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JEL codes:
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This paper proposes a new method to measure beliefs and ambiguity attitudes towards events that are not necessarily equally likely and belong to a discrete set (i.e., discrete sources of uncertainty). Our method increases robustness to misspecification and allows flexibility in parametric choices compared to previous methods. We implement our method experimentally to both equal and different sources of uncertainty in two contexts: trust and coordination games. We find two main results. First, for equal sources of uncertainty, our method successfully reveals that subjects have context-independent beliefs on events, but context-dependent utility and weighting functions. This result indicates that comparing different sources of uncertainty requires a complete measurement of the utility and weighting functions. Second, different sources of uncertainty where the events are not equally likely lead to an increase in likelihood insensitivity, which indicates that the beliefs formation process of unknown events is cognitively demanding.

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1 Introduction

Ambiguous situations are pervasive in human decisions. These decisions vary from choosing a place to work to important investment decisions. Subjects decide under ambiguous situations when the objective probabilities of the possible events are unknown (Knight, 1921). In contrast, subjects make decisions under risk when the objective probabilities are known.

The standard theory under ambiguity – Subjective Expected Utility (SEU) – considers that subjects (i) form subjective probabilities or beliefs on events, (ii) have the same utility function under ambiguity as under risk, and (iii) value lotteries as expected utility over outcomes in which the weights are the beliefs. Ellsberg (1961)'s paradox showed that people deviate from

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SEU by exhibiting *ambiguity attitudes* (aversion or even seeking). Consequently, several models (e.g. Gilboa, 1987; Schmeidler, 1989; Tversky and Kahneman, 1992; Klibanoff et al., 2005) have been proposed to account for ambiguity attitudes by allowing events weighting function and a difference in utility between risk and ambiguity.

The estimation of the utility and weighting functions – as a measure of ambiguity attitudes – has been focused on *continuous-valued sources of uncertainty*, meaning that the universal event is an interval of real numbers (Abdellaoui et al., 2021b; Van De Kuilen and Wakker, 2011). The main advantage of *continuous-valued sources of uncertainty* is that the concept of *exchangeability of events*, introduced by Baillon (2008), can be used to build elicitation methods (see subsection 2.2). Two events are exchangeable for a decision maker when she is indifferent towards permutations of their outcomes. Exchangeability allows to iteratively partition the universal event in equally likely events. Then, with a set of exchangeable events for which the subjective probabilities are known, elicitation methods can provide a measurement of the utility and weighting functions.

In our daily life, situations of *continuous-valued sources of uncertainty* are not commonly compared to situations that involve *discrete sources of uncertainty*. A *Discrete source of uncertainty* refers to any source of uncertainty that takes their values in a discrete set of events, which are not necessarily equally likely. The universal event is no longer an interval of real numbers. As such, it excludes the possibility of building *exchangeable events*. Baillon et al. (2018a,b) shed light on this regard by proposing two methods that do not require exchangeable events; therefore, the two methods can be used for discrete sources of uncertainty. However, these methods rely on restricted parametric assumptions (source independent utility function and the neo-additive weighting function of Chateauneuf et al. (2007)), which makes them prone to misspecification issues.

The objective of this paper is to develop a method to completely estimate utility function, weighting function and beliefs for discrete sources of uncertainty. Examples of discrete sources of uncertainty are present in almost all fields of economics. The following are some examples from game theory: trust, ultimatum, and public good games, among others. In the trust game (e.g. Bohnet et al., 2008), for instance, the universal event of the Trustor is often the union of two unequally likely events; either the Trustee reciprocates or betrays. Also, in the ultimatum game (e.g. Slonim and Roth, 1998), the universal event for the first mover is the union of two unequally likely events; either the second mover accepts or rejects the money sent by the first mover. Similarly, in a public good game with two players (e.g. Kosfeld et al., 2009), the universal event of each player is the union of two unequally likely events; either the other player contributes or the other player does not contribute.

Further examples of discrete sources of uncertainty can be found in health economics. For instance, the universal event of someone that consumes harmful products (e.g., tobacco, alcohol, unhealthy diets) can be represented as the union of two unequally likely events: either the development of a non-communicable disease or stay healthy (e.g. Bloom et al., 2020; Mane et al., 2019). This example can also be extended to communicable diseases like AIDS or COVID-19, where people do not know the exact probability of getting sick and they decide whether or not to wear condoms or masks (e.g. Cuddington, 1993; Rieger et al., 2020). Additionally, transport economics (e.g Guarda et al., 2016) and taxation economics (e.g. Dhami and Al-Nowaihi, 2007; Dhami and Hajimoladarvish, 2020) exemplified these situations. For instance, subjects who do not pay for the transport tickets face the union of two unequally likely events; being checked or not by controllers. Similarly, subjects who avoid taxes can be caught or not.

To measure these types of discrete sources of uncertainty, we propose a two-stage method in which the parametric assumptions of the utility function and the weighting function are made sequentially. The method allows for source-dependent utility function and any two-parameter weighting function (e.g. Goldstein and Einhorn, 1987; Prelec, 1998; Chateauneuf et al., 2007).

Using simulations, we show that the two-stage structure of the method favors robustness to misspecification issues (see subsection 3.3).

We combine our method and the empirical data from a laboratory experiment we conduct based on the trust and coordination game, in which participants make decisions under different sources of uncertainty. Our data allows us to confront the method with two validity tests on (i) symmetric events and (ii) stability of beliefs for unequally likely events of the same sources of uncertainty involved in different decision contexts. Our method successfully passes validity tests, which supports the reliability of the results derived from it.

We provide three mains results. First, we identify which sources of uncertainty are captured by likelihood insensitivity or pessimism. We find that several forms of uncertainty attitudes operate through variations in the likelihood insensitivity component, the main driver of the inverse S-shaped weighting function in the literature (e.g. Wakker, 2010; Åstebro et al., 2015; Abdellaoui et al., 2011a). People exhibit more likelihood insensitivity toward sources of uncertainty involving not symmetric events, which indicates that the beliefs formation process of unknown events is cognitively demanding. Second, empirical evidence supports theories that model ambiguity attitudes with the weighting function rather than with the utility function. Finally, our method reveals that people exhibit two additional behaviors which are not related to attitudes toward the source of uncertainty: *payoff dependence aversion* and *variety of payoffs seeking*. *Payoff dependence aversion* refers to the fact that people dislike that their own payoffs depend on the preferences of others, this behavior is captured by a more concave utility function. *Variety of payoffs seeking* means that people prefer a greater number of possible payoffs, when such possible payoffs depend on the preference of others, this is captured by a decrease in pessimism.

The remainder of this paper proceeds as follows. Section 2 presents different theoretical approaches to model ambiguity attitudes and existing measurement methods. Section 3 presents our elicitation method. Section 4 provides a review of related literature about attitudes toward sources of uncertainty in the coordination and trust game. Section 5 presents the experimental design. Section 6 provides the results. We discuss the results in section 7 and, conclude in section 8.

2 Theoretical background

This section presents a general theoretical framework of ambiguity attitudes. Also, we present existing methods of measuring ambiguity attitudes and beliefs and, the explanation of their limits.

2.1 Biseparable preferences model

Denote by $L = (x, y; E, E^c)$ a binary lottery that gives the outcome x if the event E occurs and y otherwise. E denotes an event of the state space Ω and E^c denotes the complement of E in Ω. Outcomes are real numbers. For notational convenience, we assume that $x > y \geq 0$. We denote $\succcurlyeq$ as the preference relation of the decision-maker over prospects. The relations $\succ$ and $\sim$ denote strict preference and indifference, respectively. The preference relation of the decision-maker is represented by the following model that values the prospect $L = (x, y; E, E^c)$ as

$$V(L) = W(P(E))(U(x) - U(y)) + U(y) \tag{1}$$

where $W(.)$ is the weighting function or source function for uncertainty (Abdellaoui et al., 2011a), $P(E)$ is the subjective probability or beliefs of E occurring, and $U(.)$ the utility function that captures the attitude toward outcomes. Both $W(.)$ and $U(.)$ are strictly increasing functions.

Model (1) corresponds to the biseparable preferences model of Ghirardato and Marinacci (2001), with the assumption that the decision maker can assign subjective probabilities to events, even when he does not maximize SEU (e.g. Ellsberg, 1961, p. 659). The biseparable preference model is a very general ambiguity model (e.g., Attema et al., 2018; Abdellaoui et al., 2021a) because it contains many of the ambiguity models (e.g. Gilboa, 1987; Schmeidler, 1989; Gilboa and Schmeidler, 1989; Tversky and Kahneman, 1992) that have been proposed to explain Ellsberg's paradox as special cases.

For decisions under risk, the objective probabilities of events are known. Denote by $L = (x, y; p, 1-p)$ a binary lottery that gives outcome x with probability p and y otherwise. The preference relation of the decision-maker is represented by the following model that values the prospect $L = (x, y; p, 1-p)$ as

$$V(L) = w(p)(u(x) - u(y)) + u(y) \tag{2}$$

with $w(.)$ as the weighting function or source function for risk and $u(.)$ the utility function that captures the attitude toward the outcomes. Both $w(.)$ and $u(.)$ are strictly increasing functions.

Source-dependent Utility (SDU) models assume identical weighting functions between risk and uncertainty, *i.e.* $W(.) = w(.)$. Source-dependent weighting (SDW) models assume identical utility functions between risk and uncertainty, *i.e.* $U(.) = u(.)$.

2.2 Existing methods

2.2.1 Elicitation methods based on exchangeability of events

The main difficulty for measuring the ambiguity model (1) resides in how to disentangle the weighting function $W(.)$ from the beliefs $P(.)$ (e.g. Li et al., 2020). The solution proposed in the literature is based on the concept of *exchangeability of events* (Baillon, 2008). Two events are exchangeable for a decision-maker when she is indifferent towards permutations of their outcomes. Formally, two events E_1 and E_2 are exchangeable if $(x, E_1, y) \sim (x, E_2, y)$, which implies that such events are equally likely or symmetric: $P(E_1) = P(E_2)$. If these events are complementary, then the subjective probability associated with each event should be $\frac{1}{2}$, assuming the additivity of $P(.)$.

Based on this concept of exchangeability of events, several methods have been proposed (e.g. Abdellaoui et al., 2011a; Van De Kuilen and Wakker, 2011; Abdellaoui et al., 2021a; Gutierrez and Kemel, 2021). The common idea underlying these methods is to start by splitting the universal event into two exchangeable events E_1 and E_2, such that $P(E_1) = P(E_2) = \frac{1}{2}$. The following steps of these methods consist of splitting E_1 and E_2 into exchangeable events that will result in $\frac{1}{4}$ as the subjective probability. Repeating the procedure allows to construct iteratively a series of exchangeable events that have a subjective probability of $\frac{1}{2i}$, with $i = 1, 2, ..., n$. With the set of exchangeable events for which one knows the subjective probability, these methods can provide a measurement for $W(.)$ and $U(.)$.

The construction of these exchangeable events are only possible for *continuous-valued sources of uncertainty*, which means that the universal event is an interval of real numbers (Abdellaoui et al., 2021b; Van De Kuilen and Wakker, 2011). For instance, when the source of uncertainty is the temperature in a town or the stock market index.

2.2.2 Elicitation method not based on exchangeable events

Oppositely, a *discrete source of uncertainty* comes from a source of uncertainty that takes their values in a discrete set of events which are not necessarily equally likely. Consequently, the universal event is no longer an interval of real numbers, therefore, it is not longer possible to build *exchangeable events*. In the next subsection, we introduce the indexes of Baillon et al. (2018b) (BW hereafter), which are applicable to measure ambiguity towards *discrete sources of uncertainty*.

Belief hedges method of BW

For *discrete sources of uncertainty*, BW introduced the *belief hedges method* that consists of evaluating ambiguity attitudes through two indexes. BW assume a minimal degree of richness of the state space Ω, meaning that there should be three nonnull events $E_1 = A$, $E_2 = B$ and $E_3 = C$ that are mutually exclusive and exhaustive: $E_1 \cup E_2 \cup E_3 = \Omega$ and $E_i \cap E_j = \varnothing$ for $i \neq j$. Denote by E_{ij} the union $E_i \cup E_j$ of two events. We call E_i a single event and E_{ij} a composite event. Denote by $\Omega_1^* = \{E_1, E_2, E_3\} = \{A, B, C\}$ the set of single events and by $\Omega_2^* = \{E_{12}, E_{13}, E_{23}\}$ the set of the composite events.

BW propose their two indexes in the framework of SDW. The difference in the weighting functions under ambiguity and risk is measured by the *ambiguity function* $f(.) = w^{-1}[W(.)]$. The matching probability m_E of an event E is the probability that ensures the following indifference $(x, y; E, E^c) \sim (x, y; m_E, 1 - m_E)$. Under SDW, the *ambiguity function* corresponds to the *matching probability* (Dimmock et al., 2016, Theorem 3.1):

$$m_E = f[P(E)] \tag{3}$$

The two indexes of the ambiguity function of BW are given by:

$$b = 1 - (m_1 + m_2)$$
$$a = 3\left[\frac{1}{3} - (m_2 - m_1)\right]$$

with $m_1 = \frac{1}{3}[m_A + m_B + m_C]$ and $m_2 = \frac{1}{3}[m_{AB} + m_{AC} + m_{BC}]$ being the averages matching probability for the single and composite events.

The quantity b, called *ambiguity aversion index*, approximates the elevation of the decision maker's ambiguity function. Ambiguity neutrality (*i.e.* $w(.) = W(.)$) implies $b = 0$. A higher value of b is associated with more ambiguity aversion from the pessimism component of the weighting function. The quantity a, called *ambiguity-generated insensitivity* (a-insensitivity), approximates the flatness of the ambiguity function in the middle region. Ambiguity-neutrality implies $a = 0$. A higher value of a is associated with more ambiguity aversion from the likelihood insensitivity component of the weighting function.

The main purpose of the two indexes of BW is to compare a risky situation with an ambiguous situation. Although, it can be tempting to use these two indexes to compare two different sources of uncertainty, our main point (formulated in Proposition 1) is to stress the fact that this second use of the two indexes could be misleading.

Proposition 1 *Consider two different sources of uncertainty 1 and 2 involving each three mutually exclusive and exhaustive events E_i, $i = 1, 2, 3$. Denote by $W_j(.)$ and $P_j(.)$ the weighting and belief functions for the source of uncertainty j, with $j = 1, 2$. Assume that subjects have:*

(A1) the same non-linear weighting functions for the two sources of uncertainty : $W_1(.) = W_2(.) \equiv W(.)$

(A2) different beliefs for events : $P_1(.) \neq P_2(.)$.

Assumptions (A1) and (A2) imply that $a_1 \neq a_2$ and $b_1 \neq b_2$

Proof

Under $(A1)$, we have the same ambiguity function $f_1(.) = f_2(.) = w^{-1}[W(.)] \equiv f(.)$, with $w(.)$ being the probability weighting function for risk. So, there is no difference in ambiguity attitudes in the sense of SDW. The two indexes of BW for the two sources of uncertainty are given by

$$b_i = 1 - \frac{1}{3}\left(\sum_{E\in\Omega_1^*} f[P_i(E)] + \sum_{E\in\Omega_2^*} f[P_i(E)]\right) \qquad i = 1,2$$

$$a_i = 1 - \left(\sum_{E\in\Omega_2^*} f[P_i(E)] - \sum_{E\in\Omega_1^*} f[P_i(E)]\right) \qquad i = 1,2$$

Since the ambiguity function $f(.)$ is bijective and $P_1(.) \neq P_2(.)$, there is no reason, a priori, to expect that $b_1 = b_2$ and $a_1 = a_2$. To illustrate, let's consider the following numerical example. For the source of uncertainty 1, assume that E_1, E_2, and E_3 are symmetric: $P_1(E_1) = P_1(E_2) = P_1(E_3) = \frac{1}{3}$. For the source 2, assume $P_2(E_1) = \frac{1}{10}, P_2(E_2) = \frac{1}{10}$ and $P_3(E_3) = \frac{8}{10}$. Also, assume $w(p) = p$ for risk and the non-linear Prelec (1998) compound invariance family $W(z) = (exp(-(-\ln(z))^{\alpha}))^{\beta}$ with $\alpha = 0.65$ and $\beta = 1.05$ (Wakker, 2010, pp. 270) for both treatments 1 and 2. With these values, we have $b_1 = 0.11 \neq 0.06 = b_2$ and $a_1 = 0.31 \neq 0.19 = a_2$. QED.

The Proposition 1 shows that the indexes of BW may be misleading to learn about the differences in ambiguity functions related to different sources of uncertainty when the distributions of beliefs differ markedly between these sources. Note that the only case where the indexes of BW work perfectly, is when the ambiguity function is linear (Baillon et al., 2021, Theorem 16). This happens when the weighting functions $w(.)$ and $W(.)$ are the specification of Chateauneuf et al. (2007).

Our point applies in particular to LW, who compare the indexes of BW between uncertainty generated by nature with uncertainty generated by a second player in the trust game. In this case, events are symmetric for nature (e.g Abdellaoui et al., 2011a) while they are asymmetric for the trust game. Hence, the results found by LW might be driven by the beliefs. A second drawback is that the indexes are proposed under the framework of SDW and this does not allow for ambiguity attitudes to be captured by the utility function.

Neo-additive method

Baillon et al. (2018a) proposed a method which releases the assumption of identical utility functions across sources or, in particular, between risk and uncertainty. This method allows to elicit the utility function, the neo-additive weighting function $W(P(E)) = sP(E) + c$ proposed by Chateauneuf et al. (2007), and the beliefs do not require exchangeable events.[1] The method consists of using certainty equivalent data of binary lotteries that involve three mutually exclusive and exhaustive events (E_1, E_2, E_3) and, one composite event (say E_{12}). The neo-additive weighting function and the parametric utility function (e.g. power utility x^{α}) are specified. The certainty equivalent data can be used in three-stages or one-stage procedure to estimate the utility, the neo-additive weighting function, and the beliefs of each $P(E_i)$, $i = 1, 2, 3$.

In the three-stages procedure, parametric assumptions are made sequentially. In the one-stage, the certainty equivalent data associated to one event (say E_1) is used to estimate the

[1]Similar procedure is proposed by Gutierrez and Kemel (2021, study C), but they keep the assumption of same utility for all sources of uncertainty.

utility function parameter (say α) and the one event weight (say $W(P(E_1))$), according to the method of Abdellaoui et al. (2008). In the second stage, the certainty equivalent data related to the three remaining events (E_2, E_3 and E_{12}) are used to compute, in a deterministic way, the three event weights $W(P(E_2))$, $W(P(E_3))$ and $W(P(E_{12}))$, according to Abdellaoui et al. (2011b). In the third stage, the four event weights from the first and second stage allow to estimate the two-parameter of the neo-additive weighting function and the three beliefs as follows

$$c = W(P(E_1)) + W(P(E_2)) - W(P(E_{12})) \tag{4}$$

$$s = \sum_{i=1}^{3} W(P(E_i)) - 3\,(W(P(E_1)) + W(P(E_2)) - W(P(E_{12}))) \tag{5}$$

$$P(E_i) = \frac{W(P(E_i)) - c}{s} \qquad \text{for} \qquad i = 1, 2, 3 \tag{6}$$

In the one-stage procedure, the parametric assumption of the utility and the weighting functions are not made sequentially, but simultaneously. Then, the certainty equivalent data is used in a single step to estimate the utility function parameter (say α), the two-parameters (s and c) of the neo-additive weighting function and the two beliefs $P(E_1)$ and $P(E_2)$, knowing that $P(E_3) = 1 - P(E_1) - P(E_2)$.

Even though the one-stage and three-stages neo-additive methods allow for source-dependent utility function, they might suffer from two drawbacks. The first drawback applies to both methods. This drawback relies on the fact that the assumption of the neo-additive weighting function may be restrictive to fit the data (e.g. Li et al., 2018), probably due to misspecification issues (Kpegli et al., 2022). Second, in the case of the three-stages approach, the certainty equivalents that are used to compute the event weights in a deterministic way during the second stage contain with response errors. These response errors are not controlled and, then they could bias the future estimates of the event weights in the second stage, as well as generate additional bias in the beliefs of the third stage (Etchart-Vincent, 2004, pp. 221).

3 Elicitation Method

We extend in this section the multistage neo-additive method of Baillon et al. (2018a) to any two-parameter weighting function to elicit beliefs $P(.)$, utility function $U(.)$, and weighting function $W(.)$ for discrete sources of uncertainty. In addition, we show that the two-stage method is more robust to misspecification than the one-stage method. We keep the same notations as in section 2.

3.1 Stage 1: Elicitation of utility function and willingness to bet

This stage is based on the *all at once method* of Kpegli et al. (2022). The researcher starts by considering a set of $m = 3$ mutually exclusive and exhaustive nonnull events $\Omega_1^* = \{E_1, E_2, E_3\}$.[2] The resulting set of composite events is given by $\Omega_2^* = \{E_{12}, E_{13}, E_{23}\}$. Further, the researcher will pick a composite event in Ω_2^*, say E_{12} (see also Baillon et al., 2018a). Subsequently, the researcher elicits in an experiment, at least two certainty equivalents for each single event and the chosen composite event $E \in \Omega_1^* \cup E_{12}$

$$ce_k^h \backsim (x_E^h, y_E^h; E, E^c), \quad h = 1, 2, \ldots, N_E \quad \text{and} \quad N_E \geq 2 \tag{7}$$

[2]We cover the cases of $m \neq 3$ in the subsection 3.4.

with N_E being the number of certainty equivalents that involve the event E. x_E^h and y_E^h refer to the outcomes such that $x_E^h > y_E^h$. In total, the number of certainty equivalents elicited is $N = \sum_{E \in \Omega_1^* \cup E_{12}} N_E \geq 2(m+1) = 8$.

Now, we denote by $\mathbf{ce}$, $\mathbf{x}$, and $\mathbf{y}$ the variables that collect the values ce_E^h, x_E^h, and y_E^h, respectively. Also, we denote by $\mathbf{I}^E$ a dummy variable that takes the value 1 if the event E occurs and 0 otherwise. Denote $\delta_E \equiv W(P(E))$ for $E \in \Omega_1^* \cup E_{12}$. We call δ_E the *willingness to bet* on the event E (Ghirardato and Marinacci, 2001; Abdellaoui et al., 2011a). Also, we assume that the certainty equivalents are observed with additive response error terms $\mathbf{e}$. Assuming that U is invertible, it turns out

$$\mathbf{ce}_l = U^{-1}\left[(U(\mathbf{x}_l) - U(\mathbf{y}_l))\left(\sum_{E \in \Omega_1^* \cup E_{12}} \delta_E \mathbf{I}_l^E\right) + U(\mathbf{y}_l)\right] + \mathbf{e}_l \tag{8}$$

where l is the l^{th} line in $\mathbf{ce}$, $\mathbf{x}$, and $\mathbf{y}$. Finally, the Eq. (8) is estimated by nonlinear least squares, by giving an explicit functional form for U (and thus for U^{-1}). The two-popular utility function are power (eq. 13) and exponential (eq. 14).

