0.695
	female	-0.02	0.11	-0.16	0.877

The coefficient of the ruletreatment variable (-0.21). It indicates that the average effect of the binary variable on the probability to share the endowment equally is -21,1% in comparison to subjects from the control group. This effect is also significant at the 5% significance level through a p-value equalling 0.027. The null hypothesis stated that there is no relationship between the propensity to share the endowment equally and being part, or not, of the treatment group. Those results confirm the third hypothesis and enable us to reject that null hypothesis at the 5% confidence level.

In conclusion, the regression analysis clearly indicates a substantial impact of the regulation treatment on the participant's decision-making process. It appears that the subjects included into the treatment group are, on average, 21% less likely to make an equal distribution of the endowment. The findings in section 5.1, even though mainly insignificant, revealed that the subjects were donating comparatively less when facing a regulation forcing them to give a minimum than when benefitting from a free choice. The present analysis revealed that the people from the treatment group see their incentive to share the endowment equally dropping in comparison to the control group. This switch in social incentive might explain why subjects from the treatment group donated an inferior amount at the first Dictator game.

Statistical Support:

The third hypothesis states that the implementation of a regulation will decrease subject's propensity to adopt a socially desirable behaviour. Dividing the endowment equally can be seen as one of those socially desirable behaviours.

In the present situation, we aim to observe an eventual correlation between two binary variables, 'half' (which equals 1 when the subject divided the endowment equally, 0 otherwise) and the 'ruletreatment' variable. Four distinct groups are formed as a consequence and a nonparametric test will be implemented in order to compare the numerical distribution of subjects between these four groups. As such, a Fisher exact test (N=87) is being performed to observe such discrepancies. The following figure exhibits the results of the Fisher exact test.

		RuleTreatment		
		1	0	TOTAL
Half	1	22	31	53
	0	21	13	34
	TOTAL	43	44	87

p value = 0.052

The results reveal that more subjects decided to share the endowment equally (53 versus 34). Looking at the proportions within the treatment group, a little bit less than half of the subjects decided to share the endowment equally (21 versus 22). Within the control group, approximately three fourth of the control group took the decision to share the endowment equally. This difference between the distributions seems substantial and is demonstrated to be significant by the Fischer exact test. The test result of 0.052 indicates that there is only 5.2%

chance to observe this outcome (or a more extreme one) assuming that the variable "half" is equally allocated among the two groups.

5.4. Subject's propensity to steal

Similarly to the previous procedure, the research aims to observe whether the subjects included in the control group are more likely to decide to not steal anything to their peer in comparison to the subjects part of the treatment group. In other words, the last statistical analysis looks if the participants are less likely to refuse to steal their peer when they are subject to a regulation.

Regression Analysis relative to the Fourth Hypothesis:

If the inclusion of the regulation changed the subjects' propensity to share the endowment equally through impacting the use of a certain rule of thumb, the same might hold for the framed Dictator game. Indeed, the framed Dictator game is a variant of the classical Dictator game as the decision-maker has to steal instead of donate. The social code of conduct obviously states that stealing is bad and that we should not do so.

Following the same logic as the one of the previous analysis, the fact of being subject to a rule can affect your propensity to steal (any amount, does not matter). Inversely, not being subject to any regulation might decrease your propensity to steal and make the subject more inclined to stick a behaviour respecting the social code of conduct and therefore refuse to steal anything from his peer. The binary variable used to classify subjects, between the ones that steal and the other ones that do not, is labelled as 'NOsteal' and equals 1 when the subject reported '0' in the amount they decided to steal and equals 0 otherwise. For the same reasons as the ones expressed in the previous regression analysis, a logit model was implemented to observe differences between groups. The results are the following:

	Variable	Coefficient	Standard Error	z value	p value
P(NOstealing)	ruletreatment	0.39	0.48	0.08	0.935
	knowtreatment	-0.12	0.47	-0.26	0.794
	age	0.09	0.06	1.48	0.138
	educ: Bachelor	-0.16	0.67	-0.24	0.808
	Educ: Master	-0.60	0.76	-0.80	0.421
	female	0.41	0.50	0.81	0.420
	constant	-2.13	1.50	-1.42	0.156

However, with an extremely high p-value (=0.935), the null hypothesis cannot be rejected and the effect can be considered null. There is no need to compute the marginal effects in this case since the ruletreatment variable reveals to be highly insignificant.

Statistical Support:

Following the same reasoning as in the statistical support relative to the third hypothesis, a Fisher exact test (N=87) is being conducted to test for significant discrepancies between the four distinct groups.

The test reveals a very similar distribution of the NOsteal variable among the two groups (treatment and control), which approximates one third of 'NOsteal' individual in both groups. With such a similar distribution within the groups, the test is unlikely to be deliver a significant result. Indeed, the p-value of 0.47 highlights a relatively high probability to observe such outcome assuming that the variable "NOsteal" is equally distributed among the two groups.

