# An experimental method for the elicitation of implicit attitudes to privacy risk

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## Abstract

We test an experimental method for the elicitation of implicit attitudes to privacy risk. We ask individuals to decide whether to incur the risk of revealing private information to other participants. This type of risk that involves a social component corresponds to privacy threats that individuals may face in the field. We derive a measure of individual attitudes to privacy risk with our method. We empirically test the validity of this measure by running a laboratory experiment with 148 participants. Our results confirm that the willingness to incur a privacy risk is driven by a complex array of factors including risk attitudes, self-reported value for private information, and general attitudes to privacy (derived from survey methods in our study). We also observe that attitudes to privacy risk depend on the order in which measures of risk attitude are elicited, but do not depend on whether there is a preexisting threat to privacy, over which participants have no control. We explain how our method can be simplified and extended for use in eliciting attitudes to a wide range of privacy risks and various types of private information.

**Keywords:** privacy; attitudes; disclosure; risk; control; personal information; laboratory experiment.

**JEL Codes:** C91, D81, O30.

# 1 Introduction

The widespread use of the Internet for a broad range of daily activities means that privacy concerns are not only a personal issue. Privacy issues are now debated from the economic, legislative, technological and policy perspectives. Further elaboration of policies and solutions for the regulation, protection, exchange, and use of personal information raise a serious measurement challenge: what value does personal information have, to whom, and under what conditions? While numerous empirical studies have attempted to measure the value of personal information (Grossklags and Acquisti, 2007; Tsai et al., 2011; Beresford et al., 2012; Carrascal et al., 2013; Motiwalla and Li, 2016; Benndorf and Normann, 2017), an important dimension of privacy-related behavior - attitudes to privacy *risk* - has been largely understudied. In our view, due to stochastic nature of the hazardous consequences of a privacy breach, the decision to disclose personal information depends not only on the value of information and on the context, but also on individual risk tolerance. In this paper we make the first step towards closing this empirical and methodological gap in the experimental privacy literature: we offer a conceptual framework for incentivized implicit elicitation of attitudes to privacy risk. We validate our method in a laboratory experiment with 148 participants. We then recommend further extension of the method to cover a large variety of contexts and real-world scenarios that involve privacy-related behavior.

In contrast to commonly used survey methods, we do not directly ask participants to evaluate their risk attitudes. Instead, we offer participants the option to play incentivized privacy lotteries that result in personal information disclosure with a certain probability. Based on observed behavior, we infer their implicit risk preferences. We validate our method by correlating the behavior of participants in a laboratory experiment with a range of established measures of attitudes to privacy and to risk. We find that the behavior of participants in our experiment is consistent with their general attitude to risk, with their expressed level of concern with privacy, with the amounts they are ready to pay to protect their information from disclosure, and with the amounts they are willing to accept to disclose their information. We therefore propose an index of attitudes to privacy risk as a robust and meaningful monetary measure of the level of tolerance for risks to privacy. This measures how much people are ready to pay to protect themselves from privacy threats. Finally, we discuss why our method is a good guide for policy-makers when asked to judge the level of concern with different types of privacy risks within the population.

# 2 Motivation

At present, two popular approaches to investigate individual privacy attitudes are surveys and experiments. Surveys involve questionnaires asking respondents about their attitudes, for example how they would respond to hypothetical scenarios that involve privacy concerns (e.g., Westin's Privacy Index (Westin, 1968), Internet Users' Information Privacy Concerns (Malhotra et al., 2004)). Other surveys directly ask participants for their willingness to accept (WTA) payment for revealing, or their willingness to pay (WTP) to avoid revealing private information to others. Experiments differ from surveys in that they indirectly elicit participants' privacy preferences based on their behaviors. For example, they offer them a choice between more and less privacy-friendly options, such as purchasing a product from a website that requests more or less personal information (Gideon et al., 2006; Tsai et al., 2011; Beresford et al., 2012; Egelman et al., 2013). They may also be asked to disclose personal information in exchange for discounts or rewards (Huberman et al., 2005; Grossklags and Acquisti, 2007; Hann et al., 2007; Acquisti et al., 2013; Benndorf and Normann, 2017). Elicited values for privacy vary a lot across individuals and studies, depending on the type of information being traded and on the context (Hann et al., 2007; Carrascal et al., 2013; Schreiner and Hess, 2013; Motiwalla and Li, 2016).

In our study, we use an experimental approach rather than a survey for two main reasons. First, Acquisti et al. (2016) note that stated preferences often differ from observed behavior: people claim to care about privacy (Turow et al., 2015; Madden and Rainie, 2015) but they disclose personal information relatively freely (Norberg et al., 2007). A number of studies have provided evidence of this so called "privacy paradox" (Keith et al., 2013; Sutanto et al., 2013; Taddicken, 2014). The explanation of this phenomenon may partly lie in the use of imperfect methods for eliciting privacy attitudes and valuations, which as a result do not correspond to behaviors. Therefore, preferences derived from observed choices, even in the relatively artificial context of a laboratory experiment, may be better predictors of actual behavior than general self-reported attitudes to possibly more realistic but hypothetical scenarios. Second, direct measurements of attitudes to privacy, for example asking for WTA and WTP, force people to consciously choose answers to them. This may not be reliable because people may find it difficult to accurately and explicitly assess risks and losses associated with privacy. Indeed, Wilson and Brekke (1994) claim that explicit measurements suffer from limits in the ability of people to retrieve, translate and report their attitudes. Sometimes such attitudes are not accessible to introspection. In addition, participants are more inclined towards expressing extreme values when asked explicitly for their valuation for privacy than when those valuations are elicited indirectly (Schwarz, 1999). Due to the emotional component of privacy decisions, participants are more prone to provide biased or irrational responses to high-risk situations when asked directly (Braunstein et al., 2011). The superior performance of indirect methods over direct surveys in measuring privacy concerns was supported in a number of studies (Graeff and Harmon, 2002; Lewis et al., 2008; Preibusch, 2013). In our experiment, we ask people to choose how much money they require as compensation for being exposed to some probability that they will have to reveal their private information to others. We therefore we avoid forcing people into the very difficult task of making explicit calculations of the value of their private information to them.

Moreover, with our approach we seek to avoid several weaknesses of the currently established methods for assessing the value of privacy. First, when decisions are not incentivized, such as in surveys, participants do not face the hard economic question of how to balance monetary rewards and their personal preferences. When people consider privacy outcomes in isolation from actual economic tradeoffs, they may overestimate the weight of privacy concerns, without considering the monetary payment for personal information disclosure. Therefore, our method offers both monetary and behavioral incentive (i.e. the decisions entails balancing monetary gains and privacy loss). Second, privacy scenarios in existing studies present participants with a well defined, immediate and certain threat to – or guaranteed protection from – revealing private information. In real life scenarios however, people rather have to decide how much to invest to protect their information from a non-specific threat that may or may not be realized in the future and that has uncertain consequences. This means that many if not most privacy decisions are taken in a context of risk, not certainty. Therefore, when preferences are elicited in a context of threat *certainty*, rather than spelling out the *probability* of realization of this threat, then behavior that is observed may not translate to behavior in risky situation, as it does not take into account people's level of risk tolerance for privacy risk. For example, someone may assign a high value to protecting their privacy from a sure threat, but have a high tolerance for privacy risk, so that they may not be ready to invest that much to reduce the probability of that threat. Thus, in order to control for attitude to privacy risk, we spell out the probability of disclosure in our study. We believe that the behavior of people who are confronted with the *risk* of a loss of privacy is a more nuanced predictor of their behavior than their attitudes about certain privacy outcomes.

The above mentioned reasons lead us to propose using an implicit measure to provide an assessment of privacy attitudes without requiring intentional deliberate processing and awareness about the relation between the response to the privacy threat and the mental representation of this threat (Nosek and Greenwald, 2009). We thereby avoid limitations that are typical of self-reported estimations, such as their lack of relation with actual behavior (Nosek et al., 2011). Moreover, our method for measuring privacy risk attitude meets all four criteria that privacy valuations should comply with according to Hirschprung et al. (2016), namely our metric is explicitly numeric and in monetary measurable units (Euros, USD, or any other currency), reliable, applicable to common transactions, and reflects individual preferences. This paper presents our method and tests our measure.

## 3 Synthetic generation of a privacy concern

We collected personal information from our participants by combining standard privacy items (name, photo) and opinions on a range of sensitive topics. This information remained unknown to other participants in the room unless the outcome of the experiment was such that the participant had to reveal it at the very end of the experiment. When making decisions, participants knew the probability of this disclosure.

As standard privacy items, we used name, surname, and photo of each participant, which we took after signature of consent forms after arrival in the laboratory. Combined together, those pieces of data can be classified as personally identifiable information (McCallister, 2010). We merge this information with a synthetically generated source of private information, by asking participant to answer a questionnaire about their opinion on potentially sensitive or socially relevant topics, such as abortion, illegal immigration, and appropriate methods of birth contraception (appendix C.1). We are not concerned about the truthfulness of the answers, because there is no right or wrong answer in such a survey. We chose questions for which no clear majority opinion was likely to emerge, so as to discourage participants from choosing to answer in conformity with what they see as the norm. Because opinions always differed within the population for these questions, even a participant who does not report a truthful answer will see some of his expressed opinions contradict the opinions of some other people. In other words, the potential conflict of opinions does not depend on whether one's *expressed* opinion corresponds to one's truthfully *held* opinion. Therefore, no matter whether the participant answers truthfully or not, the risk of public revelation of the opinions together with name, surname and photo is expected to cause concerns related to the information disclosure. This concern is therefore related to the fear of being shunned by some other people, which occurs if a participant expresses opinions contradict theirs (see Noelle-Neumann, 1974; Kim, 1999; Clemente and Roulet, 2015) and is relevant in many situations involving face-to-face conversations with others or discussions in online social networks.

Statistics on the answers to the preliminary questionnaire are shown in appendix C.1. Intraclass correlation coefficient among answers on preliminary questionnaire equals 0.56, proving that a large proportion of participants expressed opinions that differed from others. In other words, opinions of our participants for most of the sensitive questions were split almost equally, meaning that there was no universal truth or socially preferable norm in the group, and therefore regardless of expressed belief, once revealed, about half of the participants in the laboratory would disagreed with it. This is the core mechanism of our method to elicit concern.

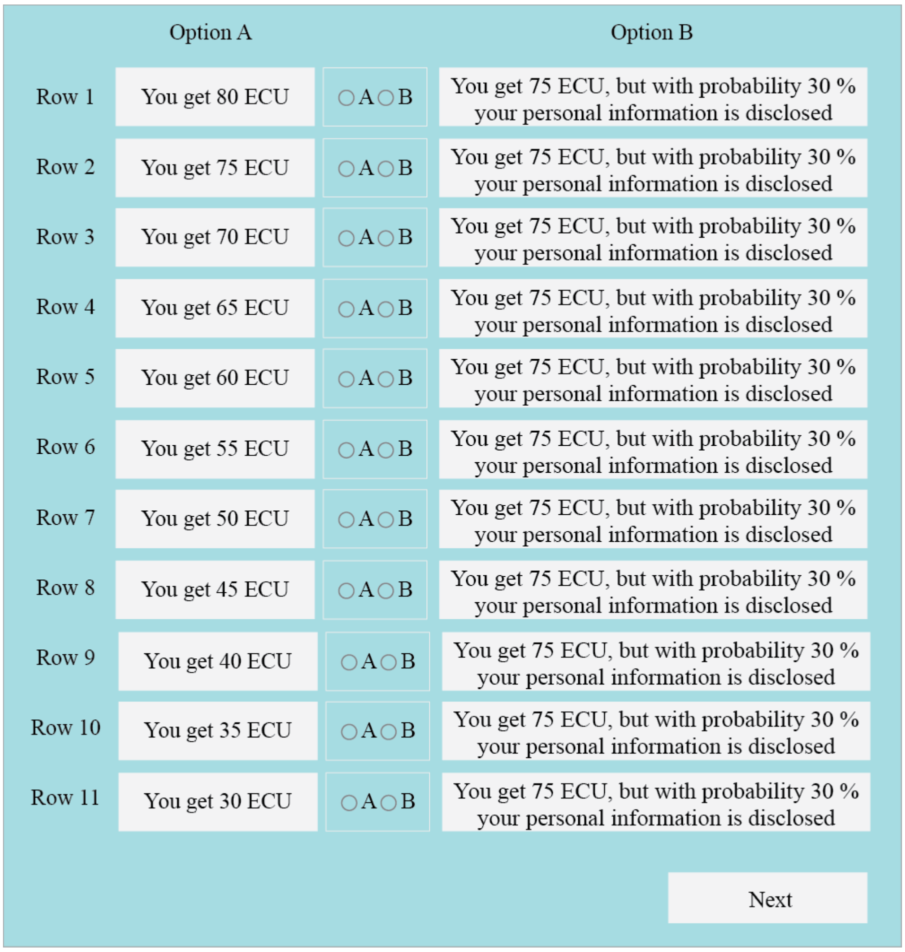
There are a few other experimental studies that *synthetically* produce personal information for the purpose of investigating privacy attitudes. Rivenbark (2012) used a public good game to endogenously generate valuable private information for further elicitation of values and beliefs. Grossklags and Acquisti (2007) used quiz performance to estimate willingness to sell or protect personal information. Feri et al. (2016) created sensitive information via a logic test score, which results in a division of participants into "bad" and "good" types, connected to the real name of the participant. Such methods suffer from an overconfidence bias (Griffin and Varey, 1996; Wallsten, 1996), which is difficult to control for, whereby people have a tendency to believe that they belong to a group with a test score above median.

Our novel method of synthetic elicitation of personal information overcomes the disadvantages of using intelligence test scores, and by covering multiple contexts, increases the probability to capture an issue that is sensitive for an individual. Our method induces a privacy concern without falling into issues with truth-telling. While eliciting information that is sensitive in the laboratory context, the personal information we obtained cannot be misused to damage the participants materially, which helps overcome legal constraints in the collection, storage, and use of personal information.

