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Ambiguity preferences and likelihood insensitivity for asymmetric events*

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Abstract

We show that existing methods for measuring ambiguity attitudes for asymmetric events (i.e. unequally likely events) are prone to downward bias and misspecification. To address this, we propose a more robust approach and test it experimentally using both asymmetric and symmetric events (i.e. equally likely events) within the contexts of trust and coordination games. Our findings reveal that individuals *i*) prefer asymmetric events, showing lower ambiguity aversion compared to symmetric events, and *ii*) demonstrate greater likelihood insensitivity, as forming beliefs is more cognitively demanding for asymmetric events. These findings explain social ambiguity and strategic uncertainty in our experiment. We identify betrayal aversion as a disutility associated with trust decisions.

Keywords: subjective beliefs; ambiguity attitudes; trust game; coordination game; symmetric and asymmetric events

JEL codes: D81, C91

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1 Introduction

Beliefs formed under uncertainty are pervasive in human decisions. Uncertainty is a rich domain that includes risk, ambiguity, strategic uncertainty, social ambiguity, among others. Subjects make decisions under risk when the objective probabilities of the possible events are known. In contrast, subjects face ambiguous situations when the objective probabilities are unknown [Knight \(1921\)](#). Our own attitudes towards uncertainty then guide many of our behaviors and decisions. In his book, [Bernstein \(1996\)](#) states the following. “The ability to anticipate future outcomes and make choices is central to societies. Uncertainty management guides us over a vast range of decisions-making, from allocating wealth to safeguarding public health, from waging war to planning a family, from paying insurance to wearing a seat-belt, from planting corn to marketing cornflakes” (p. 2).

The standard ambiguity theory – Subjective Expected Utility (SEU) – holds the following assumptions. (i) Subjects form subjective probabilities or beliefs about events, (ii) subjects’ utility is the same under ambiguity and risk, and (iii) subjects value lotteries based on expected utility, where outcomes are weighted according to their beliefs. However, [Ellsberg \(1961\)](#)’s paradox showed that people deviate from SEU by exhibiting ambiguity attitudes. Consequently, several models have been developed to explain ambiguity attitudes by allowing difference between utility for risk and ambiguity, or introducing the belief-weighting function (e.g. [Klibanoff et al., 2005](#); [Gilboa, 1987](#); [Schmeidler, 1989](#); [Tversky and Kahneman, 1992](#)).

The weighting function is characterized by two parameters: pessimism and likelihood insensitivity. Pessimism refers to a tendency to underweight the probability of favorable events and overweight that of unfavorable events, reflected by a lower elevation of the probability weighting function (e.g. [Gonzalez and Wu, 1999](#); [Baillon et al., 2018a](#)). Likelihood insensitivity describes that individuals fail to differentiate sharply between probabilities, treating uncertain outcomes more similarly, regardless of their likelihood (e.g. [Wakker, 2010](#); [Abdellaoui et al., 2011a](#)).

Previous studies on ambiguity attitudes have largely focused on measuring uncertainty associated with symmetric events (i.e. events with equal likelihoods of occurring) and have experimentally assessed attitudes under these scenarios (e.g. [Baillon, 2008](#); [Abdellaoui et al., 2011a, 2021b](#); [Van De Kuilen and Wakker, 2011](#)).

Another source of ambiguity relates to asymmetric events (i.e. events with unequal likelihoods of occurring), which are prevalent in various fields of economics. For instance, in game

theory, the probability of a Trustee reciprocating in the trust game often differs from that of betrayal (e.g. [Bohnet et al., 2008](#)). Similarly, in health economics, individuals engaging in harmful behaviors such as smoking or excessive alcohol consumption, face differing probabilities of developing non-communicable diseases versus remaining healthy (e.g. [Bloom et al., 2020](#); [Mane et al., 2019](#)). In economics of taxation, individuals who under-report income face differing probabilities of being detected versus not being detected (e.g. [Dhami and Al-Nowaihi, 2007](#); [Dhami and Hajimoladarvish, 2020](#)). Hence, understanding ambiguity attitudes in the context of asymmetric events is crucial in economics.

[Baillon et al. \(2018b\)](#) develop the leading method to measure ambiguity attitudes for asymmetric events, providing two indexes: one that captures pessimism and another that measures likelihood insensitivity. Additionally, [Baillon et al. \(2018a\)](#) extend the method of [Abdellaoui et al. \(2011a\)](#), originally developed for symmetric events, to be applicable for asymmetric events under the neo-additive weighting function of [Chateauneuf et al. \(2007\)](#).

Our paper brings three main theoretical contributions. First, we demonstrate that the method of [Baillon et al. \(2018b\)](#) is systematically downward biased, showing that for individuals with identical ambiguity attitudes towards symmetric and asymmetric events, the method yields lower estimated values of ambiguity towards asymmetric events compared to symmetric ones. Second, we show that regarding misspecification issues, the neo-additive weighting function is less robust to misspecifications than the two-parametric weighting function of [Goldstein and Einhorn \(1987\)](#), which itself is outperformed by the two-parameter weighting function of [Prelec \(1998\)](#). Finally, we propose a new method for measuring ambiguity attitudes for asymmetric events using [Prelec \(1998\)](#)'s two-parameter weighting function. Our method provides a framework to measure betrayal attitudes ([Bohnet et al., 2008](#)) and social preferences ([Fehr and Schmidt, 1999](#)), while accounting for crucial forms of ambiguity attitudes in trust interactions.

We implement our method in an experiment, where participants make decisions under different sources of uncertainty (i.e. social ambiguity, strategic uncertainty, and betrayal aversion). Our empirical evidence allows us to confront the method with two validity tests. First, the recovery of beliefs for symmetric events. Second, the assessment of the stability of beliefs for asymmetric events under the same source of uncertainty, but different decision contexts (i.e. trust game and coordination game). The method successfully meets validity tests, supporting the reliability of our findings.

We present four empirical results. First, subjects demonstrate a preference (i.e. reduced

ambiguity aversion) when facing asymmetric events compared to symmetric events. Second, they exhibit higher likelihood insensitivity for asymmetric events compared to symmetric ones, suggesting that forming beliefs about unequally likely events is more cognitively demanding. Third, we identify which components of the weighting function – pessimism and likelihood insensitivity – capture attitudes towards specific sources of uncertainty, such as social ambiguity and strategic uncertainty. Finally, our method offers structural evidence supporting that betrayal aversion reflects the disutility (cost) of trusting.

The remainder of this paper proceeds as follows. Section 2 outlines the limitations of existing measurement methods of ambiguity attitudes. Section 3 presents our elicitation method. Section 4 presents the experimental design. Section 5 presents the results, which are discussed in Section 6.

2 Theoretical background

This section outlines a general theoretical framework of ambiguity attitudes. In addition, it reviews existing methods for measuring ambiguity attitudes and beliefs, and highlights their limitations.

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 \succsim 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 $W(\cdot)$ 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 $U(\cdot)$ the utility function that captures the attitude toward outcomes. Both $W(\cdot)$ and $U(\cdot)$ 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 several 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.

2.2 Existing methods

2.2.1 Elicitation methods for symmetric events

The main difficulty for measuring the ambiguity model (1), relies on how to disentangle the weighting function $W(\cdot)$ from the beliefs $P(\cdot)$ (e.g. [Li et al., 2020](#)). The following two approaches have been proposed in the literature to solve this issue.

First, experimentally design symmetric events to facilitate the measurement of $W(\cdot)$. The classic approach to design symmetric events is based on Ellsberg-type experiment (e.g., [Abdellaoui et al., 2011a](#)). In this setup, participants choose between a known urn K , and an unknown urn, U . The known urn contains n balls, each of a different color (e.g. red, blue, yellow), with each color equally likely to be drawn $\frac{1}{n}$. The unknown urn also contains n balls in the same colors, but their composition is unknown; then, some colors may appear multiple times, while others may be missing. Lacking information about the unknown urn, participants should treat all colors as symmetric events with a subjective probability of $\frac{1}{n}$. This setup enables the elicitation of certainty equivalents, allowing the measurement of $W(\cdot)$ and $U(\cdot)$ for participants (e.g. [Abdellaoui et al., 2011a](#)).

Second, experimentally design symmetric events in which continuous sources of uncertainty are used (e.g. [Baillon, 2008](#); [Abdellaoui et al., 2011a](#); [Gutierrez and Kemel, 2021](#); [Watanabe and Fujimi, 2024](#); [Abdellaoui et al., 2021a,b](#)), such as weather conditions and stock market indices. In this case, the universal event is an interval $[a, b] \in \mathcal{R}$, which is split into two symmetric events, $E_1 = [a, c]$ and $E_2 = [c, b]$, where $c \in [a, b]$. The symmetry is established experimentally by finding c such that the indifference $(x, y; E_1, E_2) \sim (x, y; E_2, E_1)$ holds, implying that $P(E_1) = P(E_2) = \frac{1}{2}$. Next steps consist of splitting E_1 and E_2 into symmetric events that result in a subjective probability of $\frac{1}{4}$. Repeating this procedure allows to iteratively construct a series of symmetric events that have a subjective probability of $\frac{1}{2^i}$, with $i = 1, 2, \dots, n$. With a set of symmetric events and known subjective probabilities, these methods enable precise

measurement of $W(\cdot)$ and $U(\cdot)$.

2.2.2 Elicitation method for asymmetric events

Belief hedges method of Baillon et al. (2018b)

For dealing with asymmetric events, Baillon et al. (2018b) introduced the *belief hedges method* that consists of evaluating ambiguity attitudes through two indexes. Baillon et al. (2018b) assume a minimal degree of richness of the state space Ω of three non-null events ($E_1 = A$, $E_2 = B$ and $E_3 = C$) which are mutually exclusive and exhaustive ($E_1 \cup E_2 \cup E_3 = \Omega$ and $E_i \cap E_j = \emptyset$ 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.

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

$$m_E = f[P(E)] \quad (2)$$

The two indexes of the ambiguity function of Baillon et al. (2018b) 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. $w(\cdot) = W(\cdot)$) 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.

Baillon et al. (2018b) argued that their indexes are not biased by beliefs. The following proposition shows that their indexes are downward biased for sources of uncertainty that involved asymmetric events of the forms (i) $P(E_1) < \frac{1}{3}$, $P(E_2) < \frac{1}{3}$, and $P(E_3) > \frac{1}{3}$. The proposition is established under assumptions that reflect the commonly observed shape of ambiguity function (Li et al., 2020): concave for small probability and convex for high probability.

Proposition 1 (*downward biases of pessimism and insensitivity indexes for asymmetric events*): Consider an individual that has the same ambiguity function $f(\cdot)$ for two different sources of uncertainty 1 and 2, involving each three mutually exclusive and exhaustive events E_i , $i = 1, 2, 3$. Denote by $P_j(\cdot)$ the belief functions for the source of uncertainty j , with $j = 1, 2$. Let us assume symmetric events for the first sources: $P_1(E_1) = P_1(E_2) = P_1(E_3) = \frac{1}{3}$. Let us assume asymmetric events for the second source: either (i) $P_2(E_1) < \frac{1}{3}$, $P_2(E_2) < \frac{1}{3}$, and $P_2(E_3) > \frac{1}{3}$ or (ii) $P_2(E_1) > \frac{1}{3}$, $P_2(E_2) > \frac{1}{3}$, and $P_2(E_3) < \frac{1}{3}$. Hence:

- $a_2 < a_1$ if $f''\left(\frac{1}{3}\right) < 0$ and $f''\left(\frac{2}{3}\right) > 0$.
- $b_2 < b_1$ if $f''\left(\frac{2}{3}\right) > -f''\left(\frac{1}{3}\right) > 0$.

See proof of Proposition 1 in Appendix 1.

The Proposition 1 shows that the indexes of Baillon et al. (2018b) might be misleading in understanding the differences in ambiguity functions related to two sources of uncertainty, one involving symmetric events and the other asymmetric events. Note that the only case where the indexes of Baillon et al. (2018b) work perfectly, is when the ambiguity function is linear (Baillon et al., 2021, Theorem 16). This is satisfied when the weighting functions $w(\cdot)$ and $W(\cdot)$ are the specification of Chateauneuf et al. (2007).

Neo-additive method

Baillon et al. (2018a) proposed a method to elicit the utility function, weighting function, and beliefs for asymmetric events, under the neo-additive weighting function specification (Chateauneuf et al., 2007).

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 (i.e. E_{12}).

Parametric assumptions are made sequentially. In the first stage, the certainty equivalent data associated to one event (E_1) is used to estimate the power utility function (i.e. x^α) and

the four event weights (i.e. $W(P(E_1))$, $W(P(E_2))$, $W(P(E_3))$ and $W(P(E_{12}))$), according to [Abdellaoui et al. \(2011b, 2008\)](#)'s method. In the second stage, the neo-additive weighting function is specified:

$$W(P(E)) = (1 - a)P(E) + \frac{a - b}{2} \quad \text{with } a \in (0, 1) \text{ and } b \in (-a, a)$$

Parameters a and b denote likelihood insensitivity and pessimism index, respectively. The four event weights from the first stage allow to estimate the pessimism (b) and insensitivity (a) and the three beliefs as follows

$$b = 1 - W(P(E_{12})) - W(P(E_3)) \quad (3)$$

$$a = 1 - \sum_{i=1}^3 W(P(E_i)) + 3(W(P(E_1)) + W(P(E_2)) - W(P(E_{12}))) \quad (4)$$

$$P(E_i) = \frac{W(P(E_i)) - \frac{a-b}{2}}{1 - a} \quad \text{for } i = 1, 2, 3 \quad (5)$$

In what follows, we show that in terms of misspecification issues, the neo-additive weighting function is outperformed by the two-parametric weighting function of [Goldstein and Einhorn \(1987\)](#), which in turn, is outperformed by the two-parameter weighting function of [Prelec \(1998\)](#).

