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Altruism Avoidance under Risk and Ambiguity

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Abstract

Using a modification of '*corruption' game* we present a result that are in line with motivated belief theories. In our experiment, individuals were shown to use uncertainties to justify their selfish actions. These uncertainties are shown to generate rooms for individuals to bias their belief through a manipulative way of information processing, to a direction of self-interest. In particular, there are two types of uncertainties that are addressed in this paper, namely, risk and ambiguity. We then show that individuals use ambiguity more strategically than risk to lever their selfish actions due to the use of subjective probabilities in assessing ambiguous situation.

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I. Introduction

Humans, just like other living creatures, would sometimes sacrifice their fitness in the aim of increasing other's fitness (Simon, 1993). The existence of altruistic behavior among humans has been a great interest in the field of economics as standard economic theory only predicts that economic gain as the primary human motive, whereas empirically, human motives change over time and motives like altruism plays a big role in the change of human decision making process (Simon, 1993). Better understanding in human altruistic behavior thereof deemed important.

Despite often driven by a genuine concern on others (Becker, 1974), altruistic behavior also argued to be generated by the increased utility of the act of giving itself, which is called as the theory of "warm glow" giving (Andreoni, 1990). As an example by Bénabou & Tirole (2010), the feeling of warm-glow can be brought to existence when individuals are concerned with their self-image, as individuals are perceived to be good by others and themselves when acting altruistically. Thus, as the act of giving can be driven self-interestedly, Dana, Weber & Kuang (2007) argued that individuals with such concern might barely values the corresponding outcome of giving. Then, by relaxing transparency—common information to conjecture the relation between one's action and outcome—in dictator game experiment, they could provide evidence for this argument. They showed that individuals who are faced with such uncertainty are less generous than individuals in standard dictator game experiment, showing that people are inherently less concerned on appearing unfair when transparency are relaxed. Thus, the finding of Dana et al. (2007) suggested that the initiation of uncertainty gives decision makers "moral wiggle room" to act self-interestedly. This allows decision makers to be engaged in a state of self-imposed ignorance, in which they interpret such uncertainty in a way that is most favorable to them (Gino, Norton, & Weber, 2016).

Uncertainty in this matter, is becoming the central focus of this paper as it has been shown to lever the act of selfishness and can be an important way to rationalize giving behavior other than through preferences like inequality aversion (Fehr & Schmidt, 1999). Prior to that, there need to be a clear distinction on the type of uncertainty that are being discussed in this paper. Ellsberg paradox (1961) brought to light the idea that we must model two types of uncertainty differently. Risk, as one type of uncertainty, has an objective probability clearly known on an event. Whereas a vaguer type of uncertainty called *ambiguity*, does not have the same feature of probability that lies ahead of an event, making people to rely on subjective probability to assess them. Thus, Ellsberg (1961) showed that individuals respond to risk differently from a comparable ambiguity. In the context of giving behavior, more complexity that involved in ambiguous event due to the inexistence of objective probability, might give more room for people to bias information processing when faced with giving decision. The two distinct type of uncertainty then raises a question to be addressed in this paper: does ambiguity reinforce self-interested behavior more than risk?

The research question addressed in this paper is related to previous studies such as Haisley & Weber (2010) and Garcia, Massoni, & Villeval (2018). However, these growing literatures on how individuals use uncertainty to act self-interestedly seemed to have not reached a consensus as to whether risk and ambiguity have different effects towards this type of behavior. Haisley & Weber (2010) on one hand, showed that by using risky and ambiguous lottery experiment, people act more egoistical when faced with ambiguous lottery for others than in the risky setting. While on the other hand, Garcia et al. (2018) did not find any evidence on the distinction between the two situations.

In the research design of Haisley & Weber (2010), decision makers were faced with the option of a certain lower payoff for them and a certain payoff for other players, or certain higher payoff for them and uncertain (risky or ambiguous) lottery for others. Despite the fact that the outcome of the lottery for others is significantly less than the certain payoff, under ambiguity, decision makers seemed to be more convinced that the lottery will yield positive outcome for others, thus justifying them to choose the latter option more often than in risky setting. This finding suggests that in ambiguous setting, decision makers perceive self-interested behavior to be less harmful thus making them to be involved in a more selfish action in ambiguity than in risk.

On the other hand, Garcia et al. (2018) used risky and ambiguous lottery design and comparing both situations when the lottery affects individual's payoff and when it affects the payoff for a donation. Through this design, they showed that individuals act more averse to donation uncertainties and less averse to self-uncertainties indicating an excuse-driven behavior of individuals when faced with uncertainties (both risk and ambiguous setting). Thus, when they tried to compare whether there's an amplification of selfish behavior under ambiguity than in risk, Garcia et al. (2018) did not find any significant differences. They therefore concluded that individuals use any type of uncertainty as an excuse not to give.

This study then tries to once again disentangle the effects of ambiguity and risky towards self-interested behavior. In addressing this question, we used the design of 'corruption' game, a modified dictator game, by Di Tella, Perez-Truglia, Babino, & Sigman (2015) while modifying the game to best accommodate both risky and ambiguous situation adapted from the design of risky trust game by Fairley, Sanfey, Vyrastekova, & Weitzel (2012, 2016). This game is similar to the dictator game, except that the recipients were entitled to decide the overall size of the pie to be received by both the dictator and recipient without dictator knowing and creates an ambiguous perception for dictator on how the recipient would act. Thus, to create both ambiguous and risky situations, the corruption game is modified so that each dictator was being randomly assigned to four recipients, which then matched to one of the four to determine the outcome. The risky situation was made possible by disclosing the information on each of the four recipient's act.

Our design features enable a direct assessment of self-interested behavior within individuals on both the situation of ambiguous and risky. Unlike previous studies, we can provide a comparison of self-interested behavior under risk and ambiguity without using lottery, but using the uncertainties on

other people's action, therefore making our comparison to be more realistically driven. This design also allows us to not only measure the monetary outcome of altruism avoidance under risk and ambiguity, but to also measure the belief of participants to show the existence of motivated belief, which will be discussed later in this paper. Thus, this research could contribute to the vast growing literature by making clear on how in practice, organizations that are dependent on donations or individuals' altruism can act towards uncertainty. And more importantly, the findings could contribute to rationalize giving behavior in dictator game or other games through extending it in situations that involve risk and ambiguity.

This paper will then proceed as follows. Section II provides the literatures that are related with this research and ends with the statement of hypotheses. Section III explains the design of the experiment and variables that are used for the analysis. Section IV describes the data gathered in the experiment. Section V presents the result for the statistical analysis on the hypothesis. Section VI discusses the result and connects it with the literatures. And section VII provides the conclusion of the research.

II. Theoretical Framework and Hypotheses

2.1 Altruism

The existence of altruism often makes individuals to engage in activity or behavior that are costly for themselves while beneficial for others (Bénabou & Tirole, 2006). As an example, Kahneman, Knetsch, & Thaler (1986a) and Hoffman, McCabe, Shachat, & Smith (1994) showed that in a dictator game, subjects who have the ability to allocate money (dictators) between themselves and another passive recipient tend to give a non-trivial share to their recipient counterparts. Such finding is contradictory to standard game theoretic solution where purely selfish behavior should deter dictators to give any money in their possession to be transferred to the recipients. As suggested by Becker (1976), one might consider the explanation of pure altruism where individuals engage in such altruistic behavior merely as a genuine concern on others' well-being. Whereas Kahneman et al. (1986b) argued that such incidences are due to individuals' concern on fairness. Thus, the notion of individuals to be not selfish as opposed to what has long been presumed in standard economic theory, is steadily being incorporated in economic models of altruism, fairness, and social preferences through different perspectives (Becker, 1976; Kahneman et al., 1986b; Andreoni, 1990; Fehr & Schmidt, 1999; Bolton & Ockenfels, 2000; Andreoni & Miller, 2002; Charness & Rabin, 2002; Bénabou & Tirole, 2006; Konow, 2010).

Fehr & Schmidt (1999) proposed a model in which individuals engage in altruistic behavior due to their aversion to unequal outcomes with others. Therefore, they argued that individual's utility is not only determined by each individual's own payoffs but also their *relative* material payoffs, or in other words, their social preferences. In this model, people are argued to neither like to have more or less than others, although it is assumed that people dislike disadvantageous inequality more than advantageous

one. Nevertheless, this theory has been shown to be one of the underlying reasons as to why people act prosocially, where higher degree of inequality aversion for wealthy individuals generates more voluntary giving (Derin-Gure & Uler, 2010).

In other perspectives, Andreoni & Miller (2002) tried to rationalize altruism in economic model using the axiom of revealed preferences. They showed that individuals in experimental setting possessed a consistent preference with quasi-concave utility function, meaning that individuals gain utility from their altruistic behavior. In contrast with the proposition of inequality aversion, they found that dictators still give money even when their recipient counterparts already have more money. This finding shed a light on the rationality of altruism, and moreover, showed that individuals' preference on altruism is heterogeneous and shown to not only be defined by individuals' inequality aversion. In support for the mentioned altruism rationalization, Charness & Rabin (2002) proposed the term social-welfare preferences in which they argued that such preference gives more weight on those who are worse off and less weight on the better off in giving decisions while also focusing on efficiency. Unlike inequality aversion, social-welfare preferences can explain their finding where individuals do sacrifice or engage in giving behavior that are efficient and inexpensive even when it generates more inequality. Thus, they also showed that the incorporation of reciprocity (e.g. reply like with like) is essential to social preferences.