# 4 The elicitation of attitude to privacy risk

After collecting personal data we generated privacy concern by putting private information under the risk of disclosure to other participants. Specifically, we elicited risk attitude by asking participants to make choices between gambles in a variation of the multiple price list (MPL) design that is commonly used to elicit preferences in experimental economics. MPLs are easy to understand for participants and are incentive compatible (Miller et al., 1969; Holt and Laury, 2002; Harrison and Rutström, 2008; Andersen et al., 2006). Participants were offered 8 lists (See tables 1 to 8 in appendix C.3), each requiring 11 decisions between safe options and risky lotteries. Payoffs were expressed in Experimental Currency Units (ECU), with 1 ECU = 0.1 Euro. There were two types of lotteries: *monetary lotteries* that involved only monetary outcomes, which participant would receive with a certain probability, and *privacy lotteries* that in addition to monetary reward involved a certain known risk of personal information revelation to other experimental participants. Fig. 1 provides an example of MPL list in privacy task.

Figure 1: Screenshot of one of the MPL menus in the privacy task



|  | Option A |  | Option B |
|---|---|---|---|
| Row 1 | You get 80 ECU | ○A○B | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| Row 2 | You get 75 ECU | ○A○B | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| Row 3 | You get 70 ECU | ○A○B | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| Row 4 | You get 65 ECU | ○A○B | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| Row 5 | You get 60 ECU | ○A○B | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| Row 6 | You get 55 ECU | ○A○B | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| Row 7 | You get 50 ECU | ○A○B | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| Row 8 | You get 45 ECU | ○A○B | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| Row 9 | You get 40 ECU | ○A○B | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| Row 10 | You get 35 ECU | ○A○B | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| Row 11 | You get 30 ECU | ○A○B | You get 75 ECU, but with probability 30 % your personal information is disclosed |

Subjects were asked to indicate the option they preferred to play for every row. The order of MPL menus, within each task, was randomized across participants.

In each row, participants had to choose between a safe payoff $x$ and a lottery $L$. Lottery $L$ offered monetary payoff $y$, but this amount is reduced by $c$ with probability $1 - p$ (in monetary lotteries), or accompanied by individual's personal information disclosure t with probability $1 - p$ (in privacy lotteries).[1] Values of $x$, $y$, and $p$ were the same in monetary and privacy tasks.

We kept the probability of loss fixed at 30%[2] and not lower in order to avoid the issue of probability weighting, whereby low probabilities are over-weighted (Tversky and Kahneman, 1992). We chose to vary the safe payoff across rows rather than probabilities of a loss because comparisons of monetary payoffs is easier for participants than comparisons of event probabilities.

[1] We varied $c$ across monetary lotteries to be able to condition our measure of a participant's risk aversion to the level of loss he is facing. This is because we do not know in advance what value a participant attaches to privacy, and we therefore need to consider risk aversion for a range of possible values. $c$ took a negative value in one of the tables, to consider how participants respond to the probability of a gain.

[2] We also chose 30%, because 50% probability of personal information disclosure is unrealistically high for privacy risk domain. Same level of risk was used in the experimental study in Maier and Rüger (2010); Hirschprung et al. (2016).

## 4.1 Measure of financial risk attitudes

For our measurements of financial risk attitude, we calculate the ***rate of return*** ("*ror*") required by each participant to take the lottery. If a participant is indifferent between safe payoff $x_{kj}$ and expected value of the monetary lottery $L_k = (y, p; y-c, 1-p)$ in row $j \in [1, 11]$ of table $k \in [1, 4]$, then $x_{kj} \cdot (1+ror_{kj}) = y_k \cdot p + (y_k - c_k) \cdot (1-p)$. Therefore, to take lottery he requires a rate of return $ror$ of:

$$ror_{kj} = \frac{y_k \cdot p + (y_k - c_k) \cdot (1-p) - x_{kj}}{x_{kj}}. \tag{1}$$

We first compute $ror_{kj}$ for each row of each table in monetary task. Then we identify the indifference point by looking at which row participant $i$ switches from safe to risky option, and use the midpoint of the relevant interval of $ror_{ik}$ as a measurement of his financial risk attitude. Adopting the idea that back-and-forth switching behavior could be the result of indifference, we use the mean value between the lower bound of the first switch and the upper bound of the last switch in MPL table for our estimate of $ror_{ik}$ in cases where participants switched more than once (see Andersen et al., 2006; Harrison et al., 2012; Charness et al., 2013). We also compute $\overline{ror_i}$, the average individual $ror$ across all MPL tables in monetary task.

Tab. 1 shows that with our MPL menus in monetary task, we are able to obtain an estimate of the risk premium even for very high or low values of $ror$.

Table 1: Interval estimation of financial risk attitude *(ror)* across MPL tables.

| MPL table, $k$ | Range of safe outcomes (in ECU), $x$ | Lottery option, $L = (y, p; y-c, 1-p)$ | Elicitation interval for $ror$ |
|---|---|---|---|
| 1 | 46 - 56 | Get 55, but Pr=.3 to lose 10 | $-7\% < ror < 13\%$ |
| 2 | 38 - 68 | Get 65, but Pr=.3 to lose 30 | $-18\% < ror < 47\%$ |
| 3 | 30 - 80 | Get 75, but Pr=.3 to lose 50 | $-25\% < ror < 100\%$ |
| 4 | 35 - 65 | Get 30, but Pr=.3 to gain 30 | $-32\% < ror < 26\%$ |

If a participant never switched in a table then we consider the level of $ror_{ik}$ to be unobserved. If a participant never chose to play a lottery in any table for any value of the safe alternative then we consider this participant to have $ror > 100\%$. If a participant always chose the lottery rather than any safe option then we consider this participant to have $ror < -32\%$.

While we use this measure of risk attitude for monetary payoffs, none of our later results depend on this; indeed, we consider also other measures including the number of safe choices made (option A in tables), and parametric measures such as $r$ in a CRRA utility function and $\alpha$ in a CARA utility function.

## 4.2 Measure of privacy risk attitudes

We measure ***attitude to privacy risk*** ("APR") as the monetary equivalent of the risk of personal information disclosure for a risk neutral participant. Closest to our measure of APR is the notion in Hirschprung et al. (2016), which defines the value of privacy as “the value of the benefits at the equilibrium point, when an individual is indifferent to the information disclosure”. Our measure of APR is therefore an indicator of participant combined attitudes to both risk and personal information disclosure.

If a risk neutral participant is indifferent between safe payoff $x_{kj}$ and expected value of the privacy lottery $L_k = (y, p; y - APR, 1-p)$ in row $j \in [1, 11]$ of table $k \in [5, 8]$, then it must be that $x_{kj} = y_k \cdot p + (y_k - APR_{kj}) \cdot (1-p)$ . The $APR$ is therefore an implicit monetary measure of the (dis)utility of privacy risk for a participant who is risk neutral.

$$APR_{kj} = \frac{y_k - x_{kj}}{1-p} \tag{2}$$

Using formula 2 we compute an interval estimate of the value of $APR_{ik}$ as implied by individual switching points in the MPL menus of the privacy task (tab. 2). We use the midpoint of the switching interval as our measurement of $APR_{ik}$ when participants switched only once, and the mean value between the lower bound of the first switch and the upper bound of the last switch in MPL tables when participants switched more than once. We also compute $\overline{APR_i}$, the average $APR_i$ by individual across all MPL tables in privacy task.

Table 2: Interval estimation of privacy risk attitude ($APR$) across MPL tables.

| MPL table,<br>$k$ | Range of safe<br>outcomes (in ECU), $x$ | Lottery option,<br>$L = (y, p; y - APR, 1-p)$ | Elicitation interval<br>for $APR$ (in ECU) |
|---|---|---|---|
| 5 | 46 - 56 | Get 55, but Pr=.3<br>of personal information disclosure | $-3 < APR < 30$ |
| 6 | 38 - 68 | Get 65, but Pr=.3<br>of personal information disclosure | $-10 < APR < 90$ |
| 7 | 30 - 80 | Get 75, but Pr=.3<br>of personal information disclosure | $-17 < APR < 150$ |
| 8 | 35 - 65 | Get 30, but Pr=.3<br>of personal information disclosure | $-100 < APR < 0$ |

Tab. 2 shows that we can measure $APR$ between 150 ECU (15 Euro) and -100 ECU (-10 Euro). Positive value of $APR$ can be translated into a dislike for taking a risk of personal information disclosure, while negative value of $APR$ can be attributed to enjoying the risk of personal information disclosure (“privacy risk loving”). Note that the $APR$ is not a monetary equivalent of privacy loss, but of the *risk* of such a loss. In other words, $APR$ combines the value attached to privacy by a participant and his level of aversion to risk—participants who are more risk averse and participants who value privacy more have higher $APR$. While being outside of the scope of this paper, future research is called to disentangle those two aspects of decision under privacy risk.

In addition to using this measure of attitude to privacy risk, we consider also another measure, which is the number of choices of the safe option in privacy lotteries.

We also include other variables measuring attitudes to privacy from survey responses, in particular:

1. Explicit self-reported WTA for privacy disclosure (Q6 in the final questionnaire, appendix C.4) and
2. Explicit self-reported WTP for privacy protection (Q7).

Other measures of privacy attitudes based in part on Fogel and Nehmad (2009) include:

1. General privacy concern (Q16, higher is more concerned),
2. Whether participants are ready to disclose private information online (Q17 to Q20, summarized in an index of online information revelation, higher is more willing),[3]
3. Experience of privacy invasions (Q21, 0 is no, 1 is yes),
4. Questions to compute Westin's Privacy Index (Q22, see Westin, 1968, coded as 0 for unconcerned, 1 for pragmatists and 2 for fundamentalists),
5. The online social network used (Q24)[4]
6. The number of offline and online friends (Q23 and Q25),
7. Privacy settings in online networks (Q26 to Q29, summarized in index "privacy online", higher is less private).[5]
8. Questions to compute a self-disclosure index, higher indicates more self-disclosure.[6]

We also collected other variables related to privacy concerns specifically within the context of the experiment, including:

1. Number of other participants known beforehand (Q3),
2. Trust in the use of information by the experimenter (Q5, coded as 1 if trust, 0 else, only 3% did not trust), and
3. An index of *conformity* to the opinion of others in the preliminary questionnaire (average percentage of participants who agree with one's opinion, summed over all questions).

This latter variable is designed to take account of a possible exacerbated privacy concern for those participants who know or think that their opinion does not fit with the majority.

[3] The index of "online information revelation" is computed using a single-factor measurement model whereby answers to questions Q17 and Q19 are modeled as ordered logit and answers to questions Q18 and Q20 are modeled as logit.

[4] 80% indicated Facebook, only 5% did not belong to any, so the variable is coded as 1 for Facebook, 0 for others.

[5] In the "privacy settings online" index, Q26 to Q29 are coded as 1 if a participant answered 1 in Q26, 1 or 2 in Q27, 1 in Q28 and 1 in Q29 , and 0 otherwise. We then sum those variables.

[6] The self-disclosure index is computed as sum of a, c, d, f, and i minus b, e, g, h and j.

We also take into account socio-demographic indicators including gender, age, field of study, level of education, nationality, parents' education, size of the locality (city, town, village, *etc.*) and revenue(Monthly spend) (Q8 to Q15).

Finally, we elicit:

1. General and domain specific risk attitude (Q31 and Q32, summarized in index "risk"[7]) and
2. Level of trust in others (Q33 to Q37, summarized in index "trust"[8]).

# 5 Experimental procedures

We conducted our experiment in the Cognitive and Experimental Economics Laboratory of the University of Trento in Italy between May, $4^{th}$ and June, $8^{th}$ 2015. A total of 148 participants were recruited for 8 experimental sessions, in groups of 15-21 participants per one-hour session, among undergraduate students at the University of Trento, Italy. Appendix D summarizes the demographic characteristics.[9] On average participants obtained 8.83 Euro per person, including a 3 Euro show-up fee. The experiment was approved by the ethical board of the University of Trento.

## 5.1 Timeline of the experiment

1. **Invitation and informed consent:** When invited to participate, subjects were not told that the scope of the study was related to privacy. On arrival in the laboratory, they read questions in our preliminary opinion questionnaire (appendix C.1) and were told in the consent form that answers to those questions could be revealed to other participants in the session, along with a photo of them and their name. After reading the questions and consent form participants were given a chance to withdraw from the study. The payment of the show-up fee was guaranteed independently of that decision. Thus, we controlled for self-selection related to reluctance to respond to the questionnaire. All invited participants decided to go through with the experiment and signed the consent form.
2. **Collection of private information:** After consent forms were signed and before the experiment started, we took photos of the participants, and let them answer to the preliminary questionnaire (appendix C.1). They were guaranteed that their photo would be deleted from our database after the session, and that their answers to the questionnaire would not be associated with their name in our records. We did not collect participant's names in advance, however they were

[7] The "risk index" is computed using a single-factor measurement model whereby answers to questions Q31 and Q32 are modeled as ordered logit.

[8] The trust index is computed using a single-factor measurement model whereby answers to questions Q33, Q34 and Q35 are modeled as ordered logit and answers to questions Q36 and Q37 are modeled as logit.

[9] The demographic characteristics were similar across all sessions.

told that if according to the outcome of the experiment their data was to be disclosed to others, they would be required to demonstrate to the experimenter their photo ID, and their name would be revealed to other participants in the session along with the picture and questionnaire answers.

3. **Distribution of envelopes:** To improve the clarity of decision consequences, we employed the prior incentive system (PRINCE) (Johnson et al., 2015). Instead of picking one of the decisions from MPL tables for payment only at the end of the experiment, the PRINCE system involves distributing closed envelopes with a description of the real choice situation (particular row from an MPL table) that would determine an individual's payoff *before* the experiment starts.[10] Participants thus picked at random an envelope before entering the laboratory and taking a randomly assigned seat.

4. **Decisions in privacy and monetary lotteries:** Then, participants read the instructions for the main part of the experiment (appendix C.2). Before proceeding to making choices in privacy and monetary lotteries, participants had to answer correctly the control questions designed to ensure comprehension of the experimental procedures, tasks, and incentive scheme. Then they were asked to make a sequence of binary choices between safe and risky options in two types of lotteries: *monetary* lotteries that imply changes in monetary outcome; and *privacy* lotteries that imply the disclosure of personal information (appendix C.3). Participants either played monetary lotteries first, or privacy lotteries first.

5. **Final questionnaire:** Finally, participants answered a final questionnaire about the experiment, basic demographic information, attitudes towards privacy, risk, self-disclosure, fairness, trust, and WTA and WTP for their personal information (appendix C.4).