From the estimations results, one gets the parameter(s) of the utility function $U(.)$ and the willingness to bet δ_E on the event $E \in \Omega_1^* \cup E_{12}$. These willingness to bet correspond to the compound function $W(P(.))$ evaluated at each single and composite events in the set $\Omega_1^* \cup E_{12}$.

This stage allows to reject subjective expected utility theory (that is $W(z) = z$), if any of the following two equalities is not satisfied

$$\sum_{E \in \Omega_1^*} \hat{\delta}_E = 1 \quad \text{and} \quad \hat{\delta}_{E_{12}} = \hat{\delta}_{E_1} + \hat{\delta}_{E_2} \tag{9}$$

The following stage allows to break down the willingness to bet in terms of weighting function $W(.)$, and beliefs $P(E)$ for $E \in \Omega_1^* \cup E_{12}$.

3.2 Stage 2: Elicitation of weighting function and beliefs

Following Gonzalez and Wu (1999), we assume that the weighting function $W(.)$ is characterized by two parameters η and γ, which correspond to the *insensitivity* of the decision-maker to likelihood information, and the decision-maker's *pessimism/optimism*, respectively. To make explicit the dependence of the weighting function on η and γ, we write $W(.) \equiv W_{\eta,\gamma}(.)$.

With $m = 3$ single events, we have the following system of 5 equations:

$$W_{\eta,\gamma}(P(E_i)) = \hat{\delta}_{E_i} \quad , \qquad i = 1, 2, ..., m = 3 \tag{10}$$

$$W_{\eta,\gamma}(P(E_1) + P(E_2)) = \hat{\delta}_{E_{12}} \tag{11}$$

$$\sum_{i=1}^{m} P(E_i) = 1 \tag{12}$$

The system of equations (10)-(12) contains exactly 5 unknown elements: $P(E_1)$, $P(E_2)$, $P(E_3)$, η, and γ. The first three equations in (10) come from Eq. (8). The fourth Eq. in (11) comes from Eq. (8) and, the fact that the events E_1 and E_2 are mutually exclusive. The last Eq. in (12) comes from the fact that the events E_1,E_2, and E_3 are exhaustive. Any two-parameter weighting functions can be specified (see Epper and Fehr-Duda, 2020, for a review) in the system of equations (10)-(12). The three popular weighting functions in the ambiguity literature are the specifications [3] of GE87 (eq. 15), P98 (eq. 16) and CEG7 (eq. 17).

When the estimated decision weights satisfy strict monotonicity[4] in the sense that $\delta_{E_{12}} > \delta_{E_1}$ and $\delta_{E_{12}} > \delta_{E_2}$, the system of equations (10) - (12) could be solved (numerically) to estimate the strictly increasing two-parameter weighting function (*i.e.* η and γ) and the beliefs $P(E_1)$, $P(E_2)$, and $P(E_3)$.

It is noteworthy to talk about our method when the number m of single events is different from 3. When the number of single events is more than 3, the procedure to apply our method remains unchanged. The beliefs of additional single events can be estimated by using the corresponding number m of the single events in equations (10) and (12). When the number of single events is $m = 2$, the Eq. (11) collapses from the method because $W(1) = 1$ by assumption. In this case, our method does not allow to identify two-parameters weighting function. Instead, it allows to identify one-parameter weighting function (e.g. Tversky and Kahneman, 1992; Prelec, 1998).

Despite the fact that we focus on the presentation of our method on discrete source of uncertainty, it can also apply to continuous-valued sources of uncertainty (see appendix 1 for details). In this context, using the subjective probabilities of the three exclusive and exhaustive events $E_1, E_2, E_3 \subset \mathcal{R}$ allows to completely estimate continuous two-parameter distribution like the beta distribution (Abdellaoui et al., 2021a). Consequently, our method covers all types of sources of uncertainty.

Also, the method accommodates both SDU and SDW since we do not require equality of utility or weighting functions between risk and uncertainty. Then, the data allows to discriminate between SDU and SDW.

3.3 Comparison of multi-stage and one stage approaches

We propose a multistage method in which the utility function and the probability weighting function are specified sequentially.[5] In this section, we compare our multi-stage approach with the one-stage approach in which the utility and weighting functions are specified simultaneously. To that end we conduct parameter recovery and misspecification exercises (e.g. Gao et al., 2020; Kpegli et al., 2022; Nilsson et al., 2011).

3.3.1 Simulated data

We consider six specifications resulting from the combination of two utility functions $u(.)$ and three weighting functions $w(.)$.[6]

The two utility functions $u(.)$ are P(ower) (Eq. 13) and E(xponential) (Eq. 14):

$$U(z) = z^{\alpha} \tag{13}$$

$$u(z) = \frac{1 - exp(-\alpha z)}{\alpha} \tag{14}$$

For the power utility, $\alpha < 1$ (resp. $\alpha > 1$) means concavity (resp. convexity) and $\alpha = 1$ corresponds to the linear case. For the exponential utility, $\alpha > 0$ (resp. $\alpha < 0$) means

[3]We refer to Goldstein and Einhorn (1987) as GE87.

[4]Monotonicity at the aggregate level (e.g. pooled data, mean data and median data) will naturally hold. But, at the individual level this condition might not be satisfied.

[5]In case of continuous valued source of uncertainty, we also allow to specify the distribution of beliefs only in the third stage (see appendix A1).

[6]The vast majority of specifications in ambiguity studies rely on one of these six combination of utility and weighting functions (e.g. Li et al., 2018; Gutierrez and Kemel, 2021).

concavity (resp. convexity) and $\alpha \longrightarrow 0$ corresponds to the linear case. To have a common measure of the utility curvature to facilitate comparisons, we adopt the following measure of the utility curvature over the range of outcomes $[0, \overline{q}]$ (Kpegli et al., 2022; Abdellaoui et al., 2016)

$$\beta = \frac{1}{\overline{q}u(\overline{q})} \int_0^{\overline{q}} u(t)dt$$

with $\beta > 0.5$ (resp. $\beta < 0.5$) meaning concavity (resp. convexity) and $\alpha = 0.5$ corresponds to the linear case.

The three weighting functions $w(.)$ are the specifications of GE87 (Eq. 15), P98 (Eq. 16) and CEG7 (Eq. 17)

$$W(P(E)) = \frac{\eta P(E)^\gamma}{\eta P(E)^\gamma + (1 - P(E))^\gamma} \tag{15}$$

$$W(P(E)) = exp\Bigg(-\eta\Big(-ln(P(E))\Big)^\gamma\Bigg) \tag{16}$$

$$W(P(E)) = \gamma P(E) + \eta \tag{17}$$

with $\gamma > 0$, $\eta > 0$.

For the specification of CEG7, the pessimism and insensitivity indexes are given by $1 - \eta - 2\gamma$ and $1 - \eta$, respectively (e.g. Abdellaoui et al., 2011a). For the specification of P98, the parameters η and γ are an index of pessimism and an anti-index of likelihood insensitivity, respectively (Abdellaoui et al., 2021a). For the specification of GE87, the parameters η and γ are an anti-index of pessimism and an anti-index of likelihood insensitivity, respectively (e.g. Gonzalez and Wu, 1999).[7] Insensitivity makes weighting the function flatter in the range of intermediate subjective probability and steeper near the ends. Hence, the weighting function follows an inverse S-shaped. Pessimism determines the elevation of the weighting function.

The calibration of lotteries follows the outcomes in Li et al. (2019, 2020) and the ones from our experiment. We consider 12 lotteries $L = (x, y, E, E^c)$ that results from the combination of three pairs of outcomes (x, y)= $(10, 0), (15, 0)$, and $(15, 8)$ and, four events $E = E_1, E_2, E_3$ and E_{12}.

Simulated data 1: P & GE87. We simulate data for 250 ($s = 1, 2, ..., 250$) hypothetical subjects. For each subject s, we draw the parameters of weighting function η and γ of GE87 from $\mathcal{U}(0.1, 1.5)$. We draw the parameter of the power utility function α from an uniform distribution $\mathcal{U}(0.1, 2.1)$ (e.g. Abdellaoui et al., 2008; Spiliopoulos and Hertwig, 2019). For the beliefs, we draw $P(E_1)$ and $P(E_2)$ from $U(0, 1)$ and keep only the cases where $P(E_1) + P(E_2) < 1$. We derive then $P(E_3) = 1 - P(E_1) - P(E_2)$. Then, the simulated α, η, γ, $P(E_1)$, $P(E_2)$, and $P(E_3)$ are plugged into the RDU formulas to generate *noiseless* certainty equivalents of the 12 lotteries. In the last step of the data generation process, we draw 12 random values from a normal distribution with expected value 0 and standard deviation $\sigma = 0.25$, which we add to the previously generated 12 *noiseless* certainty equivalents to obtain the *noisy* ones.

Simulated data 2: P & P98. similar as simulated data 1, but in this case the two-parameter weighting function of P98 is used. We draw η and γ of P98 from $\mathcal{U}(0.1, 1.5)$.

Simulated data 3: P & CEG7. Similar as simulated data 2, but in this case the two-parameter weighting function of CEG7 is used. We draw η and γ of CEG7 from $\mathcal{U}(0, 1)$.

Simulated data 4: E & GE87. Similar as simulated data 1, but in this case the CARA utility function is used. We draw α from $\mathcal{U}(-0.15, 0.15)$.

[7] For this specification, the crossing point is given by $W(p^*) = p^* = \frac{1}{1+\eta^{\frac{1}{\gamma-1}}}$ and, $W(.)$ is well defined over all the probability range including the boundary $W(0) = 0$ and $W(1) = 1$.

Simulated data 5: E & P98. Similar as simulated data 2, but in this case the CARA utility function is used. We draw α from $\mathcal{U}(-0.15, 0.15)$.
Simulated data 6: E & CEG7. Similar as simulated data 3, but in this case the CARA utility function is used. We draw α from $\mathcal{U}(-0.15, 0.15)$.

3.3.2 Simulation results

We conduct two types of estimations for each approach by using the six simulated data. In the first type of estimation, we estimate by using the correct specification of the utility and weighting functions that are behind the simulated data. This first type of estimation corresponds to the parameter recovery exercise in which the purpose is to assess the ability of the two approaches to identify the targeted parameters (Murphy and ten Brincke, 2018; Gao et al., 2020; Kpegli et al., 2022).

In the second type of estimation, we make the estimation on each of the simulated data by assuming the 5 other specifications of utility and weighting functions that are not behind the simulated data. This second type of estimation corresponds to the misspecification exercise in which the purpose is to assess the extend to which a wrong specification of utility and weighting functions will affect the estimation results (Gao et al., 2020; Kpegli et al., 2022).

Figure 1 presents the results of the parameter recovery exercises. On the y-axis (x-axis) we have the squared difference between the true values of parameters and their estimated values over the 250 hypothetical subjects for the one-stage (resp. two-stage) approach.[8] The points are tightly aligned around the 45° lines. This suggests that the two approaches have similar performance in terms of parameter recovery. Indeed, singtest indicates that median of the difference between the squared error of the two approaches is not different from zero for the utility parameter (p-value=0.6171), event weights (p-value=0.0568) and beliefs (p-value=0.9672). Overall, singtest indicates that the median of the difference between the squared error of the two approaches is not different from zero for the utility parameter (p-value=0.5776).

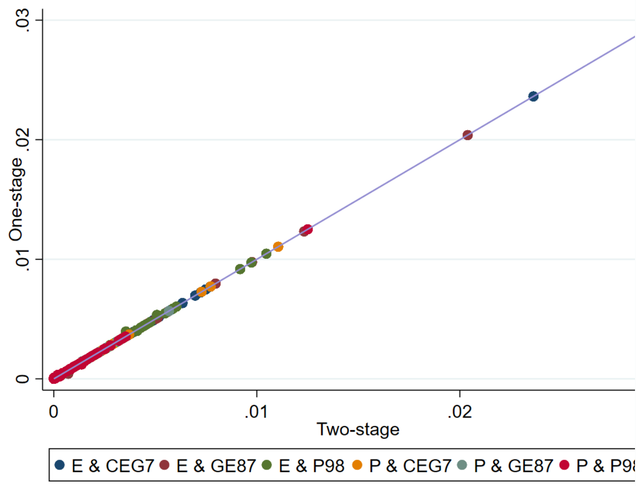
Figure 2 presents the results of the misspecification exercises. On the y-axis (x-axis) we have the squared difference between the true values of the parameters and their estimated values over the 250 hypothetical subjects for the one-stage (resp. two-stage) approach. There is some tendency of points to be above the 45° lines, especially for event weights and beliefs. This suggest that the two-stage approach seems to provide smaller error than the one-stage approach. Singtest indicates that median of the difference between the squared error of the two-stage approach and one-stage approach is significantly lower than zero for utility (p-value<0.0001), beliefs (p-value<0.0001), and no different for event weights (p-value=0.1611). Overall, singtest indicates that the median of the difference between the squared error of the two-stage approach and one-stage approach is significantly lower than zero (p-value<0001).

Table 1 provides the average of the squared difference between the true values of parameters and their estimated values over the 250 hypothetical subjects. The table provides further evidences regarding the fact that the two-stage approach leads to smaller error than the one-stage approach. Furthermore, the two-stage approach based on power utility function in combination with two-parameter weighting function of GE87 leads to smaller errors.

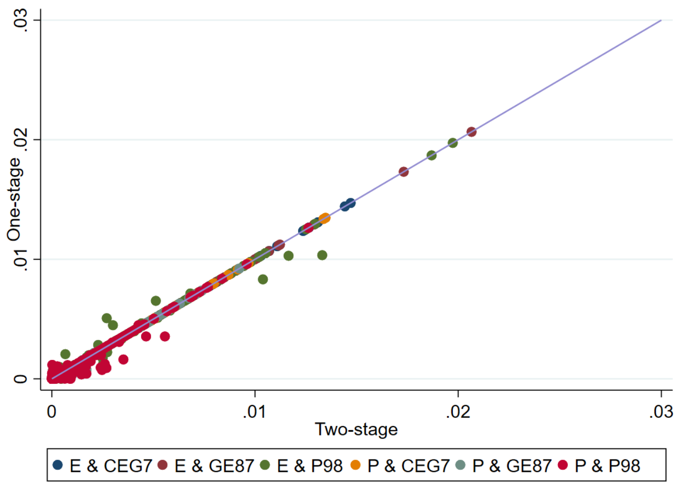
[8] Belief and events weights are evaluated at the single and composite events.

Figure 1: Result of parameter recovery

(a) Utility curvature



(b) Event weights



(c) Beliefs

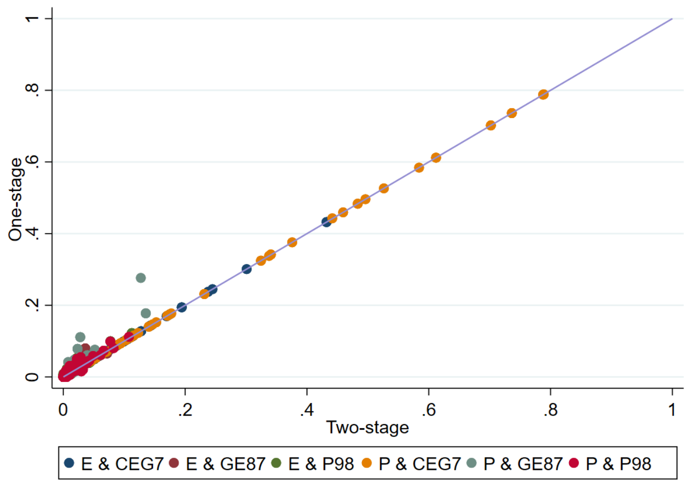
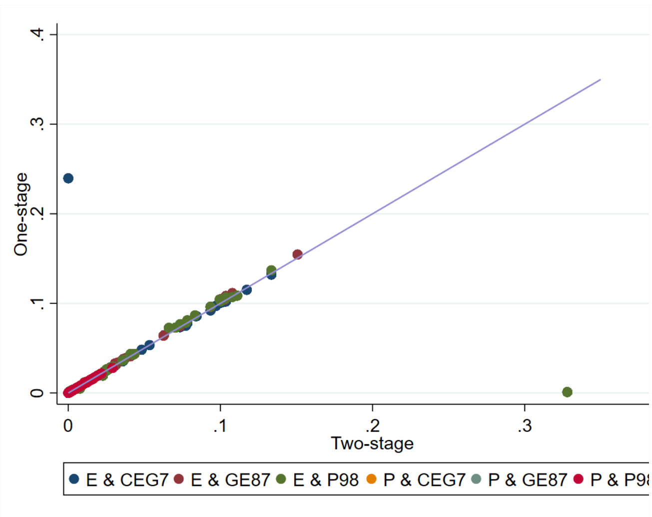
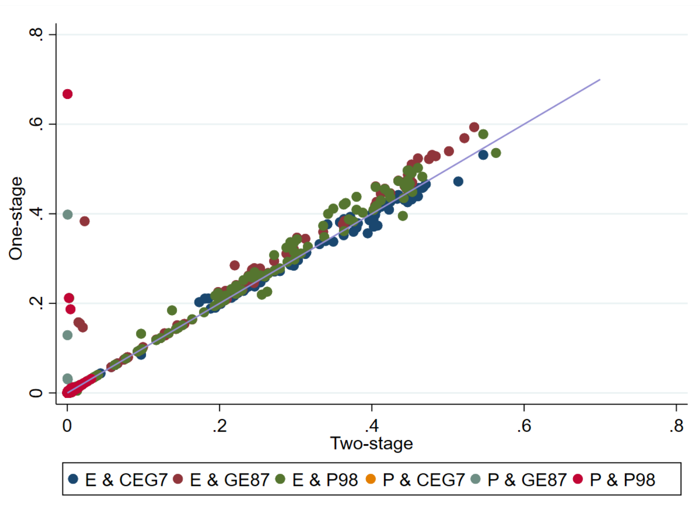


Figure 2: Result of misspecification

(a) Utility curvature



(b) Event weights



(c) Beliefs

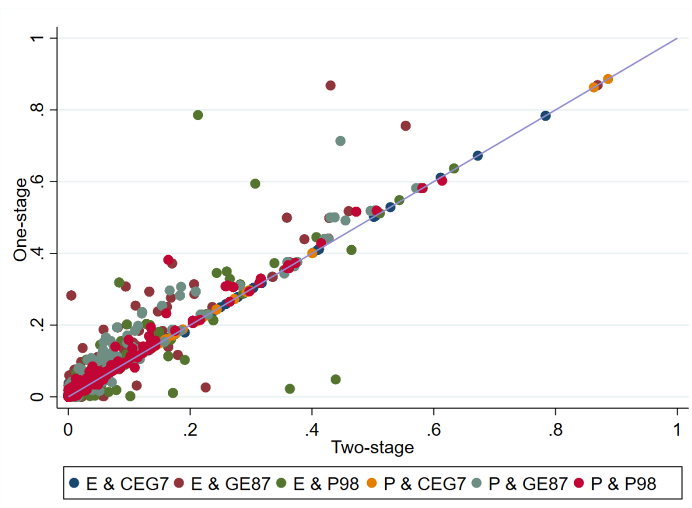


Table 1: Result of parameter recovery and misspecification excercises

	Specification		one-stage				two-stage			
	$u()$	$w()$	$u()$	$w()$	$P()$	pool	$u()$	$w()$	$P()$	pool
Parameter recovery										
1	E	CEG87	0.0010	0.0012	0.0096	**0.0039**	0.0010	0.0012	0.0096	**0.0039**
2	E	GE87	0.0011	0.0012	0.0022	**0.0015**	0.0011	0.0012	0.0020	**0.0014**
3	E	PR98	0.0011	0.0012	0.0031	**0.0018**	0.0011	0.0013	0.0028	**0.0017**
4	P	CEG87	0.0005	0.0007	0.0189	**0.0067**	0.0005	0.0007	0.0189	**0.0067**
5	P	GE87	0.0004	0.0006	0.0034	**0.0015**	0.0004	0.0006	0.0026	**0.0012**
6	P	PR98	0.0005	0.0007	0.0037	**0.0016**	0.0005	0.0007	0.0033	**0.0015**
7	**pool**	**pool**	**0.0008**	**0.0009**	**0.0068**	**0.0028**	**0.0008**	**0.0009**	**0.0065**	**0.0027**
Misspecification										
1	E	CEG7	0.0028	0.0069	0.0070	**0.0056**	0.0029	0.0070	0.0070	**0.0056**
2	E	GE87	0.0023	0.0064	0.0100	**0.0062**	0.0026	0.0059	0.0083	**0.0056**
3	E	P98	0.0026	0.0070	0.0076	**0.0057**	0.0028	0.0067	0.0070	**0.0055**
4	P	CEG7	0.0017	0.0018	0.0061	**0.0032**	0.0017	0.0018	0.0061	**0.0032**
5	P	GE87	0.0018	0.0021	0.0090	**0.0043**	0.0018	0.0019	0.0076	**0.0038**
6	P	P98	0.0019	0.0020	0.0074	**0.0038**	0.0019	0.0018	0.0068	**0.0035**
7	**pool**	**pool**	**0.0022**	**0.0044**	**0.0078**	**0.0048**	**0.0023**	**0.0042**	**0.0071**	**0.0045**
Parameter recovery and Misspecification										
1	E	CEG7	0.0019	0.0040	0.0083	0.0048	0.0020	0.0041	0.0083	**0.0048**
2	E	GE87	0.0017	0.0038	0.0061	0.0038	0.0018	0.0035	0.0052	**0.0035**
3	E	P98	0.0018	0.0041	0.0053	0.0038	0.0019	0.0040	0.0049	**0.0036**
4	P	CEG7	0.0011	0.0012	0.0125	0.0049	0.0011	0.0012	0.0125	**0.0049**
5	P	GE87	0.0011	0.0014	0.0062	0.0029	0.0011	0.0012	0.0051	**0.0025**
6	P	P98	0.0012	0.0013	0.0056	0.0027	0.0012	0.0012	0.0051	**0.0025**
7	**pool**	**pool**	**0.0015**	**0.0026**	**0.0073**	**0.0038**	**0.0015**	**0.0026**	**0.0068**	**0.0036**

3.4 Remarks about the method

4 Related literature on uncertainty attitudes in experiments

The reminder of the paper shows how our method can be used to measure beliefs and disentangle crucial forms of uncertainty in trust and coordination games. In this section, we present some of the related literature.