As opposed to purely driven by individual's genuine altruism, Andreoni (1990) argued that altruistic behavior is shown to have some pure egoistic motivation that underlies it, in which he termed it as warm-glow motivation. As an example, Bénabou & Tirole (2010) suggested that individuals' prosocial behavior is often driven by individual's image concern to be perceived as 'good' human beings, so their acquired utility of giving decisions can be generated from the act of giving itself instead of purely from the increased well-being of others that are affected by the act. Thus, as a support for the mentioned theory, Chowdhury & Jeon (2014) showed in a standard dictator game experiment, dictators seemed to give more when they were given higher show-up incentives. In addition, Crumpler & Grossman (2008) tested the proportion of warm-glow motivation on giving decisions, and found that such motivation solely have a substantial fraction in generating giving behavior in addition to pure altruism. The aforementioned findings seemed to confirm the proposition of Andreoni (1990) in which individuals' altruistic behavior is driven by impure altruism where the interplay between pure altruism and warm-glow motivation generates a substantial impact on giving behavior.

In addition to the aforementioned theories, Konow (2010) proposed a model that explains altruism through the incorporation of *conditional* altruism, which includes social norms and social preferences theories (e.g. Fehr & Schmidt, 1999) with *unconditional* altruism, which includes pure altruism, impure altruism, and warm glow. Through this model, they found that social norms like equity and needs, explain a substantial proportion of real world charitable giving. Need, for instance, explained why people give to big organizations like UNICEF or WHO. Thus, they concluded that giving is not merely driven by warm-glow and pure altruism, but also driven by context-dependent norm.

In addition, some evidence also pointed out that gender do generate differences in altruism. As Andreoni & Vesterlund (2001) suggested, men are more polarized in terms of their altruistic behavior in which they either be very selfish or very selfless, whereas women are more prone to be egalitarian. While Chowdhury & Jeon (2014) suggested that individual income do have an impact in giving behavior. These two findings suggested some treats that individuals possessed that might cause differences in how someone perceives altruism. Therefore, when conducting studies on individuals' altruism, one might consider to take these differences into account.

All in all, altruistic behavior seems to be driven by heterogeneous motivation that differs between individuals. Thus, to sum, Bénabou & Tirole (2010) suggested that prosocial behavior can be driven mainly by three interdependent motivations. First, by intrinsic motivations which drives people to genuinely do good things and help others. Second, through material incentives which for example, people are driven to give to charity when their taxes are deduced. Third, by social-esteem and self-esteem concerns such as image concerns mentioned above. Thus, despite the perspective differences on the drivers of altruism, we acknowledge that all theories at least reached a consensus on perceiving altruistic behavior as a morally good act.

2.2 Motivated Bayesians and Altruism Avoidance

Despite the prevalence of altruistic behavior as a moral act, some growing bodies of literature often found contradiction where individuals seem to shy away from such prosocial behavior when they feel it is not immoral to do so (Dana et al. 2007; Konow, 2000; Rodriguez-Lara & Moreno-Garrido, 2012; Di Tella et al., 2015). Therefore, the premise of different interpretations on morality in altruistic behavior seems to prevail. Dana et al. (2007) argued that people are compelled to give in some situations because they do not want to appear to be selfish. Therefore, these people's act of giving is pretty much an act of self-interest rather than being genuine and it might be the case that they barely value the corresponding outcome of giving. In their dictator experiment, Dana et al. (2007) made people choose two options between more or less money. This choice, however, led to a consequence for other player's payoff, in which taking more money could either make the others worse or better off. Decision makers initially blinded to which corresponding payoff that other player would get, thus had an option to reveal whether opting to take more money will lead to a high or low payoff for others. Strikingly, almost half of these decision makers didn't even bother to reveal such information and opting to choose higher money for themselves regardless. This finding then suggest that the initiation of uncertainty gives decision makers moral "wiggle room" to act self-interestedly. Simply put, such individuals are in a state of self-imposed ignorance, in which they interpret such uncertainty in a way that is most favorable to them (Gino et al., 2016).

On fairness perspective, Konow (2000) tested how fairness, self-interest, and self-deception can be elucidated through variant of dictator games. In the first game, he conducted a standard dictator game between dictators and recipient as a control group. Thus, on another set of players, he conducted the

second game which the allocation of money for dictator and recipient is allocated by a third party called *benevolent* dictators. These benevolent dictators then were paid by a fixed amount of money. As expected, dictators in the first game acted self-servingly when compared to the allocation exerted by the benevolent dictators in the second game. Thus, on the third game, dictators from the first game were requested to allocate money between another set of dictators and recipients, making them to be *double* dictators. This feature of the game was aimed to see the fairness ideals for those who have been engaged previously on a dictator decision. Strikingly, when acting as a third party, dictators seemed to allocate money in a similar way with the division of money that they exerted in the first game. This finding suggested that individuals perceive fairness in a way that best suited their financial interest.

The aforementioned findings supported the propositions of motivated Bayesians of Gino et al. (2016). Bayesians reasoning, as they defined, extracted from statistical analysis where individuals have a probability distribution of belief, prior to acquiring evidence. Thus, individuals use the acquired evidence to overhaul their beliefs in an unbiased manner. Whereas motivated Bayesians, bias the process of information gathering through omitting or underweighting the information that are unfavorable to the desirable inferences. This allows individuals to justify their self-serving aims, while also preserving their feelings to be moral. This concept of motivated Bayesians extends the proposition of Rabin (1995) where he proposed a model of self-serving bias that one can use self-deceptive reasoning to convince himself to shy away from generous act. In the finding of Dana et al. (2007), people engaged in motivated Bayesians through ignoring information, thus form a belief that their egoistic act will also yield a favorable outcome for others. While in Konow (2000), individuals seemed to adjust their fairness, thus morality standards to best fit their egoistic interest. And similarly in Di Tella et al. (2015), individuals that have better opportunity to act egoistically are more prone to belief that other people will also act in egoistic manner, thus justifying their act of self-interest.

The existence of motivated Bayesians is grounded by the prevalence of cognitive dissonance theory. The notion of cognitive dissonance was proposed by Festinger (1957) where he defined it inconsistencies of one's belief with his action. Di Tella et al. (2015) suggested an example of cognitive dissonance at dictator game setting when dictator has a desire to obtain all the money while also seeing themselves as fair. Akerlof & Dickens (1982) were one of the first to incorporate this theory into economic model where they built the model based on the premise that individuals have control over their beliefs, therefore allowing them to manipulate their belief to best fit their desire. Also, in line with what had been shown by Konow (2000), Akerlof & Dickens (1982) argued that when one has formed their belief on a certain matter, it will be preserved over time. Gneezy (2005) showed how individuals form their belief to be in line with their desire is by engaging in a self-deceptive belief. He also showed that higher monetary gains induce individuals to use deception more often in their belief formation. Furthermore, Zimmermann (in press) showed that even after providing feedback and information towards someone who had been engaged in self-deceptive belief, it would be hard to correct the misconception of such motivated belief.

The theory of cognitive dissonance therefore prevails to explain why individuals do avoid altruism even when there's a consensus that acting altruistically is considered moral, while acting egoistically is the opposite. Thus, motivated Bayesians deliver the way people use information strategically to act egoistically while also aids them to feel moral. And as shown by Dana et al. (2007) we might argue that the existence of uncertainty can be a catalyst for individuals to be engaged in motivated Bayesians manner.

2.3 Risk and Ambiguity as an Excuse to Avoid Altruism

Individuals seemed to engage in altruistic behavior when there is a full information on the distribution consequences of their act (e.g. Hoffman et al., 1994). Thus, when uncertainty in information were introduced, it creates a moral wiggle room for people to act in an egoistic manner (Dana et al., 2007). Uncertainty in this matter become an excuse for people to be a motivated Bayesians.

Risk, as a type of uncertainty in which the probability distribution is known, also seemed to be attributable as the cause of reduction in altruistic behavior. Brock, Lange, & Ozbay (2013) supported the existence of moral wiggle room under risk in which they found people to be less generous in a dictator game that involves risk in comparison to the standard game. This was further supported by Exley (2016) where she introduced a risky choice in a donation setting and found that individuals can use risk as an excuse not to give, as they act more averse to charity risk and less averse to self-risk, indicating an excuse-driven behavior not to give to a charity when faced with risk. The existence of risk in donation can be concluded as one of the causes to decrease individuals' altruistic behavior. In addition to what had been shown by Brock et al. (2013) and Exley (2016), Cettolin, Riedl, & Tran (2017) conducted a dictator game experiment that involved lottery risk either for dictators or the recipients. They showed that individuals tend to give less in the game that involve risk for the recipients, whereas no effect in giving behavior that expose risk for the dictators. This finding gave a further support on the existence of risk as a catalyst for altruism avoidance.

As another type of uncertainty, the existence of ambiguity also seemed to have a similar effect on altruistic behavior as risk. Di Tella et al. (2015) in their experiment of *basic* corruption game (a modified dictator game), made a setting where the dictators that were allocating resources between themselves and their recipient counterparts, faced an ambiguous belief on how their recipient counterparts would act, which affects their overall final payment. Unlike standard dictator games, dictators in this corruption game allocate tokens that were then translated into real money through the valuation decisions of the recipients. Recipients on one hand can value each token highly, or on the other hand can choose a corrupt decision to value each token lower but receive side payments for their own selves. The ambiguity faced by dictators prevails due to the simultaneous decision making of dictators and recipients. In addition to the basic game, they also conducted *forced seller* game on another set of players, in which the decision of recipients being represented by computer program which made the recipients to value tokens at a predetermined valuation and known by the dictators. This feature of the

game fully eliminates the ambiguity faced by the dictators. Thus, when comparing the two aforementioned games, dictators in forced seller game give recipients significantly higher amount of tokens than dictators in the standard game. This finding suggests that individuals use ambiguity on other's action as an excuse to act egoistically.

As suggested by Ellsberg (1961), there is a distinction on how people react to risk in comparison to comparable ambiguity. This distinction is then tried to be assessed in the setting of altruism avoidance. As mentioned, to date, there are only limited literature which disentangle the effect of risk and ambiguity on individuals' selfish behavior. While all the findings mentioned in this paper do reach a consensus that any types of uncertainty generate an excuse for people to reduce giving behavior, the literature that tried to disentangle the effect of risk and ambiguity on altruism avoidance do not seem to reach a consensus as to whether risk and ambiguity exert different effect. Garcia et al. (2018) and Cettolin et al. (2017) in one hand, showed that there is no difference in individuals' egoistic act under risk and ambiguity. While on the other hand, Haisley & Weber (2010) showed an amplification of self-interested behavior under ambiguity in comparison to risk. Thus, this paper tries to once again assess this differences to confirm either of the findings.