6. Chapter VI : Discussion of the results

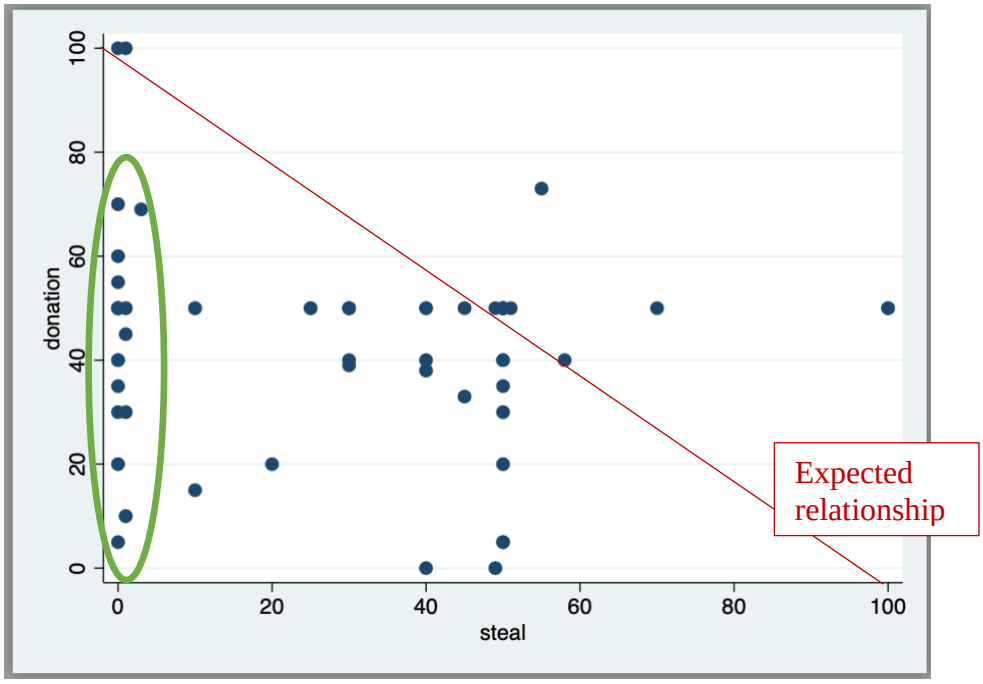
6.1. An illustration of the Framing effect

An interesting feature of the experiment setup is the resemblance between the Dictator game and the framed Dictator game. Indeed, the core decision is actually the same between the two games; the decision maker has the divide 100W$ between his peer and himself. However, the context differs among the games. On the one hand, in the classical Dictator game, the endowment is 'given' to the decision-maker in order for him to select an appropriate amount to donate to his peer. On the other hand, the framed Dictator game states that the endowment is given to the decision-maker's peer but he is allowed to steal from the endowment. Both games result into a division of 100W$ between the two players. Theories assuming perfect rationality of the decision maker expect to observe him to cash out the whole 100W$ for himself while playing both games (or 90 W$ if the player is subject to the regulation). However, in practise this is not the case, people do not maximise their own payoff at all cost. The experiment conducted by Joseph Henrich et al. (2001) highlighted the disparities of behaviour between several tribes when taking decisions over economic games. Using an Ultimatum Game, they showed certain population (i.e. Au & Gnau) typically rejects hyper-fair offers, superior to 50%, to avoid being in the debt towards someone. Those findings highlight the existence and relevance of other heuristics arising within each individual through its decision-making process.

The experiment conducted in the present research confirms the irrelevance of the perfectly rational and self-interested behaviour assumed by classical economic theories as only 2 people (over the 43 subjects of the control group) chose to donate 0 and therefore kept the whole endowment for themselves. Moreover, the outcome of the framed Dictator game should be consistent and coherent to the previous decision over the amount to donate. Since the core decision is the same between the two games, the average theft operated by the subjects should equal what the same decision maker awarded himself while playing the normal Dictator game (100 – donation). On average, the players awarded themselves with 55.38W$ (100 – 44.62) in the normal Dictator game but decided to steal only 25.77W$ while playing the framed Dictator game. This is more than twice as small. Unsurprisingly, the difference between the means reveal to be statistically significant, proving one more time the existence of the framing effect.