4.1 Crucial forms of uncertainty in trust and coordination games

In economic experiments, subjects playing the traditional trust game, face two sources of uncertainty: *strategic uncertainty* and *social ambiguity*. First, subjects face *strategic uncertainty* when the actions of others are uncertain in strategic interactions. Strategic uncertainty confronts individuals with the delicate task of forming beliefs about other individuals' decisions (Renou and Schlag, 2010). Second, decision-makers face *social ambiguity*, when the uncertainty comes from the non-strategic decisions of other individuals. Social ambiguity refers to the fact that people treat acts by humans, even in the absence of strategic interactions, differently from acts of nature, which do not involve human agency (LW). Hence, behind any strategic uncertainty, there is also social ambiguity, which might play a role in the decision-making process.

Additionally, social preferences play a role in trust games since players are aware that their actions impact not only their payoffs but also the payoffs of others (Bohnet et al., 2008) (BZ, hereafter). Also, in a modified version of the trust game, Trustors can interact with nature instead of another person, in which case, they face *nature ambiguity.* This means that the ambiguous outcomes are determined by a non-human source.

Besides social ambiguity, strategic uncertainty, and social preferences (all present in strategic interactions), a key component that differentiates the trust game from other games that comprise strategic interactions in game theory (e.g., beauty contest, and coordination games) is *betrayal aversion.* Betrayal aversion represents a cost for the Trustor when trust is violated (BZ). This cost is viewed by BZ as a dis-utility that enters into the utility function alongside the utility towards one's own payoffs and social preferences. It becomes clear that strategic uncertainty, social ambiguity and betrayal aversion can play a major role in trust and strategic interactions. Besides these elements, people also based their decisions on their beliefs about the possible events. However, due to the lack of a methodology to elicit beliefs and attitudes towards a discrete source of uncertainty, we do not know the extent to which each of these elements affects trust and strategic decisions.

4.2 Social ambiguity, strategic uncertainty and betrayal aversion

Under SDU, *strategic uncertainty, social ambiguity* and *betrayal aversion* would be captured by the utility function. Contrary, under SDW, they would be captured by the weighting function. The weighting function captures such ambiguous attitudes into two components: optimism/pessimism and likelihood insensitivity (Gonzalez and Wu, 1999). Optimism/pessimism reflects the extent to which subjects overweight/underweight the beliefs regarding whether the resulting outcome will be beneficial for them. On the other hand, likelihood insensitivity refers to subjects' cognitive ability to distinguish between several levels of subjective probabilities or beliefs (e.g. Choi et al., 2022). Wakker (2010) refers to optimism/pessimism as a motivational component and, to likelihood insensitivity as a cognitive component in the decision-making process.

BZ develop an experiment, using a version of the trust game, to identify betrayal aversion through the Minimum Acceptable Probability (MAP) related to the utility function. The MAP is the probability for which the Trustor is indifferent between trust and distrust. BZ identify betrayal aversion as the difference in MAP between two treatments: the trust game and the risky dictator game (RDG). In the trust game treatment, if the Trustor decides to trust, the final payoffs for both Trustor and Trustee are determined by the Trustee. Contrary, in the RDG, if the Trustor trusts, the payoffs for both players are determined by nature. The possible payoffs under both treatments are the same. Their results show that subjects state higher MAPs in the trust game compared to the RDG, which means that subjects are betrayal averse. Quercia (2016) provides an improvement of MAP design and confirm betrayal aversion.

LW show that the MAP design of BZ does not hold under SDW. The difference in MAP across treatments can be explained by the weighting function and beliefs instead of the utility. The authors use the two indexes of pessimism and likelihood insensitivity provided by BW to disentangle social ambiguity and strategic uncertainty in the trust game. They find that pessimism is lower when subjects face social ambiguity than when they face nature ambiguity. Also, they find that strategic uncertainty and betrayal attitudes only have cognitive implications by making subjects more likelihood insensitive in the trust game compared to nature ambiguity. The fact that social ambiguity is captured by the pessimism component of the weighting function in the trust game, suggests that social ambiguity plays a major role in strategic uncertain situations. Therefore, it is important to control for social ambiguity when studying strategic uncertainty. Nevertheless, a vast majority of previous studies (e.g., Heinemann et al., 2009; Ivanov, 2011; Bruttel et al., 2022), do not control for social ambiguity when they investigate strategic uncertainty. In this paper, we also aim to identify which components of the utility function and the weighting function (pessimism and likelihood insensitivity) capture the effect of social ambiguity, strategic uncertainty, and betrayal aversion.

5 Experimental Design

We recruit 174 students to participate in a computerized experiment, which is conduct online. Subjects are invited through the subjects pool of GATE-Lab. Participants are told that the experiment could last up to 45 minutes, that they would receive €1.5 as a participation fee and, they could additionally earn a variable amount up to €20. Such additional payment corresponds to a randomly selected outcome of one of the decisions made during the experiment. The mean age of subjects is 21 years and 56.9% are female. Our experiment follows a within-subjects design.

The experiment consists of 5 experimental conditions. Four out of these conditions have two stages, the remaining condition consists only of the second stage. In the first stage, we implement experimental treatments based on the coordination game and the trust game. In the second stage, we apply a binary decisions task between a safe option and a lottery to elicit beliefs, ambiguity attitudes, and utility functions.[9] The order in which participants play the five experimental conditions is randomized.

We refer to the blocks containing one or two stages as experimental conditions and to the task implemented in each of the stages as experimental treatments. The goal of the conditions and treatments is to implement our method experimentally and combine it with empirical data. Each of the experimental conditions allows to elicit ambiguity attitudes linked to different crucial forms of uncertainty.

5.1 First stage

We use a within-subjects design along the experiment. In four out of the five conditions of the experiment, the first stage contains the following experimental treatments: *social ambiguity – coordination game (social ambiguity - cg), strategic uncertainty - coordination game (strategic uncertainty - cg), social ambiguity – trust game (social ambiguity - tg)*, and *betrayal ambiguity*. In these conditions, 89 subjects play the role of Player 1 and, 85 participants take the role of Player 2. Participants keep their role along the whole experiment. For each condition, new couples formed by Player 1 and Player 2 are randomly re-matched. Players are informed that they do not play against the same partner more than once and, they do not receive feedback about the decisions of their counterparts until the end of the experiment.

At the beginning of each condition, Player 1s are informed whether the condition contains one or two stages, specific instructions for each stage are given at the beginning of each stage.Our implemented procedure for incentives allows to avoid hedging issues and it is established as follows. Player 1 received the payoff of one randomly selected decision in either one of the two stages of the four conditions, or one of the decisions made in the remaining treatment (*nature*). Also, one out of the four decisions done by Player 2, is randomly selected for payoff.

With the *social ambiguity - cg* treatment, we measure ambiguity attitudes and social ambiguity. Player 1s make a strategic decision between Left (L), Right (R), and Middle (M). On the other hand, Player 2s receive €5 and, their task is to answer where they would prefer to spend this money between an Amazon voucher, a Google Play voucher, and an Apple Store voucher. Player 2s do not know the payoff matrix. As such, Player 2s decide between three possible options that represent their own preferences and are independent of Player 1s' decisions.

[9] The complete instructions can be found in the Appendix 3.

Therefore, Player 1s should not base their decisions on a strategic interaction. However, decisions of Player 2s directly affect Player 1s' payoff, which is why Player 1s face social ambiguity. The structure of the payments[10] for this treatment is displayed in Table 2.

Table 2: *Social ambiguity - coordination game* treatment.

		Player 2		
		Amazon	Google Play	Apple Store
Player 1	Left	15, 5	10, 5	8, 5
	Right	8, 5	15, 5	10, 5
	Middle	10, 5	8, 5	15, 5

To measure strategic uncertainty, we implement the *strategic uncertainty - cg* treatment. The matrix of the game, which follows a traditional coordination game, and is known by both Player 1 and Player 2, is shown in Table 3. Both Players 1 and 2 make a strategic decision between alternatives L, R, or M. Hence, subjects make their decisions under ambiguity attitudes, strategic uncertainty, and social ambiguity. Contrary to the choice alternatives presented to Player 2 in the *social ambiguity - cg* treatment, in the *strategic uncertainty - cg* treatment, we use the frame L, R, and M in order to keep a neutral language unrelated with preferences.

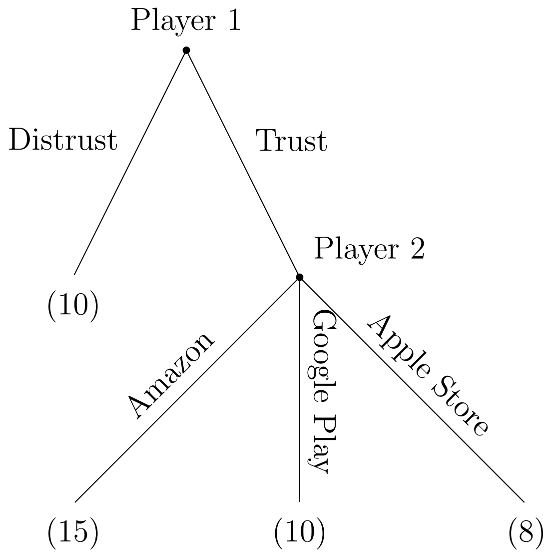
Table 3: *Strategic uncertainty - coordination game* treatment.

		Player 2		
		Left	Right	Middle
Player 1	Left	15, 15	10, 18	8, 22
	Right	8, 22	15, 15	10, 18
	Middle	10, 18	8, 22	15, 15

Treatments *social ambiguity – tg* and *betrayal ambiguity* are based on the experimental design of LW. In the *social ambiguity – tg* treatment (see Figure 3), Player 1 decides between distrust (D) or trust (T). If Player 1 decides D, she receives a payoff of 10 ECU with certainty. On the other hand, if Player 1 decides T, the payment is determined based on the preferences of Player 2. Player 2s receive €5 and are asked to decide where they would prefer to spend this money between an Amazon voucher, a Google Play voucher, or an Apple Store voucher. In this treatment, as in the *social ambiguity – cg*, Player 1s make their decisions facing ambiguity attitudes and social ambiguity.

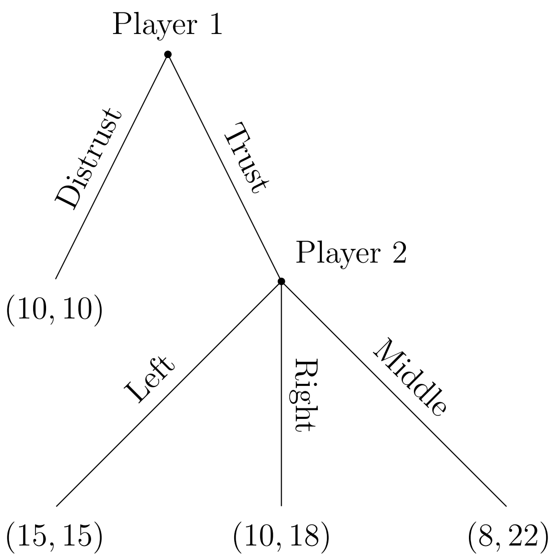
[10]The exchange rate between ECU and euros is 1. Hence, 1 ECU = 1 euro.

Figure 3: *Social ambiguity - trust game* treatment



Finally, we study ambiguity attitudes, social ambiguity, strategic uncertainty, betrayal aversion, and social preferences in the *betrayal aversion* treatment. Player 1 decides between the safe option D and the ambiguous option T. In case Player 1 chooses D, both Players 1 and 2 receive 10 ECU and no further decisions are made. Differently, if Player 1 decides T, Player 2's decision between L, R, or M, determines the final payoffs for both players. Player 2's decisions L, R, and M represent reciprocation, no hurt, and betrayal, respectevely. The structure of the game and payments are shown in Figure 4. In this treatment, Player 1 faces ambiguity regarding the strategic decision made by Player 2, which also leads to the possibility for Player 1 to be betrayed by Player 2.

Figure 4: *Betrayal aversion* treatment



5.2 Second stage: elicitation of beliefs, ambiguity attitudes, and utility function

Only Player 1s perform the second stage of each condition and the remaining condition. The first stage in every condition is followed by the second stage. Therefore, Player 1 perform the second stage of each condition immediately after each of the treatments and, only when the task of the second stage is completed, Player 1 moves to the next condition. We elicit Player 1s' certainty equivalents through the switching outcome technique (Gonzalez and Wu, 1999; Tversky and Kahneman, 1992) for a list of 12 binary lotteries $L = (x, y; E, E^c)$ that involved Player 2s' decisions as events. Such events can be either L, R, and M, or Amazon, Google Play, and Apple Store vouchers, depending on the immediately latest treatment performed by the participant. To infer the certainty equivalent of each lottery $L = (x, y; E, E^c)$, Player 1s are asked to make a series of binary decisions between a lottery and a list of equally spaced safe payoffs, ranged from the maximum value x to the minimum value y of the lottery.

Table 4 displays an example of the lotteries corresponding to the second stage of the conditions containing the treatments *strategic uncertainty - cg* and *betrayal aversion*, where the decisions done by Player 2s correspond to the options L, R, or M. Consider for example, lottery number 1 in the first set of lotteries in Table 4. In this case, Player 1 is asked to make eight decisions between a safe outcome and a lottery. Payoffs for the safe option vary from 15 ECU to 8 ECU, while the lottery remains constant.

Table 4: Binary lotteries

No. of lottery	x	y	E	E^c	Midpoint of outcome lotteries
First set of lotteries					
1	15 ECU	8 ECU	$E_1 = L$	$E_1^c = R \cup M$	11.5 ECU
2	15 ECU	8 ECU	$E_1 = R$	$E_1^c = L \cup M$	11.5 ECU
3	15 ECU	8 ECU	$E_1 = M$	$E_1^c = L \cup R$	11.5 ECU
4	15 ECU	8 ECU	$E_1 = L \cup R$	$E_1^c = M$	11.5 ECU
Second set of lotteries					
5	10 ECU	0 ECU	$E_1 = L$	$E_1^c = R \cup M$	5 ECU
6	10 ECU	0 ECU	$E_1 = R$	$E_1^c = L \cup M$	5 ECU
7	10 ECU	0 ECU	$E_1 = M$	$E_1^c = L \cup R$	5 ECU
8	10 ECU	0 ECU	$E_1 = L \cup R$	$E_1^c = M$	5 ECU
Third set of lotteries					
9	15 ECU	0 ECU	$E_1 = L$	$E_1^c = R \cup M$	7.5 ECU
10	15 ECU	0 ECU	$E_1 = R$	$E_1^c = L \cup M$	7.5 ECU
11	15 ECU	0 ECU	$E_1 = M$	$E_1^c = L \cup R$	7.5 ECU
12	15 ECU	0 ECU	$E_1 = L \cup R$	$E_1^c = M$	7.5 ECU

Finally, Player 1s complete another set of binary decisions which are not linked with any treatment performed before by the participant. Such an additional set of binary decisions is the experimental condition called *nature ambiguity*. In this task, Player 1s also decide between a safe outcome or a lottery. However, in this case, the outcome of the lottery is determined by nature, which is a randomly equally likely selection between L, R, or M made by the computer. Therefore, this condition allows us to measure only ambiguity attitudes. Figure 5 shows a screen shot of some of the binary decisions contained in the *nature ambiguity* task.[11]

[11]The image is presented in English for illustration purposes. However, the experiment was conducted in French.

Figure 5: Nature ambiguity.

Safe payments for alternative A:	Alternative A	Alternative B	Variable payments for alternative B:
15 ECU	A1	B1	You get 15 ECU if the computer randomly chooses Left or 8 ECU if the computer randomly chooses Right or Middle.
14 ECU	A2	B2	
13 ECU	A3	B3	
12 ECU	A4	B4	
11 ECU	A5	B5	
10 ECU	A6	B6	
9 ECU	A7	B7	
8 ECU	A8	B8	

Example of one of the screens of the task in the nature ambiguity treatment.

Our experimental design allows us to disregard social preferences in this part of the experiment. Therefore, at the stage of elicitation of certainty equivalents, social preferences collapse for Player 1s' decision-making process. We use the data of certainty equivalents as input to elicit the utility function, weighting function, and beliefs with our method presented in Section 3.

5.2.1 Comparison between treatments and hypotheses

We perform a series of comparisons based on the decisions done by Player 1 in the second stage of the conditions previously presented. The aim of these comparisons between the five treatments is to isolate and capture the effect of social ambiguity, strategic uncertainty, and betrayal aversion. The following are our conjectures.

1. **Comparison between *social ambiguity - cg* and *strategic uncertainty - cg*:** the condition *social ambiguity - cg* measures ambiguity attitudes and social ambiguity. The *strategic uncertainty - cg* condition, measures ambiguity attitudes, social ambiguity, and strategic uncertainty.[12] Hence, with the comparison between these two conditions, we are able to capture the effect of strategic uncertainty.

2. **Comparison between *nature ambiguity* and *social ambiguity - cg*:** the *nature ambiguity* condition captures only ambiguity attitudes and, the *social ambiguity - cg* condition captures both ambiguity attitudes and social ambiguity. Consequently, the comparison of these two conditions, allows us to capture the effect of social ambiguity under the context of the coordination game.

3. **Comparison between *nature ambiguity* and *social ambiguity - tg*:** *nature ambiguity* condition measures ambiguity attitudes and, *social ambiguity - tg* measures both ambiguity attitudes and social ambiguity. Hence, through the comparison of these conditions, we are able to capture the effect of social ambiguity in the context of the trust game.

4. **Comparison between *social ambiguity - tg* and *betrayal aversion*:** the condition *social ambiguity - tg* measures ambiguity attitudes and social ambiguity. The *betrayal aversion* condition, captures ambiguity attitudes, social ambiguity, strategic uncertainty, and betrayal aversion. Through the comparison of these two treatments we can capture the combined effect of strategic uncertainty and betrayal aversion. In addition, we are able to disentangle the effect of strategic uncertainty and betrayal aversion by controlling for

[12]Following Li et al. (2020), social preferences collapse in the second stage of the conditions. Therefore, social preferences are not considered in these comparisons.

the isolated effect of strategic uncertainty obtained from comparison 1.[13] Consequently, comparing *social ambiguity - tg* and *betrayal aversion*, allows to measure the effect of betrayal aversion.

5. **Comparison between *social ambiguity - cg* and *social ambiguity - tg*:** these two conditions have the same source of uncertainty, but differ in two aspects. First, in the *social ambiguity - cg* treatment, Player 1 does not have the possibility to make her payoffs independent from the preferences of Player 2. Contrary, the *social ambiguity - tg* offers this possibility. We call such difference *dependence payoff attitudes*. Second, in the *social ambiguity - cg*, Player 1 has multiple options of payoffs (8, 10, and 15) associated to each preference (*i.e.* Amazon, Google Play and Apple Store) of Player 2. Opposite, the *social ambiguity - tg* treatment does not offer such variety of payoff to Player 1 associated to each preference of Player 2. We call this second difference *variety of payoff attitudes*.

Based on the previous comparisons, we aim to test the following predictions.[14]

- H1: social ambiguity is captured by pessimism.
- H2: strategic uncertainty is captured by likelihood insensitivity.
- H3: betrayal aversion is captured by the utility function.

6 Results

All statistical tests are two-sided z-test computed from median regressions, unless otherwise stated. According to the simulation results presented in subsection 3.3, we perform our multi-stage method by assuming sequentially power utility function (Eq. 13) in the first stage and the weighting function of GE87 (Eq. 15) in the second stage. First, we estimate the utility and willingness to bet on the events. Second, we estimate beliefs, likelihood insensitivity, and pessimism. The details of individual estimates are provided in Appendix 2.

6.1 First stage: utility and event weights

In the first stage, we estimate at the individual level, the utility and willingness to bet on the events.

Utility curvature: Figure 6 displays the cumulative distributions of the utility curvature and Table 5 provides the summary of the estimated values. The median utility curvatures are 0.930, 0.876, 0.988, 0.968 and 0.968 for *nature ambiguity*, *social ambiguity - cg*, *strategic uncertainty - cg*, *social ambiguity - tg*, and *betrayal aversion*, respectively. These values are less than 1, the utility functions are concave in all treatments. Also, the utility curvature in the *social ambiguity -cg* is significantly different from linear ($p-values < 0.0001$). Contrary, for the other treatments, we cannot reject null hypothesis of linear utility (all $p-values > 0.0733$).

[13] Comparison 1 refers to the difference found between the treatments *social ambiguity - cg* and *strategic uncertainty - cg*.

[14] This design and behavioral conjectures have been pre-register at AsPredicted (#71020).