For each of the three weighting functions, we randomly generate data for 1000 hypothetical individuals. For each individual, we generate – from uniform distributions – the values of insensitivity and pessimism parameters,¹ as well as the triplet of subjective probabilities $((P(E_1), P(E_2), P(E_3)))$, with $P(E_i) \in (0, 1)$ and $\sum_{i=1}^3 P(E_i) = 1$. In addition, for each individual we generate the four event weights $W(P(E_1))$, $W(P(E_2))$, $W(P(E_3))$, and $W(P(E_{12}))$ using the previously simulated weighting function (i.e. insensitivity and pessimism parameters) along with subjective probabilities.

Overall, for each individual and each specification, we have a set of four data points corresponding to the four event weights $W(P(E_1))$, $W(P(E_2))$, $W(P(E_3))$, and $W(P(E_{12}))$. These four data points are used to deterministically recover four parameters: two related to the weight-

¹For neo-additive weighting function, we first draw a from $\mathcal{U}[0, 1]$. Second, we draw b from $\mathcal{U}[-a, a]$. For the weighting function of [Prelec \(1998\)](#) and [Goldstein and Einhorn \(1987\)](#), we draw insensitivity and pessimism parameters from $\mathcal{U}[0.1, 1.5]$. The simulated range are consistent with empirical estimate (e.g. [Baillon et al., 2018a](#); [Abdellaoui et al., 2011a](#); [Gonzalez and Wu, 1999](#))

ing function (pessimism and insensitivity), and two related to the beliefs $P(E_1)$ and $P(E_2)$. Note that recovering $P(E_1)$ and $P(E_2)$ also implies the recovery of $P(E_3) = 1 - P(E_1) - P(E_2)$ and $P(E_{12}) = P(E_1) + P(E_2)$.

The recovering of the four parameters proceeds as follows. For each individual data generated through the weighing functions of [Prelec \(1998\)](#) or [Goldstein and Einhorn \(1987\)](#), we use the neo-additive weighting function to estimate the underlying weighting function $\widehat{W}(\cdot)$ and subjective probabilities $\widehat{P}(E_i)$. Similarly, for each individual data generated through the neo-additive weighting function and the weighing function of [Prelec \(1998\)](#), we use the weighing function of [Goldstein and Einhorn \(1987\)](#) to estimate the underlying weighting function $\widehat{W}(\cdot)$ and subjective probabilities $\widehat{P}(E_i)$. Also, for each individual data generated through the neo-additive weighting function and the weighing function of [Goldstein and Einhorn \(1987\)](#), we use the weighing function of [Prelec \(1998\)](#) to estimate the underlying weighting function $\widehat{W}(\cdot)$ and subjective probabilities $\widehat{P}(E_i)$.

For each hypothetical individual, we compute the absolute difference between the true and estimated weighting functions, as well as the subjective probabilities as follows: $\sum_{j=1}^{999} \left| W\left(\frac{j}{1000}\right) - \widehat{W}\left(\frac{j}{1000}\right) \right|$ and $\sum_{i=1}^3 \left| P(E_i) - \widehat{P}(E_i) \right|$. [Table 1](#) reports the average of the absolute differences across all individuals. The average absolute errors (0.0216 on $W(\cdot)$ and 0.0273 on $P(\cdot)$) when specifying the weighting function of [Prelec \(1998\)](#) on data generated through the neo-additive weighting function is smaller than the average absolute errors (0.0421 on $W(\cdot)$ and 0.0852 on $P(\cdot)$) when specifying neo-additive weighting function on data generated through the weighing function of [Prelec \(1998\)](#) [p -value = 0.0003 for $P(\cdot)$ and p -value < 0.0001 for $W(\cdot)$]. Hence, the specification of [Prelec \(1998\)](#) is more robust than the neo-additive weighting function ([Chateauneuf et al., 2007](#)) in terms of misspecification issues (e.g [Kpepli et al., 2023](#); [Gao et al., 2020](#)).

The average absolute errors (0.0207 on $W(\cdot)$ and 0.0187 on $P(\cdot)$), when specifying the weighting function of [Prelec \(1998\)](#) on data generated through the weighing function of [Goldstein and Einhorn \(1987\)](#), is smaller than the average absolute errors (0.0271 on $W(\cdot)$ and 0.0258 on $P(\cdot)$) when specifying the weighting function of [Goldstein and Einhorn \(1987\)](#) on data generated through the weighing function of [Prelec \(1998\)](#) [p -value < 0.0001 for $P(\cdot)$ and p -value < 0.0001 for $W(\cdot)$]. Hence, the specification of [Prelec \(1998\)](#) is more robust than that of [Goldstein and Einhorn \(1987\)](#) in terms of misspecification issues (e.g [Kpepli et al., 2023](#); [Gao et al., 2020](#)).

The average absolute errors 0.0283 on $W()$, when specifying the weighting function of [Goldstein and Einhorn \(1987\)](#) on data generated through the neo-additive weighting function, is smaller than the average absolute errors 0.0442 on $W()$ when specifying neo-additive weighting function on data generated through the weighting function of [Goldstein and Einhorn \(1987\)](#) [$p - value < 0.0001$]. However, the average absolute errors 0.0370 on $P()$, when specifying the weighting function of [Goldstein and Einhorn \(1987\)](#) on data generated through the neo-additive weighting function is larger than the average absolute errors 0.0322 on $P()$, when specifying neo-additive weighting function on data generated through the weighting function of [Goldstein and Einhorn \(1987\)](#) [$p - value = 0.0002$]. If the primary aim is to measure ambiguity attitudes rather than beliefs, the specification of [Goldstein and Einhorn \(1987\)](#) could be considered more robust than the neo-additive weighting function of [Chateauneuf et al. \(2007\)](#) in terms of misspecification issues (e.g [Kpegli et al., 2023](#); [Gao et al., 2020](#)).

Table 1: Result of parameter recovery in misspecification exercises

	Estimated specification of $W()$	Data generation	Average absolutes differences	
			$P()$	$W()$
1	Neo-additive	Goldstein and Einhorn (1987)	0.0322	0.0442
1	Neo-additive	Prelec (1998)	0.0852	0.0421
2	Goldstein and Einhorn (1987)	Neo-additive	0.0370	0.0283
2	Goldstein and Einhorn (1987)	Prelec (1998)	0.0258	0.0271
3	Prelec (1998)	Neo-additive	0.0273	0.0216
3	Prelec (1998)	Goldstein and Einhorn (1987)	0.0187	0.0207

3 Elicitation Method

This section extends the source method of [Abdellaoui et al. \(2011a\)](#), originally proposed to measure ambiguity attitudes for symmetric events, to account for asymmetric events. We keep the same notation 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. \(2023\)](#), which unfolds as follows. The researcher starts by considering a set of $m = 3$ mutually exclusive and exhaustive nonnull events $\Omega_1^* = \{E_1, E_2, E_3\}$. The resulting set of composite events is given by $\Omega_2^* = \{E_{12}, E_{13}, E_{23}\}$. Then, the researcher selects a composite event in Ω_2^* , i.e. 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 $E \in \Omega_1^* \cup E_{12}$

$$ce_k^h \succ (x_E^h, y_E^h; E, E^c), \quad h = 1, 2, \dots, N_E \quad \text{and} \quad N_E \geq 2 \quad (6)$$

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 $x_E^h > y_E^h$. At least two different certainty equivalents are elicited for the same event, but with different payoffs. 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_k^h , x_E^h , and y_E^h , respectively. Also, we denote by \mathbf{I}^E the dummy variable that takes the value of 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 power utility function $U(z) = z^\alpha$, it turns out

$$\mathbf{ce}_l = \left[\left(\mathbf{x}_l^\alpha - \mathbf{y}_l^\alpha \right) \times \left(\sum_{E \in \Omega_1^* \cup E_{12}} \delta_E \mathbf{I}_l^E \right) + \mathbf{y}_l^\alpha \right]^{\frac{1}{\alpha}} + \mathbf{e}_l \quad (7)$$

where l is the l^{th} line in \mathbf{ce} , \mathbf{x} , and \mathbf{y} . We assume that the error term is normally distributed with mean 0 and variance that depends on the range of outcomes $\sigma_l = \sigma |\mathbf{x}_l - \mathbf{y}_l|$ (Bruhin et al., 2010; Kpegli et al., 2023).

Finally, Equation (7) is estimated by maximum likelihood method. From the estimations results, one gets the parameter(s) of the utility function (α) 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 $W(P(\cdot))$ 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

$$\sum_{E \in \Omega_1^*} \hat{\delta}_E = 1 \quad \text{and} \quad \hat{\delta}_{E_{12}} = \hat{\delta}_{E_1} + \hat{\delta}_{E_2} \quad (8)$$

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

3.2 Stage 2: Elicitation of weighting function and beliefs

We assume the two-parameter weighting function of [Prelec \(1998\)](#):

$$W(P(E)) = \exp\left(-\eta\left(-\ln(P(E))\right)^\gamma\right) \quad (9)$$

where $\eta > 0$ and $\gamma > 0$ are an index of pessimism and an anti-index of likelihood insensitivity, respectively ([Abdellaoui et al., 2021a](#)). Insensitivity makes the weighting function flatter in the range of intermediate subjective probability and steeper near the ends. Hence, the weighting function produces an inverse S-shaped. Pessimism determines the elevation of the weighting function.

Using the four estimated willingness to bet $\hat{\delta}_{E_1}$, $\hat{\delta}_{E_2}$, $\hat{\delta}_{E_3}$, and $\hat{\delta}_{E_{12}}$, the exhaustivity and exclusivity conditions imply:

$$\exp\left(-\left(-\frac{1}{\eta}\ln(\hat{\delta}_{E_1})\right)^\frac{1}{\gamma}\right) + \exp\left(-\left(-\frac{1}{\eta}\ln(\hat{\delta}_{E_2})\right)^\frac{1}{\gamma}\right) + \exp\left(-\left(-\frac{1}{\eta}\ln(\hat{\delta}_{E_3})\right)^\frac{1}{\gamma}\right) = 1 \quad (10)$$

$$\exp\left(-\left(-\frac{1}{\eta}\ln(\hat{\delta}_{E_1})\right)^\frac{1}{\gamma}\right) + \exp\left(-\left(-\frac{1}{\eta}\ln(\hat{\delta}_{E_2})\right)^\frac{1}{\gamma}\right) = \exp\left(-\left(-\frac{1}{\eta}\ln(\hat{\delta}_{E_{12}})\right)^\frac{1}{\gamma}\right) \quad (11)$$

The system of the two equations (10) and (11) allows to estimate deterministically the pessimism and insensitivity parameters η and γ .

Finally, using estimated values $\hat{\delta}_{E_1}$, $\hat{\delta}_{E_2}$, $\hat{\delta}_{E_3}$, $\hat{\delta}_{E_{12}}$, $\hat{\eta}$, and $\hat{\gamma}$, the subjective probabilities are estimated as follows:

$$P(E_i) = \exp\left(-\left(-\frac{1}{\hat{\eta}}\ln(\hat{\delta}_{E_i})\right)^\frac{1}{\hat{\gamma}}\right), \quad i = 1, 2, 3 \quad (12)$$

3.3 Stage 3: separating crucial forms of uncertainty in trust and coordination games from betrayal attitudes and social preference

In economic experiments, subjects in the traditional trust game encounter two main uncertainties: strategic uncertainty and social ambiguity. Strategic uncertainty involves forming beliefs about others' decisions in strategic interactions ([Renou and Schlag, 2010](#)). Social ambiguity arises from uncertainty regarding 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 (Li et al., 2020).

The first two stages of our method allow us to estimate the pessimism (η) and the likelihood insensitivity (γ) in the weighting function for different sources of uncertainty, leading to the assessment of social ambiguity and strategic uncertainty. Also, the first two stages provide the estimate of the utility (α) towards own outcomes and beliefs ($P(\cdot)$). The third stage of our elicitation method aims to separate social ambiguity and strategic uncertainty from social preferences and betrayal aversion, which are other elements that also influence decisions in the trust game.

Social preferences influence trust games because players recognize that their choices affect both their own payoffs and those of others (Bohnet et al., 2008). In a modified trust game, Trustors can interact with nature instead of another person, facing nature ambiguity (i.e. ambiguous outcomes are determined by a non-human source).

Alongside social ambiguity, strategic uncertainty, and social preferences, betrayal aversion uniquely distinguishes the trust game from other games comprising strategic interactions (e.g. beauty contests and coordination games). Betrayal aversion reflects a cost for the Trustor when trust is violated (Bohnet et al., 2008). This cost is viewed by Bohnet et al. (2008) as a dis-utility that enters into the utility function alongside the utility towards one’s own payoffs and social preferences. Formally, we define the utility function for player i in the trust game as follows:

$$u_i(x_i, x_j) = x_i^\alpha - s_1 \max\{x_j - x_i, 0\} - s_2 \max\{x_i - x_j, 0\} - \beta \quad (13)$$

where x_i and x_j represent the payoffs for players i and j , respectively. This utility function incorporates three main components:

1. Utility from own payoff: x_i^α , where α reflects player i ’s utility curvature, estimated from the certainty-equivalent data in the first two stages of our elicitation method.
2. Social preferences: inequality aversion is captured through parameters s_1 and s_2 , following the model in Fehr and Schmidt (1999).
3. Betrayal attitudes: represented by β , with $\beta > 0$ indicating betrayal aversion, $\beta < 0$ indicating betrayal seeking, and $\beta = 0$ reflecting neutrality (Bohnet et al., 2008).