6. **Outcome and payment:** At the end of each session participants came one-by-one to the experimenter's table and opened their envelopes. The decision of the participant that was made in the situation described in the envelope was implemented. A dice roll decided the outcome if the participant chose to play the lottery in that situation. If the result was that personal information had to be disclosed to other participants, then the participant stood in front of the audience in the lab, the experimenter verified his name and surname from the ID card, and then announced it aloud. Other participants saw on the screen the

[10] Decision-makers find it easier to condition on the events determined in the past rather than in the future (see Keren, 1991; Shafir and Tversky, 1992; Cubitt et al., 1998; Hey and Lee, 2005; Bardsley et al., 2010). This system makes it more obvious to the participants that any situation might be relevant for them, and which decision is relevant depends on the chance that has already realized at the moment they picked an envelope. Therefore, participants have to consider each decision they make as potentially payoff-relevant. Johnson et al. (2015) claims that PRINCE system improves participants' understanding that the payoff-relevant decision is chosen at random, and gives them better reassurance that this is true randomization, *i.e.* that the experimenter does not deceive them. This also makes isolation of each decision "maximally salient" (p. 3) and makes the issue of hedging across decisions (Holt, 1986) less important.

picture of the participant and the answers that this participant gave in the preliminary questionnaire. To emphasize differences in opinions, we presented the answers to the preliminary questionnaire in terms of the fraction of participants who answered in a different way, *e.g.*, “John Smith agrees that it is morally justified to abort after discovering serious disability in the fetus, while 53% of other participants do not agree”.

We now proceed to the description and analysis of the experimental results.

# 6 Results

In total our data set is made of 88 binary choices made by each of 148 individuals. There were 70 participants in the *privacy lotteries first* condition group, and 78 participants in the *monetary lotteries first* condition group. In 95.86% of cases participants switched from the safe to the risky option in the MPLs only once, demonstrating consistent monotonic preferences.[11]

## 6.1 Attitude to privacy risk

Average $\overline{APR}$ for participants for whom it was measured (90% of the total) was 25 ECU (2.5 Euro), compared with mean WTA of 16.1 Euros (excluding outliers[12]), and mean WTP of 1.9 Euros (also excluding outliers). Table 3 summarizes the estimations of attitudes to privacy risk and Figure 3 shows their distribution.

Of the 148 participants in our experiment, 49 participants(33% of the sample) had $\overline{APR} = 5$ ECU, which corresponds to 0.5 Euro. This value is the mean $APR$ for participants who consistently preferred a safe payoff to the same payoff along with a risk of privacy disclosure, but switched to the risky option as soon as the lottery outcome exceeded the safe payoff. Those participants are thus close to *indifferent* to the risk of personal information disclosure. Another 94 participants (64% of the sample) had $\overline{APR} > 5\,\text{ECU}$ (*privacy protective*), of which 14 never took any privacy risk ($\overline{APR} > 150\,\text{ECU}$). Finally, 5 participants (3% of the sample) had $\overline{APR} < 5$ ECU (*privacy risk loving*). There were no participants who always chose the risky option ($\overline{APR} < -100\,\text{ECU}$).

The majority of our participants were thus averse to privacy disclosure, a large minority was indifferent, and a small minority appeared to enjoy privacy disclosure and was ready to pay for it. This contrasts with WTA/WTP, which were all higher than or equal to zero. Possibly, participants did not realize they could express negative values for their WTA/WTP. Future experiments on privacy should be careful to make participants aware that they can also express willingness to disclose personal data rather than assuming that all participants are unwilling to disclose.

[11] This is similar to a 5.5-6.6% proportion of multiple switches observed by Holt and Laury (2002). All the results were robust to exclusion of observations from the participants who switched more than once.

[12] More than 2 standard deviations from the mean.

With the exception of a few people, most of our participants were not comfortable with personal information disclosure, and they chose safe options in privacy lotteries at least some of the time, demonstrating the presence of privacy concerns.

While the majority of people did tend to protect private information from disclosure, some appeared to want to make their personal information and opinions public. This may reflect differences in goals, attitudes, personality traits and other factors (see Zywica and Danowski, 2008; Krasnova et al., 2009; Ross et al., 2009; Correa et al., 2010). This minority tendency to disclose is consistent with the use of social technologies, such as online social networks, blogs, *etc.*, and could be especially prevalent for the active users of such technologies, extensively present in the population of students, and, consequently, in our sample.[13]

## 6.2 The drivers of attitudes to privacy risk

We test the drivers of attitudes to privacy risk by specifying two models for regression analysis. The first model relates $APR$ and $ror$ while taking into account right-censoring of the dependent variable:

$$\overline{APR_i} = \beta_0 + \beta_1 \cdot \overline{ror_i} + \beta_2 \cdot Order_i + ... + \epsilon_{ik} \quad (3)$$

where $\overline{APR_i}$ is average $APR$ for individual $i$ across tables $k \in [5,8]$, except if the individual never switched in any table, in which case we have $\overline{APR_i} > 150$ ECU. $\overline{ror_i}$ is average $ror$ for participant $i$ from his choices in tables $k \in [1,4]$. [14] $Order_k$ takes value 0 if monetary task appeared before privacy task, 1 otherwise.

We test the robustness of our results by running a second regression model, where we input the number of safe choices made in privacy task as the dependent variable, and the average number of safe choices made in monetary task, instead of $\overline{ror_i}$, as an independent variable. This second model specification therefore takes the following form:

$$safe\_privacy_{ik} = \beta_0 + \beta_1 \cdot \overline{safe\_monetary_{ik}} + \beta_2 \cdot Order_i + \beta_3 \cdot Table_k + ... + \epsilon_{ik} \quad (4)$$

whereby $safe\_privacy_{ik}$ is the number of safe choices made by individual $i$ in privacy MPL tables $k \in [5,8]$ and $\overline{safe\_monetary_{ik}}$ is the average number of safe choices made by individual $i$ in monetary MPL tables $k \in [1,4]$ (see Appendix C.3). $Order_k$ takes value 0 if monetary task appeared before privacy task, 1 otherwise; $Table_k$ is a control for differences in the number of safe choices across tables. For the estimation

[13] Only about 5% of our participants indicated they were not members of any online social network.

[14] Because three participants always avoided financial risk ($\overline{ror_i} > 100\%$), meaning that their level of risk aversion is not observed, we also include in our regressions a dummy Highly Risk Averse, which is equal to $1$ if $\overline{ror_i} > 100\%$, and equal to $0$ else. Formally, our regression is therefore of the form $\overline{APR_i} = \beta_0 + \beta_1 \cdot \overline{ror_i} \cdot 1(\overline{ror_i} < 100\%) + \beta_1' \cdot 1(\overline{ror_i} > 100\%) + \beta_2 \cdot Order_i + ... + \epsilon_{ik}$

of this second model, we run panel random-effects interval regressions, which allows us to take into account right- and left-censoring (when a participant always chooses option A or option B in a given MPL table).

### 6.2.1 The relation between financial and privacy risk attitudes

Our regressions show that the $ror$ measure of aversion to risk in monetary tasks is a significant positive predictor of the $APR$ (tab. 6). We find the same positive significant relation between the number of safe choices made in monetary lotteries and in privacy lotteries (tab. 7). This confirms that participants who are more risk-averse in monetary lotteries are also more risk-averse in privacy lotteries. In other words, risk attitudes in the financial and in the privacy domains are consistent with each other; someone who is unwilling to take a risk involving a monetary loss will also generally be unwilling to take a risk involving a loss of privacy.

### 6.2.2 The relation between explicit privacy attitudes and attitudes to privacy risk

We find that higher WTA and WTP both predict higher $APR$, whereby the $APR$ increases by an average of 0.5 ECU (= $0.05$ Euro) for every Euro increase in WTA, and by an average of 2 ECU (= $0.20$ Euro) for every Euro increase in WTP (tab. 6). There is therefore a relation between our implicit measure of privacy risk aversion and explicit measures of valuations for privacy, but that relation is rather weak.

Other factors that independently relate to $APR$ are the experience of a violation of privacy in the past (Q21), whether one's a Westin's fundamentalist, and general privacy concerns (Q16). None of the socio-demographic characteristics influences privacy decisions, except being a foreigner (non-Italian), which increases the number of safe choices made in privacy lotteries. This can be related to cultural differences, the potentially higher uncertainty among foreigners regarding sensitive opinions distribution in Italy, or generally lower self-confidence related to being a national minority group.

Those findings confirm that participants who express more concern for privacy and/or express higher values for protecting their private information are also less likely to take the risk of having to reveal private information. We confirm the robustness of our results when considering the number of safe choices in privacy lotteries as well (tab. 7).

In terms of contributions of privacy attitudes and financial risk preferences to explaining privacy risk attitudes, the McFadden's pseudo $R^2$ of our full model is 10.7% for $APR$ regressions and 8.9% for safe choice regressions.[15] Of this, about 40% is contributed by measures of risk attitude in monetary lotteries, 40% by the combination of WTA and WTP, and the rest by survey measures of privacy attitudes and

[15] McFadden's pseudo $R^2$ compare the log-likelihood $LL_0$ of the null model with only an intercept to the log-likelihood $LL_{Full}$ of the full model: $R^2 = 1 - {}^{LL_{Full}}/_{LL_0}$.

socio-demographic variables.[16]

Overall, therefore, participants who are more risk averse than others when faced with monetary lotteries, are also more risk averse than others when faced with privacy lotteries. We also find that participants who express more concern for privacy and who are ready to pay more to protect it, or who require more money to reveal it, are less likely to take a risk in privacy lotteries.

# 7 Robustness to order effect and preexisting threat

We test in this section two issues of robustness of our measure of attitude to privacy risk. The first is whether the order of elicitation of monetary risk and privacy risk attitude matters, and the second is whether our measure can be used to elicit attitude when privacy is already under threat. The first issue is important for experimenters since they have to choose what attitude to elicit first, and the order of elicitation may impact how participants perceive the tasks. The second issue is important for policy-makers since they are interested in eliciting attitude to privacy risks that the population is already incurring. Therefore, we need to know whether attitudes change depending on whether people can avoid taking a privacy risk entirely, vs. when taking some risk is unavoidable.

## 7.1 Order of elicitation

In our experiment, we controlled for the order of elicitation of privacy and financial risk preferences by presenting privacy lotteries first for some participants (N=70) and monetary lotteries first for the others (N=78). The order of elicitation can matter because theories of selective information processing state that focus on a primary task reduces attention to a secondary task (Kahneman, 1973). If the monetary lotteries are presented prior to the privacy ones, participants may keep their focus on monetary outcomes and calculation of expected values, "learned" from the monetary lotteries, when making decisions in the privacy lotteries. In this case, the emphasis on monetary values could drive attention away from the evaluation of the utility of maintaining personal information private. The latter could be even considered as irrelevant for decision-making when the financial context is set up in advance and perceived as more salient (Broadbent, 1957, 1982; Pashler and Sutherland, 1998; Dukas, 2004; Lachter et al., 2004). In contrast, playing privacy lotteries first could draw more attention to the personal information (dis)utility. Moreover, the time delay between generation of personal information by answering the sensitive questions, and putting these responses under risk of disclosure, is shorter when the privacy

[16] We measure contribution as the percentage of the difference in log-likelihood between the null model and the full model that is achieved by a model with the respective variable alone. An alternative measure of contribution is by considering by how much the log-likelihood decreases when removing one variable. In that case, the contribution of the measure of financial risk attitude is lower.

lotteries are played right after the completion of the preliminary questionnaire rather than in the second part of the experiment. Adjerid et al. (2013) found that even 15-second delay between demonstration of privacy notice and disclosure decisions was sufficient to distract participants and mute the perception of risk.

To test the order effect we consider the number of safe choices and $APR$ across different ordering of monetary and privacy tasks in the experiment. Statistical tests and cumulative distribution function show a significant order effect in privacy task: participants made more safe choices in the privacy lotteries and had higher $APR$ when privacy tasks appeared before the monetary tasks.[17] A similar effect is observed also in terms of the percentage of participants who took only safe alternative in privacy tasks (20% when privacy task first *vs.* 12% when monetary task first).[18] The proportion of people who behaved as if they had value for privacy close to zero – switching to the risky choice as soon as its payoff was higher than the safe choice – was significantly lower when privacy lotteries appeared first than when monetary lotteries appeared first (25% *vs.* 36%, respectively).[19] Our findings show that the willingness to protect personal information from the risk of revelation increases when decisions involving risk of personal information disclosure are made before the decisions involving risk of a monetary loss.

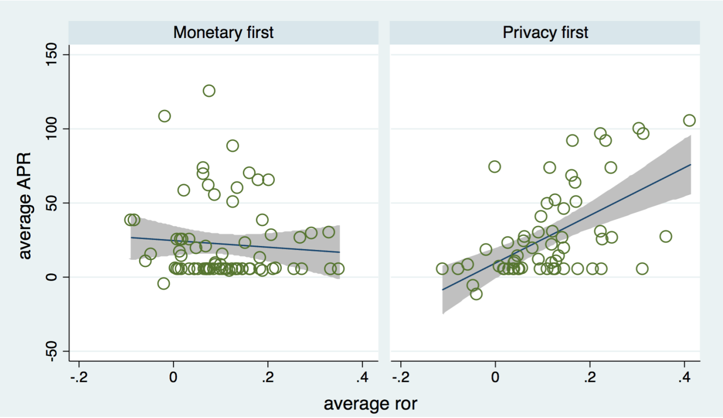


Figure 2: Scatter plot of $\overline{ror}$ and (dis)utility of privacy risk, $\overline{APR}$, by order of elicitation, with prediction line of linear regression and 95% confidence interval for forecast.

While cumulative distribution function and statistical tests show that values of $APR$ are greater when privacy task appears first, coefficients on this condition dummy

[17] Tests of the difference in the number of safe choices: two-sample Wilcoxon rank-sum test: Prob > |z| = 0.01; t-test: Pr(T < t) = 0.01; Kolmogorov-Smirnov equality-of-distributions test: corrected p-value is 0.04; ANOVA: coefficient is 0.77, P>|t|=0.02; Kruskal-Wallis equality-of-populations rank test: Prob=0.01. $N_{ID} = 148$; $N_{obs} = 592$(312 and 280 in monetary and privacy tasks first conditions, respectively). Estimated statistical power is 0.66.
Tests of the difference in $APR$: two-sample Wilcoxon rank-sum test: Prob > |z| = 0.028; t-test: Pr(T < t) = 0.03; Kolmogorov-Smirnov equality-of-distributions test: corrected p-value is 0.10; ANOVA: coefficient is 5.53, P>|t|=0.06; Kruskal-Wallis equality-of-populations rank test: Prob=0.03. $N_{ID} = 148$; $N_{obs} = 375$ (206 and 169 in monetary and privacy tasks first conditions, respectively). Estimated statistical power is 0.45.