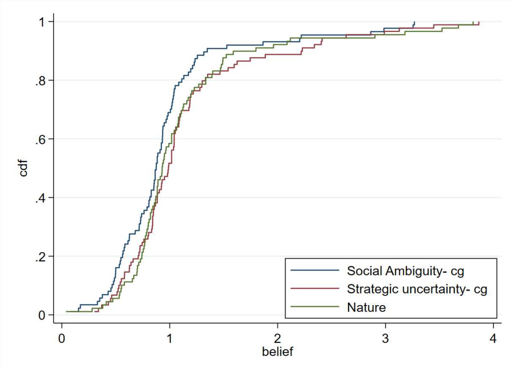
Table 5: Utility function

	Nature	Social ambiguity- cg	Strategic uncertainty	Social ambiguity- tg	Betrayal aversion
Median (α)	0.930	0.876	0.988	0.968	0.968
IQR	[0.771, 1.196]	[0.625, 1.042]	[0.760, 1.194]	[0.790,1.259]	[0.750 ,1.248]

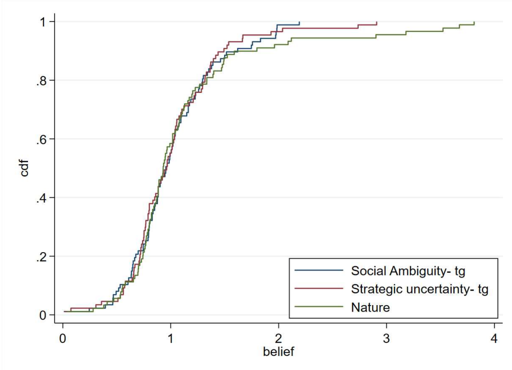
IQR: interquartile range

Figure 6: Cumulative distribution of utility curvature

(a) Coordination game



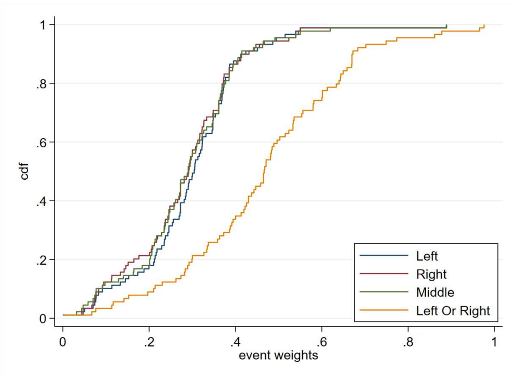
(b) Trust game



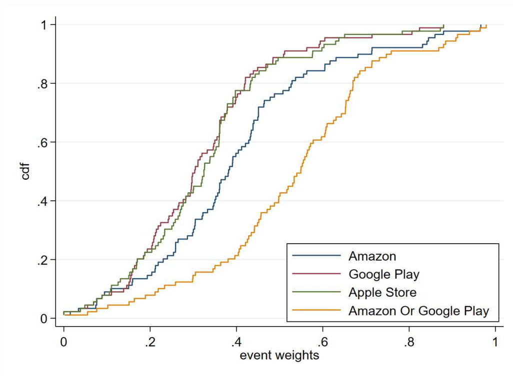
Events weights: Figure 7 provides the cumulative distribution of the event weights and Table 6 provides the summary of the estimated values. SEU is true if we cannot reject both that (i) the weights of three mutually exclusive events sum 1 and, (ii) the weight of the composite event is equal to the sum of the weights of the two single events involved in the composition (Eq. 9). Condition (i) cannot be rejected for *social ambiguity -cg* ($p-value = 0.7642$) and it is rejected in all the other treatments (all $p-values < 0.0002$). Condition (ii) is systematically rejected in all the treatments ($p-values < 0.0045$). Also, a join test of conditions (i) and (ii) leads to a strong rejection in all treatment (all $p-values < 0.0001$). Then, subjects violate SEU.

Figure 7: Cumulative distribution of event weights

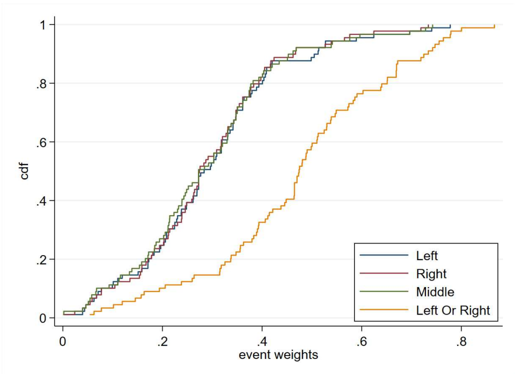
(a) Nature



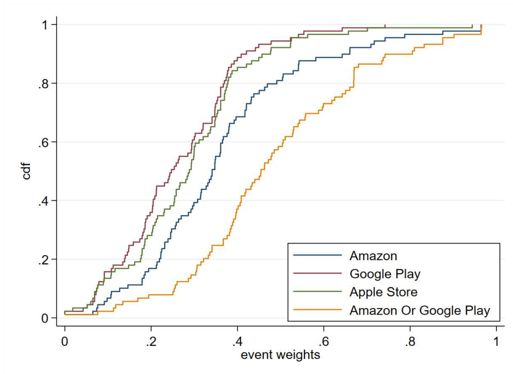
(b) Social ambiguity - cg



(c) Strategic uncertainty - cg



(d) Social ambiguity - tg



(e) Betrayal aversion

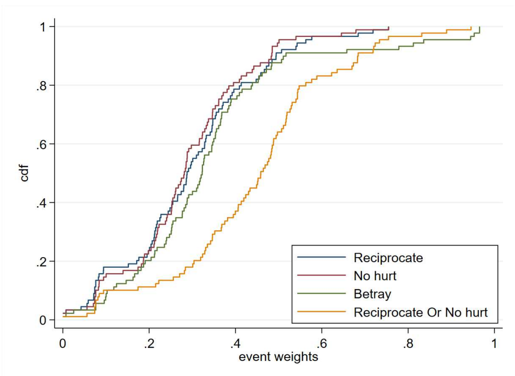


Table 6: Median of event weights or willingness to bet

	Nature	Social ambiguity- cg	Strategic uncertainty- cg	Social ambiguity- tg	Betrayal aversion
$W(P(L))$	0.305 [0.235 , 0.369]	0.382 [0.258, 0.478]	0.284 [0.203, 0.364]	0.341 [0.231, 0.432]	0.288 [0.204, 0.383]
$W(P(R))$	0.292 [0.212, 0.292]	0.303 [0.206, 0.399]	0.274 [0.202, 0.361]	0.247 [0.158, 0.354]	0.282 [0.211, 0.361]
$W(P(M))$	0.291 [0.212 , 0.364]	0.325 [0.219 , 0.392]	0.273 [0.187 , 0.369]	0.289 [0.185 , 0.370]	0.323 [0.235 , 0.390]
$W(P(L \cup R))$	0.467 [0.337 , 0.600]	0.549 [0.421 , 0.660]	0.474 [0.363 , 0.586]	0.454 [0.367 , 0.625]	0.459 [0.335 , 0.540]

Interquartile ranges are in [.]

L, R and M mean Amazon, Google Play and Apple Store in social ambiguity- cg and social ambiguity- tg

L, R and M mean Reciprocate, No hurt strategy and Betray in Betrayal aversion

L, R and M mean Left, Right and Middle in nature and strategic uncertainty- cg

6.2 Second stage: beliefs and weighting function

In the second stage, we used the weights of single and composite events from the first stage (see Figure 7) to estimate the beliefs ($P(.)$), likelihood sensitivity (γ), and the pessimism (η) at the individual level.

Beliefs

Figure 8 displays the cumulative distributions of beliefs and Figure 9 plots the mean of the estimated values.

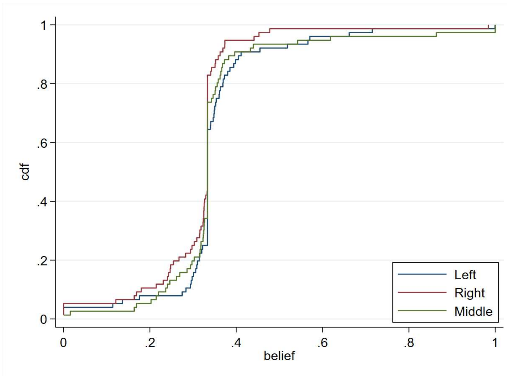
The null hypothesis of equally likely events cannot be rejected for the *nature* ($p-value =$ 0.6656) and *strategic uncertainty - cg* treatments ($p-value = 0.2974$). A priori, symmetry of events is expected for the treatment *nature*. Similarly, symmetry of events for the *strategic uncertainty - cg* treatment can be expected, since the coordination game does not have any dominated strategy. These results provide a first successful validity test of our method.

On the other hand, symmetry of events is rejected for the *social ambiguity - cg* ($p-value =$ 0.0061) and *social ambiguity - tg* ($p-value = 0.0001$). In these two conditions, the cumulative distribution function of the beliefs of Player 1 about Player 2 choosing an Amazon voucher first order stochastically dominates the Player 1's beliefs about Player 2 choosing a Google Play and an Apple Store voucher. In the *social ambiguity - cg* treatment, Player 1 thinks that Player 2 chooses to spend money in Amazon, Google Play and Apple Store vouchers with probability 40.6%, 28.1% and 31.3%, respectively. In the treatment *social ambiguity - tg*, Player 1 believes that Player 2 chooses to spend money in Amazon, Google Play and Apple Store vouchers with probability 43.4%, 25.7% and 30.9%, respectively. Join test leads to the conclusion that the distribution of beliefs are the same in these two social ambiguity treatments ($p-value = 0.7106$). This result provides a second successful validity test of our method. In fact, these two social ambiguity treatments involve the same events. Therefore, the beliefs in these two different ambiguity situations should remain the same.

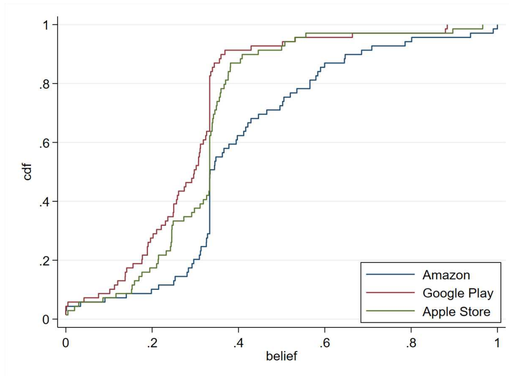
Symmetry of events is also rejected for *betrayal aversion* (p-value =0.0051). The cumulative distribution function of the beliefs about the fact that the Trustee will follow the "betray" strategy first order stochastically dominates the strategies of "no hurt" and "reciprocate". We find that Player 1 (Trustor) thinks that Player 2 (Trustee) reciprocates, adopts a no hurt strategy, and betrays with probability 29.3%, 29.7% and 41.0%, respectively.

Figure 8: Cumulative distribution of subjective probability (beliefs)

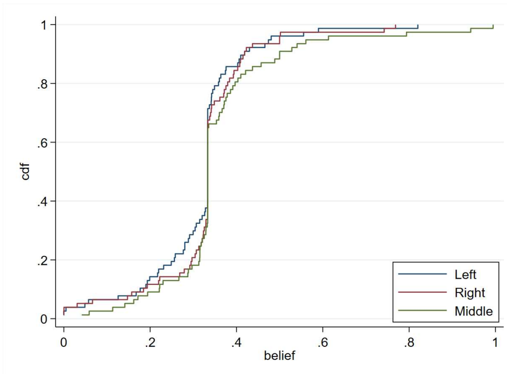
(a) Nature



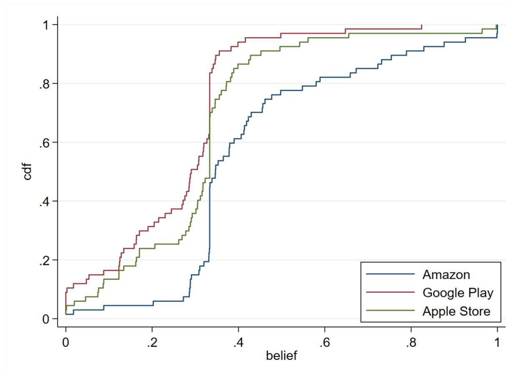
(b) Social ambiguity - cg



(c) Strategic uncertainty - cg



(d) Social ambiguity - tg



(e) Betrayal aversion

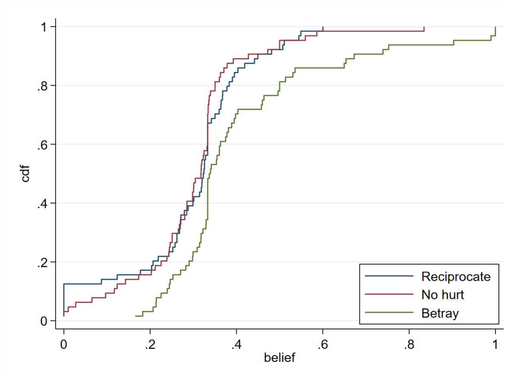
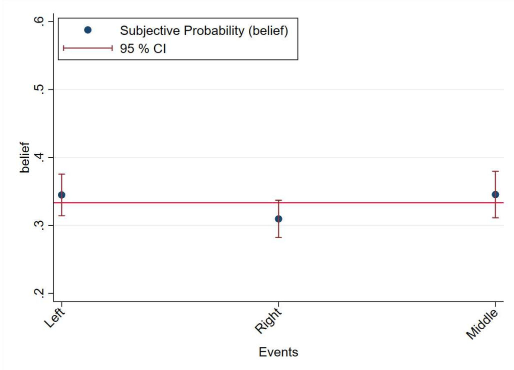
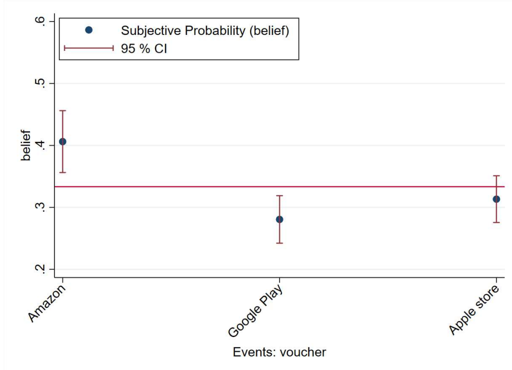


Figure 9: Mean of subjective probability (beliefs)

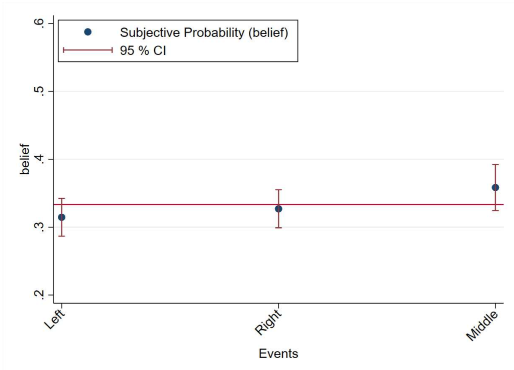
(a) Nature



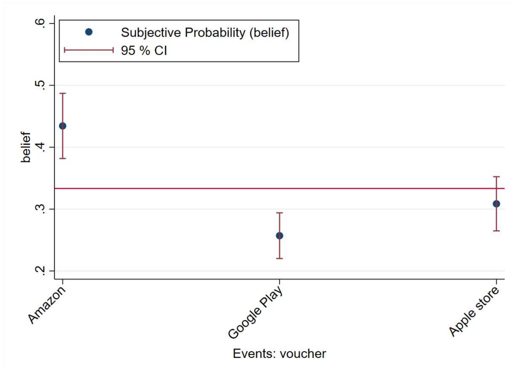
(b) Social ambiguity - cg



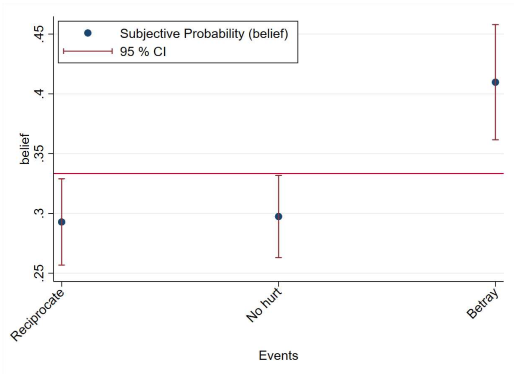
(c) Strategic uncertainty - cg



(d) Social ambiguity - tg



(e) Betrayal aversion



Weighting function

Figures 10 and 11 provide the cumulative distributions of pessimism (η) and likelihood insensitivity (γ).[15] Figure 12 displays the plots of the weighting functions based on the median estimates of η and γ. Table 7 summarizes the results of the weighting function: pessimism (η) and likelihood insensitivity (γ). The usual pattern of over-weighting of small likelihoods and under-weighting intermediate and high likelihoods is reproduced. The cross-over points are 0.210, 0.345, 0.193, 0.266, and 0.264 in the treatments *nature, social ambiguity - cg, strategic uncertainty - cg, social ambiguity - tg*, and *betrayal aversion*, respectively.

[15] The smaller η is, the higher is the level of pessimism. The smaller γ is, the higher is the level of likelihood insensitivity.

Table 7: Median weighting function by treatment

	Nature	Social ambiguity- cg	Strategic uncertainty- cg	Social ambiguity- tg	Betrayal aversion
Median (η)	0.615	0.736	0.570	0.611	0.613
IQR	[0.450, 0.973]	[0.472, 1.071]	[0.408, 0.802]	[0.438, 1.018]	[0.508, 0.888]
Median (γ)	0.633	0.534	0.607	0.513	0.524
IQR	[0.425, 0.837]	[0.361, 0.797]	[0.327, 0.922]	[0.272, 0.861]	[0.291, 0.931]

Pessimism and insensitivity correspond to small values of η and γ respectively
IQR: Interquartile ranges are presented in [.]

Figure 10: Cumulative distribution of pessimism (η)

(a) Coordination game (b) Trust game

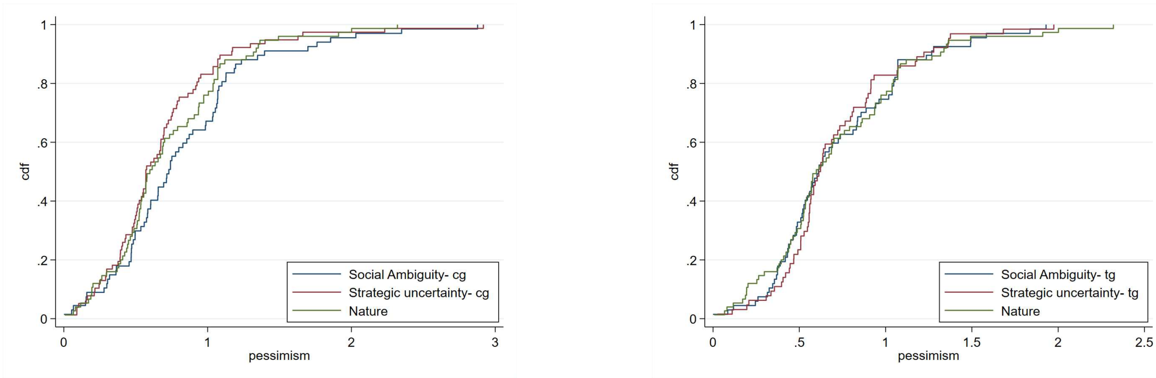


Figure 11: Cumulative distribution of likelihood insensitivity (γ)

(a) Coordination game (b) Trust game

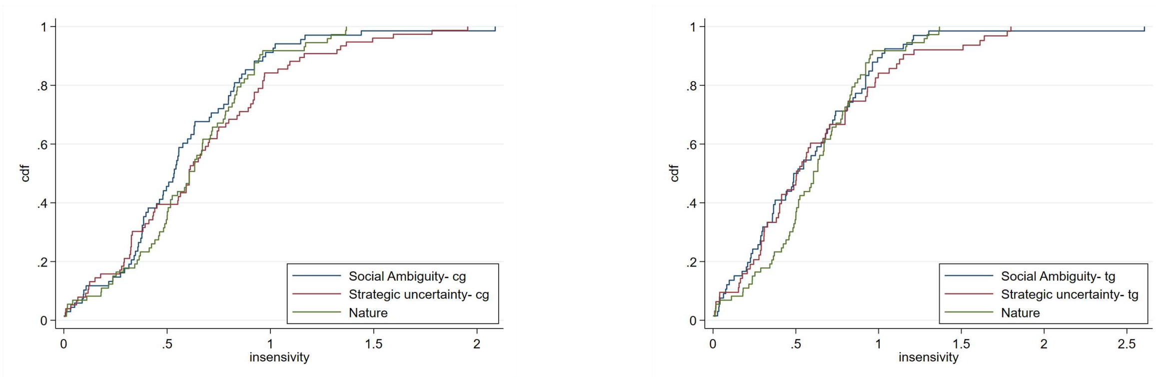
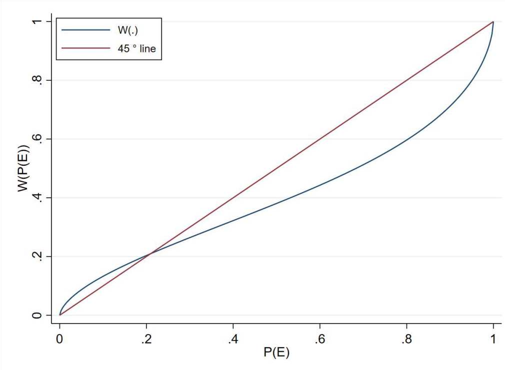
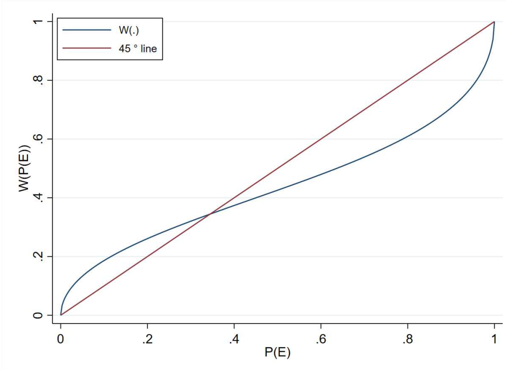


Figure 12: weighting function based median of individual estimates

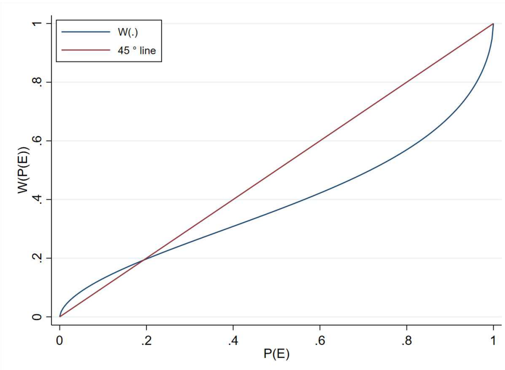
(a) Nature



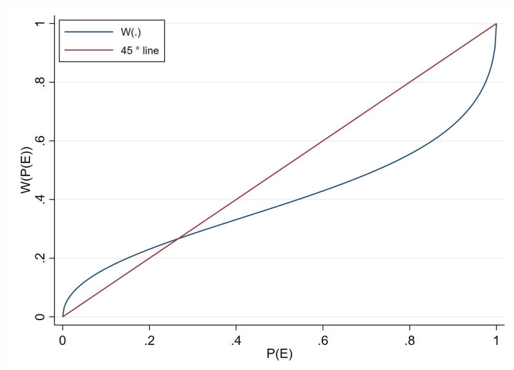
(b) Social ambiguity - cg



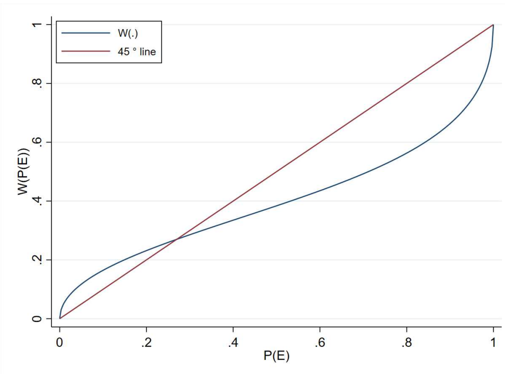
(c) Strategic uncertainty - cg



(d) Social ambiguity - tg



(e) Betrayal aversion



6.2.1 Social ambiguity, strategic uncertainty, and betrayal aversion

Now we turn into the main purpose of the application of this paper: the identification of social ambiguity, strategic uncertainty and betrayal aversion through pessimism, likelihood insensitivity and utility curvature. Table 8 presents the results of the estimation of the utility curvature (α), pessimism (η) and likelihood insensitivity (γ).