The third stage of our elicitation method models the probability of trust as a function of betrayal attitudes (β) and social preferences (s_1 and s_2), while accounting for beliefs ($P(\cdot)$), utility from

own payoff (α), attitudes towards sources of uncertainty (ambiguity aversion, social ambiguity, and strategic uncertainty) captured by pessimism (η) and likelihood insensitivity (γ). Appendix 4 details the structural estimation procedure for this third stage of our elicitation method.

The following experimental design aims to identify which components of the weighting function (η and γ) capture the effect of social ambiguity and strategic uncertainty. The experimental design also seeks to define the best way to test betrayal aversion: either as a disutility from trusting (β), as in [Bohnet et al. \(2008\)](#), or as a pessimistic attitude towards strategic uncertainty in the trust game (η), as in [Li et al. \(2020\)](#).

4 Experimental Design

We recruited 174 students from the subjects pool of GATE-Lab to participate in an online experiment. Subjects were informed that the experiment could take up to 45 minutes and that they would receive €1.5 as a participation fee, with the possibility of earning an additional amount of up to €20. The additional payment was a randomly selected outcome from one of their decisions during the experiment. The average age of subjects was 21 years and around 57% were female.

Following a within-subjects design, the experiment comprises five conditions. Four of these conditions include two stages, while the remaining condition consists only of the second stage. In the first stage, subjects undergo a task that embodies the coordination game or the trust game. The second stage involves a binary decision task where participants choose between a safe option and a lottery. This binary decision allows us to elicit subjects' beliefs, ambiguity attitudes, and utility function. While the sequence of the first and second stages remained consistent across the four two-stage conditions, the order of the five experimental conditions was randomized across subjects. Subjects were required to complete both stages within each condition before moving on to the next one.

Instructions specific to each stage are provided at the start of that stage.² To avoid hedging issues, our payment protocol ensures that participants are compensated based on the outcome of one randomly selected decision from either one of the two stages (in two-stage conditions) or the single-stage condition.

²The complete set of instructions is presented in Appendix 3.

4.1 First stage

Four of the five experimental conditions include a first stage where participants performed tasks that represent different sources of uncertainty (i.e. strategic uncertainty, social ambiguity, and betrayal aversion), within the context of either the coordination game or the trust game. These tasks required the involvement of two players: 89 subjects were assigned the role of Player 1, and 85 subjects took on the role of Player 2, maintaining their assigned roles throughout the entire experiment.³

After completing each condition (comprising one or two stages), participants moved on to the next one. At the start of each new condition, couples of Player 1s and 2s were randomly re-matched, ensuring that no two players were paired together more than once, this fact was clearly communicated to subjects in the instructions. Moreover, subjects were not given feedback about their counterpart’s decisions until the experiment fully concluded.

In what follows, we present the tasks that define the first stage of each of the two-stages conditions. From now on, we will refer to these tasks as treatments.

First, the *social ambiguity - coordination game (social ambiguity - cg)* treatment is designed to measure both ambiguity attitudes and social ambiguity. In this treatment, Player 1 chooses between three neutrally framed options: Left (L), Right (R), and Middle (M). Meanwhile, Player 2 is given €5 and must decide how she would prefer to spend them, selecting between an Amazon voucher, a Google Play voucher, or an Apple Store voucher.⁴ As such, Player 2’s own payoff is not influenced by Player 1’s choices (see Table 2 for the payoff structure).⁵ As Player 2’s decision reflects her personal preferences and is independent of Player 1’s actions, Player 1 should not consider this as a strategic interaction. Nonetheless, Player 1 faces social ambiguity because her own payoff is directly affected by Player 2’s decision. In this treatment, the ambiguous situation involves asymmetric events based on Player 1’s prior beliefs about Player 2’s preferences among Amazon, Google Play, and Apple Store options.

Second, we implement the *strategic uncertainty - coordination game (strategic uncertainty-cg)* treatment to assess strategic uncertainty. Both Player 1 and Player 2 choose between options L, R, or M. As shown in in payoff structure presented in Table 3, the game has no dominant strategies, and events are symmetric. Since both players are fully informed of the payoff matrix,

³Roles were randomly assigned by the computer at the beginning of the experiment.

⁴Player 2 is informed that her decision will impact Player 1’s payment, but she is unaware of the exact nature or extent of this impact.

⁵The exchange rate is such that 1 ECU = €1.

Table 2: Payoff-matrix social ambiguity - cg

		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

Note: Numbers on the left (right) of each cell represent payoffs for Player 1 (Player 2).

each player faces strategic uncertainty, as her final payout depends on how her decision interacts with her counterpart’s decision. Thus, this treatment captures ambiguity attitudes, strategic uncertainty, and social ambiguity simultaneously.

Table 3: Payoff-matrix strategic uncertainty - cg

		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

Note: Numbers on the left (right) of each cell represent payoffs for Player 1 (Player 2).

The next two treatments, both conducted within the framework of the trust game, are based on the experimental design of [Li et al. \(2020\)](#).⁶

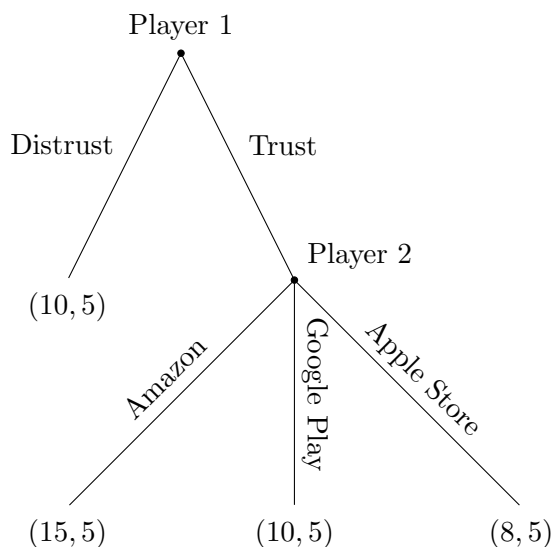
The third treatment is the *social ambiguity – trust game (social ambiguity - tg)*, illustrated in Figure 1. Player 1 chooses between Distrust (D) and Trust (T).⁷ If Player 1 selects D, she receives 10 ECU with certainty. If Player 1 opts for T, her payment depends on Player 2’s preferences. Preferences of Player 2 are elicited as follow. Player 2, receives 5 ECU and must decide how she would prefer to use the money by selecting a voucher from Amazon, Google Play, or Apple Store. This treatment shares several features with the ‘social ambiguity - cg’ treatment. First, Player 2s choice is the same in both treatments. Additionally, Player 2 is informed that her decision might affect Player 1’s payoff, but remains unaware of the specific nature or degree of this impact. Finally, both treatments allow us to study Player 1’s decisions

⁶[Li et al. \(2020\)](#)’s experiment included two treatments - social and betrayal ambiguity - each representing distinct forms of uncertainty. The social ambiguity treatment involved guessing a partner’s snack choice. In the second treatment, betrayal ambiguity stemmed from a partner’s allocation decision in a trust game.

⁷To avoid framing effects, the options Distrust and Trust are neutrally framed in the experiment as Left and Right, respectively.

in face of asymmetric events, under ambiguity attitudes and social ambiguity. The key difference between the two treatments is the context: one occurs within a coordination game, while the other within a trust game.

Figure 1: Social ambiguity - tg



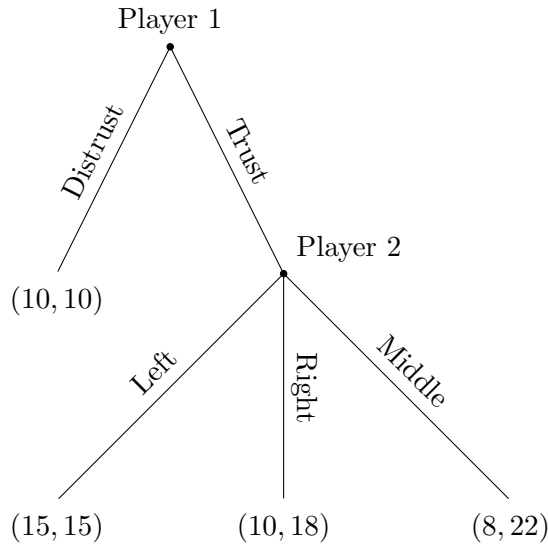
Note: Numbers on the left (right) of each final node represent payoffs for Player 1 (Player 2).

Finally, we introduce the *betrayal aversion* treatment to examine ambiguity attitudes, social ambiguity, strategic uncertainty, and betrayal aversion in face of asymmetric events. In this treatment, Player 1 chooses between a safe option, Distrust, where both players receive 10 ECU, and an ambiguous option, Trust, where the final payoffs depend on Player 2's decision.⁸ If Player 1 selects T, Player 2 must choose between L, R, or M, which in terms of retribution after Player 1's decision, represents reciprocation, neutrality, and betrayal, respectively. The game structure and corresponding payoffs are outlined in Figure 2. In this scenario, Player 1 faces ambiguity about Player 2's strategic decision, which also leads to potential betrayal.⁹

⁸In the experiment, the options Distrust and Trust are neutrally framed as Left and Right, respectively.

⁹Social preferences play a role in this first stage of the betrayal aversion condition. However, social preferences are excluded in the second stage of this condition due to the task's structure, which is independent of the counterpart's payoff. Our elicitation method leverages the fact that social preferences are present in the first stage but absent in the second, allowing us to separate social preferences from social ambiguity and strategic uncertainty in structural estimation.

Figure 2: Betrayal aversion



Note: Numbers on the left (right) of each final node represent payoffs for Player 1 (Player 2).

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

Only Player 1s participate in the second stage of each condition, as well as the remaining one-stage condition. Each condition's first stage is followed by its second stage. Therefore, Player 1 completes the second stage immediately after each treatment (i.e. first stage), moving on to the next condition only once the tasks in the two stages are completed.

We elicit Player 1s' certainty equivalents using the switching outcome technique (Gonzalez and Wu, 1999; Tversky and Kahneman, 1992) from a list of 12 binary lotteries $L = (x, y; E, E^c)$, which incorporate Player 2's decisions as events. These events can be represented by choices such as L, R, and M, or by selecting Amazon, Google Play, and Apple Store vouchers, depending on the most recently performed treatment. To determine the certainty equivalent of each lottery L , Player 1s make a series of binary choices between lottery L and a list of equally spaced safe payoffs, ranging 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 presents an example of the lotteries used in the second stage of both conditions involving the treatments *strategic uncertainty-cg* and *betrayal aversion*, where Player 2’s decisions are represented by options L, R, or M. Consider, for instance, lottery 1 from the first set of lotteries in Table 4. In this scenario, Player 1 makes eight decisions, choosing between a safe outcome and a lottery. The safe options’ payoffs decrease from 15 ECU to 8 ECU, while the lottery remains fixed, offering either 15 or 8 ECU as possible payoffs.

Table 4: Binary lotteries

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

Similarly, in the one-stage condition, referred to as *risk* treatment, which consists solely of the second stage, Player 1 selects between a safe outcome and a lottery. The lottery’s outcome is determined by nature: a random, equally likely selection of L, R, or M by the computer. This condition isolates and measures risk attitudes in face of symmetric events.¹⁰ Figure 3 presents an example of the experimental interface used in the *risk* treatment, where subjects chose either the safe option (Alternative A) or the lottery (Alternative B).

¹⁰It could be argued that evaluating risk instead of ambiguity might bias our measurement of social ambiguity. However, incorporating an ambiguity treatment would not alter the core conclusions of our paper regarding preferences for social ambiguity; rather, it would likely strengthen them. A detailed discussion on this matter is presented in Section 6.

Figure 3: Risk

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 risk treatment. *Note:* The image is presented in English for illustration purposes, but the experiment was conducted in French.

4.3 Comparison between treatments and hypotheses

In the first stage of the strategic uncertainty and betrayal aversion conditions, individuals may consider the difference between their own payoff and that of others when making decisions, meaning that social preferences play a role (e.g. [Fehr and Schmidt, 1999](#)).

Our experimental design ensures that social preferences are removed from the second stage of the experimental conditions ([Li et al., 2020](#)). Then, during the elicitation of certainty equivalents, any social preferences that might have influenced Player 1’s decisions in the earlier stages are no longer relevant.

We conduct a series of comparisons based on Player 1’s decisions in the second stage of the previously outlined conditions.¹¹ The following comparisons across the five treatments aim to isolate and identify the effects of social ambiguity, strategic uncertainty, and betrayal aversion.

1. ***Risk vs. social ambiguity - cg: social ambiguity in the coordination game context***

The *risk* condition captures only risk attitudes, while the *social ambiguity - cg* condition captures both ambiguity attitudes and social ambiguity. Comparing these two conditions allows us to identify the effect of social ambiguity within the context of the coordination game.

2. ***Risk vs social ambiguity - tg: social ambiguity in the trust game context***

The *risk* condition assesses ambiguity attitudes, while the *social ambiguity - tg* condition measures both ambiguity attitudes and social ambiguity ([Li et al., 2020](#)). Comparing these two conditions allows us to study the effect of social ambiguity within the context

¹¹This design and behavioral conjectures have been pre-registered at AsPredicted (#71020).

of the trust game.

3. *Social ambiguity - cg* vs. *strategic uncertainty - cg*: **strategic uncertainty**

The condition *social ambiguity - cg* measures ambiguity attitudes and social ambiguity.

The *strategic uncertainty - cg* condition, measures ambiguity attitudes, social ambiguity, and strategic uncertainty. By comparing these two conditions, we are able to capture the effect of strategic uncertainty.

4. *Social ambiguity - tg* vs. *betrayal aversion*: **betrayal aversion**

The *social ambiguity - tg* condition captures both ambiguity attitudes and social ambiguity, while the *betrayal aversion* condition captures ambiguity attitudes, social ambiguity, strategic uncertainty, and betrayal aversion.