2.4 Hypotheses

To address the research question, there are two hypotheses that are tested in this paper. The first hypothesis is addressed to confirm the findings of Di Tella et al. (2015) on the desire of people to be selfish that affects one's belief on others' behavior and as a support for the proposition of motivated Bayesians. Therefore, the hypothesis is:

Hypothesis 1: *Beliefs about others are influenced by one's egoistic preferences.*

In the design of corruption game by Di Tella et al. (2015), dictator can allocate 20 tokens for themselves and the recipients. The recipients can reduce the overall size of the pie in exchange for payment (decide the monetary value of one token to be higher vs lower but with a side payment). The dictators and recipients decide simultaneously, causing all dictators to face ambiguity about the recipient's act. By randomly and silently allocating dictators to two different games, where one game makes sure that the recipients receive 2 tokens while other game make certain 8 tokens, they found that dictators with ability to take more tokens (e.g. the game that only make recipient receive certainly 2 tokens) perceive recipients would act unkindly (opt to receive side payment) significantly higher than dictators who are only able to take fewer tokens. The design of randomly and silently allocating dictators to two different treatments should cause no difference on how dictators believe whether or not their matched recipient will take the side payments. The contradiction then proved their hypothesis that people's beliefs about others are affected by their own desire to be selfish, or in other words, belief distortion existed and the proposition of motivated Bayesians is true.

Di Tella et al. (2015) model this finding based on the reciprocal altruism theory (Levine, 1998), and started off the model with no motivated belief involved. Two players, the dictator and recipient are

denoted by subscript 1 and 2 respectively with each have x_i endowments and c_i consumptions. Dictator can take t amount from the recipient. Also, $\rho \in [0,1]$ reflects the degree of redistribution efficiency. Therefore, $(1 - \rho)t$ reflects the amount of transference lost, and as a function of redistribution efficiency, the higher efficiency, ρ would mean lesser amount of t that are lost in transference. Thus, the "intrinsic" utility from consumption is represented by $U(c_1)$. This function depicts a concave utility function, which has the standard properties of $U'(\cdot) > 0$ and $U''(\cdot) < 0$. In modelling the utility of the dictator, a weighted average of both dictator's and recipient's intrinsic utility is used, formalizing $U_1 + \lambda(\lambda_2) \bullet U_2$. As in the model of reciprocity, the weight $\lambda(\cdot)$ is assumed to be positive and concave and $\lambda'(\cdot) > 0$, therefore the weight $\lambda(\cdot)$ is a function of dictator's belief on recipient's unconditional altruism, represented by λ_2. Thus, the dictator is faced with the following problem.

$$\max_{t \in [0, x_2]} U(x_1 + \rho t) + \lambda(\lambda_2) U(x_2 - t)$$

The above model explains the case where the more the dictator believes recipient to act altruistically (greater λ_2), the lesser t amount taken by dictator. Thus, a marginal increase of efficiency, ρ, would mean a higher net amount taken from recipient, but not necessarily means an increase of t.

From aforementioned model, we then embark to a model with motivated belief. In this model, dictator faces an ambiguous type of recipient, as the recipient is randomly drawn from a population that consists of recipients with low and high altruism, thus implies $\lambda_2 \in \{\lambda_2^L, \lambda_2^H\}$. Due to the ambiguity, dictator will assess a subjective probability of $p \in [0,1]$ representing his belief on the proportion of recipients with low altruism in the population. On the other hand, the actual proportion is denoted by $p_0 \in [0,1]$. In the case where dictator rationally processed the information, his belief, p, will be the same as the actual proportion p_0. But dictator might bias their belief of p through the way they process the information. One could think that $p > p_0$ indicating a belief that more recipients are low in altruism than they actually are, so that could justify the dictator to take more. But such biased belief can only be obtained if the dictator ignores some available information or selectively recalling it. Thus, ignoring information needs a high effort and can be time consuming, so it can exhaustively lead to a sub-optimal choice. And when selectively recalling information, dictator might encounter an unwanted information and making them feel guilty instead. From these reasoning, a dictator that forms a bias belief might encounter a psychological cost that increases as the size of bias gets bigger and represented in the model by $\mu \cdot C(p - p_0)$. Therefore, this comes with the properties of $\mu > 0$ and $C(\cdot)$ strictly convex and increasing in $|p - p_0|$. The inclusion of psychological cost in this model is in line with the fact that the distortion of morality judgement entails a cost to individuals' self-image that burdens them psychologically (Bénabou & Tirole, 2006). Thus, when including motivated belief, the problem faced by the dictator is represented by the following model.

$$\max_{t \in [0, x_2], p \in [0,1]} U(x_1 + \rho t) + \lambda(\lambda_2^H + p(\lambda_2^L - \lambda_2^H) U(x_2 - t) - \mu \cdot C(p - p_0)$$

In the proposition of this model, the solution is assumed to be interior and $\mu < \infty$. This is due to the fact that $\mu \to \infty$ implies no biased belief. Therefore, when the assumption holds, we can interpret the model as a tradeoff between the psychological costs and increased resources. As an example, in the event where dictator takes more resources from the recipient, they are willing to encounter the psychological cost of engaging in a bias belief in order to alleviate the moral cost of taking more resources. Thus, this model depicts the proposition of motivated Bayesians which makes dictator to still feel moral when acting egoistically. Further details and prove of the model presented above can be found in Di Tella & Perez-Truglia (2010).

To accommodate the assessment of second hypotheses on decision making under risk, we modified the corruption game of Di Tella et al. (2015) through borrowing the adaptation of risky trust game by Fairley et al. (2012, 2016). In this design, dictators were assigned to 4 different recipients in which they were randomly matched with 1 of the 4 recipients after decision making takes place. Using this modified corruption game, the first hypothesis predicts that dictators who are able to take more tokens from the recipients would prone to believe more of the 4 recipients assigned to them would act unkindly. While the aforementioned hypothesis has been addressed by Di Tella et al. (2015) and proven to make individuals to avoid altruistic behavior, the main feature of this research then lies in the following hypothesis which aims to disentangle the effect of ambiguity and risk faced by the dictators. The hypothesis is as follows:

Hypothesis 2: *The act of self-interest is reinforced under ambiguity than risk*.

Unlike the previous situation where dictators under ambiguity only decide once, under risk, dictators would decide the amount of tokens taken for each different possible proportion of the 4 recipients would act unkindly, namely, 0, 1, 2, 3, and 4 of the 4 recipients opt to value the tokens lower and take the side payment. This design would omit the ambiguity faced by dictators and replacing it with objective probabilities. Through the second hypothesis, we will assess the difference in the number of tokens taken by dictators under risk and ambiguity. This hypothesis aimed to confirm whether there are any differences in altruism avoidance under risk in comparison to ambiguity.

III. Methodology

3.1 The Conduct of the Game

This paper used an experimental approach to address the research question by replicating the corruption game experiment conducted by Di Tella et al. (2015). The design of modified corruption game used in this paper is similar with the design of Di Tella et al. (2015) except for the fact that the dictators were assigned with 4 recipients before being matched with 1 recipient to determine the outcome of the game. This allows us to assess two types of situations. First, the ambiguity situation where dictators did not know the proportion (e.g. how many) of the 4 recipients assigned to them chose the unkind option. And next is the risky situation where dictators were given the information on the

aforementioned proportion. The more detailed explanation on each player's role, decisions, and implications of their action will be further explained in subsequent subsections.

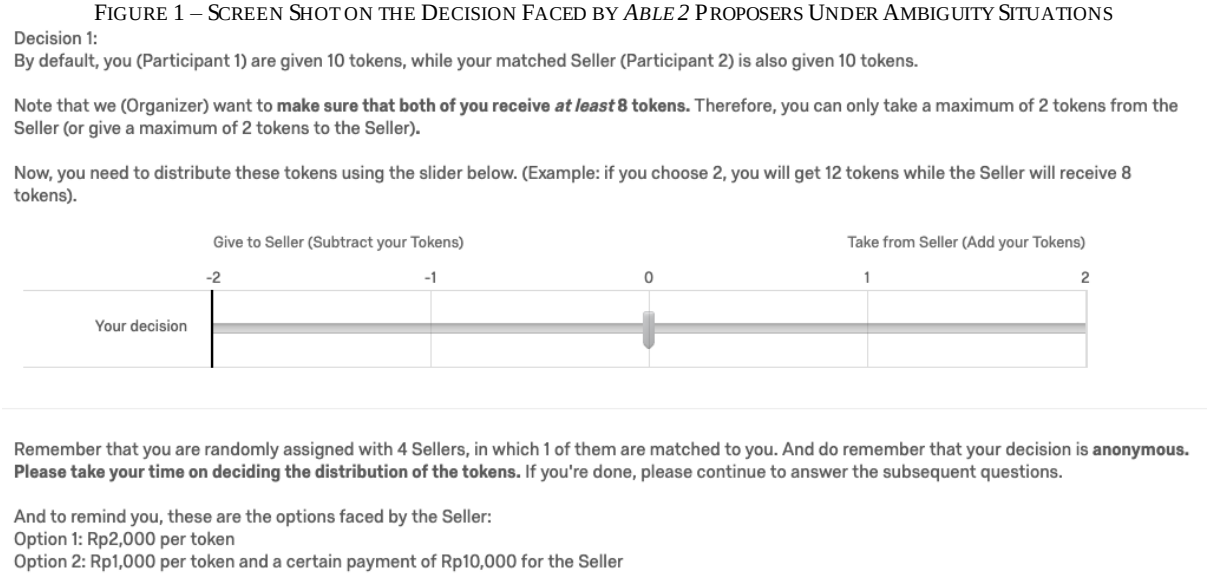
To ease the data recording, the experiment was conducted online using *Qualtrics* software in which the access is provided by Erasmus University Rotterdam. The experiment itself was conducted in class rooms to mimic experimental condition and ease the explanation of experiment instructions. The experiment was incentivized according to subjects' decision in the experiment. Prior in conducting the experiment, subjects signed a consent form regarding their willingness to be involved in the experiment, which also emphasizing subjects' anonymity in their decision making. Emphasize on anonymity is crucial to make sure that subjects will elicit their true preference on altruism (Hoffman et al., 1994). After having signed the consent form, subjects received an explanation on the conduct of corruption game. Thus, they were randomly allocated to the role of dictators and recipients. To make a more neutral term, we replace the term dictator with *proposer* and recipient with *seller* when the experiment was conducted. It is also worth to note that players with different role were allocated in separate room.