Table 8: Ambiguity attitudes by treatments

	Nature	Social ambiguity - cg	Strategic uncertainty- cg	Social ambiguity - tg	Betrayal aversion
Utility function					
curvature (α)	0.930	0.876	0.988	0.968	0.968
	[0.771, 1.196]	[0.625, 1.042]	[0.760, 1.194]	[0.790,1.259]	[0.750 ,1.248]
Weighting function					
Pessimism (η)	0.615	0.736	0.570	0.611	0.613
	[0.450, 0.973]	[0.472, 1.071]	[0.408, 0.802]	[0.438, 1.018]	[0.508, 0.888]
Insensitivity (γ)	0.633	0.534	0.607	0.513	0.524
	[0.425, 0.837]	[0.361, 0.797]	[0.327, 0.922]	[0.272, 0.861]	[0.291, 0.931]

Pessimism and insensitivity correspond to small values of η and γ respectively
Interquartile ranges are presented in [.]

1. **Social ambiguity**

   The difference between treatments 0 (*nature*) and 1 (*social ambiguity - cg*), as well as the difference between the treatments 0 (*nature*) and 3 (*social ambiguity - tg*) corresponds to what Li et al. (2020) called social ambiguity.

   Utility curvature (α): the estimates of the CRRA parameter for treatments 0, 1 and 3 are 0.93, 0.876, and 0.968, respectively. The difference in the utility parameters between treatments 0 and 1 is not significant ($p-value$=0.332, two sided sign test). This is also the case for the difference between the treatments 0 and 3 ($p-value$= 1, two sided sign test).

   Pessimism (η): the estimates of pessimism for treatments 0, 1, and 3 are 0.615, 0.736, and 0.611, respectively. Pessimism is lower in treatment 1 in treatment 0 ($p-value$= 0.0030). Pessimism is the same in treatment 3 and in treatment 0 ($p-value$= 0.9245).

   Likelihood insensitivity (γ): the estimates of the likelihood insensitivity for treatments 0, 1 and 3 are 0.633, 0.534, and 0.513, respectively. Likelihood insensitivity is lower in treatment 0 than 1 ($p-value$= 0.0001). Also, the likelihood insensitivity is lower in treatment 0 than in 3 ($p-value = 0.0037$).

   Consequently, we conclude that social ambiguity is captured by an increase in likelihood insensitivity. Also, social ambiguity can operate through a decrease in pessimism (treatments 0 vs 1). This partially confirms our Hypothesis 1: social ambiguity is capture by pessimism.

2. **Strategic uncertainty**

   The difference between treatments 1 (*social ambiguity - cg*) and 2 (*strategic uncertainty - cg*) corresponds to strategic uncertainty.

   Utility curvature (α): the estimate of CRRA parameter for treatments 1 and 2 are 0.876 and 0.988, respectively. The difference in the utility parameters between treatment 1 and 2 is not significant ($p-value$= 0.5900, two sided sign test).

   Pessimism (η): the estimate of pessimism for treatments 1 and 2 are 0.736 and 0.570, respectively. Pessimism is lower in treatment 1 than in treatment 2 ($p-value < 0.0001$).

   Likelihood insensitivity (γ): the estimates of likelihood insensitivity for treatments 1 and 2 are 0.534 and 0.607, respectively. The likelihood insensitivity in treatment 1 is larger than in treatment 2 ($p-value$= 0.0037).

Consequently, we conclude that strategic uncertainty is captured by a decrease in likelihood insensitivity and by an increase in pessimism. This partially confirms our Hypothesis 2: strategic uncertainty is captured by likelihood insensitivity.

3. **Betrayal aversion**

   The difference between treatments 3 (*social ambiguity - tg*) and 4 (*betrayal aversion*) corresponds to the mixture of strategic uncertainty and what BZ called betrayal aversion.

   Utility curvature (α): the estimate of CRRA parameter for treatments 3 and 4 are both 0.968. The difference in the utility parameters between treatment 3 and 4 is not significant ($p-value$= 0.5203, two sided sign test).

   Pessimism (η): the estimate of pessimism for treatments 3 and 4 are 0.611 and 0.613, respectively. The difference in pessimism between these treatments is not significant ($p-value$= 0.9343).

   Likelihood insensitivity (γ): the estimate of likelihood insensitivity for treatments 3 and 4 are 0.513 and 0.524, respectively. The difference in the likelihood insensitivity between treatments 3 and 4 is not significant ($p-value$= 0.8122).

   In the previously presented results from strategic uncertainty (treatment 1 versus 2), we show that strategic uncertainty decreases likelihood insensitivity. Additionally, the analysis of betrayal aversion shows a non-significant difference of the likelihood insensitivity between treatments 3 and 4. Nevertheless, given that the comparison between treatments 3 and 4 contains the effect of strategic uncertainty, we should find different likelihood insensitivities. This opposite result is due to the fact that the effect of strategic uncertainty offsets the betrayal aversion effect, leading to a lack of difference in likelihood insensitivity between treatments 3 and 4. In other words, betrayal aversion and strategic uncertainty are captured by likelihood insensitivity in two opposites directions: strategic uncertainty is captured by a decrease in likelihood insensitivity, while betrayal aversion is captured by an increase in likelihood insensitivity. Consequently, we conclude that betrayal aversion is captured by an increase in likelihood insensitivity. This rejects our Hypothesis 3: betrayal aversion is captured by the utility function.

6.3 Dependence payoff aversion and variety of payoff seeking

Besides the previously presented results, we find that people exhibit two additional behaviors which are not related to attitudes toward the source of uncertainty. In this section, we present these findings. Treatments 1 (*social ambiguity - cg*) and 3 (*social ambiguity - tg*) have the same source of uncertainty (*i.e.*, preferences of Player 2, which constitutes social ambiguity). Hence, any differences in the utilities and the weighting functions between these two conditions is not due to attitudes toward the underlying source of uncertainty. Instead, the difference between treatments 1 (*social ambiguity - cg*) and 3 (*social ambiguity - tg*) corresponds to the mixture of dependence payoff aversion and the variety of payoff attitudes.

Utility curvature (α): the estimates of CRRA parameter for treatments 1 and 3 are 0.876 and 0.968, respectively. The difference in the utility parameters between treatments 1 and 3 is significant ($p-value$= 0.0165, two sided sign test). Hence, utility is more concave in treatment 1 than in treatment 3.

Pessimism (η): the estimate of pessimism for treatments 1 and 3 are 0.736 and 0.611. The difference between these treatments is significant ($p-value$= 0.0001). Therefore, pessimism is lower in treatment 1 than in treatment 3.

Likelihood insensitivity (γ): the estimates of the likelihood insensitivity for treatments 1 and 3 are 0.534 and 0.513. The difference in the insensitivity between treatments 3 and 4 is not significant ($p - value$= 0.5884).

We conclude that the greater concavity of the utility function in treatment 1 compared to treatment 3, represents a payoff dependence aversion. Also, the higher pessimism in treatment 1 compared to treatment 3 constitutes variety of payoff seeking.

7 Discussion

7.1 Experimental discussion

Our method allows to replicate some well known results. First, we confirm that the weighting function, in the case of uncertainty, is not an identity function. Consequently, subjects distort beliefs and then violate the traditional SEU theory (e.g. Abdellaoui et al., 2005, 2011a, 2016, 2021a; Attema et al., 2018; Li et al., 2019, 2020; Tversky and Fox, 1995; Camerer and Karjalainen, 1994; Bruttel et al., 2022; Bleichrodt et al., 2018; Fehr-Duda and Epper, 2012; l'Haridon and Vieider, 2019). Typically, subjects overweight small subjective probability and underweight intermediate and high subjective probability. Also, we find that only the weighting function differs across different sources of ambiguity, but not the utility function. This provides support for ambiguity theories based on the weighting function (e.g. Schmeidler, 1989), but not for ambiguity theories based on the utility function (e.g. Klibanoff et al., 2005). These results are consistent with previous studies (e.g. Abdellaoui et al., 2016; Attema et al., 2018; Abdellaoui et al., 2022; Bruttel et al., 2022).

We make two internal validity tests for our method. First, the treatments *social ambiguity - cg* and *social ambiguity - tg* involve the same events. Therefore, the distributions of beliefs in these two conditions should be the same. Our method successfully produces this results. Second, the events in the *nature* treatment are a priori symmetric; as well as the beliefs in the *strategic uncertainty - cg* treatment, which does not have any dominated strategy. Our method also successfully satisfies the symmetry test for both *nature* and *strategic uncertainty - cg* treatments. Replicating well known results and successfully passing validity tests provide support for our method (Abdellaoui et al., 2008).

We apply our method to measure beliefs toward different discrete sources of uncertainty. One of the remarkable findings in this regard concerns the beliefs about trustworthiness. When people trust, they put themselves in a vulnerable situation based upon the belief the other will respond in a positive way (Özer and Zheng, 2017). As Arrow (1972) wrote "virtually every commercial transaction has within itself an element of trust". Because decisions of trust play a major role in social and economic interactions, it becomes important to be able to measure beliefs about trustworthiness, considering that the trustor distorts her own formation of beliefs (weighting functions). We find that the cumulative distribution function of the beliefs about trustworthiness is first order stochastically dominated by being betrayed. Most participants believe that trust is not reciprocated with a mean of subjective beliefs of people being trustworthy equal to 29%.

Regarding our empirical aim of identifying the role of social ambiguity, strategic uncertainty and betrayal attitudes, our method provides the following contributions.

First, we find that social ambiguity operates mainly through an increase in the likelihood insensitivity. Therefore, people prefer social ambiguity over nature ambiguity when there is a small probability of winning, and prefer nature ambiguity over social ambiguity when there is a high probability of winning. The increase in likelihood insensitivity suggests that people find social ambiguity more cognitively demanding compared to nature ambiguity (e.g. Wakker, 2010; Choi et al., 2022). Social ambiguity can also operate through an decrease in pessimism compared to nature ambiguity. The fact that subjects are less pessimistic towards ambiguity caused by other humans than ambiguity coming from nature, was pointed out by other studies (e.g. Li et al., 2020; Bolton et al., 2016; Chark and Chew, 2015). The decrease in pessimism due to social ambiguity could be explained by the competence hypothesis (Li et al., 2020; Heath and Tversky, 1991; Fox and Weber, 2002). Fox and Tversky (1995) propose under the competence hypothesis that, people's confidence is undermined when they contrast their limited knowledge about an event with their superior knowledge about another event. They argue that this contrast between states of knowledge is the predominant source of ambiguity aversion. Subjects' perception of their own knowledge about other humans' choices could be higher than their knowledge perception about choices done by nature.

Second, strategic uncertainty also operates, as social ambiguity, through likelihood insensitivity and pessimism, but in opposite directions. Contrary to social ambiguity, strategic uncertainty leads to a decrease in likelihood insensitivity and an increase in pessimism. The difference of likelihood insensitivity supports that subjects prefer social ambiguity over strategic uncertainty for small probabilities of winning and, prefer strategic uncertainty over social ambiguity for high probabilities of winning. These two opposite effects offset. Accordingly, we did not find a difference of likelihood insensitivity between the treatments *nature* and *strategic uncertainty - cg*. This result suggests that people tend to exhibit a similar level of likelihood insensitivity towards sources of uncertainty in which events are symmetric (e.g. *strategic uncertainty - cg* and *nature* treatments). In contrast, people tend to exhibit a high likelihood insensitivity when events are asymmetric, like in our two conditions of social ambiguity (*social ambiguity - cg* and *social ambiguity - tg*). This corroborates that beliefs formation process is cognitively demanding.

Third, betrayal aversion also operates through the likelihood insensitivity. Betrayal aversion increases likelihood insensitivity. We find that subjects prefer betrayal and social ambiguities over nature ambiguity for small probabilities of winning and prefer nature ambiguity over betrayal and social ambiguities for a high probabilities of winning. Li et al. (2020) do not make a distinction between betrayal aversion and strategic uncertainty. The authors find that the overall effect of betrayal aversion and strategic uncertainty increases likelihood insensitivity, suggesting that the effect of betrayal aversion is larger than the effect of strategic uncertainty. However, according to our Proposition 1, we should be cautious with the possibility of having a greater effect of betrayal aversion. Indeed, the fact that events are symmetric under nature ambiguity while they are highly asymmetric in the *betrayal aversion* treatment, can mislead to a difference in likelihood insensitivity measured with the method of Baillon et al. (2018b).

Finally, we identify two main behaviors which are not related to attitudes towards sources of uncertainty. First, the behaviour we call *dependence payoff aversion*, which represents the fact that people dislike situations in which their possible payoffs depend on the preferences of others. This behaviour operates by increasing the concavity of the utility function. Second, the behavior we call *variety of payoffs seeking*, which proposes that people prefer to have a more options of possible payoffs, when these payoffs depend on others. The *variety of payoffs seeking* is captured by a decrease in pessimism for situations that contain more possible payoffs (e.g. social ambiguity - cg) compared to situation containing a lower amount of possible payoffs (e.g. social ambiguity -tg).

7.2 Methodological discussion

Our method allows to completely measure the utility function, it is more robust to misspecification issues, it is easy, and error-robust. Below we discuss these features.

Complete measurement of utility function. Throughout the combination of our method with experimental data, we show the importance of measuring the utility function, which contrasts with previous methods, in which the utility function is not measured (e.g. Baillon et al., 2018b; Gutierrez and Kemel, 2021; Abdellaoui et al., 2021a). We show that the utility function can capture additional behaviors (e.g. *payoff dependence aversion*), unrelated to the source of uncertainty. This implies that not measuring the utility function makes more difficult to have a clean empirical measurement of ambiguity attitudes from the existing methods that do not allow the estimation of utility function (e.g. Baillon et al., 2018b; Gutierrez and Kemel, 2021; Abdellaoui et al., 2021a).

More robust to misspecification. We propose a multistage method instead of one-stage method (Gutierrez and Kemel, 2021). In the first stage, we only specify utility and estimate events weights non-parametrically. Based on event weights from the first stage, the method allows to estimate the parameters of any weighting function. Our method thus allows for more flexibility in the parametric choices of weighting function in comparison to existing methods (e.g. Baillon et al., 2018b, 2021, 2018a) that rely on the neo-additive weighting function of (Chateauneuf et al., 2007). Indeed, the neo-additive weighting function has difficulties to fit the data (see e.g. Li et al., 2018; Gutierrez and Kemel, 2021). Using simulation, we show that the multi-stage approach is more robust to misspecification issues than the one-stage approach that specifies simultaneously the functional form for the utility and weighting functions (e.g. Baillon et al., 2018a). These misspecification issues in the one-stage approach, would be amplified in case of continuous-valued sources of uncertainty, where the parametric specification of the beliefs is also made at the same time as the utility and weighting functions (Gutierrez and Kemel, 2021).

Easy and error-robust. Our method is based on simple choices that involve the lowest possible number of outcomes (i.e., three). As such, this method is not cognitively demanding - easy - for subjects, compared to methods that are based on *exchangeable events* or *matching probabilities* (e.g. Baillon et al., 2018b; Gutierrez and Kemel, 2021; Abdellaoui et al., 2021a), in which each choice involves four outcomes (Kpegli et al., 2022; Abdellaoui et al., 2008). Finally, contrary to previous methods (e.g. Baillon et al., 2018b,a), our method account for response errors that are pervasive in experimental data (Kpegli et al., 2022).

8 Conclusion

We proposed a two-stage method that clearly measures beliefs and ambiguity attitudes toward discrete sources of uncertainty. Subjects make decisions under these types of uncertain situations in a daily life basis. The method successfully passes validity tests and provides plausible results for trust and coordination games, showing the reliability of the results derived from it. In this paper, we implement our method in discrete sources of uncertainty; nevertheless, it also applies to continuous-valued sources of uncertainty. Therefore, this method allows to measure beliefs and ambiguity attitudes related to several field of Economics.

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Appendix 1: applicability of the method for continuous-valued sources of uncertainty

This appendix aims to show the validity of our method for continuous-valued sources of uncertainty. Consider the case in which an experimenter aims to measure the distribution of beliefs that a subject holds about a source of uncertainty S that takes its values in an interval $\mathcal{I} = [s_0, s_3] \subset \mathcal{R}$. The experimenter can proceed through the following three stages.

First stage: utility and event weights. In this step, the experimenter needs to arbitrarily split the universal event $\mathcal{I}$ in three exclusive and exhaustive events $E_1 = [s_0, s_1]$, $E_2 = (s_1, s_2]$ and $E_3 = (s_2, s_3]$ with $s_0 < s_1 < s_2 < s_3$. Hence, we have the composite event $E_{12} = [s_0, s_2]$. Applying the stage 1 of our method, presented in section 3 allows us to estimate the utility function and the four event weights: $\hat{\delta}_E$ for $E = E_1, E_2, E_3, E_{12}$.

Second stage: weighting and beliefs of single events. Applying the second stage presented in section 3 allows us to break down the estimated events weights $\hat{\delta}_E$ into the weighting function (*i.e.* $\hat{\delta}$, $\hat{\gamma}$) and the beliefs of the single events $\widehat{P\big([s_0, s_1]\big)}$, $\widehat{P\big([s_1, s_2]\big)}$, and $\widehat{P\big([s_2, s_3]\big)}$.

Third stage: density and cumulative distribution over the range $[0, 1]$. This stage complements the two stages presented in section 3 because S is a continuous-valued sources of uncertainty. The interval $\mathcal{I}$ can be re-scaled to be in the range $\tilde{\mathcal{I}} = [0, 1]$: $\tilde{s} = \frac{s - s_0}{s_3 - s_0} \in [0, 1]$ for $s \in \mathcal{I} = [s_0, s_3]$.

At this stage, a two-parameter specification of the distribution is needed. A common and flexible distribution is the beta distribution $\mathcal{B}(a, b)$ with parameters a, b. Denote by $F_{a,b}(.)$ the cumulative distribution function of the beta distribution. We then have the following three equations

$$F_{a,b}(\tilde{s}_i) - F_{a,b}(\tilde{s}_{i-1}) = \widehat{P\big([\tilde{s}_{i-1}, \tilde{s}_i]\big)} \quad , \qquad i = 1, 2, 3 \tag{18}$$

with $F_{a,b}(\tilde{s}_0) = 0$ and $F_{a,b}(\tilde{s}_3) = 1$. These three equations in (18) are summarized in the following two equations

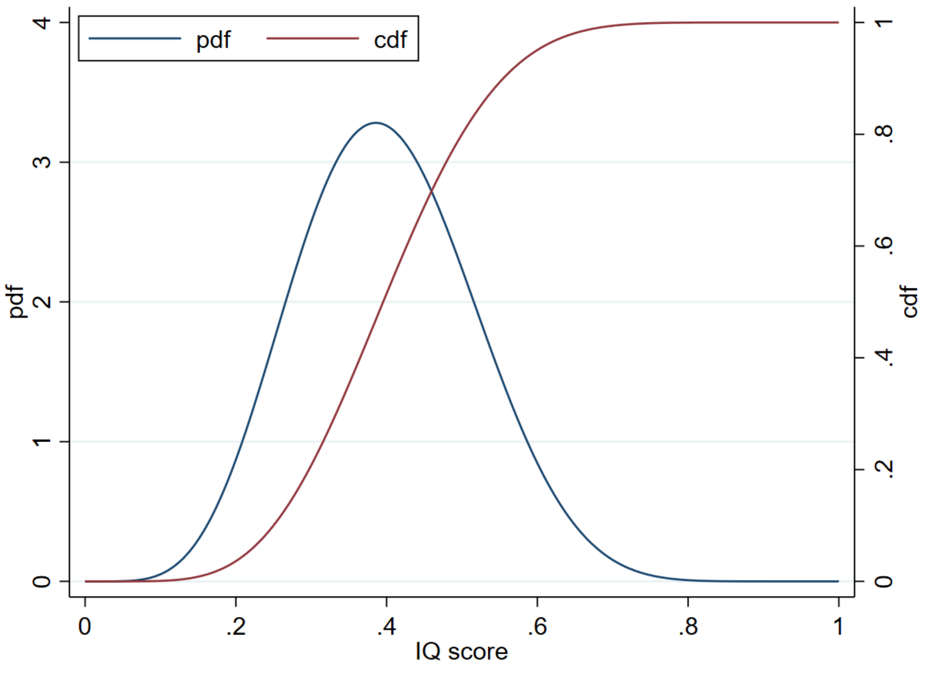
$$F_{a,b}(\tilde{s}_2) = \widehat{P\big([\tilde{s}_0, \tilde{s}_1]\big)} + \widehat{P\big([\tilde{s}_1, \tilde{s}_2]\big)} \tag{19}$$

$$1 - F_{a,b}(\tilde{s}_1) = \widehat{P\big([\tilde{s}_1, \tilde{s}_2]\big)} + \widehat{P\big([\tilde{s}_2, \tilde{s}_3]\big)} \tag{20}$$

Solving (numerically) the system of the two equations (19) and (20) provides the estimation of the distribution of beliefs (*i.e.* a, b).