[18] Excluding MPL table 4, proportion test Pr(Z < z) = 0.01. Pearson chi2(1) = 5.32 (Pr = 0.021). Estimated power is 0.63.

[19] Two-sample test of proportions: Pr(Z > z) = 0.00. Estimated power is 0.83.

in regressions (appendix B) are not consistently significant. However, we find that the relation between $APR$ and $ror$ is stronger when privacy task appeared first (fig. 2).[20] This suggests that when privacy task appeared before the monetary one, the decision in privacy task was largely driven by risk attitudes. Risk aversion played a smaller role when the privacy tasks appeared after the monetary ones, possibly because the attention of participants may have been drawn to monetary outcomes rather than to risk evaluation or privacy concerns.

### 7.2 Preexisting risk to privacy

In our experiment, we also tested the effect of introducing an unavoidable risk of revelation of personal information independently of the choice to incur privacy risks in the experiment. Prior research has identified control or the lack thereof as an important driver of risk attitudes and behaviors (Weinstein, 1984; Harris, 1996; Slovic, 2000; Nordgren et al., 2007). More specifically, individuals deprived of control are reluctant to exhibit efforts required to achieve a desirable outcome (Hopstaken et al., 2015). Choi et al. (2018) found that loss of control over one's personal data results in a perception of futility of its protection, so called "privacy fatigue", and as consequence on disengagement from privacy decision-making and behaviors.

In our experiment, we therefore tested the effect of reducing control over the release of personal information by running a treatment with the possibility of a "privacy shock" (N=67) along with a treatment with no such privacy shock (N=81). We crossed this treatment with the order of elicitation in a 2x2 treatment design (Table 5). In the Shock treatment, participants were told before the experiment that there was a 21% probability that their information would be revealed to others irrespective of their decisions in the laboratory. Such possibility of privacy shock reflects a real-world externality of data trading, whereby data subjects do not have full control over their personal information as data breach does not dependent on their behavior and choices alone, but also on the vulnerabilities of security systems deployed by of the companies, who treat personal data, and hacking techniques deployed by the attackers. Cofone (2015) argues that such externalities may force subjects to apply discount function to maximize the welfare. We compare treatments with the possibility of such a shock to treatments where participants can guarantee through their decisions that no revelation of private information will occur.

We look at the number of safe choices and APR taking into account all individual decisions. Statistical tests and cumulative distribution function show no significant effect of introducing a privacy shock: participants made the same number of safe choices in the privacy lotteries and had the same $APR$.[21] This observation is in line

[20] Results from regressions confirm that there is no significant relation between $APR$ and $ror$ if monetary lotteries are presented first, while the relation is significant if privacy lotteries are presented first.

[21] Tests of the difference in the number of safe choices show no significant effect: two-sample Wilcoxon rank-sum test: Prob > |z| = 0.84; t-test: Pr(|T| > |t|) = 0.9996; Kolmogorov-Smirnov equality-of-distributions test: corrected p-value is 0.99; ANOVA: coefficient is -0.0002, P>|t|=1.00; Kruskal-Wallis equality-of-populations rank test: Prob=0.84. N=592 (268 and 324 in shock and basic treatments, re-

with the experimental results in Wathieu and Friedman (2009), whereby introducing the certainty of personal information dissemination against probabilistic risk of revelation did not increase privacy concerns.

Thus, we conclude that the introduction of a privacy shock does not lead people to change their attitude towards protection of personal information. In other words, even when losing complete control over personal information, whereby one introduces a risk of information disclosure that is independent of one's choices, people keep on considering the level of risk that remains under their control in the same way as if they had full control over whether to incur this risk.

## 8 Discussion and conclusion

We presented a novel method for the implicit elicitation of the attitude to the risk of personal information disclosure based on choices in privacy lotteries. Our method is based on observed behavior instead of surveyed attitudes, it is incentivized, and involves probabilistic privacy risk, which is more common in real-life privacy decision space than certain privacy threats. .

We tested our methods in a laboratory experiment with 148 participants. They had to choose between sure monetary payoff and lotteries of two types. Lotteries in the financial domain served to elicit financial risk preferences, while privacy lotteries elicited the willingness to protect personal information, which included individuals' name, surname, photo, and responses to a questionnaire about their opinion on a range of controversial topics.

We found a consistent positive relationship between financial and privacy risk aversion. We also found that the decision to take privacy risk was not only dependent on risk attitudes, but also on survey measures of privacy attitudes and WTA/WTP for privacy. This supports the idea that willingness to protect personal information is driven at least in part by risk aversion rather than only, or even mainly, by differences in values for personal information and privacy attitudes. Therefore, future attempts to measure privacy attitudes should take into consideration not only attitudes to privacy, but also attitudes to risk.

We tested our measure for its sensitivity to the order in which risk and privacy attitudes are elicited, and to an already present threat to privacy. We found qualified support for the existence of an order effect, whereby presenting privacy choices prior to financial ones leads to a more privacy-protective behavior.

Further research is needed in order to test the external validity of our measure, that is, whether it correlates with actual behavior in terms of willingness to compromise or protect private information. Already however, our measure correlates well with reported behavior in terms of attitude to risk and to privacy.

spectively). Statistical power is 0.05. Tests of the difference in $APR$ also show no significant effect: two-sample Wilcoxon rank-sum test: Prob > |z| = 0.41; t-test: Pr(|T| > |t|) = 0.91; Kolmogorov-Smirnov test: corrected p-value is 0.79; ANOVA: coefficient is -0.30, P>|t|=0.91; Kruskal-Wallis rank test: Prob=0.41. N=375 (171 and 204 in shock and basic treatments, respectively). Estimated statistical power is 0.05.

Our paper makes several methodological, empirical, and practical contributions: *First*, we propose a new method to elicit a privacy concern in the laboratory that overcomes the disadvantages of other methods for the synthetic generation of privacy concerns in lab experiments by 1) avoiding the overconfidence bias about one's personal abilities and avoiding a dichotomous division between "bad" and "good" types as in intelligence tests , 2) avoiding problems with truth-telling, since any opinion is guaranteed to contradict the opinion of some other people, and 3) not being sufficiently sensitive that it could be misused to damage the participants materially. The information we elicit is sensitive in the laboratory context, but not beyond; this helps overcome legal constraints in the collection, storage, and use of such private data.

*Second*, we propose a novel technique for the implicit elicitation of attitudes to privacy risks. This method is incentive compatible, and implies a series of decisions that are more intuitive for participants than direct calculation of not readily cognitively available value of personal information. In our study, for demonstration purposes of the conceptual framework of the elicitation method we used a simplified privacy behavior scenario. For practical or academic purposes, the scenarios may be further modified to better suit real-world decisions. For instance, a realistic scenario could be spelled out as follows: "*There is a 35% probability that data generated from your health-tracking wristband will be hacked. In that case, the metrics related to your physical activity would be sold to an advertising company. That company would use this information to try to sell you fake ineffective drugs against your inferred medical issues.*" The safe option for such a scenario would involve purchasing a cyber-insurance that would compensate the buyer for negative consequences of such a hacking. The level of concern with privacy in such a scenario would correspond to the maximum price an individual would be ready to pay for such a cyber-insurance. By changing predictor variables (e.g., type of personal information, type of security threat, proposed means of protection, etc.), we would be able to map privacy risk attitudes across multiple contexts.

In this way, our method can be applied to any type of private information, for example, financial, health, social network information, *etc.* Moreover, this method is not limited to a particular type of risk, as it may be applied to a range of other risks, such as unauthorized sharing with third parties, use for unsolicited marketing purposes, fraud, price discrimination when calculating the insurance cost or premium, *etc.* The probability of encountering such risk and the entities responsible for risk occurrence (*e.g.,* banks, insurance companies, government surveillance bodies, marketing companies, independent hackers and attackers, *etc.*) may be also changed depending on the research question. Finally, the means and range of cost for privacy protection, represented by safe options in our experiment, may vary and could include purchasing of a cybersecurity insurance, privacy-enhancing technologies, or software for data protection. Future research is called on to explore those possibilities further by comparing privacy risk attitudes across cultures and various contexts, involving different types of data, kinds and probabilities of privacy risks.

Our technique can also serve a practical role for the corporate and social assessment of privacy risks, computation of premiums, and policy evaluation by researchers, policy-makers, managers and other participants in the market for private information. The conversion of our method into practical tool may involve improving the usability of the elicitation method. Instead of offering many long predefined MPL tables, one could use a dynamic iterative elicitation method, in which a participant would be first asked to make decisions between few lotteries with wide coarse-grained range of outcomes. Then based on previous choices, the outcomes of the next small batches of the lotteries would be refined until a desirable level of measurement accuracy is achieved. This way, participants would have to make only few decisions to achieve the result, and no censoring of the data would be involved (i.e. there will be no unobserved attitudes as may happen with poorly predefined tables' limits). Moreover, even only one lottery is already enough to validate a hypothesis (e.g., that the privacy risk aversion level is greater than zero or than any other value of interest).

*Third*, we found qualified support for the existence of an order effect, whereby presenting privacy choices prior to financial ones leads to a more privacy-protective behavior. We have at least two interpretations for this: 1) privacy attitudes are affected by an immediacy effect (subjects make more privacy protective decisions right after answering private questions), and 2) thinking about financial risk first, leads subjects to consider privacy in monetary terms, thus possibly leading to less risk-averse behavior. This finding may find application in creating privacy policies, in the architecture of privacy choices and in personal data marketplaces. For example, emphasizing monetary benefits before asking for privacy-related choices may lead to more disclosure. Conversely, making privacy more salient may result in more protective behavior with respect to one's personal data.

*Fourth*, we found that taking away the full control over one's personal information does not make individual change his willingness to take risk of its disclosure. This has an important methodological and practical implication: privacy risk attitudes can be measured (and will not be biased) in the situations where participants' personal information is already jeopardized by the factors out of their control, for example, if they have already provided information to a company or other entity and therefore exposed it to an existing probability of data breach or another risk. In such situation, one can rely on decisions to incur or protect against the privacy risk as comparable to the decisions that those people would make in an ideal fully controllable situation. This property is especially useful for natural and field experiments.

*Finally*, we draw the attention of researchers and practitioners interested in measuring privacy attitudes to consider the existence of people, who enjoy revealing personal information, rather than protecting it. This consideration should be acknowledged in either providing options that offer to both promote/allow and/or avoid/prohibit disclosure of personal information, or choosing the neutral wording of these options. For instance, in eliciting WTP/WTA, participants should be given a chance not only to accept payments for personal information disclosure or pay for its protection, but also to accept payments for preventing personal information sharing and to pay for its dissemination, which would reflect the positive utility of information disclosure.

## References

Acquisti, A., L. K. John, and G. Loewenstein (2013). What is privacy worth? *The Journal of Legal Studies 42*(2), 249–274. 2

Acquisti, A., C. R. Taylor, and L. Wagman (2016). The economics of privacy. *Journal of Economic Literature 52*(2), 442–492. 2

Adjerid, I., A. Acquisti, L. Brandimarte, and G. Loewenstein (2013). Sleights of privacy: Framing, disclosures, and the limits of transparency. In *Proceedings of the Ninth Symposium on Usable Privacy and Security*, pp. 9:1–9:11. ACM. 16

Andersen, S., G. W. Harrison, M. I. Lau, and E. E. Rutström (2006). Elicitation using multiple price list formats. *Experimental Economics 9*(4), 383–405. 5, 7

Bardsley, N., R. Cubitt, G. Loomes, P. Moffatt, C. Starmer, and R. Sugden (2010). *Experimental economics: Rethinking the rules*. Princeton University Press. 11

Benndorf, V. and H.-T. Normann (2017). The willingness to sell personal data. *The Scandinavian Journal of Economics*. Online in advance of print. 1, 2

Beresford, A. R., D. Kübler, and S. Preibusch (2012). Unwillingness to pay for privacy: A field experiment. *Economics Letters 117*(1), 25–27. 1, 2

Braunstein, A., L. Granka, and J. Staddon (2011). Indirect content privacy surveys: measuring privacy without asking about it. In *Proceedings of the Seventh Symposium on Usable Privacy and Security*, pp. 15. ACM. 2

Broadbent, D. E. (1957). A mechanical model for human attention and immediate memory. *Psychological Review 64*(3), 205–215. 15

Broadbent, D. E. (1982). Task combination and selective intake of information. *Acta Psychologica 50*(3), 253–290. 15

Carrascal, J. P., C. Riederer, V. Erramilli, M. Cherubini, and R. de Oliveira (2013). Your browsing behavior for a big mac: Economics of personal information online. In *Proceedings of the 22nd International Conference on the World Wide Web*, pp. 189–200. ACM. 1, 2

Charness, G., U. Gneezy, and A. Imas (2013). Experimental methods: Eliciting risk preferences. *Journal of Economic Behavior & Organization 87*, 43–51. 7

Choi, H., J. Park, and Y. Jung (2018). The role of privacy fatigue in online privacy behavior. *Computers in Human Behavior 81*, 42–51. 17

Clemente, M. and T. J. Roulet (2015). Public opinion as a source of deinstitutionalization: A “spiral of silence” approach. *Academy of Management Review 40*(1), 96–114. 4

Cofone, I. (2015). The value of privacy: Keeping the money where the mouth is. In *14th Annual Workshop on the Economics of Information Security (WEIS)*. 17

Correa, T., A. W. Hinsley, and H. G. De Zuniga (2010). Who interacts on the Web?: The intersection of users’ personality and social media use. *Computers in Human Behavior 26*(2), 247–253. 13

Cubitt, R. P., C. Starmer, and R. Sugden (1998). On the validity of the random lottery incentive system. *Experimental Economics 1*(2), 115–131. 11

Dukas, R. (2004). Causes and consequences of limited attention. *Brain, Behavior and Evolution 63*(4), 197–210. 15