Furthermore, it is insightful to look at a scatterplot of the donations versus the thefts of the players. Predictions based on subjects' complete rationality would expect a -45° decreasing

straight line connecting the two extreme combinations: 0/100 & 100/0 (if subject donates 100 he should steal 0 to be consistent, and vice versa). Indeed, if people decide to keep two third or the full endowment for themselves in the Dictator game, they should in turn steal one third or the full endowment of the framed Dictator game. Here down is displayed the scatterplot of the combination of donation and theft executed by the same player while playing both games:



Many insights can be retrieved from this scatterplot. First of all, the expected relationship line indicates the coherent combination of donation and theft if players were making abstraction of the framing effect. The area over the red line indicates combinations where the player over-steal (steal more than "optimally"), conditional to his donation. Similarly, the area under the expected relationship line indicates combination of outcomes where the player under-steal (steal less than "optimally"), conditional to his realised donation. In the present case, we can clearly observe that most of the combinations lie under the red line and therefore indicates that subjects tend to under-steal in comparison to the situation in which subjects would make coherent choices.

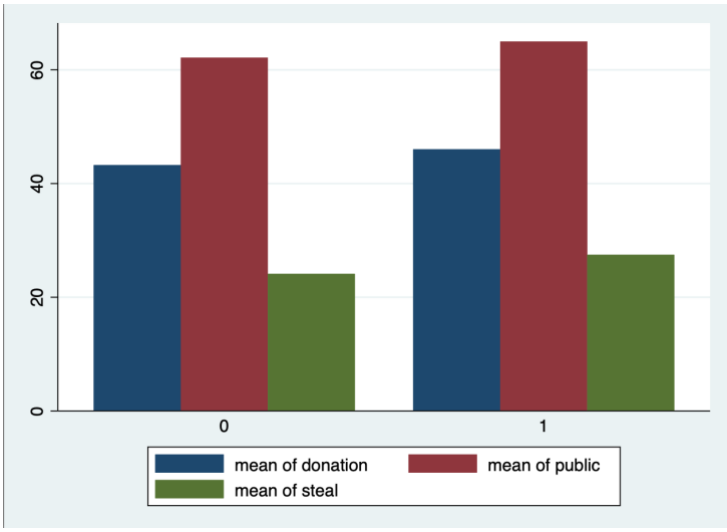
Secondly, the scatter plot also illustrates the subjects' tendency to not steal anything independently of what they decided to donate. Indeed, the green oval shape point out a big portion of combinations for which the theft stayed null even for more "selfish" individuals which donated small amounts. It might be the most appealing illustration of the framing effect. Thirdly, a 90° angle is clearly appearing in the middle of the graph, centred around the point 50-50. This observation is incontestably due to subjects' tendency to make use of the "half-half" heuristic when deciding to divide a certain amount. This rule of thumb was proven to be

statistically significant for the data relative to the donations operated. However, that same heuristic appears to also play a role when participants make the decision over the amount to steal.

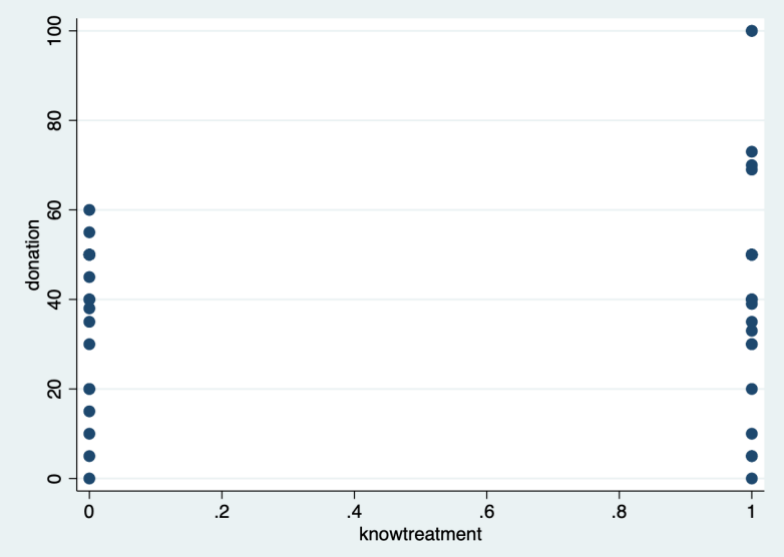
In conclusion, the scatterplot clearly exhibits patterns in people's decision-making process. Indeed, most people will either refuse to steal any amount to avoid going against their 'values' or beliefs of what is the right thing to do or either use an arbitrary rule of thumb, such as dividing the endowment equally, in half, to help them take such decision.