For illustration purposes, lets consider that an experimenter aims to elicit the beliefs of a subject A about the IQ score of a subject B. The IQ score belongs to $[0, 1]$, with high values meaning a high IQ score. After applying stages 1 and 2 with $E_1 = [0, 0.25]$, $E_2 = [0.25, 0.50]$ and $E_3 = [0.5, 1]$, the experimenter finds the following: $\widehat{P\Big([0, 0.25]\Big)} = 0.1$, $\widehat{P\Big([0.25, 0.5]\Big)} = 0.7$ and $\widehat{P\Big([0.5, 1]\Big)} = 0.2$. Then, the equations (19) and (20) of the third stage corresponds to $F_{a,b}\Big(\frac{2}{3}\Big) = 0.8$ and $1 - F_{a,b}\Big(\frac{1}{3}\Big) = 0.9$. Solving these two equations, provides $\hat{a} = 6.62$ and $\hat{b} = 9.95$. The density and cumulative functions are provided in figure 13.

Figure 13: beliefs of subject A about the IQ score of subject B: probability density (pdf) and cumulative density (cdf) functions.



Appendix 2: individual estimates

Tables 9 - 17 give results of our first stage (α and $W(P(.))$ and second stage (η, γ and $P(.)$). Dots in tables mean monotonicity violation and then η, γ and $P(.)$ cannot be estimated.

Table 9: Individual estimate: nature

id	α	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L\cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
1	0.549	0.494	0.447	0.491	0.643	1.319	0.525	0.361	0.283	0.356
2	0.754	0.386	0.365	0.365	0.672	1.086	0.874	0.348	0.326	0.326
3	1.399	0.235	0.235	0.235	0.337	0.395	0.365	0.333	0.333	0.333
4	0.821	0.385	0.385	0.385	0.601	0.973	0.633	0.333	0.333	0.333
5	3.180	0.113	0.113	0.206	0.113	.	.	.	.	.
6	0.554	0.369	0.369	0.415	0.553	0.937	0.584	0.309	0.309	0.382
7	2.088	0.153	0.134	0.141	0.153	0.172	0.006	1	0	0
8	0.891	0.229	0.229	0.229	0.483	0.527	0.828	0.333	0.333	0.333
9	0.768	0.243	0.317	0.288	0.358	0.476	0.253	0.176	0.478	0.346
10	1.589	0.174	0.151	0.209	0.197	0.254	0.216	0.294	0.164	0.542
11	0.729	0.305	0.327	0.259	0.327	.	.	.	.	.
12	0.580	0.540	0.540	0.540	0.774	2.002	0.772	0.333	0.333	0.333
13	1.392	0.299	0.270	0.309	0.299	0.437	0.013	0.136	0	0.864
14	1.471	0.200	0.220	0.184	0.282	0.297	0.237	0.322	0.441	0.237
15	0.912	0.324	0.308	0.308	0.515	0.687	0.592	0.352	0.324	0.324
16	0.867	0.368	0.368	0.368	0.650	1.038	0.837	0.333	0.333	0.333
17	1.524	0.371	0.467	0.393	0.467	0.753	0.010	0	1	0
18	1.129	0.348	0.295	0.361	0.388	0.599	0.237	0.380	0.180	0.440
19	3.523	0.145	0.098	0.020	0.230	.	.	.	.	.
20	0.713	0.410	0.431	0.463	0.683	1.364	0.825	0.306	0.329	0.364
21	3.675	0	0	0.032	0.001	0.006	3.379	0.114	0.267	0.618
22	0.744	0.306	0.374	0.374	0.580	0.907	0.743	0.275	0.363	0.363
23	1.064	0.256	0.296	0.296	0.533	0.692	0.815	0.298	0.351	0.351
24	1.478	0.050	0.067	0.058	0.067	0.067	0.018	0	0.984	0.016
25	0.654	0.291	0.317	0.317	0.613	0.857	0.943	0.314	0.343	0.343
26	1.493	0.323	0.323	0.323	0.458	0.635	0.413	0.333	0.333	0.333
27	1.196	0.284	0.235	0.214	0.289	.	.	.	.	.
28	0.772	0.424	0.406	0.406	0.702	1.268	0.857	0.347	0.327	0.327
29	0.695	0.319	0.273	0.273	0.363	0.463	0.182	0.519	0.241	0.241
30	1.108	0.269	0.246	0.246	0.640	0.762	1.164	0.349	0.325	0.325
31	1.490	0.133	0.113	0.094	0.284	0.203	0.671	0.398	0.333	0.269
32	0.532	0.412	0.412	0.442	0.580	1.046	0.517	0.316	0.316	0.368
33	0.858	0.293	0.293	0.293	0.447	0.578	0.483	0.333	0.333	0.333
34	1.269	0.235	0.217	0.261	0.292	0.382	0.288	0.320	0.247	0.433
35	0.809	0.287	0.297	0.269	0.413	0.509	0.355	0.340	0.373	0.286
36	0.783	0.238	0.238	0.238	0.485	0.542	0.797	0.333	0.333	0.333
37	1.228	0.070	0.070	0.070	0.334	0.194	1.364	0.333	0.333	0.333
38	1.122	0.214	0.201	0.201	0.214	.	.	.	.	.
39	0.667	0.285	0.236	0.236	0.471	0.525	0.635	0.394	0.303	0.303
40	0.934	0.316	0.300	0.300	0.534	0.701	0.673	0.350	0.325	0.325
41	0.537	0.550	0.550	0.550	0.749	1.911	0.644	0.333	0.333	0.333
42	0.775	0.373	0.373	0.377	0.373	.	.	.	.	.

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Table 10 – continued from previous page

id	α	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L\cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
43	0.790	0.076	0.076	0.076	0.076	.	.	.	.	.
44	0.884	0.361	0.361	0.361	0.670	1.071	0.922	0.333	0.333	0.333
45	0.832	0.354	0.326	0.326	0.644	0.936	0.890	0.354	0.323	0.323
46	1.018	0.273	0.273	0.273	0.465	0.571	0.607	0.333	0.333	0.333
47	0.411	0.455	0.546	0.464	0.861	2.320	1.276	0.310	0.374	0.316
48	1.962	0.307	0.142	0.129	0.482	0.371	0.671	0.566	0.231	0.203
49	0.472	0.369	0.369	0.369	0.634	1.005	0.783	0.333	0.333	0.333
50	0.742	0.254	0.207	0.207	0.391	0.409	0.517	0.411	0.294	0.294
51	1.042	0.348	0.348	0.348	0.669	1.038	0.963	0.333	0.333	0.333
52	1.101	0.272	0.248	0.248	0.419	0.488	0.505	0.370	0.315	0.315
53	1.080	0.322	0.322	0.322	0.443	0.615	0.371	0.333	0.333	0.333
54	0.992	0.246	0.044	0.203	0.878	1.353	3.052	0.385	0.248	0.367
55	1.158	0.313	0.313	0.294	0.600	0.791	0.839	0.341	0.341	0.318
56	0.799	0.386	0.394	0.385	0.394	.	.	.	.	.
57	2.902	0.077	0.077	0.077	0.141	0.117	0.489	0.333	0.333	0.333
58	1.334	0.212	0.212	0.212	0.422	0.444	0.719	0.333	0.333	0.333
59	1.334	0.188	0.164	0.164	0.262	0.264	0.343	0.405	0.298	0.298
60	0.884	0.361	0.361	0.361	0.670	1.071	0.922	0.333	0.333	0.333
61	0.871	0.306	0.292	0.163	0.335	.	.	.	.	.
62	0.281	0.486	0.524	0.620	0.524	1.338	0.016	0	0	1
63	0.699	0.348	0.205	0.394	0.659	1.120	1.294	0.360	0.243	0.396
64	0.843	0.377	0.444	0.350	0.582	0.864	0.425	0.301	0.453	0.246
65	1.018	0.273	0.273	0.273	0.465	0.571	0.607	0.333	0.333	0.333
66	0.379	0.515	0.414	0.414	0.556	0.941	0.180	0.662	0.169	0.169
67	3.812	0.210	0.146	0.402	0.210	0.423	0.043	0	0	1
68	0.884	0.361	0.361	0.361	0.670	1.071	0.922	0.333	0.333	0.333
69	0.930	0.216	0.258	0.258	0.430	0.512	0.666	0.284	0.358	0.358
70	1.081	0.349	0.349	0.349	0.503	0.735	0.459	0.333	0.333	0.333
71	2.117	0.092	0.092	0.092	0.274	0.195	0.949	0.333	0.333	0.333
72	0.891	0.372	0.372	0.291	0.426	.	.	.	.	.
73	1.204	0.218	0.243	0.243	0.386	0.450	0.550	0.296	0.352	0.352
74	1.018	0.273	0.273	0.273	0.465	0.571	0.607	0.333	0.333	0.333
75	0.802	0.074	0.074	0.074	0.965	1.492	4.225	0.333	0.333	0.333
76	1.172	0.451	0.176	0.201	0.533	0.536	0.463	0.715	0.121	0.164
77	0.929	0.281	0.281	0.281	0.536	0.672	0.781	0.333	0.333	0.333
78	0.963	0.373	0.333	0.333	0.400	0.577	0.111	0.571	0.215	0.215
79	0.926	0.346	0.286	0.346	0.471	0.686	0.500	0.373	0.255	0.373
80	1.799	0.083	0.083	0.044	0.437	0.188	1.368	0.369	0.369	0.262
81	0.821	0.385	0.385	0.385	0.601	0.973	0.633	0.333	0.333	0.333
82	0.949	0.323	0.266	0.217	0.497	0.523	0.501	0.455	0.325	0.220
83	0.039	0.889	0.889	0.889	0.976	18.021	1.170	0.333	0.333	0.333
84	0.941	0.291	0.291	0.291	0.430	0.556	0.441	0.333	0.333	0.333
85	0.702	0.396	0.368	0.270	0.481	.	.	.	.	.
86	0.762	0.246	0.246	0.246	0.468	0.535	0.716	0.333	0.333	0.333
87	1.074	0.300	0.300	0.364	0.300	.	.	.	.	.
88	0.952	0.332	0.310	0.310	0.489	0.656	0.496	0.363	0.318	0.318
89	0.967	0.047	0.047	0.047	0.117	0.081	0.710	0.333	0.333	0.333

Table 11: Individual estimate: social ambiguity- cg

id	α	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L\cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
1	1.316	0.440	0.168	0.168	0.643	0.604	0.826	0.579	0.210	0.210
2	0.739	0.465	0.379	0.362	0.654	1.035	0.615	0.429	0.298	0.273
3	0.172	0.845	0.807	0.784	0.908	5.999	0.449	0.446	0.308	0.246
4	0.718	0.831	0.350	0.288	0.885	1.761	0.379	0.938	0.042	0.020
5	0.466	0.617	0.594	0.637	0.759	2.349	0.547	0.334	0.296	0.370
6	1.212	0.158	0.509	0.105	0.653	0.470	0.398	0.091	0.879	0.030
7	0.479	0.605	0.605	0.630	0.605	.	.	.	.	.
8	0.857	0.303	0.283	0.283	0.456	0.575	0.497	0.363	0.319	0.319
9	1.084	0.211	0.160	0.250	0.211	0.299	0.033	0.034	0	0.966
10	0.966	0.346	0.332	0.273	0.346	.	.	.	.	.
11	0.563	0.438	0.409	0.452	0.540	0.984	0.361	0.344	0.275	0.381
12	0.680	0.438	0.295	0.392	0.686	1.186	0.977	0.395	0.256	0.349
13	0.976	0.434	0.346	0.360	0.434	.	.	.	.	.
14	0.808	0.391	0.449	0.431	0.501	0.872	0.237	0.215	0.429	0.356
15	0.732	0.333	0.361	0.379	0.498	0.777	0.479	0.284	0.340	0.376
16	0.932	0.605	0.146	0.397	0.747	1.396	1.147	0.520	0.138	0.342
17	0.910	0.631	0.419	0.338	0.631	.	.	.	.	.
18	1.194	0.259	0.208	0.225	0.259	0.318	0.010	1	0	0
19	2.219	0.159	0.139	0.159	0.410	0.363	1.013	0.345	0.309	0.345
20	1.017	0.230	0.164	0.374	0.363	0.584	0.774	0.296	0.196	0.507
21	0.376	0.298	0.298	0.108	0.298	.	.	.	.	.
22	0.613	0.526	0.311	0.436	0.610	1.100	0.528	0.505	0.156	0.339
23	0.541	0.860	0.484	0.443	0.912	2.877	0.543	0.801	0.113	0.086
24	0.330	0.563	0.563	0.603	0.731	2.031	0.576	0.312	0.312	0.376
25	0.816	0.360	0.360	0.360	0.549	0.828	0.556	0.333	0.333	0.333
26	3.255	0.089	0.089	0.089	0.189	0.151	0.630	0.333	0.333	0.333
27	0.932	0.451	0.267	0.301	0.498	0.653	0.294	0.685	0.120	0.195
28	0.884	0.361	0.361	0.361	0.670	1.071	0.922	0.333	0.333	0.333
29	0.429	0.522	0.485	0.651	0.608	1.698	0.409	0.253	0.191	0.556
30	1.131	0.374	0.224	0.361	0.565	0.855	0.861	0.397	0.221	0.381
31	0.865	0.451	0.297	0.325	0.534	0.742	0.386	0.566	0.189	0.245
32	1.348	0.150	0.209	0.185	0.520	0.496	1.168	0.292	0.369	0.339
33	2.204	0.015	0.055	0.049	0.055	0.055	0.095	0	0.664	0.336
34	0.875	0.304	0.303	0.321	0.530	0.731	0.704	0.326	0.324	0.350
35	0.922	0.219	0.219	0.219	0.219	0.280	0	0.002	0.104	0.894
36	0.533	0.412	0.361	0.353	0.441	0.656	0.108	0.645	0.202	0.152
37	0.352	0.537	0.512	0.598	0.698	1.855	0.599	0.313	0.278	0.409
38	1.529	0.384	0.184	0.151	0.569	0.483	0.631	0.600	0.231	0.169
39	0.806	0.259	0.214	0.153	0.553	0.472	0.850	0.412	0.344	0.244
40	0.934	0.357	0.277	0.300	0.442	0.582	0.359	0.466	0.236	0.298
41	0.498	0.966	0.244	0.131	0.979	.	.	.	.	.
42	0.890	0.488	0.418	0.359	0.488	.	.	.	.	.
43	0.790	0.076	0.076	0.076	0.076	.	.	.	.	.
44	0.854	0.391	0.372	0.372	0.662	1.078	0.823	0.348	0.326	0.326
45	0.625	0.254	0.254	0.254	0.478	0.559	0.714	0.333	0.333	0.333
46	3.267	0.880	0.880	0.880	0.880	.	.	.	.	.
47	0.455	0.713	0.592	0.497	0.713	.	.	.	.	.

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Table 12 – continued from previous page

id	α	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
48	2.863	0.074	0.151	0.126	0.151	0.160	0.053	0	0.884	0.116
49	0.488	0.529	0.439	0.433	0.625	1.128	0.347	0.496	0.258	0.245
50	0.922	0.320	0.170	0.170	0.517	0.468	0.747	0.502	0.249	0.249
51	1.042	0.348	0.348	0.348	0.669	1.038	0.963	0.333	0.333	0.333
52	0.828	0.478	0.311	0.339	0.555	0.799	0.373	0.590	0.177	0.233
53	1.865	0.265	0.265	0.265	0.406	0.496	0.463	0.333	0.333	0.333
54	0.154	0.714	0.714	0.872	0.714	.	.	.	.	.
55	0.876	0.364	0.364	0.364	0.660	1.054	0.879	0.333	0.333	0.333
56	166.3	0.002	0	0	0.002	0	0.390	1	0	0
57	0.547	0.259	0.399	0.472	0.558	1.063	0.797	0.198	0.356	0.446
58	1.256	0.555	0.206	0.169	0.578	.	.	.	.	.
59	1.023	0.300	0.242	0.268	0.606	0.752	1.023	0.366	0.302	0.332
60	0.828	0.964	0.069	0.069	0.964	.	.	.	.	.
61	0.937	0.404	0.157	0.350	0.404	0.605	0.089	0.786	0	0.214
62	0.079	0.094	0.824	0.576	0.940	4.604	2.088	0.140	0.502	0.358
63	0.865	0.382	0.252	0.231	0.396	.	.	.	.	.
64	0.496	0.681	0.355	0.318	0.681	.	.	.	.	.
65	0.865	0.451	0.297	0.325	0.534	0.742	0.386	0.566	0.189	0.245
66	0.500	0.432	0.432	0.432	0.563	0.988	0.380	0.333	0.333	0.333
67	2.985	0.381	0.316	0.282	0.381	.	.	.	.	.
68	0.884	0.361	0.361	0.361	0.670	1.071	0.922	0.333	0.333	0.333
69	0.985	0.240	0.154	0.326	0.299	0.454	0.508	0.328	0.141	0.531
70	1.173	0.450	0.402	0.491	0.597	1.195	0.552	0.334	0.261	0.404
71	1.227	0.212	0.212	0.212	0.449	0.469	0.797	0.333	0.333	0.333
72	0.568	0.392	0.392	0.392	0.664	1.127	0.808	0.333	0.333	0.333
73	0.762	0.428	0.320	0.320	0.428	.	.	.	.	.
74	1.006	0.193	0.193	0.233	0.233	0.304	0.217	0.250	0.250	0.500
75	23.08	0.034	0	0	0.425	0.001	3.733	0.709	0.137	0.154
76	0.935	0.508	0.468	0.468	0.673	1.347	0.535	0.378	0.311	0.311
77	0.853	0.305	0.295	0.326	0.471	0.657	0.557	0.326	0.307	0.367
78	1.034	0.350	0.305	0.270	0.350	.	.	.	.	.
79	0.584	0.352	0.397	0.397	0.550	0.897	0.533	0.281	0.360	0.360
80	1.112	0.204	0.204	0.204	0.653	0.694	1.440	0.333	0.333	0.333
81	0.949	0.463	0.378	0.378	0.652	1.068	0.635	0.417	0.292	0.292
82	1.235	0.433	0.296	0.276	0.572	0.714	0.482	0.535	0.250	0.215
83	0.627	0.110	0.110	0.110	0.163	0.156	0.327	0.333	0.333	0.333
84	0.717	0.399	0.420	0.379	0.457	0.716	0.097	0.309	0.531	0.159
85	1.050	0.286	0.155	0.234	0.305	0.366	0.275	0.584	0.076	0.340
86	0.578	0.322	0.293	0.258	0.452	0.536	0.378	0.422	0.336	0.242
87	0.729	0.421	0.421	0.576	0.421	.	.	.	.	.
88	1.027	0.841	0.188	0.188	0.869	1.235	0.315	0.990	0.005	0.005
89	1.038	0.076	0.038	0.038	0.102	0.067	0.341	0.647	0.176	0.176

Table 13: Individual estimate: strategic uncertainty

id	α	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L\cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
1	0.929	0.230	0.230	0.230	0.470	0.515	0.784	0.333	0.333	0.333
2	0.842	0.364	0.350	0.350	0.719	1.174	1.094	0.341	0.329	0.329
3	0.452	0.505	0.462	0.462	0.755	1.629	0.839	0.364	0.318	0.318
4	0.512	0.393	0.393	0.393	0.393	0.649	0	0.005	0	0.995
5	0.369	0.696	0.734	0.697	0.734	.	.	.	.	.
6	0.886	0.159	0.159	0.541	0.325	0.754	0.970	0.193	0.193	0.613
7	0.849	0.342	0.328	0.214	0.438	.	.	.	.	.
8	0.723	0.261	0.261	0.330	0.510	0.715	0.851	0.304	0.304	0.391
9	1.051	0.194	0.194	0.194	0.260	0.291	0.271	0.333	0.333	0.333
10	0.582	0.514	0.539	0.539	0.539	1.168	0.010	0	0.500	0.500
11	0.542	0.407	0.376	0.376	0.407	.	.	.	.	.
12	1.331	0.238	0.263	0.213	0.473	0.493	0.661	0.333	0.380	0.287
13	2.634	0.077	0.077	0.066	0.077	.	.	.	.	.
14	0.857	0.262	0.283	0.303	0.474	0.627	0.667	0.300	0.334	0.367
15	0.925	0.320	0.317	0.303	0.511	0.674	0.565	0.345	0.340	0.315
16	2.989	0.178	0.178	0.116	0.316	0.246	0.383	0.419	0.419	0.162
17	0.661	0.512	0.565	0.451	0.672	1.298	0.291	0.326	0.502	0.172
18	0.838	0.318	0.338	0.338	0.338	0.510	0.007	0	0.500	0.500
19	1.351	0.404	0.467	0.369	0.513	0.784	0.106	0.199	0.742	0.059
20	1.301	0.229	0.167	0.316	0.574	0.790	1.368	0.328	0.269	0.403
21	1.597	0.063	0.055	0.055	0.063	.	.	.	.	.
22	0.798	0.284	0.309	0.351	0.470	0.692	0.593	0.280	0.323	0.397
23	0.868	0.624	0.624	0.434	0.866	2.232	0.750	0.403	0.403	0.194
24	2.340	0.046	0.046	0.046	0.146	0.091	0.905	0.333	0.333	0.333
25	1.184	0.249	0.249	0.249	0.481	0.553	0.743	0.333	0.333	0.333
26	1.187	0.331	0.331	0.331	0.530	0.747	0.592	0.333	0.333	0.333
27	0.841	0.309	0.354	0.334	0.475	0.673	0.434	0.280	0.384	0.336
28	0.884	0.361	0.361	0.361	0.670	1.071	0.922	0.333	0.333	0.333
29	0.991	0.171	0.276	0.171	0.572	0.525	1.036	0.289	0.423	0.289
30	1.108	0.269	0.246	0.246	0.640	0.762	1.164	0.349	0.325	0.325
31	1.018	0.273	0.273	0.273	0.465	0.571	0.607	0.333	0.333	0.333
32	0.804	0.303	0.303	0.303	0.549	0.727	0.742	0.333	0.333	0.333
33	0.522	0.380	0.287	0.374	0.380	0.605	0.034	0.590	0	0.410
34	1.279	0.208	0.202	0.202	0.391	0.403	0.651	0.342	0.329	0.329
35	1.541	0.171	0.171	0.206	0.194	0.250	0.151	0.220	0.220	0.561
36	0.462	0.527	0.375	0.596	0.652	1.662	0.686	0.358	0.185	0.457
37	1.041	0.101	0.184	0.223	0.348	0.391	0.972	0.217	0.362	0.421
38	1.091	0.248	0.274	0.292	0.445	0.576	0.627	0.291	0.338	0.371
39	0.985	0.173	0.181	0.113	0.411	0.298	0.705	0.376	0.394	0.230
40	0.725	0.307	0.417	0.382	0.547	0.864	0.554	0.231	0.415	0.354
41	3.864	0.040	0.040	0.040	0.206	0.103	1.322	0.333	0.333	0.333
42	0.760	0.499	0.468	0.468	0.499	.	.	.	.	.
43	0.627	0.110	0.110	0.110	0.163	0.156	0.327	0.333	0.333	0.333
44	0.744	0.417	0.417	0.417	0.530	0.899	0.327	0.333	0.333	0.333
45	0.529	0.203	0.203	0.243	0.603	0.698	1.340	0.320	0.320	0.359
46	1.018	0.273	0.273	0.273	0.465	0.571	0.607	0.333	0.333	0.333
47	0.302	0.741	0.526	0.742	0.747	2.917	0.280	0.480	0.031	0.489