Egelman, S., A. P. Felt, and D. Wagner (2013). Choice architecture and smartphone privacy: There’s a price for that. In *The Economics of Information Security and Privacy*, pp. 211–236. Springer. 2

Feri, F., C. Giannetti, and N. Jentzsch (2016). Disclosure of personal information under risk of privacy shocks. *Journal of Economic Behavior & Organization 123*, 138–148. 4

Fogel, J. and E. Nehmad (2009). Internet social network communities: Risk taking, trust, and privacy concerns. *Computers in Human Behavior 25*(1), 153–160. 9

Gideon, J., L. Cranor, S. Egelman, and A. Acquisti (2006). Power strips, prophylactics, and privacy, oh my! In *Proceedings of the Second Symposium on Usable privacy and security*, pp. 133–144. ACM. 2

Graeff, T. R. and S. Harmon (2002). Collecting and using personal data: consumers’ awareness and concerns. *Journal of Consumer Marketing 19*(4), 302–318. 2

Griffin, D. W. and C. A. Varey (1996). Towards a consensus on overconfidence. *Organizational Behavior and Human Decision Processes 65*(3), 227–231. 4

Grossklags, J. and A. Acquisti (2007). When 25 cents is too much: An experiment on willingness-to-sell and willingness-to-protect personal information. In *Proceedings of the Sixth Workshop on the Economics of Information Security (WEIS’07)*, pp. 7–18. 1, 2, 4

Hann, I.-H., K.-L. Hui, S.-Y. T. Lee, and I. P. Png (2007). Overcoming online information privacy concerns: An information-processing theory approach. *Journal of Management Information Systems 24*(2), 13–42. 2

Harris, P. (1996). Sufficient grounds for optimism?: The relationship between perceived controllability and optimistic bias. *Journal of Social and Clinical Psychology 15*(1), 9–52. 17

Harrison, G. W., M. I. Lau, E. E. Rutström, and M. Tarazona-Gómez (2012). Preferences over social risk. *Oxford Economic Papers 65*(1), 25–46. 7

Harrison, G. W. and E. E. Rutström (2008). *Risk Aversion in the Laboratory*, Volume 12, Chapter Risk Aversion in Experiments, pp. 41–196. Emerald Group Publishing Limited. 5

Hey, J. D. and J. Lee (2005). Do subjects separate (or are they sophisticated)?. *Experimental Economics 8*(3), 233–265. 11

Hirschprung, R., E. Toch, F. Bolton, and O. Maimon (2016). A methodology for estimating the value of privacy in information disclosure systems. *Computers in Human Behavior 61*, 443–453. 3, 6, 8

Holt, C. A. (1986). Preference reversals and the independence axiom. *American Economic Review 76*(3), 508–515. 11

Holt, C. A. and S. K. Laury (2002). Risk aversion and incentive effects. *American Economic Review 92*(5), 1644–1655. 5, 12

Hopstaken, J. F., D. Linden, A. B. Bakker, and M. A. Kompier (2015). A multifaceted investigation of the link between mental fatigue and task disengagement. *Psychophysiology 52*(3), 305–315. 17

Huberman, B. A., E. Adar, and L. R. Fine (2005). Valuating privacy. *IEEE Security & Privacy 3*(5), 22–25. 2

Johnson, C. A., A. Baillon, H. Bleichrodt, Z. Li, D. Van Dolder, and P. P. Wakker (2015). Prince: An improved method for measuring incentivized preferences. SSRN Working Paper 2504745. 11

Kahneman, D. (1973). *Attention and effort.* Englewood Cliffs, NJ: Prentice-Hall. 15

Keith, M. J., S. C. Thompson, J. Hale, P. B. Lowry, and C. Greer (2013). Information disclosure on mobile devices: Re-examining privacy calculus with actual user behavior. *International Journal of Human-Computer Studies 71*(12), 1163–1173. 2

Keren, G. (1991). Calibration and probability judgements: Conceptual and methodological issues. *Acta Psychologica 77*(3), 217–273. 11

Kim, S.-H. (1999). Opinion expression as a rational behavior. In *Annual Meeting of the Association for Education in Journalism and Mass Communication, New Orleans.* 4

Krasnova, H., E. Kolesnikova, and O. Guenther (2009). ”It won't happen to me!”: Self-disclosure in online social networks. In *AMCIS 2009 Proceedings*. Paper 343. 13

Lachter, J., K. I. Forster, and E. Ruthruff (2004). Forty-five years after Broadbent (1958): Still no identification without attention. *Psychological Review 111*(4), 880–913. 15

Lewis, K., J. Kaufman, and N. Christakis (2008). The taste for privacy: An analysis of college student privacy settings in an online social network. *Journal of Computer-Mediated Communication 14*(1), 79–100. 2

Madden, M. and L. Rainie (2015). Americans' attitudes about privacy, security and surveillance. Report, Pew Research Center. 2

Maier, J. and M. Rüger (2010). Measuring risk aversion model-independently. Munich Discussion Paper No. 2010-33, Ludwig- Maximilians-Universität München. 6

Malhotra, N. K., S. S. Kim, and J. Agarwal (2004). Internet users' information privacy concerns (IUIPC): The construct, the scale, and a causal model. *Information systems research 15*(4), 336–355. 2

McCallister, E. (2010). *Guide to protecting the confidentiality of personally identifiable information*. Diane Publishing. 4

Miller, L., D. E. Meyer, and J. T. Lanzetta (1969). Choice among equal expected value alternatives: Sequential effects of winning probability level on risk preferences. *Journal of Experimental Psychology 79*(3p1), 419–423. 5

Motiwalla, L. F. and X.-B. Li (2016). Unveiling consumers' privacy paradox behaviour in an economic exchange. *International Journal Of Business Information Systems 23*(3), 307–329. 1, 2

Noelle-Neumann, E. (1974). The spiral of silence: A theory of public opinion. *Journal of Communication 24*(2), 43–51. 4

Norberg, P. A., D. R. Horne, and D. A. Horne (2007). The privacy paradox: Personal information disclosure intentions versus behaviors. *Journal of Consumer Affairs 41*(1), 100–126. 2

Nordgren, L. F., J. Van Der Pligt, and F. Van Harreveld (2007). Unpacking perceived control in risk perception: The mediating role of anticipated regret. *Journal of Behavioral Decision Making 20*(5), 533–544. 17

Nosek, B. A. and A. G. Greenwald (2009). (Part of) the case for a pragmatic approach to validity: Comment on De Houwer, Teige-Mocigemba, Spruyt, and Moors. *Psychological Bulletin 135*, 373–376. 3

Nosek, B. A., C. B. Hawkins, and R. S. Frazier (2011). Implicit social cognition: From measures to mechanisms. *Trends in Cognitive Sciences 15*(4), 152–159. 3

Pashler, H. E. and S. Sutherland (1998). *The psychology of attention*, Volume 15. MIT press Cambridge, MA. 15

Preibusch, S. (2013). Guide to measuring privacy concern: Review of survey and observational instruments. *International Journal of Human-Computer Studies 71*(12), 1133–1143. 2

Rivenbark, D. R. (2012). Valuing the risk from privacy loss: Experimentally elicited beliefs explain privacy behavior. Working Paper, University of Central Florida, Orlando, FL. 4

Ross, C., E. S. Orr, M. Sisic, J. M. Arseneault, M. G. Simmering, and R. R. Orr (2009). Personality and motivations associated with Facebook use. *Computers in Human Behavior 25*(2), 578–586. 13

Schreiner, M. and T. Hess (2013). On the willingness to pay for privacy as a freemium model: First empirical evidence. In *Proceedings of the 21st European Conference on Information Systems*, pp. 30–36. 2

Schwarz, N. (1999). Self-reports: how the questions shape the answers. *American Psychologist 54*(2), 93–105. 2

Shafir, E. and A. Tversky (1992). Thinking through uncertainty: Nonconsequential reasoning and choice. *Cognitive Psychology 24*(4), 449–474. 11

Slovic, P. E. (2000). *The perception of risk.* Earthscan publications, London. 17

Sutanto, J., E. Palme, C.-H. Tan, and C. W. Phang (2013). Addressing the personalization-privacy paradox: An empirical assessment from a field experiment on smartphone users. *MIS Quarterly 37*(4), 1141–1164. 2

Taddicken, M. (2014). The 'privacy paradox' in the social web: The impact of privacy concerns, individual characteristics, and the perceived social relevance on different forms of self-disclosure. *Journal of Computer-Mediated Communication 19*(2), 248–273. 2

Tsai, J. Y., S. Egelman, L. Cranor, and A. Acquisti (2011). The effect of online privacy information on purchasing behavior: An experimental study. *Information Systems Research 22*(2), 254–268. 1, 2

Turow, J., M. Hennessy, and N. Draper (2015). The tradeoff fallacy: How marketers are misrepresenting American consumers and opening them up to exploitation. Working Paper, The Annenberg School for Communication, University of Pennsylvania. 2

Tversky, A. and D. Kahneman (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty 5*(4), 297–323. 6

Wallsten, T. S. (1996). An analysis of judgment research analyses. *Organizational Behavior and Human Decision Processes 65*(3), 220–226. 4

Wathieu, L. and A. Friedman (2009). An empirical approach to understanding privacy concerns. Technical report, ESMT Working Paper No. 09-001. 18

Weinstein, N. D. (1984). Why it won't happen to me: Perceptions of risk factors and susceptibility. *Health Psychology 3*(5), 431–457. 17

Westin, A. F. (1968). *Privacy and freedom.* Atheneum, New York. 2, 9

Wilson, T. D. and N. Brekke (1994). Mental contamination and mental correction: Unwanted influences on judgments and evaluations. *Psychological Bulletin 116*(1), 117–142. 2

Zywica, J. and J. Danowski (2008). The faces of Facebookers: Investigating social enhancement and social compensation hypotheses; predicting Facebook and offline popularity from sociability and self-esteem, and mapping the meanings of popularity with semantic networks. *Journal of Computer-Mediated Communication 14*(1), 1–34. 13

# A Summary statistics

Table 3: Measures of risk aversion (in %) and (dis)utility of personal information disclosure (in Euros)
Note: Outliers for WTA and WTP are values that are 2 standard deviations away from the mean.

| | $\overline{ror}$ | $\overline{APR}$ | WTA | WTA (excluding outliers) | WTP | WTP (excluding outliers) |
|---|---|---|---|---|---|---|
| Min | -11% | -1.17 | 0 | 0 | 0 | 0 |
| Max | 41% | 12.50 | 1000 | 200 | 1000 | 30 |
| Mean | 11% | 2.52 | 36.20 | 16.12 | 10.00 | 1.92 |
| Std. deviation | 10% | 2.89 | 141.84 | 25.33 | 83.67 | 4.85 |
| N | 145 | 134 | 147 | 144 | 148 | 146 |

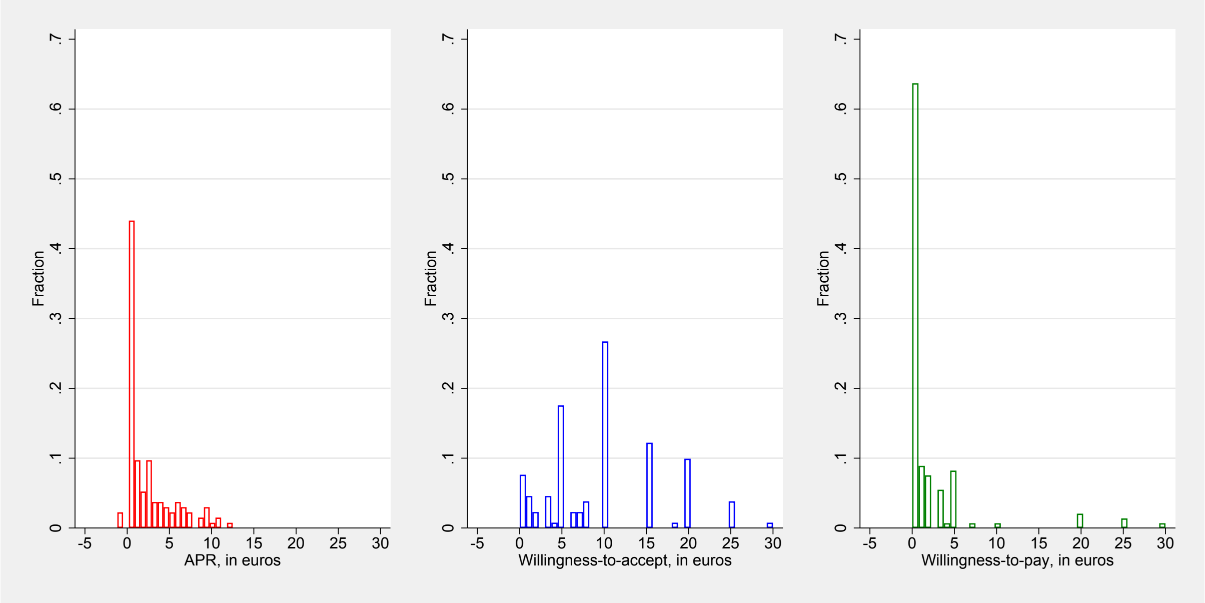


Figure 3: Distribution of APR, WTA and WTP.