6.2. Further observations on the 'knowtreatment' effect

In section 5.1, it was investigated whether knowing the identity of the peer will impact the games' outcomes. All statistical test revealed to be insignificant leading to a rejection of the potential impact of the 'knowtreatment' binary variable as it is documented by the following bar graph chart:



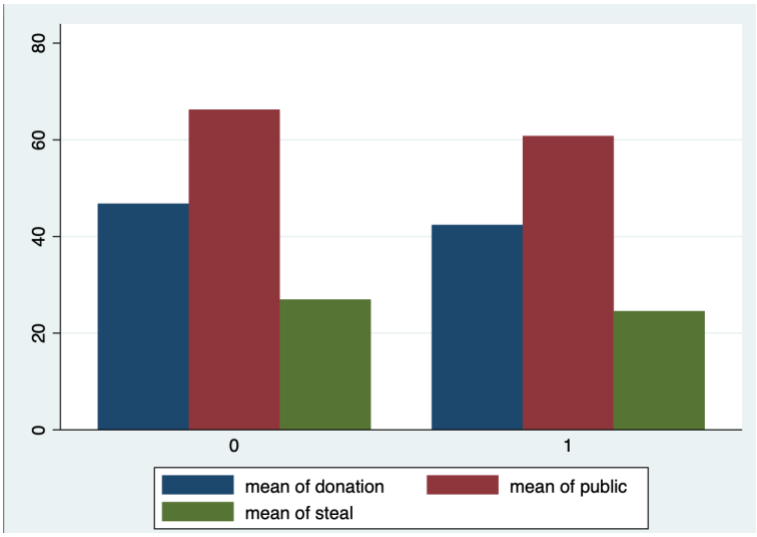
Indeed, the knowtreatment sample appears to donate, contribute and steal slightly more but none of those differences is significant. However, we could get another impression if we scatter the donations into a new plot:



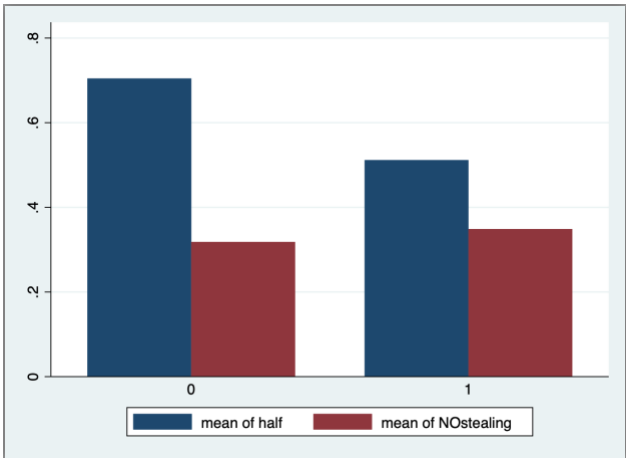
This plot reveals substantial differences, not enough to be significant, but it is undeniable that the subjects that knew each other have a higher variance of donations coupled with a higher probability of extremely high donation (>60). Indeed, looking at Figure XX in the appendices, it indicates that subjects who did not know their peer donate 60 at the maximum whereas 5 subjects, part of the treatment, donated much more than 60 (2 subjects → 100 & 3 subjects → [69,73]).

6.3. Conclusion over the 'ruletreatment' effect.

The results concerning the impact of the ruletreatment effect were mitigated between significant and insignificant effects. One thing remains certain, the inclusion of a regulation impacted the subjects' decision-making process at some point. First, let's have a closer look at the overall impact of the treatment relative to the donations, contributions and thefts.



The above graph exhibits the mean donation, contribution and theft for the subjects part of the treatment group (1) or not (0). The figure displays a superiority of the control group over the treatment group in terms of donations and contributions and a slight dominance over the average theft. This was relative to the direct effect of the regulation treatment on the games' outcomes. In addition to it, the regulation treatment significantly impacts subjects' propensity to share equally. Indeed, as demonstrated in section 5.3.1 and confirmed by the scatterplot in section 6.1, the subjects make use of some rules of thumb to help them solve a dilemma.



For instance, a subject could refuse to steal from his peer. As shown in the above graph (red bars), the probability of not stealing anything exceeds 30% for the overall sample and the difference between the two groups is minimal.

The most explicit example of a heuristic is to divide the endowment equally among the players. The inclusion of the regulation within the games decreases subjects' propensity to make use of this rule of thumb and distracts the players from the possibility of operating an equal division. This effect is illustrated in the upper graph, as the probability to share equally for a subject part of the control group is approximately equal to 70 percent whereas it only reaches 50 percent for the treatment group.

This result is quite surprising since the regulation only aims at making the second player (who has no control over the outcome) better off. However, the decision-maker seems to be distracted by the regulation and he operates in turn a lower donation than what he would or could have made in the absence of the regulation. In summary, the decrease in donation might be due to the consequent decrease in the probability to make use of a heuristic (such as the equal division) as a result of the regulation's inclusion into the game. In conclusion, people can adopt a more hostile behaviour if they experience a restriction over their set of possible actions. This result is very unexpected since the restriction imposed to the subjects aimed at increasing the fairness of the games' outcomes and theoretically should have.

7. Chapter VII : Limitations

One of the main limitations of the present research is due to the anchoring phenomenon. The anchoring phenomenon states that people are biased towards numbers they saw prior taking a decision, making an estimation or a bet. Tversky and Kahnemann (1974) were the first ones to demonstrate the anchoring bias. Russo and Schoemaker (1992) conducted several experiments on the topic and discovered a clear link between anchoring and overconfidence.

