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The Influence of (Im)perfect Data Privacy on the Acquisition of Personal Health Data

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Abstract

We investigate the consequences of imperfect data privacy on information acquisition of personal health data. In a game of persuasion with ex-ante symmetric information players decide on whether or not to acquire and reveal information about their personal health status to convince a decision maker to interact. We contrast three institutional settings: automatic dissemination of acquired information, perfect data privacy and imperfect data privacy. Assuming that the ex-ante expected payoff of an interaction with an unknown type for the decision maker is positive, equilibria with complete information acquisition and complete information revelation exist only under perfect and imperfect data privacy. Equilibria without any information acquisition exist under all institutional settings. We test our predictions in a laboratory experiment. Automatic dissemination leads to incomplete information acquisition. Both imperfect and perfect data privacy yield almost complete information acquisition and thus imperfect data privacy does not reduce the amount of acquired information.

JEL Classification: D80, D82, I1, I12

Keywords: data privacy, endogenous information acquisition, health, experiment, unraveling.

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1 Introduction

Patients regularly generate personal health data through medical check-ups. Insurance companies may access this data and use it to discriminate among different health types. How does it affect patients' behavior if data privacy cannot be guaranteed - as for instance in the UK in 2007 when hundreds of thousands of National Health Service patients' details were lost? [1] Do people take into account that doctoral visits may reduce future prospects for (health, life and disability) insurance contracts?

Acquiring and transferring private information is at the heart of economic interactions, may it be in principal-agent relationships, auctions, bargaining or financial markets.[2] One key question is how different privacy regulations affect endogenous information acquisition. This question is of particular importance for health related data. First, information about personal health characteristics has often to be generated through the help of third parties (e.g. doctors) and thus patients are not in full control of their personal data. Second, personal health data affects prospects for future insurance contracts and thus data losses can have immediate consequences for patients. If imperfect data privacy results in patients becoming reluctant to acquire personal health data, prevention of serious diseases through early interventions will become difficult and the likelihood of an infectious disease to spread may increase. Further, technological advances have increased the possibilities of health and genetic testing such that more and more data can be acquired, stored and accessed which has put data privacy issues to public and legal debate.[3]

In our paper we describe a simplified game of persuasion that captures the main decisions agents face in the context of acquisition and transmission of personal health information. We provide theoretical predictions as well as behavioral results from a laboratory experiment. In the game people have to decide whether to acquire and transfer information about their own health status (which can be good or bad) in order to persuade a decision maker (e.g. an insurance company or a sexual partner) to interact. The information transfer of their personal status affects their own prospects for a match, because the partners' welfare depends on their

[1] See http://news.bbc.co.uk/2/hi/uk_news/7158019.stm (downloaded: May 2012).

[2] See e.g. Kessler (1998) for how agents who stay uninformed change the incentive compatibility and individual rationality constraints for principals and Crémer and Khalil (1992) for contracts designed by principals such that agents stay uninformed. For consequences of endogenous information acquisition in first and second price auctions see Persico (2000) and for market entry decisions when information about demand is uncertain see Hurkens and Vulkan (2003).

[3] For a discussion with respect to legal aspects see e.g. Peppet and Posner (2011).

status. The partner will match with an identified good type, whereas he will refuse to match with an identified bad type. Whether he will match with an unknown type, may depend on the institutional setting. We contrast three institutions which differ with respect to how acquired information is transferred: automatic dissemination of acquired information (from now on *Automatic Dissemination*), only voluntary dissemination of acquired information (from now on *Perfect Privacy*) and voluntary and involuntary dissemination of acquired information (from now on *Imperfect Privacy*). We show that equilibria with complete information acquisition always exist under *Perfect Privacy* as well as under *Imperfect Privacy*. Instead, with *Automatic Dissemination* of test results, equilibria with complete information acquisition only exist if the expected loss of a match with an unknown type is sufficiently large (i.e. larger than the gains from a single match) such that matches with unknown types will never occur (i.e. acquiring information constitutes no risk). Further, equilibria without any information acquisition exist in all three institutional settings if the expected loss of a match with an unknown type is sufficiently small (i.e. smaller than the gains from a single match).