3.2 Proposer (Dictator)

Prior to the conduct of the game, proposers were given a detailed explanation on their role and the sellers' by the experimenter. This were presented in front of the class with slides and visualization, and during this time, proposers were given the opportunity to ask questions to the experimenter about the conduct of the game. The explanation aimed to help the proposers to get the gist of the decision that they would face. To make sure everyone understands clearly the conduct of the game and each of their role, proposers were asked to answer seven questions regarding the game before the game started.

At the beginning of the game, proposers were each given 20 tokens in which the default stated that 10 tokens were allocated for them and other 10 tokens for their matched seller. These proposers then could decide to take up to 2 or 8 tokens (*Able 2* and *Able 8*, henceforth) from the allocated tokens of the sellers depending on which ability group they were randomly assigned to. Note that proposers can also decide to give their allocated amount to their seller counterpart. These proposers were also provided with the information on what sellers would decide—the option to value tokens highly or to decide low monetary value for the tokens with additional side payment for the seller. Proposers were able to read the instruction given to the seller, therefore they can extrapolate the setting and condition in which the sellers were faced with. Prior to the decision making, proposers were informed that they are randomly assigned with 4 sellers, and only 1 of the 4 assigned sellers would be matched to determine their outcome. For decisions under ambiguity, proposers decided the number of tokens they would take once after receiving all the information from the experimenter. Thereafter, they decided five different decisions on number of tokens taken when 0, 1, 2, 3, and 4 of the 4 sellers opt to lower the token valuation and take the side payments as decisions under risks. An example of the decision faced by the proposer is shown on figure 1 and details on the instruction can be found in the appendix.

FIGURE 1 – SCREEN SHOT ON THE DECISION FACED BY *ABLE 2* PROPOSERS UNDER AMBIGUITY SITUATIONS



Notes: Prior to this decision, proposers were given detailed explanation on their role, including the emphasize that the sellers were making decisions simultaneously as the proposers but in separate room. As seen in the figure, the instructions did not disclose any information on the proportions of seller who choose the unkind option, making proposers to decide under ambiguity.

3.3 Seller (Recipient)

In a separate room, sellers were asked to choose one of the two options in which they were to decide the monetary value of the tokens allocated by the proposers. The first option was Rp2,000 (comparable to €0.12) per token and the second option was Rp1,000 per token plus a side payment of Rp10,000 (comparable to €0.6)[2]. When choosing between these options, sellers were kept blind from the fact that proposers were allocated to two different abilities to take tokens and were made to perceive that proposers were able to take all the 20 tokens for themselves. Unlike the proposers, sellers were not briefed orally by experimenter but have to go through all the instructions themselves in the online platform prior to the game. This is because the decision made by the sellers was very simple. However, they could ask questions personally to the experimenter during the game, although no one did.

3.4 Belief and Other Measurement

To measure belief, two questions were addressed to the proposers after their decision under ambiguity. First, was the question on how many of the 4 assigned sellers that proposers believe to choose the unkind option (option 2). The answer ranged from 0 to 4 sellers, therefore the variable outcome is either be 0, 0.25, 0.5, 0.75, or 1 respectively and is recorded as variable *Percent Corrupt*. The second question was a question on the probability that proposers believe their matched seller chooses the unkind option. This resulted in a continuous variable of *Partner Corrupt* in percentage ranging from 0 to 100. An open question on the explanation of their answer was added to make sure proposers to really think about their answer.

[2] Stated currency comparison used is the currency rate at the time of the experiment (May 2019).

As mentioned, instructions faced by the seller were made available to the proposer to be seen. Therefore, proposers knew the sellers' perceptions when sellers made their decision. This type of information in fact is a crucial design of the game as it should be the case that dictators' belief on the sellers' action will be the same regardless of the ability group that proposers were faced with. Through the belief measurement mentioned above, we then can assess whether there is any difference on the beliefs of proposers towards sellers' altruism in for proposers in *Able 2* than those in *Able 8*. Thus, contradiction to this design would prove the belief distortion on others' altruism which could lead to an act of self-interest (hypothesis 1).

Also, in order to check the consistency and understanding of subjects in their decision under risk, we also asked a similar question as the variable of *Partner Corrupt* after each of subjects' five decisions under risks, although only the recorded data from decision under ambiguity are used in the analysis of hypothesis. It should be noted that the subjects were not incentivized for any correct guess. On another note, the variable *Percent Corrupt* is also used to weight the weighted average of tokens taken for proposers under risk for a comparable comparison to their decision under ambiguity. A summary of variables used in this paper can be seen on table 1 below.

Lastly, similar to Di Tella et al., (2015), all subjects were asked additional demographic questions like age, gender, and socioeconomic status to act as additional control variables. Thus, in this paper, we replaced socioeconomic status with monthly allowances of each subject as suggested by List (2011). Note that proposers faced six different decisions throughout the experiment, whereas their payments were only determined randomly from one of the six decisions. Proposers knew this payment condition prior to their decision making. This method of payment is an adaptation of Conditional Information Lottery design by Bardsley (2000) where it allows subjects to perceive that all of their decisions can be true, whereas in reality they will only be paid for one of their decisions. Thus, the design provides the benefit of deception in experiment, but without actually deceiving the subject.

TABLE 1 – VARIABLE SUMMARY

Variable Name	Description
Percent Corrupt	"How many of the 4 sellers assigned to you that you think choose Option 2? 0 (0); 1 (0.25); 2 (0.5); 3 (0.75); 4 (1)."
Partner Corrupt	"How much do you think is the chance that your *matched* seller will choose Option 2? (in percentage)."
Able 8	Dummy variable of proposer's treatment. The variable equals to 1 if proposer able to take or give up to 8 tokens, and 0 if proposer could take or give up to 2 tokens to or from the seller.
Tokens Taken	Amount of tokens that proposer take from seller (negative if proposer give to seller). Note that in decision under *risk* this variable is weighted with proposers' answer on variable *Percent Corrupt*, i.e. if a proposer believe 2 out of 4 sellers are corrupt, then the analyzed *tokens taken* is acquired only from his decision when 2 of the 4 sellers choose option 2.
Ambiguous	Dummy variable of the type of uncertainty in which proposers decide under. It takes the value of 1 if the *Tokens Taken* were taken under ambiguity, whereas a value of 0 if the *Tokens Taken* were taken under risk.

Male	Dummy variable of gender. Takes the value of 1 if male and 0 if female.
Age	Continuous variable of age.
Allowances	Categorical variable of subjects' monthly allowances. Ranging from < Rp1,000,000 (1); Rp1,000,000 - Rp1,999,999 (2); …; >Rp5,000,000 (6)

3.5 Test of Hypotheses

Using the ordinary least square (OLS) regression, we will assess the first hypothesis by measuring the mean difference of belief, measured through *Percent Corrupt* and *Partner Corrupt* between proposers who are able to take 8 to 2 tokens (using the dummy variable *Able8*). As proposers are expected to perceive the sellers similarly regardless of the amount of tokens they are able to take, there should be no difference in dictator's measurement of belief. Any significant difference in the mean of belief thus regarded as a support of the first hypothesis. Thus, the subsequent regression will be conducted:

$$PercentCorrupt_i = \alpha_i + \beta Able8_i + \varepsilon_i \quad \text{(Hypothesis 1)}$$

$$PartnerCorrupt_i = \alpha_i + \beta Able8_i + \varepsilon_i \quad \text{(Hypothesis 1)}$$

As for the second hypothesis, the act of self-interest will be measured through the number of tokens taken by the dictator. We will compare the number of tokens taken by proposers under ambiguous and risky setting, therefore a dummy variable of *Ambiguous* will be used. Proposers in risky setting had five different decisions on the number of tokens taken, therefore a weighted average of tokens taken weighted by proposers' belief will be used in the comparison with proposers under ambiguity. This method is adapted from the research of Fairley et al. (2012) and justified by the use of belief measurement in decision comparison of typical and modified trust game by Evans & Joachim (2017). Unlike the previous hypothesis, this hypothesis will be measured through within-subject design as each dictator in this experiment decide under both situations of ambiguity and risk. Charness, Gneezy, & Kuhn (2012) suggests that such design perceived to be more naturally aligned with theoretical mindset, which in this instance, the direct measure on how individual decision affected by different type of uncertainty. Thus, in assessing the second hypothesis, the independent variable of *Able8* will be added to the regression in different due to the fact that different ability group to take tokens will yield significantly different outcome. Thus, the regression equation is as follows:

$$TokensTaken_i = \alpha_i + \beta Ambiguous_i + \gamma Able8_i + \varepsilon_i \quad \text{(Hypothesis 2)}$$

If β is positive and significant, it can be concluded that people act more self-interestedly under ambiguity than under risk. Thus, this can be a support for the second hypothesis. In addition to the aforementioned analysis, there are two other methods that will be used to test the second hypothesis due to the usage of within-subject design. As suggested by Kirk (2013), one way to test this type of design is by using the repeated measures analysis of variance (ANOVA). In addition, we will also use the repeated measures mixed model as a robustness check.