In the present experiment, subjects included in the 'ruletreatment' group were forced to donate or contribute at least 5W$. This condition was enunciated in the question heading and was therefore a possible source for the anchoring phenomenon. As a result, the participants included within the ruletreatment group might have been biased downwards, which could explain the observed and previously discussed discrepancies.

The anchoring phenomenon is not the only limitation of this research. Indeed, the sample is not optimal and many biases might be driven by the sample constitution. In fact, the sample contains only 87 observation divided in two groups of 44 and 43 observations. Firstly, such a small sample size does not allow for a very accurate estimation of the treatment effect and is also an obstacle for indicating a true causal effect as significant. True causal effects are difficult to observe since the variance within a small sample is relatively high compared to a big sample. As a consequence, only very big impacts can be revealed as statistically significant, such as the 'ruletreatment' impact on the propensity to share the endowment equally (a jump from 50% propensity to 70% propensity). Therefore, many true causal effects might have arisen in the research but were uncapable to be revealed as statistically significant due to the small sample size.

Secondly, the representativeness of the sample is far from the average population. In fact, the sample contains mainly young male Belgian students. Indeed, since the sample was constituted using the researcher's own social network, selection bias probably arose as well. Since the potential subjects were contacted through online social media, only members of those media could have been chosen. Furthermore, adults were less inclined to participate into the experiment, maybe due to a lack of time or interest. Lastly, the sample itself is not representative as the women, adults and older people are underrepresented. However, due to students' relatively low income, it might be an advantage to mainly include them in the research since they are easier to motivate with small financial reward. A sample constituted exclusively of students may decrease in turn the probability of biased results. In fact, the less financially

motivated subjects (adults) could adopt a most socially acceptable behaviour in order to be well perceived and therefore generate a bias.

Nevertheless, another source of bias can be coming from the incentive scheme applied in the present experiment. Indeed, participants were motivated by a random lottery mechanism in which 10 participants among the 87 will be rewarded their gains. The selection of the winners was operated using a randomisation program. However, since 77 participants were not rewarded anything for their participation, this low level of incentive is likely to have decrease the participants' focus on maximising their personal outcomes. As a result, we might observe biased games' outcomes consequent to this low level of incentive.

Ultimately, as mentioned in Chapter IV section 4.5, the reliability of the research might also stand as a major limitation of the study. Indeed, since the notion of generosity, cooperativity and kindness might variate among different cultures, those self-reported measures might in fact lead to different results if the experiment was being replicated with another sample. However, since proven insignificant in the analysis, it does not impact the conclusions drawn by this research.

8. Chapter VIII : Suggestions for further research

Since one of the most meaningful insights brought by the present research is relative to the rule of thumb used by the subjects while facing a social dilemma, further studies could investigate further rules of thumb commonly used subconsciously. Indeed, heuristics allow for a simple resolution of a complex problem and simplify and/or accelerate the decision-making process. Everyday, everyone of us employs many heuristics to help us take a decision in our daily lives. For instance, when choosing for a product at the supermarket, that choice can be based on a multitude of factors (e.g. quality, nutritional composition, price, etc.) and consumers usually maximise their utility in function of only one of those criteria (e.g. minimise the price) as they are uncapable to mentally process the combination of all the criteria. Furthermore, the objective of marketing is to affect people's choice through the "Recognition Heuristic" (Gigerenzer et al, 2011). In other words, companies use brands as a tool to be identifiable and recognised to the customer's eye and therefore increase the probability of their product to be purchased. Many other heuristics can be identified through our decision-making process and many still need to be discovered.

As a result, it would be insightful to investigate the extent to which obligations (derived from regulations) decrease people's propensity to act in the social interest. Indeed, it was shown by Gneezy and Rustichini (2000) that people feel a social responsibility to act in the direction they are expected to act, in the absence of regulations or fine. Can those findings be used by governmental institutions to maximise social outcomes? Should governments promote a socially responsible behaviour conduct instead of constraining people and force them to adopt that desirable behaviour? The answers to these questions are likely to modify the way we perceive state and country governance but might also impact or modify the societal expectation of what is a responsible code of conduct.

9. Chapter IX : Conclusion

The purpose of this study was to observe the impact of regulations on the outcomes of economic games under the form of social dilemmas. Specifically, the research aimed to answer the following question: *Does the inclusion of a rule, in economic games, impacts subjects' self-esteem and their propensity to adopt a socially acceptable behaviour?*

It has done so by firstly providing the background knowledge highlighting the relevance of the social norms and social comparison in predicting and influencing human behaviour. Furthermore, the two studies which are the most closely related to the topic provided great insights in comprehending the position taken by the study. In fact, Falk and Kosfeld (2006) indicated a clear control-averse behaviour among the population. Kessler & Leider (2016) built on those results by examining the control-averse behaviour through the procedural fairness perspective. They demonstrated that this control-averse behaviour is enhanced as the level of procedural fairness decreases.