If the expected loss from a match with an unknown type is larger than the gain from a match, people will not match with unknown types and all people will have themselves tested. Focusing on the case in which gains from a match with an unknown type outweigh the expected loss from this match, we find that for *Automatic Dissemination* only an equilibrium in pure strategies (in which players do not acquire information) exists. For *Perfect Privacy* and *Imperfect Privacy* there exist multiple equilibria in pure strategies with complete and no information acquisition as well as mixed strategy equilibria with incomplete information acquisition. Because of the existence of multiple equilibria it is worthwhile to investigate which equilibria may result from actual behavior. We do so by complementing our analysis with a laboratory experiment.

In the experiment, we find that with *Perfect Privacy* 95 percent of participants acquire information about their status and matching with unknown types is relatively rare (33 percent). With *Automatic Dissemination* of test results, the testing frequency is significantly lower (45 percent) and matching with unknown types is rather common (91 percent). With *Imperfect Privacy* information acquisition is not significantly different from the case with *Perfect Privacy*: 93 percent of participants acquire information about their status. However, matching with unknown types is slightly more common in *Imperfect Privacy* (55 percent), suggesting that people take into account that others might be sensitive to the lack of *Perfect Privacy* and might stop acquiring information.

At first sight, the results are surprising. Pure strategy equilibria do not reflect the basic intuition that people will always acquire less information with *Imperfect Privacy*. The behavioral data too shows that people are not less likely to acquire information when data privacy is imperfect. Interestingly, under *Imperfect Privacy* people seem to take the risk into account when deciding on a match but not when deciding on the acquisition of information.

The rest of this paper is structured as follows. In the following section, we briefly review the related literature. In Section 3 we present our theoretical arguments. Section 4 encompasses detailed information about the experimental design, predictions, and results. We conclude with Section 5.

2 Related Literature

Our work relates to three branches of literature. The first branch discusses how to increase private demand for testing of infectious diseases. The second focuses on the merits of privacy and testing for quality information in a more general context and the third branch focuses on behavioral experiments dealing with data privacy and information transmission.

We first focus on models which deal with testing for infectious diseases.[4] Philipson and Posner (1995) study under which conditions public subsidies for testing can reduce the spread of the disease. They show in a theoretical model that subsidies can increase the incidence of infectious diseases in only one special case, namely if safe sex is the status quo and only one partner tests. They complement their predictions with an empirical investigation that suggests that many couples engage in test trades (i.e. both partners test) and therefore subsidies might help limit the spread of sexually transmitted diseases (STDs). However, the authors do not explicitly consider the effects of different institutional settings with respect to perfect or imperfect data privacy about test results. Similar to our framework, Philipson and Posner (1995) also ignore psychological constraints on the willingness to test. Testing for severe STDs such as HIV might however cause a certain cost due to an aversion to medical tests in general or because individuals fear the worry a positive test result would produce. Caplin and Eliaz (2003) study the role of anxiety for testing in a theoretical model[5]. Lyter et al. (1987)

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[4] Our work relates also to the discussion about genetic testing. Tabarrok (1994) argues that the costs from genetic testing can be mitigated by a genetic insurance against a potential high probability of sickness. Hoel and Iversen (2002) analyze inefficiencies which may result from genetic testing in a theoretical model with compulsory or voluntary insurances. Bardey and De Donder (2012) provide a model which accounts for both, acquiring information about one's health status through testing and undertaking prevention effort to decrease the probability of developing a disease after a positive test result.

[5] In their model, different individuals compete for a match. Assuming the expected gain from a match never outweighs the anxiety of a positive test result the authors show that a unique sequential psychological

provide a first empirical investigation of this reasoning. In order to avoid the possible trade-off between psychological costs as well as potential individual benefits from testing (such as early treatment and medication), we decided to abstain from both.