IV. Data

The experiment was conducted with 96 undergraduate students of Faculty of Economics and Business, Gadjah Mada University in Indonesia. All subjects were enrolled in either economics, accounting, or business program of the faculty. These students were invited randomly using online poster that were distributed in student online chat groups. Thus, students who were willing to join the experiment filled up registration form days before the experiment, with the total of 108 students registered. On the day of experiment, 96 registrants showed up and employed in the experiment (48 proposers and 48 sellers). For proposers, the experiment lasted around 30 minutes during an hour lunch break of the university, whereas for sellers was only around 10 minutes. Proposers and sellers both received real incentives based on their decisions in the game, and on average earned Rp17,000 (around €1.1 at the time). Despite the trivial amount, this amount is comparable to one full set of student lunch meal in the university canteen, which can be a comparable replacement for the time used for the experiment. It should be noted that the data of sellers are not relevant for the analysis of this paper, but it is worth to mention that 60.4 percent of sellers chose option 2 (lower valuation with side payments). Thus, in the remainder of the paper, all the analyses were attributed from the data of proposers.

Of the 48 proposers, we discard 18 (37.5%) individuals in the analysis due to their failure to answer correctly at the minimum of 70% threshold for all the understanding check questions. Therefore, we proceed to analyze the remaining 30 proposers. Note however, including all the proposers in the analysis does not alter the conclusion of this study. From the 30 proposers analyzed, 14 (46.67%) were males with an average age of 20.30 years old ($SD_{age} = 0.75$). Also, it is worth to mention that even we divided proposers equally to the two ability groups during the experiment (24 individuals in each ability group), out of the 30 proposers analyzed, 16 (53%) individuals were in ability group *Able 2*, and 14 (47%) in *Able* 8. This discrepancy is due to the larger number of proposers in Able 8 who did not pass the threshold of 70% in the understanding check. The detailed descriptive statistics of the proposers can be found in the subsequent table.

TABLE 2 – SUMMARY STATISTICS

Variable	Average	Median	SD	Min	Max	Interquartile Range
Percent Corrupt	0.65	0.75	0.27	0.25	1	[0.5, 0.75]
Partner Corrupt	0.67	0.75	0.25	0.12	1	[0.5, 0.8]
Able 8	0.47	0	0.51	0	1	[0, 1]
Tokens Taken (Under Ambiguity)	2.87	2.00	3.01	-8	8	[2, 5]
Tokens Taken (Under Risk)	2.90	2.00	3.44	-8	8	[1, 5]
Male	0.47	0	0.51	0	1	[0, 1]
Age	20.30	20	0.75	19	22	[20, 21]
Allowances	3.30	3	1.44	1	6	[2, 4]

Notes: This summary statistics only corresponds to the proposers. Number of observations, N = 30.

V. Results

5.1 Result of Hypothesis 1

Table 3 shows the average of key characteristics of proposers that were randomly assigned to two different ability groups, namely, Able 2 and Able 8. As a robustness check, subjects' characteristics of gender, age, and allowances category were assessed. As shown, the mean differences of these characteristics between ability groups are not statistically significant. This essentially indicates a random allocation of proposers to ability group. It is also shown that the number of tokens taken between ability groups differs significantly, indicating different restrictions on the ability to take or give tokens from and to the sellers were binding for the proposers. This difference occurred both for the decisions under ambiguity and risk.

TABLE 3 – DECISIONS, BELIEFS, AND CHARACTERISTICS, BY ABILITY GROUP

	Able 2	Able 8	*p*-value
Post-treatment			
Tokens Taken (Under Ambiguity)	1.81	4.07	
	(0.40)	(4.14)	0.05
Tokens Taken (Under Risk)	1.38	4.64	
	(1.02)	(4.36)	0.01
Percent Corrupt	0.61	0.70	
	(0.29)	(0.24)	0.38
Partner Corrupt	0.64	0.72	
	(0.29)	(0.19)	0.38
Robustness Check			
Male	0.38	0.57	
	(0.50)	(0.51)	0.30
Age	20.13	20.50	
	(0.89)	(0.52)	0.16
Allowances	3.31	3.29	
	(1.35)	(1.59)	0.96
Observations	16	14	30

Notes: The number shown is the average characteristics. Standard deviation is underneath the average, in the parentheses. Able 2 is the ability group where proposer can take or give up to 2 tokens from or to the seller, whereas Able 8 is up to 8 tokens. The *p*-value obtained from the standard mean differences test, where under the null hypothesis, there is no difference in the distribution of mean between Able 2 and Able 8. All of the observations only included the proposers.

TABLE 4 – REGRESSION OF HYPOTHESIS 1: MEAN DIFFERENCES OF ABLE 8 AND ABLE 2

	Objectives				Control Variables
	Tokens Taken (Under Ambiguity)	*Tokens Taken* (Under Risk)	*Percent Corrupt*	*Partner Corrupt*	
Able 8	2.259	3.268	0.087	0.078	No
	(1.109)*	(1.191)***	(0.097)	(0.088)	
Able 8	3.434	4.113	0.067	0.063	Yes
	(0.883)***	(0.801)***	(0.083)	(0.085)	
Observations	30	30	30	30	

Notes: All used OLS regressions. All coefficients are mean differences of Able 8 and Able 2. Robust standard errors are in parentheses below the coefficient. Control variables included are male, age, and allowances. All of the observations only included the proposer. * $p < 0.1$; *** $p < 0.01$.

In testing the first hypothesis, we assess whether there are any differences in both measurement of beliefs of *Percent Corrupt* and *Partner Corrupt* between ability groups. The null hypothesis should be that the two beliefs are not affected by different ability to take tokens. As shown in table 4, our result suggests that both beliefs have no statistically significant differences in both groups. Despite the fact that the mean beliefs in Able 8 are slightly higher than Able 2 by 9% and 8% for *Percent Corrupt* and *Partner Corrupt* respectively, both are not statistically significant. Including control variables also do not alter the result. Therefore, we fail to reject the null hypothesis.

Despite the failure to present evidence to confirm the first hypothesis through the replication of the analysis method done by Di Tella et al. (2015), we present a slight different way to show that the existence of motivated Bayesians could still persists. When digging deeper into the data, we find an increasing trend of both *Percent Corrupt* and *Partner Corrupt* along with the increasing number of tokens taken under ambiguity. This assessment is conducted based on the assumption of how proposers believe what the sellers would act should not be affected by the amount of tokens they take, in line with the first hypothesis. The thought process that underlies this assumption is the finding of Di Tella et al. (2015) where they found that the individuals' belief on other's altruism is affected by their willingness and opportunity to act selfishly. Thus, the deviation from the assumption could provide a support what has been shown by Di Tella et al. (2015) which technically also provide support for our first hypothesis. Then, as shown in figure 2, the linear prediction of both beliefs on the number of tokens taken yields a positive slope, making us to analyze further through regression analysis. The regression model used both belief measurements as the dependent variable, in line with the assumption and hypothesis explained above. This analysis aimed to see whether there is any statistically significant effect of the number of tokens taken under ambiguity on both belief measurements of the proposers, which the result is shown in table 5.

FIGURE 2 – SCATTER AND LINEAR PREDICTION PLOTS OF BELIEFS ON TOKENS TAKEN (UNDER AMBIGUITY)

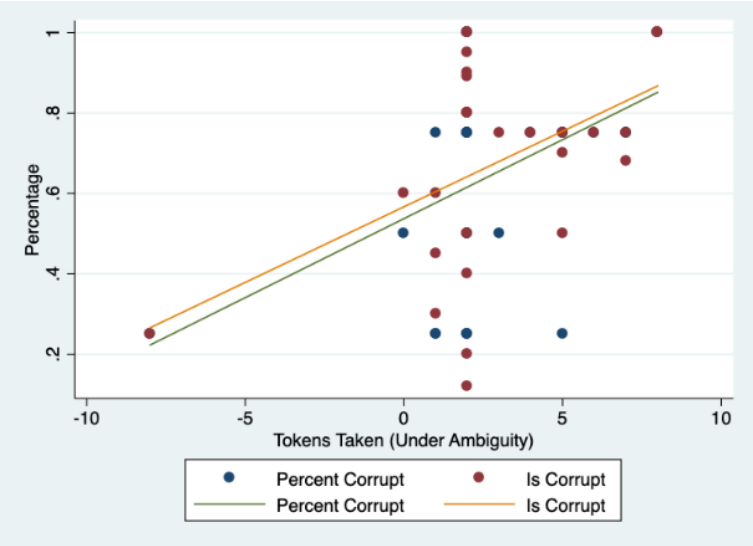


Table 5 shows the regression of belief measurements on the amount of tokens taken under ambiguous situation, where it should be that proposers' belief on other altruism should not be affected by the amount of tokens they take. In all the regression models shown in table 5, we include the dummy variable *Able 8* in order to capture the discrepancy of belief due to the difference in ability group. The result shows that the amount of tokens taken affects the proposers' perception on the act of their seller counterparts. All results shown are statistically significant, with or without control variables included in the regression. Thus, the result indicates that an additional token taken by proposers, increases the likelihood of proposers to believe that the proportion of sellers assigned to them are acting unkindly by 3.9 to 4.7 percent (*Percent Corrupt)* or the probability of their matched seller to act unkindly by 3.8 to 4.8 percent (*Partner Corrupt)*. This result shows that proposer who take more tokens, exaggerate their beliefs on other's action more often, which is in line with the proportion of motivated Bayesians. Despite the fact that this particular way of providing support for the first hypothesis is different from the assessment by Di Tella et al. (2015), this result can be shown as an evidence that one's belief on other's altruism is affected by one's craving to be egoistical.