The experiment implemented to investigate the research question consists of three economics games: a Dictator game, a Public Good game and a framed Dictator game. The 87 independent observations collected were analysed, through several regression analysis and nonparametric tests. This was done with the aim to observe whether the participants to the experiment exhibited discrepancies in their donation, contribution and theft realised between the treatment and the control groups. Furthermore, the results section explored whether the treatment group appear to differ in its propensity to use of two distinct heuristics (i.e. dividing the endowment in half or refusing to steal). On top of this, the self-esteem of the decision-maker was also studied as differences may arise between the groups due to the inclusion of the rule (cited to be at the aim for fairer outcomes). Lastly, a second treatment was applied on the participant pool as half of them are aware of the identity of their peer and the other half were not. Discrepancies over the donation, contribution and theft which occurred between the two groups were also analysed.

The main results of the experiment are the following. Starting with the most insightful result, it does appear that subjects facing a rule donate less, in comparison to their counterpart. This effect accounts for approximately 10% of the donation. An explanation for this result is provided by the analysis of the third hypothesis investigating the subject's propensity to divide the endowment equally. The probability to make use of this heuristic seems to be negatively correlated to the inclusion within the treatment group. In other words, the members of the control group appeared to give half the endowment to their peer significantly more than their

counterpart. This finding can provide an interesting intuition to explain why the subjects included in the treatment group appeared to donate less.

Concerning the other heuristic involving the propensity to steal, no significant result was found. The same conclusion was drawn when we investigated whether the subject's self-esteem was impacted by the treatment.

Nevertheless, however insignificant, the second treatment led us to interesting results. It appears that the subjects that were informed of the identity of their peer donate, contributed and stole to a greater extent. This tendency was illustrated through multiple regression analysis coupled with three Mann Whitney U tests. Furthermore, Chapter VI, section 6.2, illustrated the difference in variance over the donations between the two groups. It was shown that the control group had a higher spread of donations compared to the ones executed by the treatment group. Indeed, the spread of donations performed by the treatment group ranges between 0W$ and 60W$ whereas 5 subjects issued from the control group donated more than 60 (2 subjects → 100 & 3 subjects → [69,73]). This latter observation highlights the superior probability of extreme results (donation > 60W$) experienced by the subjects knowing the identity of their peer.

This research comes with its limitations. Several concerns can be addressed. First of all, the participants subject to the rule (forcing them to donate or contribute at least 5W$) might suffer from the anchoring phenomenon. Subsequently, the observed results might be a consequence of the anchoring phenomenon. Secondly, the sample composition might reveal to be a source of bias through the sample size and the sample representativeness. Indeed, the sample contains only 87 independent observations and is composed mainly of young, male and Belgian individuals. Moreover, the incentive scheme applied in the present experiment, under the form of a random lottery, do not provident sufficient incentive since only 10 over the 87 participants earned their realised earnings. Lastly, the reliability of the experiment setting is questionable even though its replicability and validity should not be a concern.

Finally, the present research highlighted the eventual counterproductive effects consequent to the implementation of a regulation due to people's "control-averse behaviour". The major change brought by the inclusion of the regulation occurs through the heuristics people will make use of, while subject to a social dilemma. These findings are considerably relevant for policymakers since they can target citizens' intrinsic motivation to adopt a socially desirable behaviour without constraining their set of possible actions.

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11. Appendix

Figure 1:

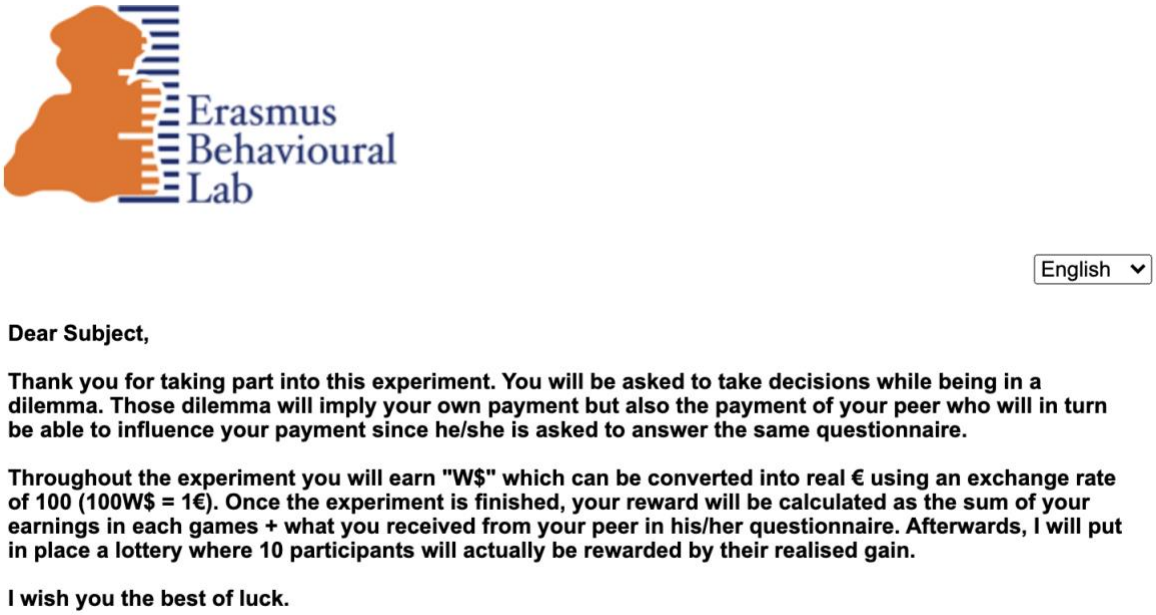
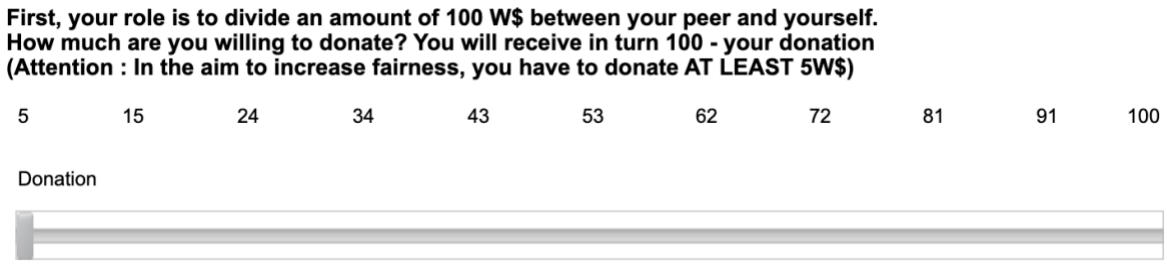
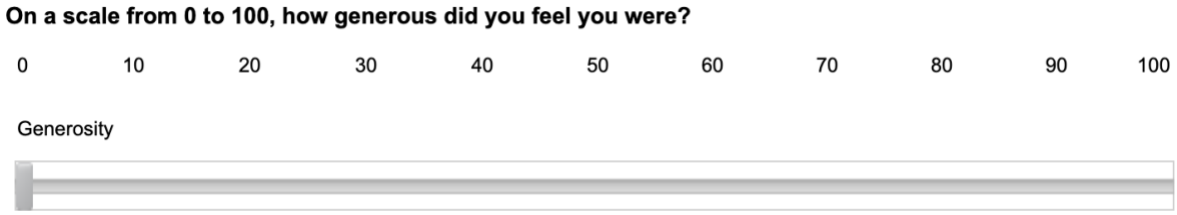


Figure 2:



Note: Subjects part of the control group were not shown the sentence between brackets, starting with “Attention:”.

Figure 3:



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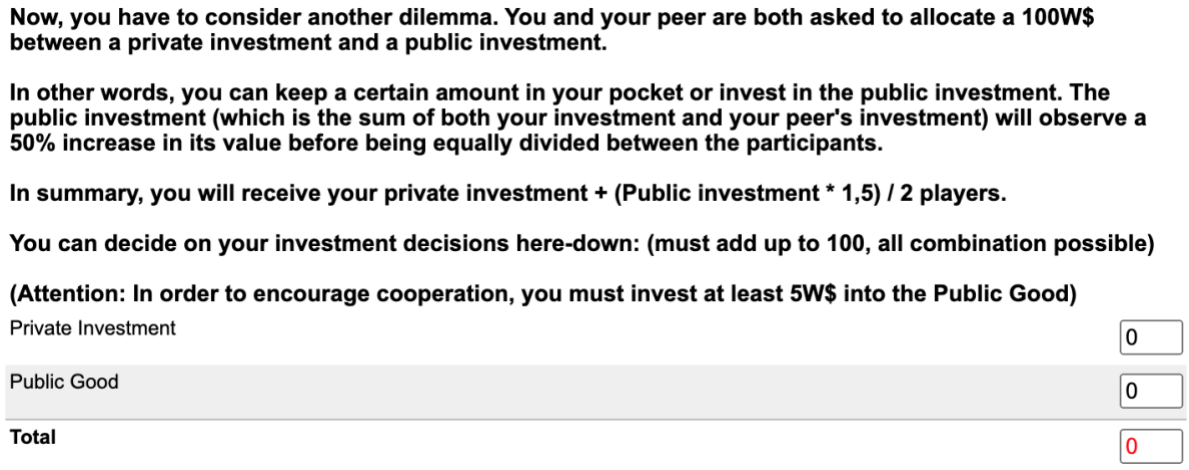