Table 4: Differences across treatments, in Euros.

| | By pre-existing threat | | By order of elicitation | | Total |
|---|---|---|---|---|---|
| | Basic | Shock | Monetary first | Privacy first | |
| $\overline{ror}$ | | | | | |
| Mean | 10% | 12% | 10% | 12% | 11% |
| Std. deviation | 10% | 11% | 10% | 11% | 10% |
| Observations | 80 | 65 | 78 | 67 | 145 |
| $\overline{APR}$ | | | | | |
| Mean | 2.53 | 2.52 | 2.25 | 2.85 | 2.52 |
| Std. deviation | 2.91 | 2.88 | 2.71 | 3.08 | 2.89 |
| Observations | 73 | 61 | 73 | 61 | 134 |

Table 5: Number of participants by treatment group

| | Shock | Basic | Total |
|---|---|---|---|
| Monetary first | 37 | 41 | 78 |
| Privacy first | 30 | 40 | 70 |
| Total | 67 | 81 | 148 |

## B Regressions

Table 6: Interval regression with $\overline{APR_i}$ as the dependent variable.

| Model | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| $\overline{ror_i}$ [a] | 116.62**<br>[42.63,190.62] | 113.62**<br>[39.21,188.02] | 119.75***<br>[48.75,190.76] | 127.33***<br>[54.70,199.96] | 122.54***<br>[50.27,194.81] | 118.53***<br>[48.13,188.93] |
| Highly Risk Averse (=1 if $\overline{ror_i} > 100\%$[a]) | 109.76***<br>[49.29,170.23] | 106.08***<br>[44.92,167.25] | 77.38**<br>[20.13,134.62] | 67.47*<br>[10.01,124.93] | 67.91*<br>[9.89,125.93] | 75.08*<br>[12.79,137.36] |
| Treatment with privacy shock | | -4.47<br>[-19.81,10.86] | -7.79<br>[-22.15,6.57] | -11.65<br>[-25.87,2.56] | -12.44+<br>[-26.88,2.00] | -12.88+<br>[-27.62,1.86] |
| Condition with privacy lotteries first | | 8.11<br>[-7.36,23.58] | 7.04<br>[-7.55,21.63] | 3.19<br>[-11.51,17.89] | 5.50<br>[-9.22,20.23] | -1.47<br>[-15.95,13.01] |
| Q6: WTA | | | 0.53**<br>[0.19,0.86] | 0.53**<br>[0.21,0.86] | 0.52**<br>[0.20,0.85] | 0.59***<br>[0.27,0.92] |
| Q7: WTP | | | 1.43+<br>[-0.08,2.94] | 1.72*<br>[0.25,3.20] | 2.17*<br>[0.45,3.88] | 2.38**<br>[0.62,4.14] |
| Q16: General privacy concern | | | 9.15*<br>[1.01,17.29] | 7.28+<br>[-0.93,15.50] | 5.42<br>[-3.06,13.90] | 6.12<br>[-2.39,14.64] |
| Q3: Nr of participants known | | | | -1.81<br>[-7.27,3.64] | -1.03<br>[-6.77,4.71] | 0.20<br>[-5.91,6.31] |
| Q5: Trust in experimenters | | | | -6.63<br>[-58.31,45.05] | -16.45<br>[-68.94,36.03] | -1.78<br>[-63.95,60.39] |
| Q17-Q20: Index of online information revelation | | | | 5.02<br>[-4.18,14.22] | 3.01<br>[-6.28,12.29] | -2.53<br>[-12.10,7.03] |
| Q21: Victim of invasion of privacy | | | | 17.40*<br>[0.30,34.50] | 14.93+<br>[-2.85,32.70] | 22.06*<br>[4.02,40.11] |
| Q22: Westin's pragmatist | | | | -4.01<br>[-21.06,13.05] | -3.53<br>[-20.92,13.85] | -1.33<br>[-18.77,16.10] |
| Q22: Westin's fundamentalist | | | | 11.23<br>[-8.89,31.35] | 15.44<br>[-5.92,36.80] | 30.97**<br>[9.06,52.89] |
| Q26-Q29: Index for online privacy settings | | | | -4.51<br>[-12.85,3.82] | -3.30<br>[-11.89,5.28] | 1.36<br>[-7.64,10.35] |
| Q30: Index of self-disclosure | | | | 1.23<br>[-0.75,3.21] | 1.01<br>[-1.00,3.02] | 0.81<br>[-1.26,2.89] |
| Index of conformity (from preliminary questionnaire) | | | | -1.69<br>[-120.53,117.16] | -8.12<br>[-128.38,112.14] | -21.86<br>[-146.45,102.74] |
| Q31-Q32: Index of risk attitude | | | | | -4.42+<br>[-9.22,0.38] | -6.56*<br>[-11.63,-1.50] |
| Q33-Q37: Index of trust | | | | | 1.11<br>[-3.24,5.46] | 0.90<br>[-3.56,5.36] |
| Q23: Number of close friends | | | | | 0.92<br>[-0.59,2.43] | 0.21<br>[-1.30,1.72] |
| Q25: Number of online connections | | | | | -0.00<br>[-0.02,0.01] | -0.01<br>[-0.02,0.01] |
| Constant | 23.88***<br>[12.67,35.09] | 22.47**<br>[8.10,36.83] | 2.81<br>[-14.22,19.84] | 8.88<br>[-75.89,93.64] | 7.83<br>[-77.93,93.58] | -55.72<br>[-157.99,46.54] |
| Socio-demographic controls | No | No | No | No | No | Yes |
| N | 148 | 148 | 143 | 143 | 140 | 140 |
| of which right-censored | 14 | 14 | 13 | 13 | 13 | 13 |
| log likelihood | -725.56 | -724.83 | -690.81 | -685.57 | -668.16 | -655.90 |
| LR $\chi^2$(degrees of freedom) | 19*** (2) | 21*** (4) | 41*** (7) | 51*** (16) | 55*** (20) | 80*** (39) |

95% confidence intervals in brackets

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[a] If a person never took risk in monetary lotteries, $\overline{ror_i}$ in the regression takes value 0, and the dummy HighlyRiskAverse ($\overline{ror_i} > 100\%$) takes value 1.

Table 7: Panel random-effects interval-data regression, with the number of safe choices in privacy lotteries as the dependent variable.

| Model | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Safe choices in monetary lotteries | 0.632*** | 0.659*** | 0.617** | 0.585** | 0.530** | 0.489** | 0.517** |
| | [0.29,0.98] | [0.30,1.02] | [0.24,0.99] | [0.23,0.94] | [0.17,0.89] | [0.13,0.85] | [0.18,0.86] |
| Table 6 | | -1.332*** | -1.332*** | -1.323*** | -1.321*** | -1.356*** | -1.358*** |
| | | [-1.81,-0.86] | [-1.81,-0.86] | [-1.81,-0.84] | [-1.81,-0.83] | [-1.85,-0.86] | [-1.86,-0.86] |
| Table 7 | | -1.799*** | -1.800*** | -1.798*** | -1.795*** | -1.840*** | -1.841*** |
| | | [-2.27,-1.33] | [-2.27,-1.33] | [-2.28,-1.31] | [-2.28,-1.31] | [-2.34,-1.35] | [-2.34,-1.35] |
| Table 8 | | 9.500*** | 9.498*** | 9.500*** | 9.498*** | 9.427*** | 9.426*** |
| | | [8.70,10.30] | [8.70,10.30] | [8.68,10.32] | [8.68,10.32] | [8.59,10.26] | [8.59,10.26] |
| Treatment with privacy shock | | | -0.226 | -0.530 | -0.791 | -0.843 | -1.070+ |
| | | | [-1.44,0.99] | [-1.66,0.60] | [-1.90,0.32] | [-1.97,0.28] | [-2.20,0.06] |
| Condition with privacy elicited first | | | 0.701 | 0.522 | 0.255 | 0.449 | -0.0883 |
| | | | [-0.53,1.94] | [-0.65,1.69] | [-0.92,1.43] | [-0.73,1.62] | [-1.22,1.04] |
| Q6: WTA | | | | 0.0470*** | 0.0434*** | 0.0434*** | 0.0483*** |
| | | | | [0.02,0.07] | [0.02,0.07] | [0.02,0.07] | [0.02,0.07] |
| Q7: WTP | | | | 0.111+ | 0.134* | 0.168* | 0.164* |
| | | | | [-0.01,0.23] | [0.02,0.25] | [0.03,0.30] | [0.03,0.30] |
| Q16: Generally privacy concern | | | | 0.830* | 0.721* | 0.599+ | 0.781* |
| | | | | [0.20,1.46] | [0.09,1.36] | [-0.06,1.25] | [0.13,1.43] |
| Q3: Nr of participants known | | | | | -0.328 | -0.327 | -0.225 |
| | | | | | [-0.75,0.09] | [-0.77,0.12] | [-0.69,0.24] |
| Q5: Trust in experimenters | | | | | -1.671 | -2.012 | -0.0322 |
| | | | | | [-5.82,2.48] | [-6.21,2.19] | [-4.82,4.76] |
| Q17-Q20: Index of information revelation | | | | | 0.457 | 0.340 | -0.125 |
| | | | | | [-0.26,1.17] | [-0.38,1.06] | [-0.85,0.60] |
| Q21: Victim of invasion of privacy | | | | | 1.241+ | 0.943 | 1.562* |
| | | | | | [-0.08,2.56] | [-0.43,2.31] | [0.20,2.93] |
| Q22: Westin's pragmatist | | | | | -0.456 | -0.398 | -0.256 |
| | | | | | [-1.78,0.87] | [-1.75,0.95] | [-1.58,1.07] |
| Q22: Westin's fundamentalist | | | | | 0.973 | 1.168 | 2.308** |
| | | | | | [-0.58,2.52] | [-0.48,2.82] | [0.66,3.95] |
| Q26-Q29: Index for online privacy settings | | | | | -0.194 | -0.162 | 0.269 |
| | | | | | [-0.84,0.46] | [-0.83,0.51] | [-0.42,0.95] |
| Q30: Index of self-disclosure | | | | | 0.0313 | 0.00860 | 0.00305 |
| | | | | | [-0.12,0.19] | [-0.15,0.17] | [-0.16,0.16] |
| Index of conformity in preliminary questionnaire | | | | | -2.582 | -3.117 | -4.301 |
| | | | | | [-11.80,6.64] | [-12.44,6.20] | [-13.84,5.24] |
| Q31-Q32: Index of risk attitude | | | | | | -0.292 | -0.472* |
| | | | | | | [-0.67,0.08] | [-0.86,-0.08] |
| Q33-Q37: Index of trust | | | | | | 0.163 | 0.124 |
| | | | | | | [-0.18,0.50] | [-0.22,0.46] |
| Q23: Number of close friends | | | | | | 0.0722 | 0.0259 |
| | | | | | | [-0.05,0.19] | [-0.09,0.14] |
| Q25: Number of online connections | | | | | | 0.0000371 | -0.000180 |
| | | | | | | [-0.00,0.00] | [-0.00,0.00] |
| Constant | 3.231** | 1.672 | 1.737 | 0.310 | 2.705 | 2.956 | -1.400 |
| | [0.78,5.68] | [-0.92,4.27] | [-0.86,4.33] | [-2.26,2.88] | [-4.69,10.10] | [-4.50,10.41] | [-9.81,7.01] |
| Socio-demographic controls | No | No | No | No | No | No | Yes |
| N observations | 592 | 592 | 592 | 572 | 572 | 560 | 560 |
| of which left-censored | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| of which right-censored | 212 | 212 | 212 | 204 | 204 | 201 | 201 |
| N individuals | 148 | 148 | 148 | 143 | 143 | 140 | 140 |
| log likelihood | -1386 | -1030 | -1030 | -988 | -982 | -959 | -944 |
| Wald $\chi^2$ (degrees of freedom) | 13*** (1) | 810*** (4) | 812*** (6) | 790*** (9) | 803*** (18) | 776*** (22) | 802*** (41) |

95% confidence intervals in brackets
+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

# C Experimental material

## C.1 Preliminary questionnaire on opinions about potentially sensitive and socially relevant topics

This questionnaire is translated from the Italian original. We show options that were offered to participants and the percentage of participants who chose each option.

—

1. Experimentation of medications on animals can have an important implication for development of drugs for humans and is often distressing and fatal for animals. Are you in favor or against medical experiments on animals?
   (a) 0. In favor - 72%; 1 Against - 28%
2. Using genetically modified organisms in agriculture can help to fight hunger in the world and can present a great danger to ecosystem. Are you in favor or against implementation of such agricultural practices?
   (a) 0. In favor - 46%; 1 Against - 54%
3. Which of the following is the more appropriate penalty for rape?
   (a) 0. Death - 1%; 1. Chemical castration - 34%; 2. Life imprisonment - 35%; 3. Prison sentence, less than life imprisonment - 30%
4. Albeit rare, there are observed cases of serious complications as consequences of vaccination. The choice not to undergo vaccination significantly increases the risk of getting and transmitting potentially dangerous diseases. Are you in favor or against obligatory vaccination?
   (a) 0. In favor - 83%; 1. Against - 17%
5. Billions of Euros are spent each year for aerospace research. Do you think that this money should or should not be spent in other way?
   (a) 0. Should - 52%; 1. Should not - 48%
6. Would you for any reason read your mate's email, SMS or pose as him/her online, without his/her knowledge and permission?
   (a) 0. Yes, they shouldn't be keeping secrets anyway - 14%; 1. Yes, I'd be too curious not to - 6%; 2. Yes, if I suspected them of something - 35%; 3. Never - 45%
7. Do you think it is morally justified or not justified to abort after discovering serious disability in the fetus?
   (a) 0. Justified - 58%; 1. Not justified - 42%
8. Are you in favor or against legislation of prostitution?
   (a) 0. In favor - 82%; 1. Against - 18%
9. Which of following substances should be prohibited? (More than one answer is allowed)
   (a) Alcohol - 3%
   (b) Tobacco - 7%
   (c) Cannabis - 22%
   (d) Cocaine - 85%

    (e) Acids (LSD, ecstasy, etc.) - 82%
    (f) Heroin - 89%
    (g) None - 9%

10. Are you in favor or against adoption of children by homosexual couples?
    (a) 0. In favor - 56%; 1. Against - 44%
11. Are you in favor or against the closure of Italian borders as a solution for the problem of illegal immigration?
    (a) 0. In favor - 25%; 1. Against - 75%
12. Are you in favor or against euthanasia (i.e. the painless killing of a patient suffering from an incurable and painful disease or in an irreversible coma)?
    (a) 0. In favor - 84%; 1. Against - 16%
13. Some people believe that the trails left by aircrafts in the sky contain chemicals that are inserted specifically to influence the population. Do you think this is a plausible theory or not?
    (a) 0. Plausible - 10%; 1. Not plausible - 90%
14. Which of the following methods of birth contraception do you consider as the most appropriate?
    (a) 0. Hormonal (oral pills, implants, injections, patches, etc.) - 26%;
    (b) 1. Barrier (condoms, cervical caps, diaphragms, sponges with spermicide, etc.) - 67%;
    (c) 2. Intrauterine devices - 1%;
    (d) 3. Sterilization (surgical or chemical) - 3%;
    (e) 4. Behavioral (interrupted intercourse, fertility awareness method based on the menstrual cycle, sexual abstinence) - 2%;
    (f) 5. None - 1%

## C.2 Instructions

The following instructions are for the “privacy choices first” condition and are translated from the Italian original. In the “monetary choices first”, we simply revert part I and part II of the instructions.