In the more general context, early work by Posner (1981) and Stigler (1980) argues that regulation is not needed in markets for personal information. Although Stigler (1980) also observes that involuntary disclosure can discourage efficient investment in obtaining information, he did not conclude that this fact can lead to inefficient outcomes when privacy is not guaranteed. Hermalin and Katz (2006) argue that people may stop collecting information about themselves if privacy is not guaranteed. Doherty and Thistle (1996) discuss this topic in detail for a competitive insurance market model, in which the insured are risk-averse and insurance companies act in a risk neutral way. Similar to our findings, Doherty and Thistle (1996) show that if test results can only be revealed voluntarily and information acquisition is costless, not only will the value of information in equilibrium be positive (i.e. people will acquire information) but also the insurance markets will be efficient (i.e. insurance companies can charge prices according to risk types).[6] In contrast to our work the authors do not consider the case in which data privacy is imperfect.

The third branch covers behavioral experiments. Early experimental contributions follow Grossman's (1981) and Milgrom's (1981) idea of unraveling in markets with asymmetric information. For instance, Forsythe et al. (1989) study sellers' willingness to reveal quality information of products experimentally. They show that unraveling occurs over time (in the experiment bids for products of unknown quality are low in the late rounds and sellers tend to reveal information about their products). More recent experimental contributions focus on the value of personal information (i.e. willingness to transfer personal information). Evidence on the value of personal information is mixed. Beresford et al. (2010) measure the value of privacy in a field experiment in which subjects chose to buy identical DVDs at different online stores. They find that people's purchasing behavior is not affected

equilibrium exists in which nobody tests and matches occur with certainty. However, a mechanism which ensures that a positive test (i.e., infected) result might be ambiguous and a negative test result is always true can increase testing and therefore decrease infections. The authors conclude that psychological interventions such as decreasing the informativeness of a bad test result or mitigating the fear of bad news can decrease infection rates. Similar to our work, both studies ignore the potential benefits of testing for the tested individual, such as earlier treatment possibilities for the infected. We also regard the potential partner as the main beneficiary of a test, since the test enables her to learn about the quality of the services exchanged (see also Philipson and Posner, 1995, p. 446).

[6] Our work further relates to theoretical contributions following Grossman's (1981) and Milgrom's (1981) idea of unraveling in markets with asymmetric information. It relates in particular to models with endogenous information acquisition (see e.g. Brocas et al., forthcoming and Gentzkow and Kamenica, 2012).

by a requirement to provide more sensitive personal data (date of birth and monthly income). Tsai et al. (2011) show in a laboratory experiment that a more salient display of privacy disclaimers in online shops increases the number of items bought at privacy friendly shops and find that participants are willing to pay a premium to purchase from privacy protective websites (about 4% of a good's price). Grossklags and Acquisti (2007) provide a laboratory experiment on the willingness to sell and the willingness to protect personal information (results from a quiz or weight) and find an endowment effect with respect to privacy goods (i.e. people's willingness to protect differs significantly from people's willingness to sell information). The endowment effect is also found in a field experiment by Acquisti et al. (2009) in which subjects are given unidentified or identified gift cards in a shopping mall. While about half of the participants rejected an offer of additional $2 to switch from an unidentified to an identified card when they were endowed with the unidentified card, less than 10 percent paid 2 dollars for receiving the unidentified card when holding the identified card. Huberman et al. (2005) provide evidence that the fear of embarrassment or stigma influences the willingness to accept money for publishing personal information (weight, age). In contrast to all these studies, our experiment does not only deal with people's willingness to transfer personal information, but also with their willingness to acquire personal information before deciding on whether or not to transfer it. Hall et al. (2006) conduct a discrete choice experiment evaluating people's demand for genetic testing. In particular, they find strong heterogeneity among individuals with respect to the value they attached to the genetic testing results. They also state that people prefer the anonymity of a clinic rather than a test at the local doctor.

3 Theory

Assume there are two risk neutral players, player 1 (she) and player 2 (he). The two players can match and both may benefit from the match. A match is always profitable for player 1. However, player 2's payoff depends on player 1's type. Player 1 can be a good (Type G) or a bad type (Type B). A match with a good type increases player 2's payoff. A match with a bad type decreases his payoff (e.g. costs for medical treatments). While the occurrence of a match usually requires two decision makers to agree on the match, we simplify the model as far as possible and abstain from a symmetric version of the game. Instead we assign different roles to the two players and construct a simplified game of persuasion in which player 1 always wants to match and therefore has an incentive to persuade player 2 to agree on the match.