TABLE 5 – REGRESSION OF BELIEFS ON TOKENS TAKEN (UNDER AMBIGUITY)

	Objective: *Percent Corrupt*		Objective: *Partner Corrupt*	
	(1)	(2)	(3)	(4)
Tokens Taken (Under Ambiguity)	0.039	0.047	0.038	0.048
	(0.007)***	(0.016)***	(0.005)***	(0.010)***
Able 8	-0.002	-0.095	-0.008	-0.101
	(0.089)	(0.094)	(0.079)	(0.089)
Control Variables	No	Yes	No	Yes
Observations	30	30	30	30

Notes: All used OLS regressions. Robust standard errors are in parentheses below the coefficient. Control variables included are male, age, and allowances. Column 1 and 3 implies regression without control variables, whereas in column 2 and 4, control variables are included. All of the observations only corresponds to the proposer. *** $p < 0.01$.

5.2 Result of Hypothesis 2

For the main feature of this paper, the second hypothesis assesses whether there are any differences in selfish behavior under risk and ambiguity. The null hypothesis would be that proposers' selfish actions are the same regardless of the type of uncertainty that they are deciding under. Table 6 shows the regression analysis of this hypothesis after acknowledging the difference in the number of tokens taken between ability groups, by including dummy variable *Able 8* into the regression model (column 1 and 2). Also, to acknowledge the potential interaction between the ambiguous situation and the difference in the ability of number of tokens taken by the proposers, interaction term between ambiguous situation dummy and *Able 8* dummy are included in the model (column 3 and 4). Thus, it is shown that there is no statistically significant difference even after the inclusion of control variables in all type of regression models.

TABLE 6 – REGRESSION OF HYPOTHESIS 2

	(1)	(2)	(3)	(4)
Objectives: *Tokens Taken*				
Ambiguous	-0.033	-0.033	0.438	0.438
	(0.759)	(0.624)	(0.276)	(0.727)
Able 8	2.763	3.773	3.268	4.278
	(0.809)***	(0.563)***	(1.191)***	(0.776)***
Ambiguous x *Able 8*			-1.009	-1.009
			(1.627)	(1.280)
Control Variables	No	Yes	No	Yes
Observations	60	60	60	60
Individuals Obs.	30	30	30	30

Notes: All used OLS regressions. Robust standard errors are in parentheses below the coefficient. Control variables included are male, age, and allowances. Column 1 and 3 implies regression without control variables, whereas in column 2 and 4, control variables are included. All of the observations only included the proposer. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

It might be tempting to make a conclusion to reject the null hypothesis based on the aforementioned analysis, due to the fact that there are already two papers that found statistically insignificant differences of self-interested behavior under risk and ambiguity (Cettolin et al., 2017; Garcia et al., 2018). However, as depicted in figure 3, there seemed to be a distinctive trend in the number of tokens taken between proposers in Able 2 and Able 8. On one hand, proposers in Able 2 on average take more tokens under ambiguous situation than in risk, whereas proposers in Able 8 are the other way around. For a comparison, proposers in Able 2 on average took 1.81 (SD = 0.40) tokens under ambiguity and 1.38 (SD = 1.02) tokens under weighted average risk. Whereas for proposers in Able 8, we can see that the average amount of tokens taken under risk (4.64, SD = 4.36) is higher than the average amount of tokens taken under weighted average ambiguity (4.07, SD = 4.14). However, as we can see, there is a much higher standard deviation for proposers in the Able 8 ability group which could indicate a higher noise in the data of the particular group. Thus, analyzing both ability group separately could be desirable. This reasoning leads us to further analyze this hypothesis through different ability group.

FIGURE 3 – DISTRIBUTIONS OF TOKENS TAKEN BY UNCERTAINTY TYPE FOR EACH ABILITY GROUP

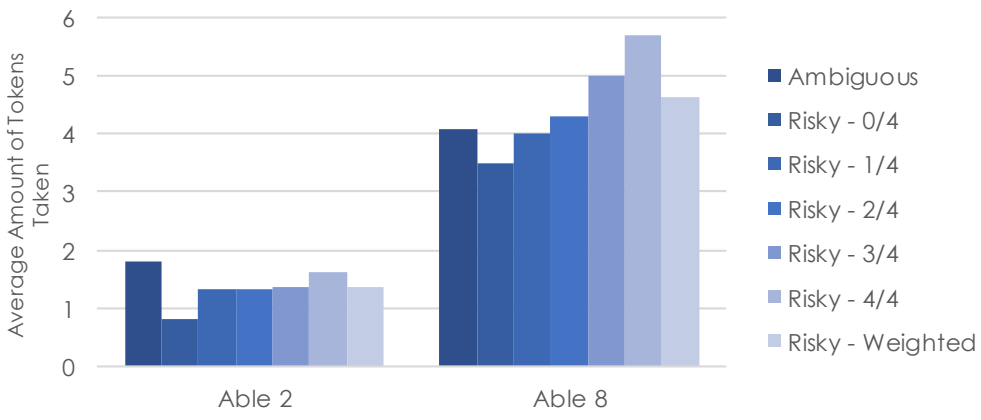


Table 7 shows similar analysis that was shown in table 6 but separated by proposers' ability group. As shown, there is a significant difference between the amount of tokens taken under ambiguity and risk for proposers in Able 2 when including the control variables in the model, which is significant below 10% level. Thus we can say that the average amount of tokens taken under ambiguity in Able 2 is greater by 0.438 than under risk. This result at least shows a small support for the second hypothesis under the condition of Able 2. While for the ability group of Able 8, the result is contradictory than the ones in Able 2, where the coefficient is negative. But both models with and without control variables of ability group Able 8 do not yield any statistically significant differences, thus exert no support or contradiction for the second hypothesis.

TABLE 7 – REGRESSION OF HYPOTHESIS 2 SEPARATED BY ABILITY GROUP

	Able 2		Able 8	
	(1)	(2)	(3)	(4)
Objectives: *Tokens Taken Ambiguous*	0.438	0.438	-0.571	-0.571
	(0.275)	(0.230)*	(1.607)	(0.901)
p-value	0.122	0.070	0.725	0.534
Control Variables	No	Yes	No	Yes
Observations	32	32	28	28
Individual Obs.	16	16	14	14

Notes: All used OLS regressions. Robust standard errors are in parentheses below the coefficient. Control variables included are male, age, and allowances. Column 1 and 3 implies regression without control variables, whereas in column 2 and 4, control variables are included. All of the observations only included the proposer. * $p < 0.1$.

To further check the robustness of the result shown in table 8, we conducted two additional analysis using the repeated measures ANOVA and mixed model which is shown in table 8. Using the repeated measures ANOVA, it can be seen that the coefficient differences of tokens taken under ambiguity and risk for proposers in Able 2 is identical to what has been shown previously. The *F* test was nearly significant, even after using the Huynh-Feldt adjustments [$F(1,15) = 2.88$]. Whereas for the mixed model, the result is similar with the previous analysis, except for being statistically significant at 10% level. Note however, due to the small amount of sample it could be the case that the p-value biased downward, thus providing the lower bound significance. Whereas again, for the proposers in Able 8, the tests do not provide any support for the second hypothesis.

TABLE 8 – ADDITIONAL TEST OF HYPOTHESIS 2 BY ABILITY GROUP

	Able 2		Able 8	
	(1)	(2)	(3)	(4)
Objectives: *Tokens Taken Ambiguous*	0.438	0.438	-0.571	-0.571
	(0.258)	(0.258)*	(0.500)	(0.570)
p-value	0.110	0.090	0.273	0.253
Huynh-Feldt *p*-value	0.110		0.273	
$F(1,15)$	2.88		1.31	

Observations	32	32	28	28
Individual Obs.	16	16	14	14

Notes: Column 1 and 3 used repeated measures ANOVA analysis, whereas column 2 and 4 used repeated measures mixed model. Standard errors are in parentheses below the coefficient. The mixed model in column 2 and 4 used restricted maximum-likelihood (REML) method for a comparable analysis to ANOVA and report result as chi-squared, therefore the *p*-value could be biased downward. The Huynh-Feldt epsilon in both ability group is 1. All of the observations only included the proposer. * $p < 0.1$.

VI. Discussions

6.1 Belief and Altruism Avoidance

Our result shows a support for the first hypothesis where proposers' belief on the altruism of their seller counterparts is affected by their willingness to take more tokens in the experiment. This shows that proposers who aimed to take more tokens, modify their belief to best suit their desire to be selfish. However, as mentioned, the method that we use to support the hypothesis is particularly different from the method used by Di Tella et al. (2015) as we failed to find significant differences on the belief of proposers between those in Able 2 and Able 8. As a refresher, Di Tella et al. (2015) found that proposers in Able 8 believe that sellers act unkindly significantly higher than those in Able 2, thus such beliefs were made to justify proposers' selfish action. This particular finding provides a clear distinction that the cause of belief differences of the proposers is due to the difference in ability group. Therefore, it makes clear that there's a spillover effect of belief distortion due to the wider opportunity to act selfishly, and such evidence is used to provide the support for the first hypothesis. Thus, our failure to find the differences in belief between Able 2 and Able 8 makes us unable to provide such message.

As an explanation, our failure to find a deviation of belief in different ability group might be attributed by the fact that the average amount of tokens taken by proposers in Able 8 of our experiment is substantially lower than what was shown in Di Tella et al. (2015). We argue that the tendency of subjects in this experiment to act selfishly is lower than the subjects employed in the study of Di Tella et al. (2015), therefore the incidence of biased belief do not seem to be as much in our set of subjects, especially those in Able 8 group. Thus, the difference in the amount of tokens taken by subjects in this experiment might be attributed from the cultural differences of the subjects As a comparison, our subjects were pooled in Indonesia, whereas theirs were pooled in Argentina. As a support for this reasoning, Roth, Prasnikar, Okuno-Fujiwara, & Zamir (1991) found particular differences in bargaining behavior among four countries in Asia, America, and Europe which are caused by distinctive cultural background. Roth (1995) suggested that the aforementioned finding could be interpreted as that people in different countries can have a different view on what's fair because of their differences in culture, therefore provide an argument as to why we found the differences in the amount of tokens taken with those in Di Tella et al. (2015) studies. Another reasoning for this differences might also be due to the higher noise in the data in Able 8, which will be discussed later in the subsequent subsection.