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Table 14 – continued from previous page

id	α	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
48	3.127	0.119	0.059	0.166	0.119	0.164	0.068	0.057	0	0.943
49	0.641	0.277	0.212	0.172	0.583	0.539	0.941	0.410	0.324	0.267
50	0.903	0.197	0.154	0.154	0.500	0.427	1.084	0.374	0.313	0.313
51	1.042	0.348	0.348	0.348	0.669	1.038	0.963	0.333	0.333	0.333
52	1.086	0.342	0.239	0.252	0.356	0.432	0.121	0.820	0.067	0.113
53	0.848	0.420	0.383	0.420	0.538	0.918	0.412	0.360	0.279	0.360
54	2.404	0.208	0.246	0.002	0.764	.	.	.	.	.
55	1.625	0.269	0.269	0.260	0.393	0.476	0.394	0.342	0.342	0.315
56	1.042	0.348	0.348	0.348	0.669	1.038	0.963	0.333	0.333	0.333
57	3.447	0.068	0.068	0.068	0.102	0.091	0.319	0.333	0.333	0.333
58	1.056	0.343	0.343	0.343	0.383	0.570	0.125	0.333	0.333	0.333
59	1.035	0.225	0.265	0.331	0.315	0.477	0.323	0.177	0.295	0.528
60	1.189	0.224	0.024	0.139	0.415	0.338	1.495	0.474	0.147	0.379
61	1.886	0.044	0.104	0.058	0.421	0.212	1.595	0.277	0.408	0.316
62	1.746	0.151	0.156	0.134	0.742	0.667	1.955	0.337	0.342	0.321
63	0.708	0.336	0.424	0.093	0.779	.	.	.	.	.
64	1.178	0.347	0.347	0.374	0.448	0.697	0.332	0.307	0.307	0.386
65	1.018	0.273	0.273	0.273	0.465	0.571	0.607	0.333	0.333	0.333
66	0.580	0.527	0.576	0.576	0.590	1.399	0.118	0.126	0.437	0.437
67	2.412	0.238	0.238	0.211	0.238	.	.	.	.	.
68	0.884	0.361	0.361	0.361	0.670	1.071	0.922	0.333	0.333	0.333
69	1.084	0.211	0.211	0.211	0.488	0.506	0.917	0.333	0.333	0.333
70	2.229	0.099	0.158	0.158	0.318	0.296	0.893	0.249	0.376	0.376
71	1.466	0.051	0.078	0.051	0.464	0.217	1.782	0.315	0.370	0.315
72	0.552	0.401	0.401	0.401	0.638	1.086	0.700	0.333	0.333	0.333
73	1.194	0.183	0.221	0.284	0.264	0.377	0.324	0.168	0.292	0.540
74	1.018	0.273	0.273	0.273	0.465	0.571	0.607	0.333	0.333	0.333
75	1.297	0.071	0.135	0.453	0.157	0.393	0.552	0.049	0.157	0.794
76	0.431	0.778	0.719	0.728	0.778	.	.	.	.	.
77	0.832	0.589	0.398	0.187	0.725	.	.	.	.	.
78	1.218	0.296	0.215	0.215	0.363	0.394	0.293	0.556	0.222	0.222
79	1.041	0.206	0.259	0.232	0.356	0.409	0.431	0.258	0.409	0.332
80	0.922	0.409	0.320	0.320	0.651	0.938	0.798	0.406	0.297	0.297
81	0.952	0.377	0.377	0.377	0.586	0.926	0.613	0.333	0.333	0.333
82	0.842	0.320	0.292	0.184	0.525	0.499	0.440	0.466	0.393	0.141
83	2.218	0.001	0.001	0.001	0.054	0.007	3.119	0.333	0.333	0.333
84	0.980	0.318	0.318	0.318	0.337	0.487	0.061	0.333	0.333	0.333
85	0.988	0.298	0.405	0.239	0.490	0.550	0.178	0.190	0.768	0.041
86	0.625	0.408	0.318	0.185	0.800	0.953	1.142	0.430	0.349	0.221
87	1.094	0.389	0.239	0.239	0.389	.	.	.	.	.
88	0.715	0.362	0.403	0.403	0.488	0.802	0.327	0.256	0.372	0.372
89	0.340	0.331	0.331	0.331	0.480	0.676	0.451	0.333	0.333	0.333

Table 15: Individual estimate: social ambiguity- tg

id	α	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L\cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
1	1.757	0.270	0.079	0.018	0.391	.	.	.	.	.
2	1.266	0.245	0.203	0.203	0.597	0.615	1.149	0.365	0.318	0.318
3	0.806	0.397	0.302	0.302	0.619	0.838	0.741	0.419	0.291	0.291
4	28.42	0	0	0	0	0	0.506	1	0	0
5	0.745	0.643	0.643	0.701	0.643	.	.	.	.	.
6	1.296	0.092	0.092	0.525	0.113	0.375	0.327	0.018	0.018	0.965
7	1.620	0.219	0.203	0.191	0.540	0.527	1.037	0.353	0.331	0.316
8	0.677	0.379	0.379	0.379	0.530	0.831	0.442	0.333	0.333	0.333
9	1.972	0.098	0.052	0.052	0.118	0.085	0.240	0.732	0.134	0.134
10	1.259	0.299	0.386	0.286	0.386	.	.	.	.	.
11	0.604	0.367	0.367	0.298	0.367	.	.	.	.	.
12	0.909	0.365	0.285	0.332	0.402	0.577	0.226	0.498	0.163	0.339
13	0.394	0.315	0.300	0.300	0.315	.	.	.	.	.
14	1.353	0.245	0.263	0.289	0.396	0.516	0.513	0.288	0.327	0.385
15	0.876	0.296	0.321	0.321	0.528	0.726	0.676	0.308	0.346	0.346
16	1.231	0.504	0.212	0.293	0.504	0.649	0.042	1	0	0
17	1.516	0.431	0.247	0.175	0.431	.	.	.	.	.
18	0.746	0.376	0.376	0.376	0.376	0.602	0	0.286	0.286	0.428
19	0.986	0.392	0.392	0.384	0.558	0.887	0.474	0.339	0.339	0.323
20	1.832	0.146	0.042	0.378	0.251	0.451	1.211	0.310	0.128	0.561
21	0.644	0.107	0.134	0.107	0.134	.	.	.	.	.
22	0.902	0.417	0.239	0.311	0.417	0.569	0.035	0.999	0	0.001
23	0.968	0.661	0.205	0.205	0.810	1.047	0.861	0.673	0.164	0.164
24	0.468	0.541	0.541	0.523	0.670	1.494	0.375	0.347	0.347	0.305
25	1.977	0.108	0.108	0.108	0.333	0.245	1.021	0.333	0.333	0.333
26	1.984	0.179	0.179	0.179	0.367	0.356	0.705	0.333	0.333	0.333
27	0.794	0.328	0.352	0.352	0.454	0.673	0.359	0.289	0.356	0.356
28	0.884	0.361	0.361	0.361	0.670	1.071	0.922	0.333	0.333	0.333
29	0.634	0.491	0.400	0.371	0.734	1.279	0.808	0.414	0.308	0.278
30	1.226	0.717	0.213	0.215	0.902	1.584	1.303	0.589	0.205	0.206
31	0.699	0.420	0.409	0.433	0.478	0.836	0.201	0.331	0.280	0.389
32	0.920	0.308	0.348	0.370	0.557	0.858	0.723	0.287	0.342	0.371
33	0.610	0.380	0.191	0.563	0.409	0.943	0.483	0.291	0.054	0.655
34	1.077	0.239	0.294	0.255	0.406	0.483	0.438	0.272	0.416	0.312
35	1.095	0.660	0.554	0.657	0.660	1.930	0.037	0.548	0	0.452
36	0.800	0.231	0.186	0.186	0.434	0.419	0.736	0.390	0.305	0.305
37	0.954	0.286	0.092	0.209	0.286	0.325	0.083	0.926	0	0.074
38	1.290	0.222	0.139	0.162	0.260	0.260	0.288	0.580	0.158	0.262
39	0.464	0.469	0.374	0.374	0.650	1.054	0.619	0.430	0.285	0.285
40	1.005	0.359	0.243	0.337	0.485	0.692	0.592	0.413	0.215	0.372
41	0.828	0.964	0.069	0.069	0.964	.	.	.	.	.
42	0.666	0.529	0.523	0.523	0.529	.	.	.	.	.
43	0.790	0.076	0.076	0.076	0.076	.	.	.	.	.
44	0.884	0.361	0.361	0.361	0.670	1.071	0.922	0.333	0.333	0.333
45	0.946	0.184	0.184	0.184	0.306	0.315	0.487	0.333	0.333	0.333
46	1.340	0.742	0.742	0.944	0.742	.	.	.	.	.
47	0.494	0.876	0.442	0.400	0.876	.	.	.	.	.

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Table 16 – continued from previous page

id	α	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
48	1.500	0.186	0.186	0.202	0.321	0.346	0.547	0.320	0.320	0.360
49	0.796	0.224	0.187	0.177	0.472	0.438	0.846	0.380	0.319	0.301
50	0.648	0.417	0.294	0.294	0.454	0.588	0.176	0.754	0.123	0.123
51	1.042	0.348	0.348	0.348	0.669	1.038	0.963	0.333	0.333	0.333
52	0.955	0.432	0.293	0.293	0.494	0.636	0.272	0.659	0.171	0.171
53	1.148	0.258	0.258	0.258	0.463	0.547	0.654	0.333	0.333	0.333
54	0.802	0.074	0.074	0.074	0.965	1.492	4.225	0.333	0.333	0.333
55	0.995	0.349	0.349	0.349	0.680	1.069	0.994	0.333	0.333	0.333
56	44.23	0.194	0	0	0.194	.	.	.	.	.
57	0.009	0.506	0.354	0.354	0.506	.	.	.	.	.
58	1.163	0.542	0.241	0.267	0.599	0.738	0.359	0.789	0.088	0.123
59	1.027	0.438	0.320	0.280	0.511	0.637	0.209	0.723	0.190	0.087
60	1.042	0.348	0.348	0.348	0.669	1.038	0.963	0.333	0.333	0.333
61	1.174	0.127	0.254	0.457	0.254	0.534	0.077	0	0.003	0.997
62	0.636	0.335	0.174	0.477	0.419	0.811	0.691	0.334	0.124	0.542
63	0.991	0.292	0.140	0.253	0.292	0.374	0.063	0.829	0	0.171
64	1.462	0.709	0.112	0.060	0.738	.	.	.	.	.
65	1.163	0.463	0.231	0.231	0.463	.	.	.	.	.
66	0.878	0.339	0.377	0.254	0.480	0.560	0.128	0.333	0.648	0.020
67	2.192	0.341	0.341	0.338	0.341	.	.	.	.	.
68	0.884	0.361	0.361	0.361	0.670	1.071	0.922	0.333	0.333	0.333
69	0.851	0.214	0.065	0.299	0.305	0.433	0.941	0.378	0.125	0.496
70	1.094	0.247	0.208	0.265	0.398	0.489	0.627	0.347	0.272	0.382
71	1.391	0.212	0.212	0.212	0.409	0.431	0.680	0.333	0.333	0.333
72	0.517	0.421	0.421	0.421	0.588	1.018	0.487	0.333	0.333	0.333
73	1.302	0.381	0.148	0.148	0.381	.	.	.	.	.
74	0.531	0.316	0.317	0.300	0.336	0.465	0.028	0.456	0.498	0.046
75	0.828	0.964	0.069	0.069	0.964	.	.	.	.	.
76	1.747	0.256	0.181	0.089	0.256	.	.	.	.	.
77	1.378	0.179	0.159	0.179	0.383	0.368	0.824	0.346	0.308	0.346
78	0.652	0.541	0.478	0.478	0.625	1.236	0.301	0.461	0.269	0.269
79	1.020	0.314	0.296	0.229	0.440	0.483	0.296	0.455	0.383	0.162
80	1.186	0.223	0.148	0.185	0.544	0.520	1.203	0.378	0.287	0.334
81	1.034	0.331	0.265	0.283	0.396	0.509	0.286	0.477	0.230	0.293
82	1.986	0.264	0.072	0.116	0.876	0.962	2.606	0.406	0.276	0.318
83	0.245	0.450	0.091	0.091	0.450	.	.	.	.	.
84	0.837	0.348	0.370	0.370	0.389	0.611	0.098	0.203	0.399	0.399
85	1.013	0.232	0.205	0.258	0.303	0.389	0.366	0.332	0.245	0.424
86	0.463	0.581	0.449	0.449	0.805	1.837	0.899	0.423	0.289	0.289
87	1.068	0.341	0.341	0.387	0.341	.	.	.	.	.
88	0.767	0.787	0.198	0.244	0.833	1.267	0.547	0.876	0.048	0.076
89	0.852	0.065	0.145	0.065	0.169	0.119	0.230	0.088	0.824	0.088

Table 17: Individual estimate: betrayal aversion- tg

id	α	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
1	1.284	0.287	0.187	0.187	0.407	0.397	0.488	0.507	0.246	0.246
2	1.025	0.286	0.268	0.277	0.673	0.888	1.214	0.342	0.325	0.333
3	0.906	0.353	0.353	0.353	0.544	0.807	0.562	0.333	0.333	0.333
4	0.660	0.332	0.332	0.812	0.474	1.975	0.704	0.124	0.124	0.753
5	1.006	0.485	0.426	0.437	0.519	0.915	0.154	0.544	0.203	0.253
6	0.835	0.248	0.219	0.415	0.304	0.557	0.382	0.203	0.143	0.654
7	1.417	0.171	0.186	0.163	0.367	0.336	0.679	0.328	0.363	0.309
8	0.770	0.309	0.288	0.288	0.465	0.592	0.500	0.364	0.318	0.318
9	2.036	0.056	0.056	0.025	0.056	.	.	.	.	.
10	0.968	0.291	0.329	0.345	0.329	0.508	0.016	0	0.097	0.903
11	0.561	0.494	0.395	0.439	0.516	0.914	0.166	0.600	0.117	0.283
12	0.668	0.369	0.439	0.390	0.683	1.173	0.816	0.299	0.378	0.322
13	1.929	0.207	0.140	0.103	0.222	.	.	.	.	.
14	0.962	0.274	0.220	0.247	0.544	0.625	0.931	0.368	0.298	0.334
15	1.056	0.219	0.261	0.300	0.419	0.557	0.664	0.262	0.335	0.403
16	1.522	0.152	0.071	0.310	0.174	0.308	0.524	0.262	0.065	0.673
17	1.295	0.383	0.316	0.277	0.517	0.640	0.396	0.481	0.305	0.214
18	0.939	0.341	0.368	0.368	0.368	0.583	0.010	0	0.500	0.500
19	2.736	0.083	0.083	0.099	0.282	0.208	1.109	0.320	0.320	0.361
20	0.561	0.577	0.337	0.285	0.623	.	.	.	.	.
21	0.017	0	0	0.096	0.946	1.361	15.938	0.270	0.270	0.460
22	0.706	0.252	0.335	0.517	0.335	0.734	0.039	0	0	1
23	1.366	0.472	0.501	0.147	0.832	.	.	.	.	.
24	0.764	0.409	0.409	0.409	0.547	0.915	0.403	0.333	0.333	0.333
25	0.712	0.719	0.385	0.385	0.719	.	.	.	.	.
26	1.493	0.323	0.323	0.323	0.458	0.635	0.413	0.333	0.333	0.333
27	1.017	0.355	0.273	0.313	0.481	0.650	0.503	0.419	0.251	0.330
28	0.884	0.361	0.361	0.361	0.670	1.071	0.922	0.333	0.333	0.333
29	0.752	0.215	0.215	0.382	0.215	.	.	.	.	.
30	1.365	0.346	0.189	0.366	0.352	0.560	0.245	0.442	0.028	0.531
31	1.076	0.255	0.255	0.354	0.400	0.604	0.575	0.271	0.271	0.458
32	1.035	0.225	0.251	0.328	0.331	0.492	0.414	0.219	0.285	0.496
33	1.054	0.176	0.284	0.124	0.284	.	.	.	.	.
34	0.940	0.314	0.298	0.338	0.424	0.613	0.402	0.326	0.285	0.389
35	1.319	0.454	0.483	0.483	0.483	0.933	0.010	0	0.500	0.500
36	0.573	0.331	0.223	0.327	0.518	0.723	0.797	0.383	0.239	0.378
37	1.439	0.072	0.100	0.100	0.256	0.196	0.981	0.279	0.360	0.360
38	1.216	0.266	0.240	0.240	0.342	0.406	0.291	0.403	0.298	0.298
39	0.729	0.211	0.211	0.181	0.469	0.442	0.812	0.350	0.350	0.299
40	0.976	0.329	0.286	0.326	0.494	0.688	0.589	0.360	0.285	0.355
41	5.298	0.007	0.007	0.007	0.081	0.025	1.800	0.333	0.333	0.333
42	0.511	0.684	0.679	0.658	0.684	.	.	.	.	.
43	0.790	0.076	0.076	0.076	0.076	.	.	.	.	.
44	1.094	0.371	0.292	0.292	0.452	0.583	0.309	0.511	0.245	0.245
45	0.307	0.094	0.442	0.389	0.720	1.279	1.639	0.178	0.428	0.395
46	1.103	0.755	0.755	0.953	0.755	.	.	.	.	.
47	0.883	0.543	0.645	0.507	0.734	1.682	0.329	0.258	0.559	0.183

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Table 18 – continued from previous page

id	α	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L\cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
48	1.123	0.042	0.347	0.779	0.347	1.366	0.207	0	0.010	0.990
49	0.533	0.448	0.381	0.455	0.577	1.067	0.504	0.368	0.251	0.381
50	0.723	0.201	0.285	0.251	0.488	0.566	0.798	0.266	0.393	0.342
51	0.802	0.074	0.074	0.965	0.074	.	.	.	.	.
52	1.371	0.266	0.182	0.218	0.529	0.561	0.978	0.391	0.280	0.329
53	1.665	0.301	0.252	0.252	0.301	.	.	.	.	.
54	0.802	0.074	0.074	0.965	0.074	.	.	.	.	.
55	0.922	0.347	0.347	0.347	0.724	1.181	1.150	0.333	0.333	0.333
56	1.395	0.244	0.253	0.253	0.545	0.636	0.933	0.326	0.337	0.337
57	1.537	0.477	0.477	0.323	0.477	.	.	.	.	.
58	0.799	0.348	0.485	0.453	0.485	0.883	0.040	0	0.835	0.165
59	1.208	0.217	0.217	0.255	0.531	0.623	1.064	0.319	0.319	0.363
60	43.27	0	0	0	0	0	1.002	0.021	0.021	0.958
61	1.317	0.059	0.324	0.368	0.324	0.528	0.157	0	0.350	0.650
62	0.654	0.280	0.259	0.239	0.451	0.508	0.538	0.378	0.332	0.290
63	0.851	0.392	0.288	0.191	0.889	1.376	1.777	0.395	0.334	0.270
64	0.891	0.084	0.084	0.356	0.319	0.509	1.510	0.243	0.243	0.514
65	0.993	0.280	0.280	0.320	0.406	0.568	0.448	0.301	0.301	0.398
66	0.721	0.494	0.485	0.511	0.589	1.222	0.308	0.325	0.301	0.375
67	0.739	0.540	0.540	0.836	0.540	.	.	.	.	.
68	1.013	0.298	0.316	0.316	0.636	0.899	0.998	0.320	0.340	0.340
69	0.580	0.204	0.204	0.403	0.484	0.796	1.127	0.268	0.268	0.464
70	1.330	0.213	0.238	0.213	0.395	0.421	0.565	0.315	0.371	0.315
71	1.227	0.212	0.212	0.212	0.449	0.469	0.797	0.333	0.333	0.333
72	0.657	0.345	0.458	0.345	0.526	0.766	0.278	0.207	0.586	0.207
73	0.768	0.459	0.288	0.288	0.459	.	.	.	.	.
74	1.669	0.072	0.084	0.118	0.084	0.111	0.017	0	0	1
75	0.075	0.094	0.094	0.945	0.094	.	.	.	.	.
76	0.716	0.396	0.361	0.318	0.511	0.699	0.310	0.450	0.336	0.214
77	1.039	0.388	0.242	0.166	0.488	.	.	.	.	.
78	1.045	0.288	0.275	0.365	0.346	0.552	0.287	0.252	0.212	0.536
79	0.750	0.296	0.346	0.281	0.434	0.547	0.291	0.288	0.472	0.240
80	2.908	0.195	0.174	0.174	0.375	0.356	0.686	0.364	0.318	0.318
81	0.968	0.286	0.372	0.205	0.430	.	.	.	.	.
82	1.297	0.198	0.198	0.235	0.683	0.814	1.613	0.323	0.323	0.354
83	0.790	0.076	0.076	0.076	0.076	.	.	.	.	.
84	0.753	0.467	0.497	0.471	0.497	.	.	.	.	.
85	1.168	0.227	0.253	0.350	0.271	0.447	0.178	0.087	0.173	0.740
86	0.359	0.507	0.484	0.484	0.507	.	.	.	.	.
87	1.037	0.413	0.413	0.462	0.413	.	.	.	.	.
88	0.861	0.563	0.282	0.323	0.563	.	.	.	.	.
89	0.643	0.328	0.262	0.262	0.382	0.468	0.224	0.549	0.225	0.225

Appendix 3: Instructions

In this appendix we present the instructions we show to Players 2 in the experiment. The order of the presentation of the instructions of each experimental condition is randomized, accordingly to the randomization of the order of the conditions in the experiment. The instructions are translated from the original French instructions.