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Figure 5:

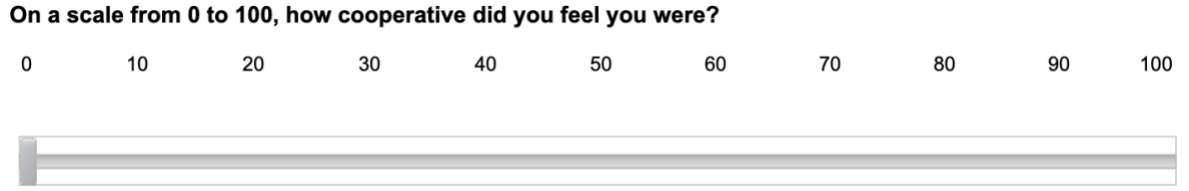


Figure 6:

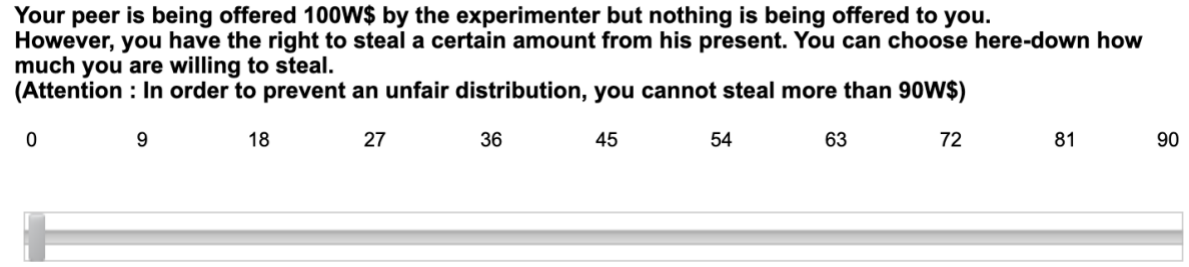
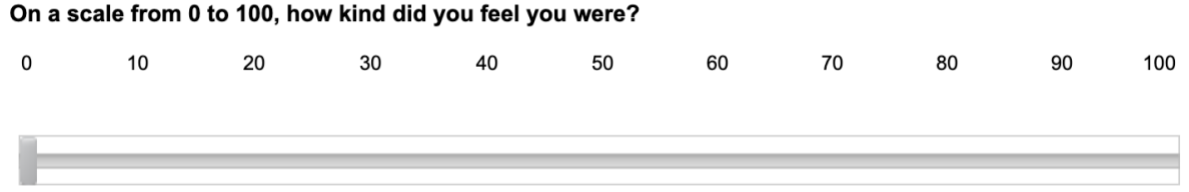


Figure 7:



Mann Whitney U tests outputs relative to the First Hypothesis:

Donation

		Observations	Rank sum	Expected Rank sum
Ruletreatment	1	43	1722	1892
	0	44	2106	1936

Z value 1.641
p value 0.1008

Contribution

		Observations	Rank sum	Expected Rank sum
Ruletreatment	1	43	1759.5	1892
	0	44	2068.5	1936

Z value 1.133
p value 0.257

Theft

		Observations	Rank sum	Expected Rank sum
Ruletreatment	1	43	1875.5	1892
	0	44	1952.5	1936

Z value 0.144
p value 0.885

Mann Whitney U Tests relative to the Fifth Hypothesis:

Donation

		Observations	Rank sum	Expected Rank sum
Knowtreatment	1	43	1915.5	1892
	0	44	1912.5	1936

Z value -0.227
p value 0.820

Contribution

		Observations	Rank sum	Expected Rank sum
Knowtreatment	1	43	1951.5	1892
	0	44	1876.5	1936

Z value -0.509
p value 0.611

Theft

		Observations	Rank sum	Expected Rank sum
Knowtreatment	1	43	1974.5	1892
	0	44	1853.5	1936

Z value -0.720
p value 0.471

Mann Whitney U tests relative to the Second Hypothesis:

Generosity

		Observations	Rank sum	Expected Rank sum
Ruletreatment	1	43	1806	1892
	0	44	2022	1936

Z value 0.733
p value 0.463

Cooperativity

		Observations	Rank sum	Expected Rank sum
Ruletreatment	1	43	1791.5	1892
	0	44	2036.5	1936

Z value 0.858
p value 0.391

Kindness

		Observations	Rank sum	Expected Rank sum
Ruletreatment	1	43	2000	1892
	0	44	1828	1936

Z value -0.931
p value 0.352

Fischer Exact Test relative to the Fourth Hypothesis:

		RuleTreatment 1	RuleTreatment 0	TOTAL
NOstealing	1	15	14	29
	0	28	30	58
	TOTAL	43	44	87

p value = 0.47