Despite the distinct method we use to provide the support for the first hypothesis, we could provide a similar message of when people are craving to be egoistical, they are shown to use distorted belief to justify their selfish action. Not only this support the finding of Di Tella et al. (2015) but it is also in line with several theories and findings on motivated belief and self-serving biases. Murnighan, Oesch, & Pillutla (2001), for instance, suggested that even when in a complete anonymity from other people, individuals that are deciding under dictator game setting cannot be separated from their impression for themselves. Logically, most people that acts as a dictator want to feel that they are being fair, at least for themselves. Thus, Murnighan et al. (2001) found that when given the opportunity to act egoistically without forming a negative perception of themselves, the altruistic behavior of dictators diminishes significantly. This also echoed what have been proposed by Rabin (1995) and Konow (2000) on the self-deception proposition. Our result of this paper further support the aforementioned findings, but the key difference from previous studies is the use of ambiguity on other's altruism as an enabler for individuals to act selfishly. Individuals seem to use this ambiguity strategically to make themselves feel justified to take more from others. Thus, they use the ambiguity as an enabler for them to bias the information processing into a direction of self-interest and making them to be a motivated Bayesians as proposed by Gino et al. (2016). Furthermore, this finding resonates to the theory of warm-glow giving by Andreoni (1990) as it is true that people gain a warm-glow feeling for themselves when they are being generous to others and really concern with what they think about themselves. But when an ambiguity on other's altruism is introduced, they use this as a leverage to act egoistically without thinking themselves as immoral and persisting their perception on their self-image. Also, this finding translates the mathematical model proposed by Di Tella & Perez-Truglia (2010) well, where individuals are willing to encounter the psychological cost of biased belief to alleviate the moral cost of taking more tokens.

6.2 Altruism Avoidance under Risk and Ambiguity

The main feature of this paper is to address the research question on the comparison of self-interested behavior under risk and ambiguity which is translated into our second hypothesis. As stated, our analysis shows a small support for the second hypothesis, which in the ability group *Able 2*, we found significant amplification in the amount of tokens taken under ambiguity than in risk. Despite the trivial significance level ($\alpha = 10\%$), this finding suggest that the evidence lean towards the finding of Haisley & Weber (2010) where they found reinforced self-interested behavior in ambiguous setting than in risky one, rather than the findings of Garcia et al. (2018) or Cettolin et al. (2017). Note however, our study is particularly different from any other studies that assessed these differences, as in generating ambiguous and risky setting, we used ambiguity and risk directly on other person's altruism, rather than relying on ambiguous or risky lottery. Therefore, this situation is much more aligned with real situations that we face, in comparison to previous studies. This were made possible by combining the experiment design of Di Tella et al. (2015) and Fairley et al. (2012, 2016).

When comparing our finding with the finding of Haisley & Weber (2010), we share similar message on how self-interested behavior are reinforced in ambiguous situation, but the way we arrive to this message is pretty distinctive. Haisley & Weber (2010) land on its conclusion by showing individuals to view lottery with ambiguity more favorably than risk when it justifies them to be self-interested. This is shown by individuals' willingness to take more of the expensive lottery for others in ambiguous than in risky setting. Thus, our message is more straightforward due to our direct assessment, which individuals use ambiguity more strategically in justifying their selfish action than risk. This is made possible by the involvement of subjective probability on other's altruism under ambiguous situation, where it makes room for people to manipulate their belief more and lean towards their desire to be selfish. Whereas in risky situations, the objective probability on other's altruism involved in the decision making, restrict people to bias their belief to an egoistic direction. Aligning our finding with the model of Di Tella & Perez-Truglia (2010), the existence of objective probability in risky situation entails higher psychological cost for people to bias their belief, therefore diminish their selfish action in comparison to the ambiguous setting.

Although our finding lean to support the finding of Haisley & Weber (2010), it is important to know that we only find a trivial evidence for it. Our findings only based on the situation where individuals were restricted to take a maximum amount of two tokens, and cannot be extended to those with the ability to take up to eight tokens. Our seemingly contradictory result for those in Able 8 ability group makes us to be very prudent on concluding this study. Although the contradiction was proven to be not significant, we dig deeper to find the reasoning behind the higher average amount of tokens taken under risk than ambiguity for those in Able 8. It turns out that the understanding on the experiment for those in Able 8 is significantly lower by 6% in comparison to those in Able 2. Therefore, the noise in the data of those in Able 8 could be higher and led to a non-conclusive result. Nevertheless, our finding at least shows a small support that ambiguity reinforces self-interested behavior more than risk. And furthermore, it shows support for the proposition that says the conflict between perceiving oneself to be moral while wanting to act selfishly is resolved through a biased belief enabled by the existence of uncertainty like ambiguity and risk (Brock et al., 2013; Gneezy, Saccardo, Serra Garcia, & Van Veldhuizen, 2015; Di Tella et al., 2015; Garcia et al., 2018).

6.3 Limitation

In this study, our biggest limitation is the lack of understanding of the experiment subjects. As stated, nearly 40% of our subjects were discarded from the analysis due to their low scores on the understanding check questions. This makes us to analyze a very limited number of observations (30 proposers) which leads to low variability and high standard error of the data, and makes us to barely find significant result. Furthermore, we found evidence that those who are in Able 8 have lower understanding on the conduct of the game than those in Able 2. These evidences lead us to a big potential of measurement error, and therefore leads to a potential biased result. However, our mitigation to this is by conducting robustness checks on our results. This at least can confirm as to whether the presented

results were robust to changes. For future research, the number of observations can be increased and the limitation on the lack of game understanding should be addressed whether it be through a simplification of instructions or a modification of the experiment. Although it should be noted that the feature of direct assessment via within subject design as shown in this study enables a more realistic explanation on addressing the mentioned research question.

VII. Conclusions

In this study we presented the result of modified corruption game. This game is similar to the dictator game, except that the recipients were entitled to decide the overall size of the pie to be received by both the dictator and recipient without dictator knowing and creates an ambiguous perception for dictator on how the recipient would act. Thus, to create both ambiguous and risky situations, the corruption game is modified so that each dictator was being randomly assigned to four recipients, which then matched to one of the four to determine the outcome. Through this design, the risky situation was made possible by disclosing the information on each of the four recipient's act.

Our finding shows support for both of hypothesis addressed in this study. First, we found evidence that beliefs about others is affected by one's egoistic preferences. Our finding on this matter is a confirmation of what have been found by Di Tella et al. (2015) but through a different methodology of assessment. This assessment complements the previous finding as we provide a direct assessment of the selfish act towards individuals' belief on others' act.

Second, we also found little support for our second hypothesis, which in this case is the main feature of this study. The result presented shows that individuals act of self-interest is reinforced under ambiguity than risk. The result of this study therefore supports the finding of Haisley & Weber (2010) on the distinction between the effect of ambiguity and risk on self-interested behavior. However, unlike previous studies on this matter, we use direct assessment within individuals to compare risk and ambiguity, and we did not use lottery uncertainties which therefore making our finding more realistic. From this finding, we shed a light that the feature of subjective probability in assessing ambiguous situation widens the moral wiggle room for individuals to act self-interestedly. Ambiguity in this matter allows individuals to manipulate their belief more severely than in risk, and therefore amplifies selfish act.

Our findings are in line with the theories of motivated belief and motivated Bayesians which predicts uncertainty as one of the reasoning for people to act self-interestedly (e.g. Rabin, 1995; Dana et al., 2007; Gino et al., 2016). Therefore, our study could be relevant in both economics literature and policy making. In economics literature, one could interpret this as an evidence to model ambiguity and risky situations differently, especially on the context of prosocial behavior. Thus, on other economic context such as policy making, one might consider to reduce uncertainty on a situation that requires

individual altruistic behavior (e.g. donations), especially when it includes subjective uncertainty which can lever individuals' selfish act.

However, it should be noted that our results are subject to some limitations due to a potential measurement error and high standard error. Therefore, future research could use the design of this research with a more simplified way to increase the understanding of the subjects employed in future studies. Nevertheless, this study could contribute to the literature by showing its novelty through directly assessing self-interested behavior under risk and ambiguity without the employment of lottery uncertainties.

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Appendix

Appendix A: Experiment Instruction and Questionnaire for Proposers (Able 2)

Introduction to Experiment

In this experiment, you will face 6 decisions that are divided into two parts:
Part I consisted of 1 decision, and
Part II consisted of 5 decisions
(This will be explained to you just before you make a decision later)

This experiment will be played out in **pairs:**
Participant 1 as a **Proposer**
Participant 2 as a **Seller**

Proposer (Participant 1) will be **randomly assigned to 4 Sellers** (Participant 2). **1 of the 4 Sellers** assigned **will be randomly matched with a Proposer** to determine the outcome of the experiment. This will be further explained to you in a moment.

In the consent form, you are guaranteed to play with **real** persons, therefore your decisions will affect your payment and the payment of other person you're matched with.

This experiment is **completely anonymous.** Therefore, none of the other participants and the organizer will be able to know what your decision was. And you will not be able to know the identity of the other persons that you're playing with.

Click next to know your role

Your Role: Participant 1 or 'Proposer'

In this experiment, you have been randomly assigned with 4 Sellers (Participant 2), in which 1 of them is randomly matched to you.

Initially, you are given 10 tokens, while your matched Seller also given 10 tokens. These tokens are given to both of you as a reward for your willingness to join this experiment. In short, between the two of you, you have 20 tokens.
These tokens will be translated into money by the end of the experiment.

As a Proposer, **you can and need to distribute these 20 tokens between you and your matched Seller.**
Or in other word, you have to decide how many of the 20 tokens you will keep and how many tokens to be given to your matched seller.

To determine how much money you (Proposer) and your matched seller get by the end of the experiment, **your matched Seller** will **simultaneously** decide the valuation of the token. He/she can decide between these two options:
Option 1: 1 Token = Rp2,000
Option 2: 1 Token = Rp1,000 and a certain payment of Rp10,000 **for the Seller**
As we, the organizer prefer the second option for obvious reason, we will incentivize Seller who chooses the lower valuation of token.