A match results in payoff *M* for both players. However, if player 1 is a bad type, player 2 additionally incurs a loss of *I*. We assume $M>0$, $I>0$, and $I>M$. The last assumption describes the fact that a match with a bad type decreases player 1's payoff. Let $0<b<1$ be the share of bad types in the population of players 1.

We assume that player 1 does ex-ante not know her type, but she can test and report her type to player 2 before player 2 decides on whether to match. Testing and reporting is costless. The variable *t* indicates the probability that player 1 tests herself. The action of testing (not testing) is denoted by T ($\overline{T}$). The action of voluntarily disclosing (not voluntarily disclosing) the test result to player 2 is denoted by D ($\overline{D}$). Let d_G, d_B be the probabilities that type G and type B voluntarily disclose their types after testing.

Player 2 can learn player 1's type only if player 1 had herself tested. After a test, player 1 might disclose her type voluntarily. However, the test result about player 1's type may also be transferred involuntarily (e.g. through data loss, knowledge about the person by the staff involved in testing or illegal acquisition of data) with probability $0 \le p \le 1$. Note that the action of testing itself cannot be observed. Hence, if player 2 does not learn player 1's type, he also does not learn whether player 1 had herself tested or not. Let *U* (unknown) denote the fact that player 2 does not know player 1's type. X ($\overline{X}$) denotes player 2's decision to match (not to match). The probability that player 2 matches with an unknown type is denoted by *m* and s_i denotes the strategy of player *i*. We are now ready to describe the existence of equilibria under the different institutions.

Complete information acquisition

We first show that there exists a pure strategy equilibrium, in which complete information is acquired and player 2 matches only with disclosed type G players.

Proposition 1

$$s_1 = T, s_1(G \mid T) = D, s_1(B \mid T) \in \{\overline{D}, D\},$$
$$s_2(G) = X, s_2(B) = \overline{X}, s_2(U) = \overline{X}$$

is an equilibrium for all $p<1$ and for $p=1$ if $M \le bI$.

Formal proofs of all propositions can be found in appendix A. The main intuition for the proof of Proposition 1 is as follows: If player 2 does not match with unknown types, it is worthwhile to test for player 1. Also, it will be worthwhile for player 1 to report her test result if the test reveals that player 1 is of type G. Type *B* is indifferent whether or not to disclose her type. In turn, since everybody tests and all type G reports her type, player 2 will not match with unknown types (who are all of type *B*). However, for $p=1$ all test results are revealed. An unknown type is thus an untested player. The expected payoff of a match with an untested player is non-positive as long as $M \leq bI$. Therefore player 2 will not match with an untested player 1.

In a next step, we characterize pure strategy equilibria in which information is not acquired (no testing) at all and player 2 matches with a player 1 of unknown type.

No information acquisition

Proposition 2

$$s_1 = \overline{T}, s_1(G \mid T) \in \{\overline{D}, D\}, s_1(B \mid T) = \overline{D},$$
$$s_2(G) = X, s_2(B) = \overline{X}, s_2(U) = X$$

is an equilibrium for all p and $M \geq bI$.

Assuming player 2 matches with type *G* and unknown types *U* it is clearly worthwhile to forgo acquiring information as long as data privacy is not guaranteed ($p>0$) because not acquiring information prevents involuntary disclosure.[7] If nobody tests, matching with unknown types will be worthwhile (or at least not harmful) for player 2 as long as the ex-ante expected loss of a match with an unknown type does not outweigh the gains from a match ($M \geq bI$). We provide an intuition for the case of $p=0$ below proposition 5.

Finally we characterize equilibria with incomplete data acquisition for imperfect privacy, automatic data dissemination and perfect data privacy.