Based on the previous comparisons, we aim to test the following conjectures.¹²

- Hypothesis 1: social ambiguity is captured by pessimism.
- Hypothesis 2: strategic uncertainty is captured by likelihood insensitivity.
- Hypothesis 3:
 - (a) betrayal aversion is not captured by pessimism (Li et al., 2020).
 - (b) betrayal aversion is captured by the disutility or cost associated with trust (Bohnet et al., 2008).

The certainty equivalent data in the second stage is then used to derive the utility function towards own outcome, weighting function (pessimism and insensitivity), and beliefs, as detailed in Subsections 3.1 and 3.2. Comparing pessimism and insensitivity across treatments allows us to test Hypotheses 1, 2, and 3(a). Our Subsection 3.3 allows us to test Hypothesis 3(b) by measuring the cost of trust alongside social preferences. This is done by comparing the probability of trust in the social ambiguity and betrayal aversion treatments during the first stage of our experiment, while controlling for beliefs, utility from one's own outcome, pessimism, and insensitivity as measured in the second stage

¹²This design and behavioral conjectures have been pre-registered at AsPredicted (#71020).

5 Results

All statistical tests are two-sided t -test computed from regressions, unless otherwise stated. The details of individual estimates are provided in Appendix 2.

5.1 Utility

Following the literature (e.g. Abdellaoui et al., 2011a; Baillon et al., 2018a,b), our estimate relies on equal utility function across sources of uncertainty. The utility function was close to linear both at the aggregate and at the individual level (see Table 5). The mean power coefficient α was 0.997, and is not significantly different from linear (p -value = 0.9376).¹³

Table 5: Utility function

	Mean	Median	Interquartile range
Curvature (α)	0.997	0.960	[0.807, 1.080]

5.2 Events weights

Table 6 provides the estimate of events' weights. The absence of event weighting function supported by SEU holds if we cannot reject both that (i) the sum of the weights of the three mutually exclusive events is 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. 8). The joint test of conditions (i) and (ii) leads to its strong rejection in all treatments (all p -values < 0.0001). Then, subjects violate SEU.

¹³In the second stage of the experiment, we assume a common utility function across all sources of uncertainty, implying that all attitudes toward uncertainty are fully captured by the weighting function (e.g. Baillon et al., 2018b; Li et al., 2020).

Table 6: Events weights

	Mean	Median	Interquartile range
Risk			
$W(P(\text{Left}))$	0.296	0.301	[0.241, 0.355]
$W(P(\text{Right}))$	0.288	0.282	[0.220, 0.352]
$W(P(\text{Middle}))$	0.290	0.289	[0.236, 0.352]
$W(P(\text{Left or Right}))$	0.470	0.463	[0.380, 0.586]
Social ambiguity-cg			
$W(P(\text{Amazon}))$	0.393	0.361	[0.269, 0.472]
$W(P(\text{Google Play}))$	0.288	0.272	[0.201, 0.360]
$W(P(\text{Apple Store}))$	0.298	0.289	[0.208, 0.358]
$W(P(\text{Amazon or Google Play}))$	0.509	0.535	[0.365, 0.639]
Strategic uncertainty-cg			
$W(P(\text{Left}))$	0.305	0.287	[0.240, 0.371]
$W(P(\text{Right}))$	0.297	0.281	[0.229, 0.358]
$W(P(\text{Middle}))$	0.297	0.284	[0.222, 0.355]
$W(P(\text{Left or Right}))$	0.481	0.470	[0.380, 0.614]
Social ambiguity-tg			
$W(P(\text{Amazon}))$	0.380	0.358	[0.245, 0.430]
$W(P(\text{Google Play}))$	0.276	0.275	[0.199, 0.359]
$W(P(\text{Apple Store}))$	0.291	0.282	[0.213, 0.359]
$W(P(\text{Amazon or Google Play}))$	0.491	0.469	[0.354, 0.621]
Betrayal aversion			
$W(P(\text{Reciprocate}))$	0.312	0.290	[0.227, 0.384]
$W(P(\text{No hurt strategy}))$	0.306	0.295	[0.225, .360]
$W(P(\text{Betray}))$	0.349	0.317	[0.238, 0.390]
$W(P(\text{Reciprocate or No hurt strategy}))$	0.434	0.448	[0.317, 0.550]

5.3 Beliefs

Table 7 provides the subjective probability (i.e. beliefs). A priori, symmetry of events is expected for the *risk* treatment. Similarly, given that the coordination game does not have any dominated strategy, we can also expect symmetry of events for the *strategic uncertainty - cg* treatment. In line with this expectations, the null hypothesis of equally likely events cannot be rejected for the *risk* and *strategic uncertainty - cg* treatments $p - value = 0.2342$ and $p - value = 0.5802$, respectively. These results provide a first successful validity test of our method.

On the other hand, symmetry of events is rejected for the treatments *social ambiguity - cg* ($p - value < 0.0001$) and *social ambiguity - tg* ($p - value < 0.0001$). In the *social ambiguity - cg* treatment, Player 1s believe that Player 2s choose to spend money in Amazon, Google Play, and Apple Store vouchers with probability 49.9%, 23.8%, and 26.3%, respectively. In

the treatment *social ambiguity - tg*, Player 1s believe that Player 2s choose to spend money in Amazon, Google Play, and Apple Store vouchers with probability 49.9%, 23.2%, and 27.0%, respectively. Although under two different context (i.e. trust game and coordination game), the two social ambiguity treatments involve the same events. Therefore, beliefs about these event under different context, should remain the same. Accordingly, a joint test leads to the conclusion that the beliefs are the same in these two social ambiguity treatments ($p - value = 0.9487$). This result provides the second successful validity test of our method.

Symmetry of events is also rejected for *betrayal aversion* ($p - value = 0.0440$). We find that Player 1s (Trustors) thinks that Player 2s (Trustees) reciprocate, choose a no hurt strategy, and betray with probability 30.8%, 29.1% and 40.1%, respectively.

Table 7: Subjective probability (beliefs)

	Mean*	95 % Confidence interval
Risk		
$P(\text{Left})$	0.343	[0.329,0.357]
$P(\text{Right})$	0.325	[0.313,0.338]
$P(\text{Middle})$	0.331	[0.314,0.348]
Social ambiguity-cg		
$P(\text{Amazon})$	0.499	[0.424,0.574]
$P(\text{Google Play})$	0.238	[0.197,0.300]
$P(\text{Apple Store})$	0.263	[0.215,0.310]
Strategic uncertainty-cg		
$P(\text{Left})$	0.345	[0.322,0.367]
$P(\text{Right})$	0.328	[0.309,0.346]
$P(\text{Middle})$	0.328	[0.303,0.353]
Social ambiguity-tg		
$P(\text{Amazon})$	0.499	[0.415, 0.582]
$P(\text{Google Play})$	0.232	[0.189, 0.275]
$P(\text{Apple Store})$	0.270	[0.213,0.326]
Betrayal aversion		
$P(\text{Reciprocate})$	0.308	[0.257,0.358]
$P(\text{No hurt strategy})$	0.291	[0.256,0.327]
$P(\text{Betray})$	0.401	[0.338,0.464]

* estimates based on the mean event weights in Table 6

5.4 Ambiguity attitudes

Table 8 presents the results of the index of pessimism (η) and the anti-index¹⁴ of likelihood insensitivity (γ). In what follows, we present how these indexes capture the sources of uncertainty tested in the experiment.

¹⁴Anti-index defines a negative relation (i.e. when the γ increases, the likelihood insensitivity decreases).

- **Social ambiguity:** overall, social ambiguity is captured by a decrease in pessimism and an increase in likelihood insensitivity, which partially confirms our Hypothesis 1. Pessimism is lower in *social ambiguity - cg* than in *risk* ($p - value = 0.0060$). Pessimism is qualitatively lower in *social ambiguity - tg* than in *risk*, even though we cannot reject the null hypothesis of equality ($p - value = 0.0841$). Insensitivity is qualitatively higher in *social ambiguity - cg* than in *risk*, even though we cannot reject the null hypothesis of equality ($p - value = 0.1443$). Insensitivity is higher in *social ambiguity - tg* than in *risk* ($p - value = 0.0438$).
- **Strategic uncertainty:** in the coordination game, strategic uncertainty is captured by a decrease in likelihood insensitivity and by an increase in pessimism, which partially confirms our Hypothesis 2. Pessimism is lower in the *social ambiguity - cg* than in the *strategic uncertainty - cg* treatment ($p - value = 0.0315$). The likelihood insensitivity in *social ambiguity - cg* is larger than in *strategic uncertainty - cg* ($p - value = 0.0344$). In the condition under the trust game, we do not find any significant differences in pessimism or insensitivity between the *social ambiguity - tg* and *betrayal aversion* treatments.
- **Betrayal aversion:** overall, we find no evidence for betrayal aversion from the weighting function side, which confirms our Hypothesis 3(a). The difference in pessimism between *social ambiguity - tg* and *betrayal aversion* is not significant ($p - value = 0.4815$). Also, the difference in the likelihood insensitivity between treatments *social ambiguity - tg* and *betrayal aversion* is not significant ($p - value = 0.8000$).

Table 8: Ambiguity attitudes by treatmentst

	Mean*	Median	Interquartile range
Index of pessimism			
Risk	1.177	1.185	[0.986,1.336]
Social ambiguity-cg	1.079	1.118	[0.911,1.318]
Strategic uncertainty-cg	1.151	1.172	[0.962,1.379]
Social ambiguity-tg	1.111	1.109	[0.952,1.421]
Betrayal aversion	1.090	1.120	[0.975,1.391]
Anti-index of insensitivity			
Risk	0.490	0.549	[0.284,0.772]
Social ambiguity-cg	0.396	0.475	[0.142,0.769]
Strategic uncertainty-cg	0.492	0.512	[0.261,0.849]
Social ambiguity-tg	0.385	0.444	[0.080,0.747]
Betrayal aversion	0.399	0.377	[0.093,0.730]

* estimates based on the mean event weights in Table 6

Estimates of pessimism follow a general pattern of preference for asymmetric events. Individuals are more pessimistic about sources of uncertainty that involve symmetric events (1.177 in the *risk* treatment and 1.151 in the *strategic uncertainty - cg* treatment) compared to the sources of uncertainty that involve asymmetric events (1.079 for the *social ambiguity-cg* and 1.111 for the *betrayal aversion* treatment).

In addition, estimates of insensitivity follow a general pattern of higher insensitivity for asymmetric events. Individuals exhibit lower insensitivity for the sources of uncertainty that involve symmetric events (0.490 for *risk* and 0.492 for *strategic uncertainty - cg*) compared to the sources of uncertainty that involve asymmetric events (0.396 for *social ambiguity-cg* and 0.399 for *betrayal aversion*).

Preference for and insensitivity to asymmetric events are general behaviors that help explain patterns of social ambiguity and strategic uncertainty. Given that these sources of uncertainty are commonly used in various economic experiments, these findings shed light on general attitudes relevant for experimental setups.

5.5 Estimating betrayal aversion as the disutility associated with trust

5.5.1 Descriptive evidence

Data regarding the frequency of trust collected in the first stage is presented in Table 9. In the *social ambiguity - tg* treatment, 65.2% of Player 1s chose the Trust strategy (see Figure 1),

whereas in the *betrayal aversion* treatment, the amount of Player 1s choosing Trust decreases to 55.2% (see Figure 2), indicating a 10% decrease in trust. This reduction suggests evidence of betrayal aversion.

Table 9: Trust Frequency

	Social Ambiguity	Betrayal Aversion
Trust	65.2 %	55.1 %
Distrust	34.8 %	44.9 %

5.5.2 Structural identification

Descriptive evidence alone may be confounded by factors like beliefs, ambiguity aversion, social ambiguity, strategic uncertainty, and social preferences across the two treatments. Table 10 presents the structural estimates for betrayal attitudes (β) and social preference parameters (s_1 and s_2) as outlined in the third stage of our elicitation method (subsection 3.3 and Appendix 4). Our method controls for beliefs, ambiguity aversion, social ambiguity, strategic uncertainty, and utility from one’s own outcome. The positive and significant estimate for β ($\beta = 4.6$, p-value = 0.020) supports the presence of betrayal aversion as a cost associated with trust, which confirms our hypothesis 3(b) (Bohnet et al., 2008).

Table 10: Structural estimate of betrayal aversion

	Coefficient	(Std. Err.)
β	4.644 *	(1.991)
s_1	-0.516*	(0.255)
s_2	2.818 *	(1.400)
N	178	

Significance levels: †: 10% *: 5% **: 1%.

Standard errors are adjusted for clustering at the participant level.

6 Discussion

Li et al. (2020) introduce the difference between social ambiguity and strategic uncertainty. They define social ambiguity as the tendency for individuals to respond differently to outcomes resulting from human decisions compared to those originating from natural. On the other hand, strategic uncertainty refers to subjects’ reactions towards situation in which the outputs depend on strategic interactions.

Using the belief hedge method of [Baillon et al. \(2018b\)](#), [Li et al. \(2020\)](#) show experimentally that social ambiguity in a trust game (involving asymmetric events) corresponds to a decrease in ambiguity aversion compared to ambiguity derived from nature (involving symmetric events). They also show that strategic uncertainty results in an increase of likelihood insensitivity compared to ambiguity from nature.

Our proposition 1 provides two theoretical insights on the experimental results of [Li et al. \(2020\)](#). First, the decrease in ambiguity aversion might not exist, as their findings could reflect the downward bias inherent in their method. Second, the increase in insensitivity is underestimated. Our Proposition states that the belief hedge method is systematically downward biased as follow. For an individual exhibiting identical levels of ambiguity aversion and likelihood insensitivity for symmetric and asymmetric events, the belief hedge method is expected to consistently yield lower ambiguity aversion and insensitivity for asymmetric events compared to symmetric ones.