—

# Welcome to the experiment!

The experiment will last about 60 minutes. Please make sure that you can stay until the end. You will be paid 3 Euros for showing up on time (participation fee). You can earn more money but this depends on the choices you make in this experiment and on chance. It is therefore important that you read the following instructions carefully.

**General rules**

You are not allowed to communicate with other participants during the experiment. If you have any doubts or questions, please raise your hand. An assistant will then come to you and answer your question privately. You received an envelope before the experiment. You are not allowed to open it before the end of the experiment. You will have to open it in front of an assistant. If you do not follow those rules or disturb the experiment in other ways, then we will ask you to leave the room and we will not pay you.

**The experiment**

There are two parts in the experiment: the first part is described in a separate sheet now, while you will get the description of the second part only after completing the first task. You will be presented with tables of choices between two options, one of which gives a certain payoff while the other gives an outcome that depends on chance.

**Payment**

At the beginning of the experiment, you were asked to pick an envelope from a bag. In total there were 88 envelopes, which describe a choice situation that you will face during the experiment. You will get the payoff corresponding to the choice you made in the situation described in your envelope. This means that any of your choices during the experiment could be the one that determines your payoff. After having completed both tasks your final payoff will be calculated, each ECU earned will be converted into Euro at the rate of 1 euro for 10 ECUs and paid together with the show-up fee (30 ECUs = 3 euros). For example, if you earned 48 ECUs from your decision during the experiment, then you will receive 48+30 ECUs = 78 ECUs =7,8 Euro in cash.

**Anonymity**

Since your position in the lab corresponds to the number on a ball taken from a box randomly we only know you by the number of your seat and not by your name, surname or other credentials. Thus, we cannot establish any link between your identity and the decisions you made in the lab, unless the outcome of the experiment suggests revelation of your personal information so that we need to check your name and surname from the ID card.

## I. First part of the experiment

In the first part of the experiment, you are asked to make choices between two options of the type described in the following table:

| Row | Option A | Option B | Choice |
|---|---|---|---|
| 1 | You get 13 ECUs | You get 35 ECUs but with probability 50% your personal information is revealed to others | |
| ... | ... | ... | ... |

Option A guarantees you a certain payoff, while option B is a lottery that gives out a certain amount of ECUs, but implies some probability of having to disclose your name, surname, photo and answers in the preliminary questionnaire (from then on

” personal information”) to other participants in the room at the end of the experiment. You will face 44 choice situations of the type described above. In each of those situations, you must choose the option (A or B) that you prefer. Any of those decisions might be the one that determines your payoff.

**Random draw**

If you chose option B in which your payoff depends on chance, then you will have to toss a 10-sided die. Each side of the die shows a number, between 0 and 90 in steps of 10 (you can check that the die shows all possible numbers, 0, 10, 20, 30, 40, 50, 60, 70, 80, 90). The probability of personal data revelation defined in this option will be compared with the outcome of this toss:

1. If the outcome of the toss is strictly less than the probability of revelation then your information will be disclosed;
2. If the outcome of the toss is more or equal to the _probability of revelation then your information will not be disclosed.

**Envelopes**

As explained before, you will get a payoff at the end of the experiment that depends on what is in the envelope that you drew at the beginning of the experiment. There were 88 envelopes, of which 44 \describe a choice situation from the first part of the experiment. If you drew an envelope from those 44, then it will look as follows:

Option A: You get 13 ECUs
Option B: You get 65 ECUs but with probability 50%
your personal information will be revealed to others.

*Example:* If you have chosen the option B in this situation, you will get 35 ECUs. Then if the outcome of the toss is strictly less than 50, your personal information is revealed to others. If the outcome of the toss is more or equal to 50 then your personal information is not revealed to others.

**Procedure for personal information disclosure**

If your personal information has to be disclosed to other participants, then you will be asked to stand in front of the audience in the lab, we will verify your name and surname from your ID card and we will announce your name. Other participants will see on the screen your personal photo and the answers that you gave in preliminary questionnaire, along with a short descriptive comment comparing your answers with the answers of others as in an example below:

Seat #23:
- ... agrees it is morally justified to abort after discovering serious disability in the fetus, while 36 % of other participants does not agree
- ... is in favor of chemical castration as appropriate penalty for rape, while 87% of other participants did not choose this option
- ...

## II. Second part of the experiment

You have finished the first part of the experiment. Now, please, read carefully the description of the second part of the experiment. In this part you are also asked to make several choices between two options. Consider the following table:

| Row | Option A | Option B | Choice |
|---|---|---|---|
| 1 | You get 37 ECUs | You get 52 ECUs but with probability 50% you lose 14 of those ECUs | |
| . . . | . . . | . . . | . . . |

Option A guarantees you a certain payoff, while option B is a lottery that gives out a certain amount of ECUs, but implies some probability of having to give back some of those ECUs at the end of the experiment. In some tables, option B gives out a certain amount of ECUs and some probability of getting some more ECUs at the end of the experiment. You must choose the option (A or B) that you prefer.

**Random draw**

If you chose option B in which your payoff depends on chance, then you will have to toss the 10-sided die. Each side of the die shows a number, between 0 and 90 in steps of 10 (you can check that the die shows all possible numbers, 0, 10, 20, 30, 40, 50, 60, 70, 80, 90). The probability of gaining or losing ECUs that is defined in this option will be compared with the outcome of this toss:

1. If the outcome of the toss is strictly less than the probability of loss/gain then you will lose/gain some ECUs;

2. If the outcome of the toss is more or equal to the probability of loss/gain then you will not lose/gain any ECUs.

**Envelopes**

As explained before, you will get a payoff at the end of the experiment that depends on what is in the envelope that you drew at the beginning of the experiment. There were 88 envelopes, of which 44 relate to the second part of the experiment. If you drew an envelope from those 44, then it will look as follows:

Option A: You get 37 ECUs
Option B: You get 52 ECUs but with probability 50%
you lose/gain 14 of those ECUs.

*Example:* If you chose option B in this case, then you will have to toss the 10-sided die. If the outcome of the toss is strictly less than 50, then you get 52-14=38 ECUs if the loss was indicated or 52+14=66 ECUs if the gain was indicated. If the outcome of the toss is more or equal to 50 then you get 52 ECUs.

## C.3 Monetary and privacy lotteries

Table 8: Monetary lotteries (MPL tables 1 to 4)

(a) MPL table 1

| Row | Option A | Option B |
|---|---|---|
| 1 | You get 56 ECU | You get 55 ECU, but with probability 30 % you lose 10 of those ECU |
| 2 | You get 55 ECU | You get 55 ECU, but with probability 30 % you lose 10 of those ECU |
| 3 | You get 54 ECU | You get 55 ECU, but with probability 30 % you lose 10 of those ECU |
| 4 | You get 53 ECU | You get 55 ECU, but with probability 30 % you lose 10 of those ECU |
| 5 | You get 52 ECU | You get 55 ECU, but with probability 30 % you lose 10 of those ECU |
| 6 | You get 51 ECU | You get 55 ECU, but with probability 30 % you lose 10 of those ECU |
| 7 | You get 50 ECU | You get 55 ECU, but with probability 30 % you lose 10 of those ECU |
| 8 | You get 49 ECU | You get 55 ECU, but with probability 30 % you lose 10 of those ECU |
| 9 | You get 48 ECU | You get 55 ECU, but with probability 30 % you lose 10 of those ECU |
| 10 | You get 47 ECU | You get 55 ECU, but with probability 30 % you lose 10 of those ECU |
| 11 | You get 46 ECU | You get 55 ECU, but with probability 30 % you lose 10 of those ECU |

(b) MPL table 2

| Row | Option A | Option B |
|---|---|---|
| 1 | You get 68 ECU | You get 65 ECU, but with probability 30 % you lose 30 of those ECU |
| 2 | You get 65 ECU | You get 65 ECU, but with probability 30 % you lose 30 of those ECU |
| 3 | You get 62 ECU | You get 65 ECU, but with probability 30 % you lose 30 of those ECU |
| 4 | You get 59 ECU | You get 65 ECU, but with probability 30 % you lose 30 of those ECU |
| 5 | You get 56 ECU | You get 65 ECU, but with probability 30 % you lose 30 of those ECU |
| 6 | You get 53 ECU | You get 65 ECU, but with probability 30 % you lose 30 of those ECU |
| 7 | You get 50 ECU | You get 65 ECU, but with probability 30 % you lose 30 of those ECU |
| 8 | You get 47 ECU | You get 65 ECU, but with probability 30 % you lose 30 of those ECU |
| 9 | You get 44 ECU | You get 65 ECU, but with probability 30 % you lose 30 of those ECU |
| 10 | You get 41 ECU | You get 65 ECU, but with probability 30 % you lose 30 of those ECU |
| 11 | You get 38 ECU | You get 65 ECU, but with probability 30 % you lose 30 of those ECU |

(c) MPL table 3

| Row | Option A | Option B |
|---|---|---|
| 1 | You get 80 ECU | You get 75 ECU, but with probability 30 % you lose 50 of those ECU |
| 2 | You get 75 ECU | You get 75 ECU, but with probability 30 % you lose 50 of those ECU |
| 3 | You get 70 ECU | You get 75 ECU, but with probability 30 % you lose 50 of those ECU |
| 4 | You get 65 ECU | You get 75 ECU, but with probability 30 % you lose 50 of those ECU |
| 5 | You get 60 ECU | You get 75 ECU, but with probability 30 % you lose 50 of those ECU |
| 6 | You get 55 ECU | You get 75 ECU, but with probability 30 % you lose 50 of those ECU |
| 7 | You get 50 ECU | You get 75 ECU, but with probability 30 % you lose 50 of those ECU |
| 8 | You get 45 ECU | You get 75 ECU, but with probability 30 % you lose 50 of those ECU |
| 9 | You get 40 ECU | You get 75 ECU, but with probability 30 % you lose 50 of those ECU |
| 10 | You get 35 ECU | You get 75 ECU, but with probability 30 % you lose 50 of those ECU |
| 11 | You get 30 ECU | You get 75 ECU, but with probability 30 % you lose 50 of those ECU |

(d) MPL table 4

| Row | Option A | Option B |
|---|---|---|
| 1 | You get 65 ECU | You get 35 ECU, but with probability 30 % you gain 30 additional ECU |
| 2 | You get 62 ECU | You get 35 ECU, but with probability 30 % you gain 30 additional ECU |
| 3 | You get 59 ECU | You get 35 ECU, but with probability 30 % you gain 30 additional ECU |
| 4 | You get 56 ECU | You get 35 ECU, but with probability 30 % you gain 30 additional ECU |
| 5 | You get 53 ECU | You get 35 ECU, but with probability 30 % you gain 30 additional ECU |
| 6 | You get 50 ECU | You get 35 ECU, but with probability 30 % you gain 30 additional ECU |
| 7 | You get 47 ECU | You get 35 ECU, but with probability 30 % you gain 30 additional ECU |
| 8 | You get 44 ECU | You get 35 ECU, but with probability 30 % you gain 30 additional ECU |
| 9 | You get 41 ECU | You get 35 ECU, but with probability 30 % you gain 30 additional ECU |
| 10 | You get 38 ECU | You get 35 ECU, but with probability 30 % you gain 30 additional ECU |
| 11 | You get 35 ECU | You get 35 ECU, but with probability 30 % you gain 30 additional ECU |

Table 9: Privacy lotteries (MPL tables 5 to 8)

(a) MPL table 5

| Row | Option A | Option B |
|---|---|---|
| 1 | You get 56 ECU | You get 55 ECU, but with probability 30 % your personal information is disclosed |
| 2 | You get 55 ECU | You get 55 ECU, but with probability 30 % your personal information is disclosed |
| 3 | You get 54 ECU | You get 55 ECU, but with probability 30 % your personal information is disclosed |
| 4 | You get 53 ECU | You get 55 ECU, but with probability 30 % your personal information is disclosed |
| 5 | You get 52 ECU | You get 55 ECU, but with probability 30 % your personal information is disclosed |
| 6 | You get 51 ECU | You get 55 ECU, but with probability 30 % your personal information is disclosed |
| 7 | You get 50 ECU | You get 55 ECU, but with probability 30 % your personal information is disclosed |
| 8 | You get 49 ECU | You get 55 ECU, but with probability 30 % your personal information is disclosed |
| 9 | You get 48 ECU | You get 55 ECU, but with probability 30 % your personal information is disclosed |
| 10 | You get 47 ECU | You get 55 ECU, but with probability 30 % your personal information is disclosed |
| 11 | You get 46 ECU | You get 55 ECU, but with probability 30 % your personal information is disclosed |

(b) MPL table 6

| Row | Option A | Option B |
|---|---|---|
| 1 | You get 68 ECU | You get 65 ECU, but with probability 30 % your personal information is disclosed |
| 2 | You get 65 ECU | You get 65 ECU, but with probability 30 % your personal information is disclosed |
| 3 | You get 62 ECU | You get 65 ECU, but with probability 30 % your personal information is disclosed |
| 4 | You get 59 ECU | You get 65 ECU, but with probability 30 % your personal information is disclosed |
| 5 | You get 56 ECU | You get 65 ECU, but with probability 30 % your personal information is disclosed |
| 6 | You get 53 ECU | You get 65 ECU, but with probability 30 % your personal information is disclosed |
| 7 | You get 50 ECU | You get 65 ECU, but with probability 30 % your personal information is disclosed |
| 8 | You get 47 ECU | You get 65 ECU, but with probability 30 % your personal information is disclosed |
| 9 | You get 44 ECU | You get 65 ECU, but with probability 30 % your personal information is disclosed |
| 10 | You get 41 ECU | You get 65 ECU, but with probability 30 % your personal information is disclosed |
| 11 | You get 38 ECU | You get 65 ECU, but with probability 30 % your personal information is disclosed |

(c) MPL table 7

| Row | Option A | Option B |
|---|---|---|
| 1 | You get 80 ECU | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| 2 | You get 75 ECU | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| 3 | You get 70 ECU | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| 4 | You get 65 ECU | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| 5 | You get 60 ECU | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| 6 | You get 55 ECU | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| 7 | You get 50 ECU | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| 8 | You get 45 ECU | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| 9 | You get 40 ECU | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| 10 | You get 35 ECU | You get 75 ECU, but with probability 30 % your personal information is disclosed |
| 11 | You get 30 ECU | You get 75 ECU, but with probability 30 % your personal information is disclosed |