IN SUMMARY:
You have to decide how many tokens will you **keep for yourself** and how many tokens will you **give to the Seller.**
at the same time
Seller will choose the value of tokens that you distributed as stated above.

Click next to see the detail of option that **Sellers** are faced with

These are **NOT** your instruction. These are ALL the instructions that the Seller (Participant 2) sees:

Participant 1 ('Proposer') is distributing 20 tokens between you (Participant 2) and him/her (Participant 1). In other words, Participant 1 can decide how many tokens that he/she will keep and how many tokens to be given to you. These tokens will be translated into money by the end of the experiment.

As a Seller, you can decide what is the value of those tokens that will affect both your payment and Participant 1's payment. The options are as follows:

***Option 1**: 1 Token = Rp2,000*
***Option 2:** 1 Token = Rp1,000, and as a compensation you'll receive Rp10,000 just for yourself*

The Proposer will not able to know if you choose Option 1 or Option 2 until after they made a decision on the distribution. And you will not know how the Proposer distribute the tokens until after you choose between the Option 1 or Option 2.

*Remember: This game is completely **anonymous,** so none of the participant will know whom of the other participant he/she is playing with.*

Click next to do some quiz

Note that the instruction given to the Sellers **do not** give any details on how the Proposer may distribute the tokens.

Before making your decision, we want to make sure that you understand the game and your role correctly. Therefore, please answer the following questions.

You need to remember the experiment instructions to answer the following questions. If you forgot the game instructions, you can consult to the bottom of this page

Q1:
If, for instance, You (Proposer) keep the initial distribution, where you keep 10 tokens for yourself, and leave 10 tokens to the Seller.

In addition to your decision, the Seller decide to choose to value the tokens with Option 2 (value Rp1000 per token and a certain payment of Rp10,000 for the seller).

How much money will each of you get by the end of the experiment? (In Rupiah)

You (Proposer/Participant 1):

Your Matched Seller (Participant 2):

Q2:
If, for instance, you distribute the tokens in the following manner: you (Proposer) keep 19 tokens for yourself, and leave 1 token to the Seller.

In addition to your decision, the Seller decide to choose to value tokens with Option 1 (value Rp2000 per token)

How much money will each of you get by the end of the experiment? (In Rupiah)

You:

Your Matched Seller (Participant 2)

Q3:
Other participants and the organizer of the experiment will know what your decision (as a Proposer) was in this experiment

- ○ True
- ○ False

Q4:
Although no one knows your identity, your matched Seller (Participant 2) will know how you (Participant 1) distributed the 20 tokens, *before* choosing Option 1 or Option 2.

- ○ True
- ○ False

Q5:
Your matched Seller will be drawn from 4 of the Seller assigned to you

- ○ True
- ○ False

You will soon make your decision.

Your decision will be consisted of two parts, Part I and Part II
Part I consisted of 1 decisions
Part II consisted of 5 decisions
These decisions will be based on your role as a Proposer as mentioned before, and you will decide based on information that you will encounter in each part.

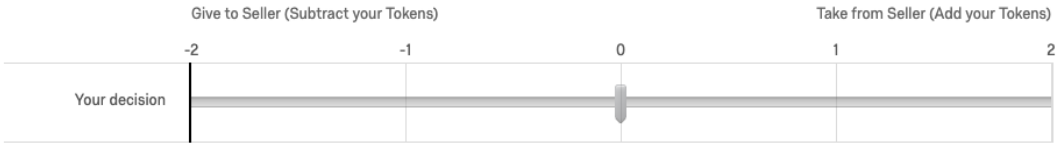
Note that your payment will be determined **either** from your decision in **Part I or Part II** (only 1 of the 6 decisions will determine your payment). This will be randomized by computer. You will only able to know the outcome when the payment is given to you tomorrow. Remember that the organizer **will not** in any way deceive you, therefore, how you get the payment will be exactly like what stated above.

Click next to continue to Part I of your decision

Decision 1:
By default, you (Participant 1) are given 10 tokens, while your matched Seller (Participant 2) is also given 10 tokens.

Note that we (Organizer) want to **make sure that both of you receive *at least* 8 tokens.** Therefore, you can only take a maximum of 2 tokens from the Seller (or give a maximum of 2 tokens to the Seller).

Now, you need to distribute these tokens using the slider below. (Example: if you choose 2, you will get 12 tokens while the Seller will receive 8 tokens).



Remember that you are randomly assigned with 4 Sellers, in which 1 of them are matched to you. And do remember that your decision is **anonymous. Please take your time on deciding the distribution of the tokens.** If you're done, please continue to answer the subsequent questions.

And to remind you, these are the options faced by the Seller:
Option 1: Rp2,000 per token
Option 2: Rp1,000 per token and a certain payment of Rp10,000 for the Seller

How many of the **4 Sellers** do you think will choose Option 2 (value Rp1,000 per token and get Rp10,000 side payment)?

- ○ 0
- ○ 1
- ○ 2
- ○ 3
- ○ 4

How much do you think is the chance that your **matched Seller** will choose Option 2 (value Rp1,000 per token and get Rp10,000 side payment)?

(In percentage %)

Why do you think your matched Seller have the chance to choose the Option 2 as you stated above?

PART II

In Part I you were not given the information about the 4 Sellers you are randomly assigned with. While in this part (Part II), you will be given the information of the choices of the 4 possible Sellers. Therefore there are 5 decisions of distribution of the 20 tokens that you have to make:

1. When none of the four possible Sellers choose the Option 2
2. When one of the four possible Sellers choose the Option 2
3. When two of the four possible Sellers choose the Option 2
4. When three of the four possible Sellers choose the Option 2
5. When all the four possible Sellers choose the Option 2

Remember! **Option 1** is when Seller valuate Rp2,000 per token. While **Option 2** is the choice where the valuation of token is Rp1,000 per token and the Seller get certain payment of Rp10,000

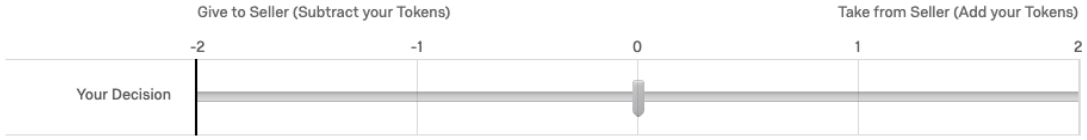
You will submit your decision on five different pages, one for each of the five decisions.

Decision 2:
None of the 4 Sellers assigned to you chose Option 2 (Rp1,000 per tokens with Rp10,000 payment).

By default, you (Participant 1) are given 10 tokens, while your matched Seller (Participant 2) is also given 10 tokens.

Note that we (Organizer) want to **make sure that both of you receive *at least* 8 tokens.** Therefore, you can only take a maximum of 2 tokens from the Seller (or give a maximum of 2 tokens to the Seller).

Now, you need to distribute these tokens using the slider below. (Example: if you choose 2, you will get 12 tokens while the Seller will receive 8 tokens).



To remind you, these are the options faced by the Seller:
Option 1: Rp2,000 per token
Option 2: Rp1,000 per token and a certain payment of Rp10,000 for the Seller

Also remember that only 1 of the 4 Seller will be matched to you. And do remember that your decision is **anonymous. Please take your time on deciding the distribution of the tokens.** If you're done, please continue to answer the subsequent decisions.

In this case, how likely do you think your matched Seller will choose the Option 2 (Rp1,000 per token and a certain payment of Rp10,000 for the Seller)?

(in percentage %)

… similarly continued until decision 5, where 4 out of 4 assigned were choosing the Option 2

Please answer the following questions

Did you understand the rules of the experiment?

- ○ I fully understood the rules
- ○ I almost fully understood the rules
- ○ I partly understood the rules
- ○ I did not understand the rules

How old are you?

What is you gender?

- ○ Male
- ○ Female

How much is your *monthly* allowances (**excluding** your house rent)?

- ○ < Rp1,000,000
- ○ 1,000,000 - 1,999,999
- ○ 2,000,000 - 2,999,999
- ○ 3,000,000 - 3,999,999
- ○ 4,000,000 - 4,999,999
- ○ >= 5,000,000

Please provide your phone number that you use in your Go-Pay account: (this will only be used for your payment purposes)

Appendix B: Experiment Instruction and Questionnaire for Seller

Introduction to Experiment

This experiment will be played out in pairs:
Participant 1 as a **Proposer**
Participant 2 as a **Seller**

The role will be explained to you in a moment.

In the consent form, you are guaranteed to play with **real** persons, therefore your decisions will affect your payment and the payment of other person you're matched with. You will know the outcome of the experiment and your payment **tomorrow**.

This experiment is **completely anonymous.** Therefore, none of the other participants and the organizer will be able to know what your decision was. And you will not be able to know the identity of the other persons that you're playing with.

Click next to know your role

Your Role: Participant 2 or 'Seller'

Participant 1 ('Proposer') is distributing 20 tokens between you (Participant 2) and him/her (Participant 1). In other words, Participant 1 can decide how many tokens that he/she will keep and how many tokens to be given to you. These tokens will be translated into money by the end of the experiment.

As a Seller, you can decide what is the value of those tokens that will affect both your payment and Participant 1's payment. The options are as follows:

Option 1: 1 Token = Rp2,000
Option 2: 1 Token = Rp1,000, and as a compensation you'll receive Rp10,000 just for yourself

The Proposer will not able to know if you choose Option 1 or Option 2 until after they made a decision on the distribution. And you will not know how the Proposer distribute the tokens until after you choose between the Option 1 or Option 2.

Remember: This game is completely **anonymous,** so none of the participant will know whom of the other participant he/she is playing with.

Now, which option do you choose?

- ○ Option 1
- ○ Option 2

Continued with demographic questions similar to the proposers.