Incomplete information acquisition under imperfect privacy

Proposition 3

$$s_1 : t = \frac{M - bI}{pbM + M - bM - pbI}, s_1(G \mid T) = D, s_1(B \mid T) = \overline{D},$$
$$s_2(G) = X, s_2(B) = \overline{X}, s_2(U) = m = \frac{1-b}{1-b(1-p)}, 0 < m < 1$$

is a mixed strategy equilibrium for all $0<p<1$ and $M \geq bI$.

[7] If instead data privacy is perfect ($p=0$), player 1 is indifferent whether or not to test given player 2 matches with unknown types.

In this mixed strategy equilibrium player 2 matches with type *G*, does not match with type *B* and matches with probability $m \in (0,1)$ with unknown types such that player 1 is indifferent between testing and not testing. In equilibrium, player 1 tests with probability t, such that player 2 is indifferent between matching and not matching with unknown types. As can be seen from the characterization of the matching and testing probabilities in Proposition 3, the equilibrium matching probability will decrease if *p* increases whereas the testing probability increases for larger values of *p*. The intuition for this result lies in the fact that if the probability of a data loss increases from *p*' to *p*'', the chance to meet a type *G* player when matching with an unknown type is less likely under *p*'' than under *p*' and thus player 1, who was indifferent between testing and not testing at *p*', does not test under *p*''. In order to make him indifferent between testing and not testing, the probability to be matched for a player with unknown type under *p*'' has to be lower than under *p*'.

Incomplete information acquisition under automatic dissemination

Proposition 4

$$s_1 : t \in [0,1], s_1(G \mid T) = D, s_1(B \mid T) = \overline{D},$$
$$s_2(G) = X, s_2(B) = \overline{X}, s_2(U) : m = 1 - b$$

is a mixed strategy equilibrium for *p=1* and *M=bI*.

The logic behind this equilibrium in mixed strategies is as follows. If the ex-ante gain of a match equals the expected loss from the match (*M=bI*), player 2 is indifferent between matching and not matching. If she matches with a probability which is exactly as high as the share of good types, player 1 neither gains nor loses from testing in expected terms because his (automatically revealed) test result will be of a good type with a probability equivalent to the share of good types and thus be equivalent to the probability *m* of a match with an unknown type.

Incomplete information acquisition under perfect privacy

Proposition 5

$$s_1 : t \in \left[0, \frac{M - bI}{d_G M(1-b)}\right), s_1(G \mid T) = d_G, s_1(B \mid T) = \overline{D},$$
$$s_2(G) = X, s_2(B) = \overline{X}, s_2(U) = X$$

characterizes an equilibrium for *p=0* and *M>bI*.

The intuition behind this equilibrium is that as long as the fraction of tested players is sufficiently low, player 2 will match with unknown types. Because she does so, tested good types are indifferent as to whether or not to disclose their type and thus player 1 is also indifferent between testing and not testing.

We summarize Propositions 1 through 5 shortly.

If $M<bI$, risk neutral players will never match with unknown types irrespective of the institution (i.e. for any p) but will only match with revealed type G. Therefore, all players 1 will have themselves tested in order to exploit the likelihood of being type G.

For $M\geq bI$ predictions depend on the institutional setting (i.e. on the value of p). Under this assumption it is ex-ante (weakly) profitable to match with an unknown type. As long as nobody acquires information or type G players do not report their type, player 2 will match with unknown types. However, type G is indifferent as to whether to report or not report her type.

Under *Perfect Privacy*, i.e. if $p=0$, player 2 will match with unknown types as long as the fraction of tested players is sufficiently low and thus good types are indifferent as to whether or not to disclose their information. If player 2 does not match with certainty with an unknown type and assuming that players acquire information because they run no risk in doing so ($p=0$), disclosure of good types is a dominant strategy. This yields an equilibrium in pure strategies with complete information acquisition and revelation of all types.

Under *Automatic Dissemination*, i.e. if $p=1$, player 1 has a clear preference against acquiring information, since staying ignorant secures a match with certainty (for $M>bI$), whereas acquiring information risks disseminating that one is of type B. The only pure equilibrium is a state where nobody tests and everybody receives a match. This equilibrium also exists if $M=bI$. For $M=bI$ and $p=1$, an additional equilibrium exists in which player 2 matches with unknown types with a positive probability independent of player 1's decision to acquire information.