We implement our method in an online experiment, in which we revisited and extend the experimental results of [Li et al. \(2020\)](#). We confirm that people are less averse and more likelihood insensitive in trust games. However, contrary to [Li et al. \(2020\)](#), we find that both of these behaviors (less aversion and more insensitivity) correspond to social ambiguity.

We argue that the results from our experimental treatments under the trust game context can be explained by a more general conjecture: people are less averse in face of asymmetric events (preference for asymmetric events) and more insensitive to asymmetric events in comparison to symmetric events. We find evidence for this general conjecture by comparing asymmetric and symmetric events in the experimental treatments under a coordination game context, in addition to the comparison done under the context of the trust game. Our experimental manipulation of events corroborate the preference for and insensitivity to asymmetric events.

The rationale behind this general conjecture is the following. Asymmetric events suggest that individuals have some information indicating that one event is more likely than others, whereas symmetric events do not provide such information. As a result, individuals may perceive outcomes of asymmetric events as more predictable than those of symmetric events, leading them to prefer asymmetric events if they are ambiguity averse ([Ellsberg, 1961](#); [Snow, 2010](#)). Additionally, processing information to form beliefs about events can impose a cognitive load ([Sweller, 1988, 1994](#)), making individuals more insensitive to asymmetric events than to symmetric events ([Choi et al., 2022](#); [Wakker, 2010](#)). Many economic experiments beyond trust and

coordination games (e.g. public goods game, beauty contests) involve asymmetric events. Then, our findings provide insights into the mechanisms underlying these types of uncertainty, which often take part in experimental and behavioral economic studies.

The evidence on betrayal aversion in the literature is mixed. While some studies, like [Bohnet et al. \(2008\)](#), support its existence, others do not (e.g. [Li et al., 2020](#); [Fetchenhauer and Dunning, 2012](#); [Houser et al., 2010](#)). There are two possible explanations for these mixed findings. First, confounding factors – such as beliefs, ambiguity aversion, social preferences, social ambiguity, strategic uncertainty, and utility from one’s own outcome – may affect the results, and these factors need to be controlled when measuring betrayal attitudes (e.g. [Li et al., 2019](#)). Second, differences in experimental designs may influence the results. For instance, [Bohnet et al. \(2008\)](#) interpret betrayal aversion as a disutility from trusting (β), while [Li et al. \(2020\)](#) interpret it as a pessimistic attitude toward strategic uncertainty in the trust game (η). Our experimental design allows us to test both interpretations while controlling for confounding factors. Ultimately, we find evidence supporting betrayal aversion as a disutility from trust.

Our method allows us to replicate the well-known result of the nonlinear weighting function in the case of uncertainty. As such, subjects distort beliefs and then violate 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.

We make two internal validity tests for our method. First, we have two different treatments that involve the same asymmetric events. Therefore, the distributions of beliefs in these two treatments is expected to be the same. Our method successfully leads to this result. Second, we have two treatments that involve symmetric events. Our method also successfully satisfies the symmetry test. Replicating well-known results and successfully passing validity tests provide support for our method ([Abdellaoui et al., 2008](#)).

Finally, we acknowledge this paper faces the following two limitations.

First, in our *risk* treatment, the outcome of the lottery is determined by nature, which is a randomly equally likely selection between the three possible outcomes (L, R, or M) done by the computer. Since ambiguous situations are characterized by containing unknown objective probabilities of the possible events [Knight \(1921\)](#), the fact that we announce that the computer selects one of the outcomes with equal probability, moves the treatment from ambiguity to risk.

Although we measure risk, this does not impact our conclusions regarding strategic uncertainty and betrayal aversion, which rely on direct comparisons between social ambiguity, trust, and coordination games. However, our findings on the preference for social ambiguity, observed by comparing risk with social ambiguity, likely underestimate this preference due to the general evidence in favor of ambiguity aversion (e.g. [Ellsberg, 1961](#)). In other words, comparing social ambiguity with standard ambiguity would not weaken our result, but rather strengthen it. One advantage of announcing these probabilities is the fact that it allows us to perform an internal validity test for our method. Such test involves testing the null hypothesis of equally likely events for the *risk* treatment, which our method successfully satisfies.

Second, our method relies on parametric specifications, which can be prone to misspecification issues. However, we show that our specification, based on [Prelec \(1998\)](#) weighting function, is more robust to these issues than the commonly used neo-additive specification for measuring ambiguity attitudes ([Baillon et al., 2018a,b](#)).

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Appendix 1: Proof of Proposition 1

Point i): The insensitivity index of [Baillon et al. \(2018b\)](#) for the two sources of uncertainty are given by:

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

For the first source of uncertainty in which $P_1(E_1) = P_1(E_2) = P_1(E_3) = \frac{1}{3}$, we have $a_1 = 1 - 3\left(f\left(\frac{2}{3}\right) - f\left(\frac{1}{3}\right)\right)$. For simplicity, denote by $p_k = P_2(E_k)$, $k = 1, 2, 3$. We then have for the second source of uncertainty:

$$a_2 \equiv a(p_1, p_2) = 1 - f(p_1 + p_2) - f(1 - p_1) - f(1 - p_2) + f(p_1) + f(p_2) + f(1 - p_1 - p_2)$$

Second order approximation of $a(p_1, p_2)$ around $(p_1, p_2) = \left(\frac{1}{3}, \frac{1}{3}\right)$ leads to

$$a_2 - a_1 \simeq -2 \left(f''\left(\frac{2}{3}\right) - f''\left(\frac{1}{3}\right) \right) \left[\left(p_1 - \frac{1}{3}\right)^2 + \left(p_2 - \frac{1}{3}\right)^2 + \left(p_1 - \frac{1}{3}\right)\left(p_2 - \frac{1}{3}\right) \right]$$

As $f''\left(\frac{1}{3}\right) < 0$ and $f''\left(\frac{2}{3}\right) > 0$, it follows that $a_2 < a_1$.

Point ii): The ambiguity aversion index of [Baillon et al. \(2018b\)](#) for the two sources of uncertainty are given by:

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

For the first source of uncertainty in which $P_1(E_1) = P_1(E_2) = P_1(E_3) = \frac{1}{3}$, we have $b_1 = 1 - f\left(\frac{2}{3}\right) - f\left(\frac{1}{3}\right)$. We have for the second source of uncertainty:

$$b_2 \equiv b(p_1, p_2) = 1 - \frac{f(p_1 + p_2) + f(1 - p_1) + f(1 - p_2) + f(p_1) + f(p_2) + f(1 - p_1 - p_2)}{3}$$

Second order approximation of $b(p_1, p_2)$ around $(p_1, p_2) = \left(\frac{1}{3}, \frac{1}{3}\right)$ leads to

$$b_2 - b_1 \simeq -\frac{2}{3} \left(f''\left(\frac{2}{3}\right) + f''\left(\frac{1}{3}\right) \right) \left[\left(p_1 - \frac{1}{3}\right)^2 + \left(p_2 - \frac{1}{3}\right)^2 + \left(p_1 - \frac{1}{3}\right)\left(p_2 - \frac{1}{3}\right) \right]$$

As $f''\left(\frac{2}{3}\right) > -f''\left(\frac{1}{3}\right) > 0$, it follows that $b_2 < b_1$. QED.

Appendix 2: individual estimates

Tables 13 - 21 give results of our first stage (α and $W(P(\cdot))$) and second stage (η , γ and $P(\cdot)$).

Dots in tables mean monotonicity violation and then η , γ and $P(\cdot)$ cannot be estimated.

Table 11: Individual estimate: risk

id	α
1	1.219
2	0.821
3	0.934
4	0.511
5	0.610
6	0.954
7	1.124
8	0.740
9	1.058
10	1.065
11	0.584
12	0.807
13	1.740
14	1.130
15	0.961
16	0.994
17	1.239
18	1.007
19	2.177
20	0.874
21	0.018
22	0.786
23	1.025
24	0.825
25	0.802

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Table 12 – continued from previous page

id	α
26	1.629
27	0.960
28	0.905
29	0.642
30	1.165
31	1.012
32	0.963
33	0.864
34	1
35	1.133
36	0.756
37	1.116
38	1.206
39	0.705
40	0.957
41	0.881
42	0.733
43	0.809
44	0.914
45	0.640
46	1.056
47	0.455
48	2.599
49	0.536
50	0.753
51	1.019
52	1.007
53	1.334
54	0.825

Continued on next page

Table 12 – continued from previous page

id	α
55	1.036
56	1.029
57	2.230
58	1.103
59	1.086
60	0.980
61	1.208
62	0.541
63	0.828
64	0.909
65	1.008
66	0.611
67	2.479
68	0.919
69	1.052
70	1.241
71	1.242
72	0.611
73	1.134
74	1.043
75	0.854
76	0.799
77	0.916
78	1.068
79	0.904
80	1.126
81	0.942
82	1.079
83	0.793

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Table 12 – continued from previous page

id	α
84	0.925
85	1.001
86	0.723
87	1.034
88	0.757
89	0.926

Table 13: Individual estimate: risk

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
1	0.420	0.215	0.236	0.592	1.170	0.641	0.535	0.216	0.249
2	0.355	0.343	0.343	0.662	0.970	0.931	0.341	0.329	0.329
3	0.328	0.328	0.328	0.479	1.071	0.415	0.333	0.333	0.333
4	0.511	0.511	0.511	0.701	0.633	0.638	0.333	0.333	0.333
5	0.580	0.559	0.703	0.421	1.300e+11	40.698	0.591	0.591	0.595
6	0.237	0.237	0.259	0.429	1.336	0.569	0.319	0.319	0.361
7	0.288	0.269	0.256	0.406	1.269	0.311	0.390	0.327	0.283
8	0.281	0.281	0.281	0.538	1.185	0.719	0.333	0.333	0.333
9	0.164	0.219	0.186	0.313	1.611	0.345	0.248	0.430	0.322
10	0.261	0.228	0.283	0.294	1.333	0.188	0.352	0.176	0.472
11	0.321	0.384	0.295	0.384	1.111	0.007	0	1	0
12	0.473	0.473	0.473	0.727	0.691	0.855	0.333	0.333	0.333
13	0.271	0.220	0.240	0.235	0	60.774	0.301	0.300	0.300
14	0.303	0.278	0.257	0.332	1.261	0.008	0.999	0.001	0
15	0.313	0.295	0.295	0.494	1.145	0.510	0.358	0.321	0.321
16	0.337	0.337	0.337	0.610	1.009	0.791	0.333	0.333	0.333
17	0.399	0.507	0.450	0.507	0.765	0.063	0	0.859	0.141
18	0.389	0.323	0.378	0.412	0.991	0.173	0.473	0.117	0.410
19	0.257	0.210	0.104	0.365	1.508	0.025	0.986	0.014	0
20	0.397	0.372	0.408	0.594	0.881	0.645	0.341	0.302	0.358

Continued on next page

Table 14 – continued from previous page

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
21	0.096	0.096	0.096	0.098	2.341	0.011	0.333	0.333	0.333
22	0.321	0.347	0.347	0.598	1.008	0.780	0.311	0.344	0.344
23	0.249	0.271	0.271	0.551	1.233	0.837	0.315	0.343	0.343
24	0.124	0.162	0.174	0.162	1.819	0.049	0	0.357	0.643
25	0.227	0.281	0.281	0.540	1.233	0.844	0.288	0.356	0.356
26	0.314	0.314	0.314	0.448	1.120	0.368	0.333	0.333	0.333
27	0.321	0.311	0.270	0.380	1.159	0.012	0.817	0.183	0
28	0.410	0.363	0.363	0.663	0.901	0.804	0.373	0.314	0.314
29	0.301	0.275	0.275	0.412	1.222	0.318	0.388	0.306	0.306
30	0.249	0.245	0.245	0.644	1.258	1.156	0.336	0.332	0.332
31	0.216	0.183	0.208	0.421	1.507	0.642	0.358	0.299	0.343
32	0.268	0.268	0.301	0.474	1.205	0.619	0.315	0.315	0.370
33	0.294	0.294	0.294	0.454	1.175	0.441	0.333	0.333	0.333
34	0.246	0.301	0.317	0.409	1.194	0.436	0.236	0.363	0.402
35	0.213	0.235	0.203	0.315	1.497	0.217	0.313	0.426	0.262
36	0.240	0.240	0.240	0.511	1.328	0.757	0.333	0.333	0.333
37	0.090	0.090	0.090	0.350	2.228	0.835	0.333	0.333	0.333
38	0.240	0.187	0.187	0.166	0	69.460	0.301	0.300	0.300
39	0.255	0.231	0.231	0.475	1.350	0.623	0.361	0.319	0.319
40	0.314	0.296	0.296	0.528	1.131	0.607	0.354	0.323	0.323
41	0.406	0.406	0.406	0.648	0.842	0.733	0.333	0.333	0.333
42	0.384	0.384	0.384	0.396	0.954	0.031	0.333	0.333	0.333
43	0.076	0.076	0.076	0.078	2.572	0.010	0.333	0.333	0.333
44	0.360	0.360	0.360	0.661	0.939	0.907	0.333	0.333	0.333
45	0.419	0.384	0.384	0.668	0.860	0.788	0.363	0.319	0.319
46	0.270	0.270	0.270	0.450	1.250	0.498	0.333	0.333	0.333
47	0.443	0.542	0.382	0.864	0.687	1.380	0.323	0.399	0.279
48	0.175	0.129	0.094	0.417	1.918	0.623	0.425	0.328	0.247
49	0.357	0.357	0.357	0.597	0.965	0.694	0.333	0.333	0.333

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Table 14 – continued from previous page