(d) MPL table 8

| Row | Option A | Option B |
|---|---|---|
| 1 | You get 65 ECU | You get 35 ECU, but with probability 30 % your personal information is disclosed |
| 2 | You get 62 ECU | You get 35 ECU, but with probability 30 % your personal information is disclosed |
| 3 | You get 59 ECU | You get 35 ECU, but with probability 30 % your personal information is disclosed |
| 4 | You get 56 ECU | You get 35 ECU, but with probability 30 % your personal information is disclosed |
| 5 | You get 53 ECU | You get 35 ECU, but with probability 30 % your personal information is disclosed |
| 6 | You get 50 ECU | You get 35 ECU, but with probability 30 % your personal information is disclosed |
| 7 | You get 47 ECU | You get 35 ECU, but with probability 30 % your personal information is disclosed |
| 8 | You get 44 ECU | You get 35 ECU, but with probability 30 % your personal information is disclosed |
| 9 | You get 41 ECU | You get 35 ECU, but with probability 30 % your personal information is disclosed |
| 10 | You get 38 ECU | You get 35 ECU, but with probability 30 % your personal information is disclosed |
| 11 | You get 35 ECU | You get 35 ECU, but with probability 30 % your personal information is disclosed |

## C.4 Final questionnaire

1. What do you think was the purpose of the experiment?
2. How difficult was it for you to make a decision? (1. Very difficult, 2. Somewhat difficult; 3. Not very difficult; 4. Not difficult at all)
3. Please, indicate how many of today's participants you knew before the experiment? If you did not know anybody in the lab please write zero.
4. Do you think that the remuneration for the experiment is appropriate? (1. Yes; 2. No)
5. Do you trust that experimenters will not misuse the personal information you gave in this experiment? (1. Yes; 2. No)
6. Suppose that you do not have to reveal your private information at the end of the experiment, but the experimenter offers you money so that your name, surname, photo, and answers to the preliminary questionnaire are shown to other participants. What is the minimum amount (in Euros) that you would be ready to accept for this?
7. Suppose that you have to reveal your private information at the end of the experiment, but you can pay the experimenter so that your name, surname, photo, and answers to the preliminary questionnaire are not shown to other participants. What is the maximum amount (in Euros) that you would be ready to pay for this?
8. What is your gender? (1. Male; 2. Female)
9. What is your age? (1. $<$ 18 years; 2. 18-25 years; 3. 26-30 years; 4. 31-35 years; 5. 36-40 years; 6. 41-45 years; 7. 46-50 years; 8. 51-55 years; 9. 56-60 years; 10. $>$ 61 years)
10. What is your field of study? (1. Social Sciences (Economics, Sociology, Low, etc.; 2. Technical sciences (Informatics, Engineering, Architecture, etc.); 3. Medical sciences (Medicine, Nursing, Pharmaceutics, etc.); 4. Humanities and Arts (Literature, Languages, Arts, etc.); 5. Natural Sciences (Chemistry, Physics, Mathematics, etc.); 6. Education science and pedagogics; 7. Agriculture (Agriculture, Veterinary, etc.); 8. Other applied sciences (specify)
11. What is the highest level of education you have completed up to now? (1. Secondary education; 2. Bachelor's Degree; 3. Master's Degree; 4. PhD; 5. Other (specify)
12. What is your nationality? (1. Italian; 2. Other (specify))
13. Did your parents complete their secondary education? (1. None of my parents completed secondary education; 2. Only one of my parents completed secondary education; 3. Both parents completed secondary education)
14. Where did you live for most part of your life? (1. Big city with population $>$ 1 million inhabitants; 2. City with 100.001 - 1.000.000 inhabitants; 3. City with 10.001 - 100.000 inhabitants; 4. Town with 1.000 - 10.000 inhabitants; 5. Village with $<$ 1.000 inhabitants)
15. How much do you spend every month? (including food, clothes, rent, utilities

(heating, water), education, entertainment, etc.) (1. < 500 Euro; 2. 501-800 Euro; 3. 801-1200 Euro; 4. 1201-2000 Euro; 5. > 2000 Euro; 6. No answer)

16. Are you generally concerned about your privacy? (1. Not concerned at all; 2. Somewhat unconcerned; 3. Somewhat concerned; 4. Very concerned)
17. How willing are you to provide personally identifiable information and demographics to websites in general? (1. Very willing; 2. I would not mind; 3. I am indifferent; 4. Not very willing; 5. Not willing at all)
18. Would you be more willing to provide personally identifiable information and demographics to websites in general if you were compensated for your information? (1. Yes; 2. No)
19. How willing are you to provide information about your tastes, interests and preferences without personal identification to websites in general? (1. Very willing; 2. I would not mind; 3. I am indifferent; 4. Not very willing; 5. Not willing at all)
20. Would you be more willing to provide personal information about your tastes, interests and preferences to websites in general if you were compensated for your information? (1. Yes; 2. No)
21. Have you personally been the victim of what you felt was an invasion of privacy? (1. Yes; 2. No)
22. Please indicate to which extend you (dis)agree with the following statements (1. Strongly agree; 2. Somewhat agree; 3. Somewhat disagree; 4. Strongly disagree):
    (a) Consumers have lost all control over how personal information is collected and used by companies
    (b) Most businesses handle the personal information they collect about consumers in a proper and confidential way
    (c) Existing laws and organizational practices provide a reasonable level of protection for consumer privacy today
23. Currently in your life, how many close friends would you say you have?
24. If you are a member of online social networks, which do you use the most actively? (The online social network chosen in this questions will be called *your primary social network* hereinafter) (1. Facebook; 2. Google +; 3. Twitter; 4. My Space; 5. Instagram; 6. LinkedIn; 7. FourSquare; 8. Other (specify); 9. I am not a member of any online social network)
25. How many connections do you have in your primary social network? (Write zero if you are not a member of any online social network)
26. What do you use as your user name in your primary social network? (1. Real name; 2. Pseudonym, and nobody knows who I am in real life; 3. Pseudonym, but everybody knows who I am in real life; 4. I am not a member of any online social network)
27. What do you use as profile picture in your primary social network? (1. Real photo of me; 2. Real photo of me with other person/people; 3. Photo of other

person or celebrity; 4. Photo/image of non human being; 5. No photo at all; 6. I am not a member of any online social network; 7. Other (specify))

28. What are your privacy settings in your primary social network? (1. Public. Everybody can get access to my profile and read my entries; 2. Private. Only my friends can get access to my profile and read my entries; 3. My profile and entries are mostly public and partially private; 4. My profile and entries are mostly private and partially public; 5. I have different accounts for public and private entries; 6. I am not a member of any online social network; 7. Other (please describe in details))
29. Did you ever change your privacy settings in primary social network? (1. Never; 2. I changed privacy settings immediately after registration; 3. I changed privacy settings several times; 4. I changed privacy settings after someone misused my personal information; 5. I am not a member of any online social network; 6. Other (please describe in details))
30. Please, read the following statements and using the scale below rate how accurately each statement describes **you,** as you generally are now, not as you wish to be in the future. Apart from being anonymous, your responses will be kept in absolute confidence. (1. Very Inaccurate; 2. Moderately Inaccurate; 3. Neither Inaccurate nor Accurate; 4. Moderately Accurate; 5. Very Accurate)
    (a) I am open about myself.
    (b) I don't talk a lot.
    (c) I disclose my intimate thoughts.
    (d) I show my feelings.
    (e) I reveal little about myself.
    (f) I talk about my worries.
    (g) I bottle up my feelings.
    (h) I prefer to deal with strangers in a formal manner.
    (i) I act wild and crazy.
    (j) I have little to say.
31. How do you see yourself: Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks? Please, indicate a number on the scale from 0 to 10, where the value 0 means: *Unwilling to take risks* and the value 10 means *Fully prepared to take risk.*
32. In different areas you can behave differently too. How would you assess your risk tolerance with respect to the following areas (please, indicate a number on the scale from 0 to 10, where the value 0 means: *Unwilling to take risks* and the value 10 means *Fully prepared to take risk).*
    (a) in car driving
    (b) in financial matters
    (c) in leisure and sports
    (d) in you professional career
    (e) in your health

(f) in trusting strangers

33. "In general, one can trust people . . . " (1. I totally agree; 2. I somewhat agree; 3. I somewhat disagree; 4. I totally disagree)
34. "Nowadays one cannot rely on anyone . . . " (1. I totally agree; 2. I somewhat agree; 3. I somewhat disagree; 4. I totally disagree)
35. "When dealing with strangers it's better to be careful before trusting them. . . " (1. I totally agree; 2. I somewhat agree; 3. I somewhat disagree; 4. I totally disagree)
36. Do you think that the majority of people. . . (1. . . . would exploit you if they had an opportunity; 2. . . . would try to be fair to you)
37. Do you think that people most of the times. . . (1. . . . try to be considerate of others; 2. . . . follow their own interests)

## D Summary of answers to the post-experimental questionnaire

| | Mean | SD | Min | Max |
|---|---|---|---|---|
| **Part A: About the experiment** | | | | |
| Q2. Ease of understanding (0 very difficult, 3 not difficult at all) | 2.14 | 0.61 | 0 | 3 |
| Q3. Number of known other participants | 1.28 | 1.31 | 0 | 5 |
| Share which knew another participant (s) | 66% | | | |
| Q4. Appropriate remuneration (0 No, 1 Yes) | 70% | | | |
| Q5. Trust experimenters (0 No, 1 Yes) | 97% | | | |
| Q6. WTA, Euro | 36.2 | 142 | 0 | 1000 |
| WTA excluding outliers, Euro | 16.1 | 25.4 | 0 | 200 |
| Q7. WTP, Euro | 10 | 83.7 | 0 | 1000 |
| WTP excluding outliers, Euro | 1.92 | 4.85 | 0 | 30 |
| **Part B: Demographics** | | | | |
| Q8. Males | 66% | | | |
| Q9. Age | 18-25 years, 94%; 26-30 years, 6% | | | |
| Q10. Field of study: | Social sciences, 82%; Technical sciences, 10%; Humanities and Arts, 5%; Natural sciences, 1%; Other 1% | | | |
| Q11. Education level: | Secondary education 82%; Bachelor's degree 15%; Master's degree 3% | | | |
| Q12. Italians | 93% | | | |
| Q13. Parents completed secondary education: | None of the parents, 16%; One of the parents, 25%; Both parents, 59% | | | |
| Q14. Size of city (inhabitants): | > 1 million, 3%; 100 001 - 1 000 000, 16%; 10 001 - 100 000, 49%; 1 001 - 10 000, 28%; < 1 000, 4% | | | |
| Q15. Expenses per month: | < Euro 500, 43%; Euro 501-800, 41%; Euro 801-1200, 11%; Euro 1201-2000, 1%; >Euro 2000, 0%; No answer, 4% | | | |

| | Mean | SD | Min | Max |
|---|---|---|---|---|
| **Part C: Privacy preferences, OSN activities and self-disclosure** | | | | |
| Q16. General privacy concern (0 not concerned at all, 3 very concerned) | 1.12 | 0.90 | 0 | 3 |
| Q17. Willingness to provide Personal Identifying Information ("PII") to websites (0 very willing, 4 not willing at all) | 2.68 | 0.91 | 0 | 4 |
| Q18. Provide PII to websites if compensated (0 No, 1 Yes) | 57% | | | |
| Q19. Willingness to provide information about tastes, interests and preferences to websites (0 very willing, 4 not willing at all) | 1.57 | 1.18 | 0 | 4 |
| Q20. Provide information about tastes, interests and preferences if compensated (0 No, 1 Yes) | 86% | | | |
| Q21. Victim of privacy invasion (0 No, 1 Yes) | 34% | | | |
| Q22. Westin's Privacy Index | 0: Unconcerned, 44%; 1: Pragmatist, 28%; 2: Fundamentalist, 28% | | | |
| Q23. Number of close friends offline | 6.37 | 4.79 | 1 | 30 |
| Q24. Primary online social network (POSN) | Facebook, 80%; Google+, 2%;, Twitter, 1%; Pinterest, 1%; LinkedIn, 1%; Instagram, 10%; Not a member, 5% | | | |
| Q25. Number of connections in POSN | 545 | 488 | 0 | 3200 |
| Q26. Name in POSN (if use) | Real name, 94% ; Pseudonym, and nobody knows who I am in real life, 2%; Pseudonym, but everybody knows who I am in real life, 4% | | | |
| Q27. Profile picture in POSN (if use) | Real photo, 74%; Real photo with other people, 19%; Photo of other person, 2%; Image of non human being, 4%; No photo at all, 1% | | | |
| Q28. Privacy settings in POSN (if use) | Public, 13%; Private, 57%; Mostly public, 11%; Mostly private, 19% | | | |
| Q29. Changed privacy settings in POSN (if use) | Never, 15%; Immediately after registration, 34%; Several times, 48%; After misuse, 3%; Other, 1% | | | |
| Q30. Self-disclosure index | -1.86 | 3.61 | -13 | 10 |
| | | | | |
| **Part D: Attitudes to risk and trust** | | | | |
| Q31. General risk attitude (0 averse, 10 risk -seeking) | 5.91 | 1.6 | 1 | 10 |
| Q32. Risk attitude in: (0 averse, 10 risk-seeking) | | | | |
| Driving | 3.6 | 2.66 | 0 | 10 |
| Finance | 4.28 | 2.31 | 0 | 10 |
| Sports | 6.69 | 2.18 | 0 | 10 |
| Career | 4.63 | 2.34 | 0 | 10 |
| Health | 3.03 | 2.65 | 0 | 10 |
| Trusting strangers | 4.41 | 2.54 | 0 | 10 |
| Q33. Trust people (0 agree, 3 disagree) | 1.6 | 0.71 | 0 | 3 |
| Q34. Cannot rely on people (idem) | 1.82 | 0.72 | 0 | 3 |
| Q35. Should not trust strangers (idem) | 0.85 | 0.65 | 0 | 3 |

|  | Mean | SD | Min | Max |
|---|---|---|---|---|
| Q36. People try to be fair (0 No, 1 Yes) | 33% |  |  |  |
| Q37. People follow their own interests (idem) | 83% |  |  |  |