Beginning instructions

The experiment consists of five (5) parts and will last approximately 45 minutes. You will receive specific instructions for each part at the beginning of each of them. At the end of the experiment, only one part out of the five will be randomly selected to determine your final payment. Each of these five parts has the same chance of being randomly selected by the computer. In each part, you make several decisions. If a part is randomly selected for payment, one of the decisions in that part will be randomly selected by the computer. Each decision has the same chance of being drawn at random. Therefore, only one of your decisions will affect your final payment, but it could be any of your decisions. Thus, it is in your best interest to make each decision as if it were the one that will be selected for payment.

Payments for your decisions will be expressed in experimental currency units (ECU). Please note that each ECU is equal to 1 euro. For example, 1 ECU = 1€ and 15 ECU = 15€.

Social ambiguity - coordination game

You will now read the instructions for Part 1 of the experiment. Part 1 has two sub-parts. You will receive instructions for each sub-part before you make your decisions in each of them.

First stage

Instructions for the first sub-part of Part 1

In this part of the experiment, you are randomly paired with another participant, we call this person, Participant 2. You will never be informed of Participant 2's identity, nor will Participant 2 ever be informed of your identity. Your final payment will depend on your decision and the decision of Participant 2.

Your decision in this section will be to choose an action between Left, Right or Middle. Participant 2 will receive 5 euros. Then, Participant 2 will decide where he/she would prefer to spend these 5 euros between one of the following options: An Amazon voucher, a Google Play voucher or an Apple Store voucher. You will not be notified of Participant 2's decision until you receive payment for this experiment. The values below are numerical examples of how Participant 2's decision affects your payment.

- If you choose **Left** and Participant 2 chooses an **Amazon voucher**, you will receive **30 ECU**.
- If you choose **Left** and Participant 2 chooses a **Google Play** voucher, you will receive **20 ECU**.
- If you choose **Left** and Participant 2 chooses an **Apple Store** voucher, you will receive **16 ECU**.
- If you choose **Right** and Participant 2 chooses an **Amazon voucher**, you will receive **16 ECU**.

- If you choose **Right** and Participant 2 chooses a **Google Play voucher**, you will receive **30 ECU**.
- If you choose **Right** and Participant 2 chooses an **Apple Store voucher**, you receive **20 ECU**.
- If you choose **Middle** and Participant 2 chooses an **Amazon voucher**, you will receive **20 ECU**.
- If you choose **Middle** and Participant 2 chooses a **Google Play voucher**, you will receive **16 ECU**.
- If you choose **Middle** and Participant 2 chooses an **Apple Store voucher**, you will receive **30 ECU**.

Your possible payments (in ECU), depending on your decision and the decision of Participant 2, are summarized in the table below.

		Participant 2		
		Amazon voucher	Google Play voucher	Apple Store voucher
Your decision	Left	30	20	16
	Right	16	30	20
	Middle	20	16	30

Note that Participant 2 is informed that his or her choice will affect you, but he or she does not know in what direction. This means that Participant 2 does not know how your payment changes based on his or her decision.

Example

Suppose you decide to choose the **Right** action and Participant 2 prefers to spend his or her 5 euros on a **Google Play voucher** (remember that you will not be informed of Participant 2's decision until you receive the payment for the experiment). The table below shows in orange the payment (in ECU) you will get in this scenario. If this decision is chosen at random for the payment, you earn 30 ECU.

		Participant 2		
		Amazon voucher	Google Play voucher	Apple Store voucher
Your decision	Left	30	20	16
	Right	16	30	20
	Middle	20	16	30

Second stage

Instructions for the second sub-part of Part 1

In the second and final subpart of this part of the experiment, you will choose between several options. The options will be presented in 12 tables (see an example of the table below). Each row represents one option. For each option, you will be asked to indicate whether you prefer Alternative A or Alternative B.

- **Alternative A** offers you a safe payment.
- **Alternative B** offers you a variable payment that depends on the decision made by Participant 2 in the first sub-part of this part of the experiment. This means that the payment you can receive varies depending on what Participant 2 decided between an **Amazon voucher, a Google Play voucher, or an Apple Store voucher**. This alternative changes from table to table, but it is the same for all rows in a given table.

Example of a table with payments (in ECU):

Safe payment of alternative A	Alternative A	Alternative B	Variable payment of alternative B
30	A1	B1	You get **30 ECU** if Participant 2 chooses an **Amazon voucher** in the first sub-part of this part of the experiment or **16 ECU** if Participant 2 chooses a **Google Play voucher or an Apple Store voucher**
28	A2	B2	
26	A3	B3	
24	A4	B4	
22	A5	B5	
20	A6	B6	
18	A7	B7	
16	A8	B8	

In each line you will be asked to indicate whether you prefer **Alternative A or Alternative B**.

Both alternatives are initially displayed in gray. You must click on one of the two alternatives to select it. Your selection will be highlighted in blue. You can change your selection at any time by clicking on the cell of the desired alternative, before moving on to the next screen. Once you confirm your decision, you cannot go back and change your previous decision.

If you select Alternative A for a given row, the computer will mark Alternative A for all previous rows (up to the first). Similarly, if you select Alternative B for a line, the computer will mark Alternative B for all subsequent lines (up to the last one).

Example

Suppose that the following option is randomly selected for payment:

Safe payment of alternative A	Alternative A	Alternative B	Variable payment of alternative B
26	A1	B1	You get **30 ECU** if Participant 2 chooses an **Amazon voucher** in the first sub-part of this part of the experiment or **16 ECU** if Participant 2 chooses a **Google Play voucher or an Apple Store voucher**

- If you select **Alternative A** for this line, you earn **26 ECU**.
- If you select **Alternative B** for this line, you can earn **30 ECU or 16 ECU**. Your payment depends on the decision of Participant 2 that you were associated with in sub-part 1 of this part of the experiment (the most recent task you completed). Payment is determined as follows:

  - If Participant 2 chooses an **Amazon voucher**, you earn **30 ECU**.
  - If Participant 2 chooses either a **Google Play voucher or an Apple Store voucher**, you earn **16 ECU**.

During this task, you will be able to use the back button to re-view the decisions that you and Participant 2 were asked to make in the first sub-part of this part of the experiment.

Strategic uncertainty - coordination game

You will now read the instructions for Part 2 of the experiment. Part 2 has two sub-parts. You will receive instructions for each sub-part before you make your decisions in each of them.

First stage

Instructions for the first sub-part of Part 2

In this part of the experiment, you are again randomly paired with another participant. We call this new person Participant 2. However, this Participant 2 is a **different person** than the one you were paired with in the previous part of the experiment. You will never be informed of Participant 2's identity, nor will Participant 2 be informed of your identity. Your final payment will depend on your decision and the decision of Participant 2.

You and Participant 2 will each choose one of three actions: **Left, Right and Middle**. You will not be informed of Participant 2's decision until the end of the experiment and Participant 2 will not be informed of your decision until the end of the experiment. A numerical example of the payments (in ECU) for you and for Participant 2 are presented in the table below. In each cell, the first amount is your payment, and the second amount is Participant 2's payment. These payments can be summarized as follows:

- If you choose **Left** and Participant 2 chooses **Left**, you receive **7 ECU**.
- If you choose **Left** and Participant 2 chooses **Right**, you receive **5 ECU**.
- If you choose **Left** and Participant 2 chooses **Middle**, you receive **4 ECU**.
- If you choose **Right** and Participant 2 chooses **Left**, you receive **4 ECU**.
- If you choose **Right** and Participant 2 chooses **Right**, you receive **7 ECU**.
- If you choose **Right** and Participant 2 chooses **Middle**, you receive **5 ECU**.
- If you choose **Middle** and Participant 2 chooses **Left**, you receive **5 ECU**.
- If you choose **Middle** and Participant 2 chooses **Right**, you receive **4 ECU**.
- If you choose **Middle** and Participant 2 chooses **Middle**, you receive **7 ECU**.

		Participant 2		
		Left	Right	Middle
Your decision	Left	7,7	5,9	4,11
	Right	4,11	7,7	5,9
	Middle	5,9	4,11	7,7

Example

Suppose you decide to choose the **Left** action and Participant 2 chooses the **Middle** action (remember that you will not be informed of Participant 2's decision until the end of the experiment). The table below shows in orange the payment (in ECU) that you and Participant 2 will have in this scenario. If this decision is chosen randomly for the payment, you will win 4 ECU and Participant 2 will win 11 ECU.

		Participant 2		
		Left	Right	Middle
Your decision	Left	7,7	5,9	4,11
	Right	4,11	7,7	5,9
	Middle	5,9	4,11	7,7

Second stage

Instructions for the second sub-part of Part 2

In the second and final sub-part of this part of the experiment, you will choose between several options. The options will be presented in 12 tables (see an example of the table below). Each row represents one option. For each option, you will be asked to indicate whether you prefer Alternative A or Alternative B.

- **Alternative A** offers you a safe payment.
- **Alternative B** offers you a variable payment that depends on the decision made by Participant 2 in the first sub-part of this part of the experiment. This means that the payment you can receive varies depending on what Participant 2 decided between the **Left, Right or Middle** actions. This alternative changes from table to table, but it is the same for all rows in a given table.

Example of a table with payments (in ECU):

Safe payment of alternative A	Alternative A	Alternative B	Variable payment of alternative B
7	A1	B1	You get **7 ECU** if Participant 2 chooses an **Left** in the first sub-part of this part of the experiment or **3.5 ECU** if Participant 2 chooses a **Right or Middle**
6.5	A2	B2	
6	A3	B3	
5.5	A4	B4	
5	A5	B5	
4.5	A6	B6	
4	A7	B7	
3.5	A8	B8	

In each line you will be asked to indicate whether you prefer **Alternative A or Alternative B**.

Both alternatives are initially displayed in gray. You must click on one of the two alternatives to select it. Your selection will be highlighted in blue. You can change your selection at any time by clicking on the cell of the desired alternative, before moving on to the next screen. Once you confirm your decision, you cannot go back and change your previous decision.

If you select Alternative A for a given row, the computer will mark Alternative A for all previous rows (up to the first). Similarly, if you select Alternative B for a line, the computer will mark Alternative B for all subsequent lines (up to the last one).

Example

Suppose that the following option is randomly selected for payment:

Safe payment of alternative A	Alternative A	Alternative B	Variable payment of alternative B
6	A1	B1	You get **7 ECU** if Participant 2 chooses an **Left** in the first sub-part of this part of the experiment or **3.5 ECU** if Participant 2 chooses a **Right or Middle**

- If you select **Alternative A** for this line, you earn **6 ECU**.
- If you select **Alternative B** for this line, you can win **7 ECU or 3.5 ECU**. Your payment depends on the decision done by the Participant 2 which you were associated with in sub-part 1 of this part of the experiment (the most recent task you completed). Payment would be determined as follows:
  - If Participant 2 chooses **Left**, you earn **7 ECU**.
  - If Participant 2 chooses **Right or Middle**, you earn **3.5 ECU**.

During this task, you will be able to use the back button to re-view the decisions that you and Participant 2 were asked to make in the first sub-part of this part of the experiment.

Social ambiguity - trust game

You will now read the instructions for Part 3 of the experiment. Part 3 has two sub-parts. You will receive instructions for each sub-part before you make your decisions in each of them.

First stage

Instructions for the first sub-part of Part 3

In this part of the experiment, you are again randomly paired with another participant. We call this new person Participant 2. However, this Participant 2 is **a different person** than the ones you were paired with in the previous parts of the experiment. You will never be informed of Participant 2's identity, nor will Participant 2 be informed of your identity. Depending on your decision, your payment may or may not depend on Participant 2's decision.

Your decision in this sub-section will be to choose an action between the **Left or Right** possibilities. Participant 2 receives 5 euros. Participant 2 decides where he or she would prefer to spend the 5 euros between one of the following options: **an Amazon voucher, a Google Play voucher or an Apple Store voucher**. You will not be informed of Participant 2's decision until the end of the experiment. If you chose **Left**, you will receive a sure payment, and Participant 2's decision does not affect your payment. If you choose **Right**, your payment is determined by Participant 2's decision. Participant 2 knows that your payment may or may not depend on their decision. However, Participant 2 does not know how his or her decision is associated with your payment.

A numerical example of possible payments for this part of the experiment can be summarized as follows:

- If you choose **Left**, you receive **30 ECU** for sure.
- If you choose **Right**, your payment depends on the decision of Participant 2, as follows:
  - If Participant 2 chooses an **Amazon voucher**, you receive **45 ECU**.
  - If Participant 2 chooses a **Google Play voucher**, you receive **30 ECU**.
  - If Participant 2 chooses an **Apple Store voucher**, you will receive **24 ECU**.

Example

Suppose you decide to choose the **Right** action and Participant 2 prefers to spend his or her 5 euros on an **Amazon voucher** (remember that you will not be informed of Participant 2's decision until you receive the payment for the experiment).

Below you can see in orange the payment (in ECU) you will get in this scenario. If this decision is chosen randomly for the payment, you will earn 45 ECU.

- If you choose **Left**, you will receive **30 ECU** for sure.
- If you choose **Right**, your payment depends on Participant 2's decision, as follows:
  - If Participant 2 chooses an **Amazon voucher**, you receive 45 ECU.
  - If Participant 2 chooses a **Google Play voucher**, you receive **30 ECU**.
  - If Participant 2 chooses an **Apple Store voucher**, you will receive **24 ECU**.

Second stage

Instructions for the second sub-part of Part 3

In the second and final sub-part of this part of the experiment, you will choose between several options. The options will be presented in 12 tables (see an example of the table below). Each row represents one option. For each option, you will be asked to indicate whether you prefer Alternative A or Alternative B.

- **Alternative A** offers you a safe payment.
- **Alternative B** offers you a variable payment that depends on the decision made by Participant 2 in the first sub-part of this part of the experiment. This means that the payment you can receive varies depending on what Participant 2 decided between an **Amazon voucher, a Google Play voucher, or an Apple Store voucher**. Alternative B changes from table to table, but it is the same for all rows in a given table.

Safe payment of alternative A	Alternative A	Alternative B	Variable payment of alternative B
45	A1	B1	You get **45 ECU** if Participant 2 chooses an **Amazon voucher** in the first sub-part of this part of the experiment or **24 ECU** if Participant 2 chooses a **Google Play or an Apple Store voucher**
42	A2	B2	
39	A3	B3	
36	A4	B4	
33	A5	B5	
30	A6	B6	
27	A7	B7	
24	A8	B8	

Example of a table with payments (in ECU):

In each line you will be asked to indicate whether you prefer **Alternative A or Alternative B**.

Both alternatives are initially displayed in gray. You must click on one of the two alternatives to select it. Your selection will be highlighted in blue. You can change your selection at any time by clicking on the cell of the desired alternative, before moving on to the next screen. Once you confirm your decision, you cannot go back and change your previous decision.

If you select Alternative A for a given row, the computer will mark Alternative A for all previous rows (up to the first). Similarly, if you select Alternative B for a line, the computer will mark Alternative B for all subsequent lines (up to the last one).

Example

Suppose that the following option is randomly selected for payment:

Safe payment of alternative A	Alternative A	Alternative B	Variable payment of alternative B
39	A1	B1	You get **45 ECU** if Participant 2 chooses an **Amazon voucher** in the first sub-part of this part of the experiment or **24 ECU** if Participant 2 chooses a **Google Play or an Apple Store voucher**

- If you select **Alternative A** for this line, you earn **39 ECU**.
- If you select **Alternative B** for this line, you can earn **45 ECU or 24 ECU**. Your payment depends on the decision of the Participant 2 you are associated with in the sub-part 1 of this part of the experiment (the most recent task you completed). The payment is determined as follows:
  - If Participant 2 chooses an **Amazon voucher**, you earn **45 ECU**.
  - If Participant 2 chooses either a **Google Play or an Apple Store voucher**, you earn **24 ECU**.

During this task, you will be able to use the back button to re-view the decisions that you and Participant 2 were asked to make in the first sub-part of this part of the experiment.

Betrayal aversion

You will now read the instructions for Part 4 of the experiment. Part 4 has two sub-parts. You will receive instructions for each sub-part before you make your decisions in each of them.

First stage

Instructions for the first sub-part of Part 4

In this part of the experiment, you are again randomly paired with another participant. We call this new person Participant 2. However, this Participant 2 is a **different person** than the ones you were paired with in the previous parts of the experiment. You will never be informed of Participant 2's identity, nor will Participant 2 be informed of your identity. Your decision will affect Participant 2's payment. In addition, depending on your decision, your payment may or may not depend on Participant 2's decision.

Your decision in this section is to choose an action between the **Left or Right** options. Participant 2 decides between three options: **Left, Right or Middle**. You will not be informed of Participant 2's decision until you receive payment for the experiment. If you choose **Left**, you and Participant 2 receive a sure payment, and Participant 2's decision does not affect your payment. In contrast, if you choose **Right**, the payments for you and Participant 2 are determined by Participant 2's decision.

A numerical example of the possible payments for this part of the experiment can be summarized as follows:

- If you choose **Left**, you and Participant 2 receive **20 ECU** for sure.
- If you choose **Right**, your payment depends on Participant 2's decision, as follows:
  - If Participant 2 chooses **Left**, you receive **25 ECU** and Participant 2 receives **25 ECU**.
  - If Participant 2 chooses **Right**, you receive **20 ECU** and Participant 2 receives **28 ECU**.
  - If Participant 2 chooses **Middle**, you receive **18 ECU** and Participant 2 receives **32 ECU**.

Example

Suppose you decide to choose the action **Right** and Participant 2 chooses the action **Right** (remember that you will not be informed of Participant 2's decision until you receive your payment).

Below you can see in orange the payment (in ECU) you will get in this scenario. If this decision is chosen at random for the payment, you win 20 ECU.

- If you choose **Left**, you and Participant 2 each get **20 ECU** for sure.
- If you choose **Right**, your payment depends on Participant 2's decision as follows:
  - If Participant 2 chooses **Left**, you receive **25 ECU** and Participant 2 receives **25 ECU**.
  - If Participant 2 chooses **Right**, you receive **20 ECU** and Participant 2 receives **28 ECU**.
  - If Participant 2 chooses **Middle**, you receive **18 ECU** and Participant 2 receives **32 ECU**.

Second stage

Instructions for the second sub-part of Part 4

In the second and final sub-part of this part of the experiment, you choose between several options. The options are presented in 12 tables (see an example of the table below). Each row represents an option. For each option, you must indicate whether you prefer Alternative A or Alternative B.

- **Alternative A** offers you a safe payment.
- **Alternative B** offers you a variable payment that depends on the decision made by Participant 2 in the first sub-part of this part of the experiment. This means that the payment you can receive varies depending on what Participant 2 decided between **Left, Right or Middle** actions.

Example of a table with payments (in ECU):

Safe payment of alternative A	Alternative A	Alternative B	Variable payment of alternative B
25	A1	B1	You get **25 ECU** if Participant 2 chooses **Left** in the first sub-part of this part of the experiment or **18 ECU** if Participant 2 chooses **Right or Middle**
24	A2	B2	
23	A3	B3	
22	A4	B4	
21	A5	B5	
20	A6	B6	
19	A7	B7	
18	A8	B8	

In each line you will be asked to indicate whether you prefer **Alternative A or Alternative B**.

Both alternatives are initially displayed in gray. You must click on one of the two alternatives to select it. Your selection will be highlighted in blue. You can change your selection at any time by clicking on the cell of the desired alternative, before moving on to the next screen. Once you confirm your decision, you cannot go back and change your previous decision.

If you select Alternative A for a given row, the computer will mark Alternative A for all previous rows (up to the first). Similarly, if you select Alternative B for a line, the computer will mark Alternative B for all subsequent lines (up to the last one).

Example

Suppose that the following option is randomly selected for payment:

- If you select **Alternative A** for this line, you earn **23 ECU**.
- If you select **Alternative B** for this line, you can earn **25 ECU or 18 ECU**. Your payment depends on the decision done by the Participant 2's that you were associated with in sub-part 1 of this part of the experiment (the most recent task you completed). Payment is determined as follows:
  - If Participant 2 chooses **Left**, you earn **25 ECU**.

Safe payment of alternative A	Alternative A	Alternative B	Variable payment of alternative B
23	A1	B1	You get **25 ECU** if Participant 2 chooses **Left** in the first sub-part of this part of the experiment or **18 ECU** if Participant 2 chooses **Right or Middle**

- If Participant 2 chooses **Right or Middle**, you earn **18 ECU**.

During this task, you will be able to use the back button to re-view the decisions that you and Participant 2 were asked to make in the first sub-part of this part of the experiment.

Nature

In this part of the experiment, you must choose between several options. The options are presented in 12 tables (see an example of the table below). Each row represents an option. For each option, you must indicate whether you prefer Alternative A or Alternative B.

- **Alternative A** offers you a safe payment.
- **Alternative B** offers you a variable payment that depends on a random selection made by the computer. The computer chooses one of three options: **Left, Right or Middle**. Each option has an equal chance of being drawn. Alternative B changes from table to table, but is the same for all rows in a given table.

Example of a table with payments (in ECU):

Safe payment of alternative A	Alternative A	Alternative B	Variable payment of alternative B
20	A1	B1	You get **20 ECU** if the computer randomly chooses **Left** or **13 ECU** if the computer randomly chooses **Right or Middle**
19	A2	B2	
18	A3	B3	
17	A4	B4	
16	A5	B5	
15	A6	B6	
14	A7	B7	
13	A8	B8	

In each line you will be asked to indicate whether you prefer **Alternative A or Alternative B**.

Both alternatives are initially displayed in gray. You must click on one of the two alternatives to select it. Your selection will be highlighted in blue. You can change your selection at any time by clicking on the cell of the desired alternative, before moving on to the next screen. Once you confirm your decision, you cannot go back and change your previous decision.

If you select Alternative A for a given row, the computer will mark Alternative A for all previous rows (up to the first). Similarly, if you select Alternative B for a line, the computer will mark Alternative B for all subsequent lines (up to the last one).

Example

Safe payment of alternative A	Alternative A	Alternative B	Variable payment of alternative B
20	A1	B1	You get **20 ECU** if the computer randomly chooses **Left** or **13 ECU** if the computer randomly chooses **Right or Middle**

Suppose that the following option is randomly selected for payment:

- If you select **Alternative A** for this line, you win **20 ECU**.
- If you select **Alternative B** for this line, you can win **20 ECU or 13 ECU**. Your payment depends on which option the computer randomly selects. Remember that each option has the same chance of being drawn. The payment is determined as follows:
  - If the computer selects **Left**, you win **20 ECU**.
  - If the computer selects **Right or Middle**, you win **13 ECU**.