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
50	0.241	0.217	0.217	0.377	1.437	0.394	0.378	0.311	0.311
51	0.353	0.353	0.353	0.660	0.955	0.923	0.333	0.333	0.333
52	0.286	0.282	0.282	0.452	1.207	0.458	0.339	0.330	0.330
53	0.291	0.291	0.291	0.357	1.213	0.181	0.333	0.333	0.333
54	0.199	0.074	0.263	0.916	1.291	3.390	0.344	0.292	0.364
55	0.348	0.348	0.301	0.635	1.024	0.764	0.354	0.354	0.292
56	0.342	0.376	0.304	0.281	1.107	-0.284	0.326	0.214	0.460
57	0.095	0.095	0.095	0.252	2.241	0.540	0.333	0.333	0.333
58	0.263	0.263	0.263	0.492	1.259	0.634	0.333	0.333	0.333
59	0.234	0.202	0.202	0.278	1.529	0.142	0.499	0.250	0.250
60	0.341	0.341	0.341	0.646	0.988	0.905	0.333	0.333	0.333
61	0.166	0.176	0.140	0.314	1.770	0.353	0.352	0.388	0.259
62	0.352	0.485	0.520	0.358	0.757	-0.015	1	0	0
63	0.279	0.190	0.333	0.639	1.169	1.329	0.343	0.272	0.385
64	0.361	0.417	0.328	0.586	0.955	0.458	0.317	0.438	0.245
65	0.282	0.282	0.282	0.463	1.208	0.498	0.333	0.333	0.333
66	0.384	0.338	0.338	0.481	1.012	0.291	0.440	0.280	0.280
67	0.308	0.304	0.697	0.204	1.018	0.047	0	0	1
68	0.358	0.358	0.358	0.660	0.942	0.907	0.333	0.333	0.333
69	0.198	0.220	0.220	0.426	1.459	0.626	0.307	0.346	0.346
70	0.289	0.289	0.289	0.450	1.191	0.442	0.333	0.333	0.333
71	0.180	0.180	0.180	0.461	1.589	0.796	0.333	0.333	0.333
72	0.454	0.454	0.408	0.522	0.793	0.015	0.500	0.500	0
73	0.223	0.256	0.256	0.428	1.336	0.549	0.292	0.354	0.354
74	0.273	0.273	0.273	0.454	1.239	0.498	0.333	0.333	0.333
75	0.070	0.070	0.070	0.955	1.812	4.066	0.333	0.333	0.333
76	0.461	0.299	0.334	0.661	0.936	0.772	0.458	0.249	0.293
77	0.267	0.267	0.267	0.539	1.228	0.760	0.333	0.333	0.333
78	0.340	0.318	0.318	0.373	1.112	0.101	0.478	0.261	0.261

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Table 14 – continued from previous page

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
79	0.363	0.291	0.363	0.487	1.032	0.492	0.381	0.238	0.381
80	0.204	0.204	0.150	0.487	1.581	0.685	0.364	0.364	0.271
81	0.352	0.352	0.352	0.567	0.986	0.613	0.333	0.333	0.333
82	0.335	0.196	0.160	0.469	1.443	0.284	0.687	0.215	0.098
83	0.399	0.399	0.399	0.531	0.888	0.374	0.333	0.333	0.333
84	0.310	0.310	0.310	0.425	1.137	0.314	0.333	0.333	0.333
85	0.313	0.280	0.177	0.416	1.242	0.021	0.961	0.039	0
86	0.250	0.250	0.250	0.490	1.302	0.667	0.333	0.333	0.333
87	0.419	0.371	0.382	0.123	1.017	-0.834	0.300	0.357	0.344
88	0.348	0.376	0.376	0.565	0.948	0.599	0.302	0.349	0.349
89	0.061	0.061	0.061	0.119	2.729	0.277	0.333	0.333	0.333

Table 15: Individual estimate: Social ambiguity - cg

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
1	0.377	0.174	0.174	0.746	1.270	1.317	0.441	0.280	0.280
2	0.468	0.338	0.318	0.630	0.933	0.518	0.512	0.262	0.227
3	0.505	0.462	0.440	0.636	0.729	0.395	0.429	0.313	0.258
4	0.850	0.422	0.391	0.890	0.688	0.077	1	0	0
5	0.584	0.553	0.565	0.693	0.544	0.426	0.377	0.296	0.327
6	0.270	0.540	0.138	0.650	1.162	0.045	0	1	0
7	0.480	0.480	0.408	0.241	0.843	-0.770	0.301	0.301	0.397
8	0.359	0.306	0.306	0.517	1.080	0.469	0.409	0.295	0.295
9	0.219	0.153	0.241	0.219	1.516	0.077	0.357	0	0.643
10	0.396	0.319	0.250	0.275	0	71.049	0.302	0.301	0.300
11	0.419	0.384	0.407	0.564	0.868	0.475	0.366	0.292	0.341
12	0.407	0.214	0.325	0.624	1.058	0.935	0.432	0.224	0.344
13	0.289	0.151	0.190	0.321	1.533	0.238	0.664	0.089	0.247
14	0.303	0.373	0.325	0.440	1.071	0.257	0.217	0.484	0.299
15	0.242	0.285	0.295	0.463	1.224	0.598	0.279	0.353	0.369
16	0.577	0.156	0.404	0.677	0.870	0.959	0.538	0.110	0.352
17	0.561	0.333	0.289	0.572	1.011	0.028	1	0	0
18	0.320	0.264	0.312	0.286	1.099	0.517	0.341	0.235	0.326
19	0.164	0.138	0.164	0.430	1.723	0.836	0.347	0.306	0.347
20	0.265	0.208	0.441	0.380	1.124	0.631	0.272	0.182	0.546
21	0.505	0.354	0.096	0.096	1.369	-1.468	0.201	0.299	0.500
22	0.481	0.232	0.347	0.566	0.981	0.566	0.551	0.132	0.318
23	0.704	0.310	0.288	0.805	0.775	0.533	0.798	0.115	0.088
24	0.313	0.313	0.335	0.587	1.055	0.815	0.324	0.324	0.351
25	0.361	0.361	0.361	0.540	0.972	0.504	0.333	0.333	0.333
26	0.265	0.265	0.265	0.369	1.291	0.288	0.333	0.333	0.333
27	0.424	0.267	0.295	0.506	1.077	0.354	0.592	0.168	0.240
28	0.363	0.363	0.363	0.663	0.932	0.907	0.333	0.333	0.333
29	0.395	0.288	0.610	0.550	0.758	0.904	0.286	0.177	0.536

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Table 16 – continued from previous page

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
30	0.328	0.201	0.339	0.586	1.129	1.028	0.372	0.245	0.383
31	0.406	0.248	0.281	0.510	1.120	0.428	0.549	0.189	0.263
32	0.242	0.298	0.264	0.559	1.221	0.808	0.300	0.372	0.329
33	0.167	0.392	0.203	0.167	0	76.448	0.299	0.302	0.300
34	0.210	0.274	0.284	0.513	1.262	0.820	0.274	0.357	0.369
35	0.181	0.181	0.181	0.185	1.708	0.015	0.333	0.333	0.333
36	0.331	0.325	0.240	0.365	1.119	0.007	0.807	0.193	0
37	0.229	0.268	0.298	0.426	1.260	0.563	0.267	0.338	0.394
38	0.396	0.230	0.208	0.625	1.203	0.712	0.500	0.265	0.235
39	0.292	0.268	0.194	0.572	1.300	0.654	0.399	0.360	0.241
40	0.336	0.255	0.296	0.439	1.174	0.395	0.437	0.229	0.333
41	0.871	0.152	0.067	0.954	1.273	0.142	1	0	0
42	0.530	0.487	0.418	0.486	0.753	-0.109	0.008	0.221	0.771
43	0.076	0.076	0.076	0.078	2.572	0.010	0.333	0.333	0.333
44	0.407	0.360	0.360	0.616	0.921	0.646	0.382	0.309	0.309
45	0.251	0.251	0.251	0.456	1.312	0.569	0.333	0.333	0.333
46	0.946	0.946	0.946	0.970	0.052	0.591	0.333	0.333	0.333
47	0.689	0.627	0.497	0.696	0.492	-0.016	0	0	1
48	0.109	0.158	0.142	0.167	1.963	0.124	0.073	0.547	0.380
49	0.523	0.416	0.436	0.597	0.755	0.316	0.539	0.202	0.259
50	0.377	0.176	0.176	0.608	1.331	0.769	0.513	0.243	0.243
51	0.353	0.353	0.353	0.660	0.955	0.923	0.333	0.333	0.333
52	0.424	0.249	0.282	0.535	1.097	0.460	0.557	0.187	0.256
53	0.357	0.357	0.357	0.468	1.001	0.307	0.333	0.333	0.333
54	0.388	0.430	0.555	0.149	0.867	-0.015	0.997	0.003	0
55	0.326	0.326	0.326	0.646	1.025	0.943	0.333	0.333	0.333
56	0.947	0.048	0.355	0.947	0.473	0.641	0.966	0	0.034
57	0.003	0.034	0.093	0.158	3.224	1.172	0.185	0.352	0.463
58	0.570	0.230	0.209	0.621	1.285	0.046	1	0	0

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Table 16 – continued from previous page

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
59	0.269	0.202	0.234	0.590	1.318	1.013	0.370	0.298	0.333
60	0.949	0.054	0.054	0.949	1.796	0.152	1	0	0
61	0.396	0.165	0.271	0.341	1.227	0.275	0.698	0.018	0.287
62	0.171	0.474	0.358	0.659	0.992	1.059	0.178	0.465	0.356
63	0.403	0.243	0.217	0.456	1.322	0.024	1	0	0
64	0.553	0.190	0.176	0.588	1.448	0.046	1	0	0
65	0.407	0.249	0.282	0.511	1.118	0.428	0.549	0.189	0.262
66	0.384	0.384	0.384	0.563	0.911	0.511	0.333	0.333	0.333
67	0.360	0.434	0.250	0.408	0	66.453	0.300	0.301	0.299
68	0.358	0.358	0.358	0.660	0.942	0.907	0.333	0.333	0.333
69	0.220	0.121	0.322	0.289	1.447	0.541	0.338	0.133	0.529
70	0.472	0.388	0.495	0.595	0.750	0.574	0.368	0.223	0.409
71	0.201	0.201	0.201	0.461	1.497	0.730	0.333	0.333	0.333
72	0.384	0.384	0.384	0.693	0.873	0.961	0.333	0.333	0.333
73	0.350	0.202	0.202	0.350	1.514	0.018	1	0	0
74	0.200	0.200	0.222	0.222	1.558	0.096	0.250	0.250	0.500
75	0.823	0.070	0.070	0.955	1.931	0.102	1	0	0
76	0.541	0.519	0.519	0.700	0.609	0.559	0.361	0.319	0.319
77	0.303	0.279	0.277	0.451	1.203	0.416	0.375	0.315	0.310
78	0.340	0.260	0.296	0.340	1.179	0.047	0.864	0	0.136
79	0.250	0.273	0.273	0.432	1.267	0.488	0.301	0.349	0.349
80	0.204	0.204	0.204	0.639	1.412	1.273	0.333	0.333	0.333
81	0.477	0.374	0.374	0.655	0.844	0.613	0.446	0.277	0.277
82	0.453	0.303	0.347	0.657	0.928	0.791	0.441	0.253	0.307
83	0.078	0.078	0.078	0.147	2.481	0.284	0.333	0.333	0.333
84	0.358	0.333	0.310	0.428	1.081	0.151	0.492	0.324	0.184
85	0.288	0.177	0.221	0.335	1.440	0.273	0.555	0.139	0.305
86	0.312	0.256	0.221	0.335	1.328	0.010	1	0	0
87	0.374	0.292	0.549	0.235	1.023	-0.017	0	1	0

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Table 16 – continued from previous page

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
88	0.847	0.276	0.276	0.877	0.743	0.332	0.989	0.005	0.005
89	0.084	0.061	0.061	0.119	2.643	0.173	0.505	0.248	0.248

Table 17: Individual estimate: strategic uncertainty

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
1	0.206	0.206	0.206	0.466	1.477	0.729	0.333	0.333	0.333
2	0.371	0.355	0.355	0.704	0.925	1.051	0.344	0.328	0.328
3	0.371	0.276	0.276	0.558	1.117	0.580	0.443	0.278	0.278
4	0.391	0.391	0.391	0.401	0.935	0.027	0.333	0.333	0.333
5	0.565	0.707	0.614	0.630	1.950e+10	106.663	0.451	0.453	0.451
6	0.165	0.165	0.468	0.329	1.249	0.822	0.210	0.210	0.580
7	0.269	0.226	0.151	0.378	1.441	0.025	0.977	0.023	0
8	0.245	0.245	0.325	0.517	1.202	0.875	0.302	0.302	0.396
9	0.186	0.186	0.186	0.241	1.655	0.167	0.333	0.333	0.333
10	0.366	0.344	0.344	0.344	0	62.042	0.300	0.300	0.300
11	0.396	0.360	0.360	0.396	1.008	0.004	1	0	0
12	0.378	0.413	0.344	0.645	0.913	0.661	0.333	0.386	0.281
13	0.152	0.190	0.135	0.135	1.880	-0.173	0.371	0.129	0.500
14	0.160	0.203	0.248	0.456	1.469	0.888	0.277	0.334	0.389
15	0.313	0.311	0.295	0.494	1.132	0.473	0.348	0.344	0.308
16	0.434	0.434	0.390	0.643	0.824	0.563	0.360	0.360	0.281
17	0.349	0.422	0.223	0.557	1.002	0.033	0.011	0.989	0
18	0.264	0.312	0.312	0.312	1.184	0.042	0	0.500	0.500
19	0.238	0.310	0.319	0.440	1.181	0.522	0.234	0.375	0.392
20	0.386	0.291	0.342	0.659	0.986	0.964	0.381	0.283	0.336
21	0.096	0.096	0.096	0.098	2.341	0.011	0.333	0.333	0.333
22	0.321	0.295	0.347	0.479	1.082	0.529	0.333	0.284	0.383
23	0.570	0.570	0.440	0.869	0.572	1.140	0.373	0.373	0.253
24	0.261	0.261	0.261	0.418	1.290	0.434	0.333	0.333	0.333
25	0.345	0.345	0.345	0.614	0.988	0.784	0.333	0.333	0.333
26	0.260	0.260	0.260	0.448	1.283	0.518	0.333	0.333	0.333
27	0.291	0.306	0.295	0.438	1.171	0.379	0.316	0.357	0.327
28	0.363	0.363	0.363	0.663	0.932	0.907	0.333	0.333	0.333
29	0.275	0.445	0.275	0.521	1.079	0.276	0.149	0.702	0.149

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Table 18 – continued from previous page

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
30	0.249	0.245	0.245	0.644	1.258	1.156	0.336	0.332	0.332
31	0.281	0.281	0.281	0.462	1.211	0.498	0.333	0.333	0.333
32	0.242	0.242	0.242	0.564	1.303	0.912	0.333	0.333	0.333
33	0.271	0.180	0.265	0.265	1.379	0.129	0.520	0.004	0.476
34	0.240	0.284	0.284	0.465	1.240	0.594	0.283	0.359	0.359
35	0.256	0.256	0.278	0.288	1.320	0.121	0.272	0.272	0.457
36	0.388	0.274	0.501	0.554	0.871	0.843	0.331	0.201	0.468
37	0.090	0.184	0.206	0.328	1.733	0.711	0.204	0.381	0.415
38	0.208	0.240	0.286	0.446	1.318	0.709	0.279	0.327	0.394
39	0.255	0.227	0.157	0.529	1.462	0.626	0.408	0.359	0.233
40	0.284	0.324	0.296	0.473	1.150	0.451	0.295	0.384	0.321
41	0.351	0.351	0.351	0.625	0.970	0.802	0.333	0.333	0.333
42	0.508	0.487	0.487	0.463	0.713	-0.112	0.201	0.399	0.399
43	0.076	0.076	0.076	0.143	2.507	0.281	0.333	0.333	0.333
44	0.360	0.360	0.360	0.552	0.971	0.545	0.333	0.333	0.333
45	0.189	0.189	0.225	0.553	1.447	1.099	0.321	0.321	0.358
46	0.270	0.270	0.270	0.450	1.250	0.498	0.333	0.333	0.333
47	0.666	0.473	0.610	0.708	0.500	0.497	0.518	0.105	0.377
48	0.175	0.109	0.175	0.125	0	58.880	0.301	0.299	0.301
49	0.357	0.245	0.125	0.618	1.477	-0.015	0	0	1
50	0.241	0.217	0.217	0.512	1.387	0.771	0.356	0.322	0.322
51	0.353	0.353	0.353	0.660	0.955	0.923	0.333	0.333	0.333
52	0.286	0.266	0.282	0.424	1.231	0.418	0.354	0.303	0.344
53	0.340	0.246	0.340	0.408	1.132	0.375	0.415	0.169	0.415
54	0.478	0.416	0.229	0.865	0.868	1.293	0.414	0.365	0.222
55	0.460	0.460	0.436	0.526	0.784	0.145	0.388	0.388	0.224
56	0.350	0.350	0.350	0.658	0.962	0.923	0.333	0.333	0.333
57	0.109	0.109	0.109	0.252	2.118	0.477	0.333	0.333	0.333
58	0.332	0.332	0.332	0.354	1.098	0.060	0.333	0.333	0.333

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Table 18 – continued from previous page

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
59	0.212	0.234	0.289	0.372	1.342	0.512	0.266	0.311	0.423
60	0.289	0.054	0.133	0.470	1.775	0.877	0.514	0.171	0.314
61	0.124	0.229	0.182	0.467	1.602	0.849	0.256	0.404	0.341
62	0.438	0.327	0.422	0.875	0.765	2.036	0.354	0.300	0.346
63	0.211	0.435	0.074	0.785	1.371	0.757	0.307	0.597	0.096
64	0.406	0.406	0.439	0.552	0.837	0.466	0.309	0.309	0.381
65	0.282	0.282	0.282	0.463	1.208	0.498	0.333	0.333	0.333
66	0.501	0.565	0.565	0.604	0.592	0.261	0.163	0.418	0.418
67	0.251	0.232	0.360	0.125	0	70.208	0.300	0.300	0.302
68	0.358	0.358	0.358	0.660	0.942	0.907	0.333	0.333	0.333
69	0.220	0.220	0.220	0.504	1.404	0.794	0.333	0.333	0.333
70	0.265	0.307	0.307	0.455	1.172	0.496	0.275	0.362	0.362
71	0.064	0.083	0.064	0.518	2.342	1.357	0.324	0.351	0.324
72	0.384	0.384	0.384	0.624	0.894	0.708	0.333	0.333	0.333
73	0.202	0.223	0.277	0.302	1.406	0.344	0.234	0.301	0.465
74	0.273	0.273	0.273	0.454	1.239	0.498	0.333	0.333	0.333
75	0.119	0.229	0.600	0.205	1.289	0.043	0	0	1
76	0.666	0.646	0.636	0.620	0.438	-0.157	0.196	0.364	0.441
77	0.640	0.272	0.200	0.737	1.110	0.057	1	0	0
78	0.340	0.238	0.238	0.395	1.283	0.189	0.671	0.165	0.165
79	0.248	0.316	0.282	0.371	1.236	0.243	0.194	0.473	0.332
80	0.355	0.271	0.271	0.634	1.113	0.869	0.399	0.301	0.301
81	0.374	0.374	0.374	0.600	0.924	0.657	0.333	0.333	0.333
82	0.248	0.215	0.188	0.445	1.458	0.508	0.400	0.330	0.270
83	0.078	0.078	0.078	0.206	2.436	0.481	0.333	0.333	0.333
84	0.333	0.333	0.333	0.380	1.087	0.131	0.333	0.333	0.333
85	0.302	0.380	0.232	0.483	1.141	0.026	0.002	0.998	0
86	0.386	0.280	0.198	0.755	1.126	1.114	0.423	0.327	0.250
87	0.427	0.316	0.316	0.279	1.082	-0.307	0.113	0.444	0.444

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Table 18 – continued from previous page

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
88	0.353	0.376	0.376	0.478	0.968	0.332	0.288	0.356	0.356
89	0.141	0.141	0.141	0.247	1.899	0.338	0.333	0.333	0.333

Table 19: Individual estimate: social ambiguity- tg

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
1	0.267	0.250	0.086	0.477	1.379	0.045	0.676	0.324	0
2	0.388	0.304	0.304	0.663	1.015	0.881	0.397	0.301	0.301
3	0.413	0.249	0.249	0.558	1.141	0.490	0.551	0.224	0.224
4	0.809	0.391	0.319	0.773	0.797	0.050	1	0	0
5	0.668	0.664	0.698	0.624	4.550e+10	48.457	0.554	0.553	0.554
6	0.138	0.138	0.630	0.172	1.227	0.444	0.052	0.052	0.895
7	0.315	0.269	0.280	0.577	1.156	0.788	0.369	0.309	0.323
8	0.359	0.359	0.359	0.517	0.983	0.441	0.333	0.333	0.333
9	0.227	0.130	0.130	0.263	1.818	0.136	0.800	0.100	0.100
10	0.330	0.463	0.341	0.385	1.020	-0.296	0.471	0.076	0.435
11	0.396	0.373	0.308	0.425	0.972	0.007	0.998	0.002	0
12	0.410	0.297	0.382	0.467	0.977	0.343	0.465	0.151	0.384
13	0.034	0.016	0.016	0.014	3.966	-0.166	0.078	0.461	0.461
14	0.278	0.325	0.358	0.436	1.091	0.444	0.239	0.343	0.418
15	0.291	0.295	0.295	0.494	1.164	0.559	0.329	0.336	0.336
16	0.563	0.256	0.359	0.496	0.974	0.016	1	0	0
17	0.473	0.276	0.233	0.484	1.202	0.023	1	0	0
18	0.312	0.312	0.312	0.319	1.163	0.021	0.333	0.333	0.333
19	0.187	0.187	0.204	0.337	1.575	0.463	0.319	0.319	0.362
20	0.300	0.140	0.616	0.425	0.941	1.003	0.278	0.125	0.597
21	0.096	0.272	0.096	0.096	2.189	-0.186	0.500	0	0.500
22	0.456	0.255	0.347	0.469	1.001	0.256	0.678	0.035	0.287
23	0.626	0.204	0.204	0.786	0.982	0.833	0.662	0.169	0.169
24	0.412	0.412	0.365	0.566	0.894	0.356	0.377	0.377	0.246
25	0.345	0.345	0.345	0.528	1.014	0.512	0.333	0.333	0.333
26	0.245	0.245	0.245	0.448	1.334	0.561	0.333	0.333	0.333
27	0.291	0.295	0.295	0.416	1.188	0.342	0.326	0.337	0.337
28	0.363	0.363	0.363	0.663	0.932	0.907	0.333	0.333	0.333
29	0.426	0.468	0.361	0.741	0.804	0.838	0.342	0.394	0.265

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Table 20 – continued from previous page

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
30	0.678	0.217	0.245	0.918	0.793	1.803	0.510	0.237	0.253
31	0.323	0.372	0.274	0.410	1.102	0.011	0	1	0
32	0.324	0.346	0.320	0.573	1.043	0.655	0.324	0.358	0.319
33	0.321	0.157	0.441	0.354	1.115	0.507	0.354	0.066	0.580
34	0.266	0.334	0.284	0.415	1.189	0.288	0.234	0.470	0.296
35	0.755	0.541	0.695	0.643	0.075	0.072	0	0	0
36	0.240	0.216	0.216	0.433	1.421	0.549	0.365	0.317	0.317
37	0.249	0.059	0.184	0.273	1.749	0.438	0.553	0.050	0.397
38	0.240	0.156	0.187	0.261	1.612	0.168	0.616	0.098	0.286
39	0.337	0.291	0.291	0.570	1.109	0.690	0.378	0.311	0.311
40	0.370	0.268	0.329	0.495	1.079	0.501	0.428	0.226	0.347
41	0.954	0.067	0.067	0.954	1.662	0.154	1	0	0
42	0.530	0.476	0.476	0.465	0.718	-0.133	0.080	0.460	0.460
43	0.076	0.076	0.076	0.078	2.572	0.010	0.333	0.333	0.333
44	0.360	0.360	0.360	0.661	0.939	0.907	0.333	0.333	0.333
45	0.276	0.276	0.276	0.352	1.262	0.211	0.333	0.333	0.333
46	0.946	0.946	0.946	0.450	10.419	-0.767	0	0	0
47	0.934	0.426	0.497	0.868	0.573	0.062	1	0	0
48	0.069	0.069	0.094	0.290	2.371	0.836	0.316	0.316	0.369
49	0.188	0.284	0.154	0.604	1.450	0.897	0.309	0.425	0.265
50	0.368	0.241	0.241	0.425	1.244	0.200	0.716	0.142	0.142
51	0.353	0.353	0.353	0.660	0.955	0.923	0.333	0.333	0.333
52	0.424	0.282	0.282	0.487	1.091	0.224	0.711	0.145	0.145
53	0.215	0.215	0.215	0.462	1.442	0.691	0.333	0.333	0.333
54	0.074	0.074	0.074	0.956	1.775	4.077	0.333	0.333	0.333
55	0.360	0.360	0.360	0.657	0.940	0.893	0.333	0.333	0.333
56	0.947	0.426	0.117	0.947	0.956	-0.037	0	0	1
57	0.003	0.002	0.093	0.003	4.870	0.102	0.001	0	0.999
58	0.553	0.220	0.252	0.621	1.042	0.417	0.773	0.086	0.142

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Table 20 – continued from previous page

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
59	0.440	0.300	0.278	0.500	1.135	0.023	1	0	0
60	0.363	0.363	0.363	0.668	0.928	0.925	0.333	0.333	0.333
61	0.135	0.248	0.406	0.316	1.272	0.596	0.117	0.312	0.571
62	0.444	0.125	0.482	0.488	0.952	0.746	0.446	0.058	0.496
63	0.377	0.224	0.254	0.302	0	59.962	0.302	0.299	0.300
64	0.759	0.181	0.164	0.803	1.346	0.080	1	0	0
65	0.591	0.282	0.282	0.463	0	65.336	0.303	0.299	0.299
66	0.337	0.454	0.384	0.594	0.888	0.555	0.236	0.445	0.319
67	0.383	0.434	0.307	0.144	1.072	-0.916	0.323	0.269	0.407
68	0.358	0.358	0.358	0.660	0.942	0.907	0.333	0.333	0.333
69	0.165	0.046	0.209	0.267	1.893	0.747	0.393	0.146	0.461
70	0.201	0.181	0.245	0.355	1.488	0.554	0.319	0.276	0.406
71	0.222	0.222	0.222	0.461	1.413	0.666	0.333	0.333	0.333
72	0.384	0.384	0.384	0.583	0.906	0.575	0.333	0.333	0.333
73	0.401	0.213	0.213	0.401	1.445	0.022	1	0	0
74	0.182	0.168	0.145	0.178	0	59.926	0.300	0.300	0.300
75	0.955	0.070	0.070	0.955	1.628	0.154	1	0	0
76	0.450	0.358	0.294	0.438	0	51.859	0.302	0.300	0.299
77	0.277	0.303	0.277	0.435	1.210	0.375	0.309	0.381	0.309
78	0.421	0.366	0.366	0.511	0.931	0.280	0.465	0.268	0.268
79	0.363	0.314	0.257	0.487	1.141	0.177	0.597	0.336	0.069
80	0.225	0.182	0.204	0.531	1.459	0.927	0.359	0.307	0.334
81	0.326	0.270	0.318	0.455	1.138	0.461	0.380	0.257	0.363
82	0.389	0.203	0.258	0.893	1.017	2.333	0.380	0.298	0.323
83	0.232	0.078	0.078	0.205	2.394	0.020	1	0	0
84	0.358	0.333	0.333	0.380	1.068	0.072	0.564	0.218	0.218
85	0.232	0.199	0.266	0.346	1.401	0.444	0.334	0.253	0.414
86	0.469	0.359	0.359	0.660	0.870	0.660	0.444	0.278	0.278
87	0.430	0.385	0.357	0.290	0.976	-0.389	0.234	0.346	0.420

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Table 20 – continued from previous page

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
88	0.778	0.216	0.240	0.837	0.810	0.604	0.866	0.056	0.078
89	0.061	0.119	0.061	0.172	2.501	0.229	0.194	0.612	0.194

Table 21: Individual estimate: betrayal aversion- tg

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
1	0.290	0.164	0.164	0.432	1.527	0.449	0.535	0.232	0.232
2	0.355	0.304	0.330	0.704	0.996	1.157	0.355	0.311	0.334
3	0.354	0.354	0.354	0.534	0.990	0.506	0.333	0.333	0.333
4	0.397	0.397	0.833	0.556	0.496	0.987	0.152	0.152	0.695
5	0.607	0.545	0.594	0.632	0.528	0.201	0.471	0.136	0.393
6	0.222	0.188	0.312	0.307	1.374	0.430	0.289	0.206	0.505
7	0.226	0.271	0.238	0.374	1.363	0.331	0.271	0.417	0.312
8	0.325	0.269	0.269	0.484	1.192	0.470	0.413	0.293	0.293
9	0.227	0.163	0.120	0.120	0	73.261	0.302	0.300	0.300
10	0.297	0.316	0.308	0.264	0	66.581	0.300	0.300	0.300
11	0.489	0.396	0.419	0.533	0.815	0.215	0.579	0.162	0.259
12	0.266	0.404	0.396	0.735	0.910	1.363	0.268	0.369	0.363
13	0.240	0.200	0.118	0.248	1.668	-0.012	0	0	1
14	0.235	0.171	0.203	0.536	1.462	0.945	0.372	0.294	0.334
15	0.242	0.295	0.317	0.448	1.192	0.565	0.257	0.351	0.392
16	0.256	0.178	0.390	0.290	1.248	0.372	0.283	0.092	0.625
17	0.377	0.322	0.300	0.507	1.063	0.346	0.459	0.301	0.240
18	0.334	0.367	0.367	0.367	1.013	0.029	0	0.500	0.500
19	0.104	0.104	0.173	0.307	1.932	0.781	0.293	0.293	0.413
20	0.487	0.208	0.184	0.552	1.406	0.039	1	0	0
21	0.096	0.096	0.096	0.946	1.647	3.751	0.333	0.333	0.333
22	0.243	0.295	0.501	0.321	1.029	0.329	0.073	0.185	0.743
23	0.522	0.555	0.227	0.842	0.643	0.093	0.320	0.680	0
24	0.387	0.387	0.387	0.555	0.907	0.478	0.333	0.333	0.333
25	0.767	0.310	0.310	0.716	1.001	0.048	1	0	0
26	0.314	0.314	0.314	0.448	1.120	0.368	0.333	0.333	0.333
27	0.369	0.295	0.317	0.494	1.074	0.424	0.432	0.258	0.310
28	0.363	0.363	0.363	0.663	0.932	0.907	0.333	0.333	0.333
29	0.336	0.275	0.334	0.213	0	69.420	0.301	0.300	0.301

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Table 22 – continued from previous page

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
30	0.346	0.239	0.394	0.444	1.062	0.539	0.368	0.176	0.456
31	0.281	0.281	0.337	0.418	1.155	0.451	0.292	0.292	0.416
32	0.242	0.275	0.393	0.320	1.160	0.309	0.146	0.244	0.610
33	0.225	0.373	0.242	0.275	0	66.375	0.299	0.302	0.300
34	0.302	0.284	0.306	0.409	1.174	0.339	0.348	0.293	0.359
35	0.518	0.552	0.552	0.552	0.601	0.032	0	0.500	0.500
36	0.240	0.192	0.262	0.457	1.366	0.746	0.347	0.276	0.378
37	0.110	0.131	0.131	0.317	1.966	0.636	0.302	0.349	0.349
38	0.272	0.240	0.240	0.390	1.340	0.342	0.399	0.301	0.301
39	0.231	0.231	0.157	0.507	1.493	0.616	0.379	0.379	0.243
40	0.348	0.296	0.318	0.495	1.088	0.473	0.391	0.281	0.328
41	0.328	0.328	0.328	0.535	1.055	0.579	0.333	0.333	0.333
42	0.673	0.613	0.582	0.541	0.493	-0.427	0.190	0.361	0.448
43	0.076	0.076	0.076	0.078	2.572	0.010	0.333	0.333	0.333
44	0.405	0.360	0.360	0.505	0.954	0.303	0.431	0.285	0.285
45	0.096	0.315	0.258	0.521	1.391	1.014	0.188	0.435	0.377
46	0.946	0.946	0.946	0.395	15.325	-0.832	0	0	0
47	0.683	0.663	0.742	0.760	0.343	0.496	0.291	0.239	0.471
48	0	0.281	0.767	0.012	1.047	0.062	0	0	1
49	0.458	0.381	0.440	0.565	0.816	0.451	0.403	0.234	0.363
50	0.136	0.297	0.163	0.534	1.515	0.812	0.246	0.468	0.287
51	0.049	0.049	0.948	0.049	1.848	0.153	0	0	1
52	0.342	0.282	0.304	0.593	1.089	0.791	0.374	0.299	0.327
53	0.327	0.311	0.311	0.360	1.141	0.098	0.444	0.278	0.278
54	0.074	0.074	0.956	0.074	1.595	0.154	0	0	1
55	0.326	0.326	0.326	0.691	1.009	1.111	0.333	0.333	0.333
56	0.327	0.350	0.350	0.562	1.008	0.650	0.309	0.345	0.345
57	0.611	0.360	0.266	0.356	0.988	-0.445	0.008	0.396	0.595
58	0.230	0.402	0.380	0.413	1.031	0.292	0.035	0.519	0.446

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Table 22 – continued from previous page

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
59	0.234	0.234	0.256	0.556	1.301	0.945	0.325	0.325	0.350
60	0.128	0.128	0.440	0.054	1.836	0.036	0	0	1
61	0.124	0.379	0.415	0.255	1.053	0.696	0.069	0.411	0.462
62	0.188	0.269	0.320	0.537	1.234	1.003	0.258	0.345	0.397
63	0.433	0.282	0.192	0.867	1.026	1.678	0.413	0.322	0.266
64	0.119	0.119	0.332	0.244	1.605	0.679	0.219	0.219	0.562
65	0.282	0.282	0.304	0.407	1.196	0.377	0.313	0.313	0.373
66	0.522	0.533	0.565	0.654	0.589	0.467	0.292	0.316	0.392
67	0.271	0.652	0.549	0.095	0.767	-1	0.556	0.166	0.278
68	0.310	0.358	0.358	0.660	0.975	1.009	0.301	0.349	0.349
69	0.111	0.111	0.199	0.278	1.855	0.688	0.279	0.279	0.442
70	0.233	0.265	0.233	0.427	1.353	0.466	0.309	0.381	0.309
71	0.201	0.201	0.201	0.461	1.497	0.730	0.333	0.333	0.333
72	0.384	0.522	0.384	0.522	0.909	0.016	0	1	0
73	0.395	0.170	0.170	0.361	1.649	0.022	1	0	0
74	0.144	0.209	0.255	0.154	1.538	0.006	0	0	1
75	0.070	0.107	0.664	0.070	1.817	0.066	0	0	1
76	0.367	0.339	0.316	0.469	1.050	0.251	0.438	0.325	0.237
77	0.404	0.303	0.180	0.550	1.119	0.037	0.996	0.004	0
78	0.271	0.282	0.388	0.340	1.129	0.296	0.195	0.229	0.576
79	0.223	0.307	0.234	0.410	1.326	0.348	0.239	0.487	0.273
80	0.403	0.355	0.355	0.639	0.924	0.737	0.377	0.312	0.312
81	0.270	0.374	0.225	0.444	1.247	0.020	0	1	0
82	0.264	0.264	0.286	0.579	1.194	0.927	0.325	0.325	0.350
83	0.078	0.078	0.078	0.080	2.546	0.010	0.333	0.333	0.333
84	0.424	0.459	0.426	0.459	0.837	0.008	0	1	0
85	0.254	0.288	0.380	0.335	1.148	0.294	0.162	0.267	0.571
86	0.303	0.280	0.280	0.423	1.207	0.340	0.381	0.310	0.310
87	0.508	0.508	0.486	0.213	0.750	-0.863	0.324	0.324	0.352

Continued on next page

Table 22 – continued from previous page

id	$W(P(L))$	$W(P(R))$	$W(P(M))$	$W(P(L \cup R))$	η	γ	$P(L)$	$P(R)$	$P(M)$
88	0.707	0.300	0.324	0.511	0.984	-1.224	0.096	0.428	0.409
89	0.229	0.225	0.225	0.312	1.452	0.238	0.343	0.328	0.328

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. This instructions are translated from the original French version.

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.

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.

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

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				
Your decision		Amazon voucher	Google Play voucher	Apple Store voucher
	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.

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	

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
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:

- If you select **Alternative A** for this line, you earn **6 ECU**.

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 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.

Example of a table with payments (in ECU):

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	

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:

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 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**.
 - 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

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

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

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**.

Appendix 4: structural estimation of betrayal attitudes and social preferences

Social Ambiguity Treatment

Let STG_i denote a binary variable, with $STG_i = 1$ if player i chooses to trust, and $STG_i = 0$ otherwise, in the social ambiguity treatment. The utility function for player i is modeled as:

$$u_i(x_i, x_j) = x_i^\alpha - s_1 \max\{x_j - x_i, 0\} - s_2 \max\{x_i - x_j, 0\}$$

where x_i is the payoff of player i , x_j is the payoff of player j , s_1 and s_2 capture inequality aversion as in [Fehr and Schmidt \(1999\)](#), and α reflects utility curvature based on certainty equivalent data from the experiment's second stage.

Let L , R , and M represent the events corresponding to Amazon, Google Play, and Apple Store in this social ambiguity treatment. The rank-dependent utilities for the choices $STG_i = 0$ (no trust) and $STG_i = 1$ (trust) are:

$$V_i(STG_i = 0) = 10^\alpha - 5s_2 + \epsilon_i^0$$

$$V_i(STG_i = 1) = W(P(L))(15^\alpha - 10s_2) + (W(P(L \cup R)) - W(P(L)))(10^\alpha - 5s_2) + (1 - W(P(L \cup R)))(8^\alpha - 3s_2) + \epsilon_i^1$$

where $W(P(L))$ and $W(P(L \cup R))$ are weighting functions derived from certainty equivalents, and ϵ_i^0 and ϵ_i^1 are error terms.

The probability p_i that $STG_i = 1$ is given by:

$$p_i = P(STG_i = 1) = F_{STG}(V_i(STG_i = 1) - V_i(STG_i = 0)) \quad (14)$$

assuming that $\epsilon_i^0 - \epsilon_i^1$ follows a normal distribution with mean zero and variance σ_{STG}^2 , where $F_{STG}(\cdot)$ denotes the cumulative distribution function.

Betrayal Aversion Treatment

Define TG_i as a variable equal to 1 if player i chooses to trust, and 0 if not, in the betrayal aversion treatment. The utility function for player i is:

$$u_i(x_i, x_j) = \begin{cases} x_i^\alpha - s_1 \max\{x_j - x_i, 0\} - s_2 \max\{x_i - x_j, 0\}, & \text{if } TG_i = 0 \\ x_i^\alpha - s_1 \max\{x_j - x_i, 0\} - s_2 \max\{x_i - x_j, 0\} - \beta, & \text{if } TG_i = 1 \end{cases}$$

where $\beta > 0$ indicates betrayal aversion, $\beta < 0$ betrayal seeking, and $\beta = 0$ betrayal neutrality (Bohnet et al., 2008).

The rank-dependent utilities for choices $TG_i = 0$ and $TG_i = 1$ are:

$$V_i(TG_i = 0) = 10^\alpha + \mu_i^0$$

$$V_i(TG_i = 1) = W(P(L)) \cdot 15^\alpha + (W(P(L \cup R)) - W(P(L))) (10^\alpha - 8s_1) + (1 - W(P(L \cup R))) (8^\alpha - 14s_1) - \beta + \mu_i^1$$

where μ_i^0 and μ_i^1 are error terms.

The probability q_i that $TG_i = 1$ is:

$$q_i = P(TG_i = 1) = F_{TG}(V_i(TG_i = 1) - V_i(TG_i = 0)) \quad (15)$$

assuming $\mu_i^0 - \mu_i^1$ is normally distributed with mean zero and variance σ_{TG}^2 , where $F_{TG}(\cdot)$ is the cumulative distribution function.

Structural estimation of betrayal attitudes

The log-likelihood function for the decisions made by 89 players in both treatments is:

$$\mathcal{L} = \sum_{i=1}^{89} [STG_i \ln(p_i) + (1 - STG_i) \ln(1 - p_i)] + \sum_{i=1}^{89} [TG_i \ln(q_i) + (1 - TG_i) \ln(1 - q_i)] \quad (16)$$

Here, values for α and weighting function W are derived from second-stage certainty equivalent data. Maximizing this log-likelihood function yields estimates for the betrayal aversion parameter β and social preference parameters s_1 and s_2 .