Imperfect Privacy (i.e. $0<p<1$) allows for two equilibria in pure strategies: one with perfect information acquisition and revelation of all types and one without any information acquisition. Further with *Imperfect Privacy*, a mixed strategy equilibrium exists in which player 1 tests with a positive probability and player 2 matches with a positive probability with unknown types.

4 Experiment

Experimental design

For the experiment we focus on $M>bI$, i.e. the gain from a match ex-ante outweighs the expected loss. We chose the following parameter values: The share of bad types B within players 1 is $b=1/3$. A match yields 10 points for both players ($M=10$). A match with type B additionally decreases player 2's payoff by 15 points ($I=15$).

At the beginning of the experiment, each player received an endowment of 10 points to prevent negative payoffs. Then, two players (player 1 and player 2) were randomly assigned to each other to form a pair. Player 1 was either a good (type G) or bad type (type B).[8] Player 2 had no particular type. When the pair was formed, the type of player 1 was unknown to both members of the pair. However, we informed all players that the share of types B in the population of players 1 was $b = 1/3$.

Player 2 decided on whether to match with player 1 or not. The match between player 1 and player 2 affected both players' payoffs. If the match was realized, player 1 received 10 additional points, irrespective of her type. Player 2 received 10 points if player 1 was of type *G*. However, if player 1's type was *B*, players 2's income would decrease by 5 points. If player 2 decided not to match, both players kept their endowment.

Before player 2 decided on the match, player 1 had to decide whether to test for her type. Testing is costless. As mentioned above, we implemented three treatment conditions: *Automatic Dissemination, Perfect Privacy and Imperfect Privacy*.

In *Automatic Dissemination* ($p=1$), if player 1 decided to test, the test result was displayed to both players automatically.

In *Perfect Privacy* ($p=0$), after a test, player 1 first learned the test result and second decided whether to display the result to player 2. Player 2 could not learn the test result any other way.

In *Imperfect Privacy* ($p=.5$), after a test, player 1 first learned the test result and second decided whether to display the result to player 2. However, if player 1 decided to test she ran the risk of involuntary dissemination of the test result with probability $p=.5$.[9] Note that player

[8] Note that we did not use the expressions "good" or "bad" in the experiment and types were A or B.

[9] We implemented two variants of how this was exactly done. In the first variant, subjects first decided whether to transfer information voluntarily and then a random device decided whether the test result was shown on player 2's screen (irrespective of whether player 1 disclosed her type). In the second variant, the random device first

2 only received information about the type of player 1 but not about whether or not this information was voluntarily revealed. Note also that reporting was costless and the test result displayed was true in all treatments.[10]

Behavioral Predictions

Based on the propositions of our theoretical model we derive the following behavioral predictions for the chosen parameters.[11]

Prediction 1: *Automatic Dissemination* will not lead to more information acquisition than *Perfect Privacy* and *Imperfect Privacy*.

Prediction 2: *Perfect Privacy* and *Imperfect Privacy* will not lead to more matches with unknown types than *Automatic Dissemination*.

Procedures

In all treatments each participant decided in both roles, first as player 1 and then as player 2. For every role players were matched with a different player (perfect stranger matching). Players received no feedback on their payoff as player 1 until the end of the experiment. Players were paid for both roles.

We computerized the experiment using z-Tree (Fischbacher, 2007). Each player sat at a randomly assigned and separated computer terminal and was given a copy of instructions.[12] A set of control questions was provided to ensure that participants understood the game. If any participant repeatedly failed to answer correctly, the experimenter provided an oral explanation. No form of communication between the players was allowed during the experiment. Procedures and parameters were common knowledge. We conducted four sessions at the LakeLab (University of Konstanz, Germany) in January 2011 and another two sessions in December 2011. The first four sessions were run after a completely unrelated experiment with 84 participants in total. The two sessions in December with another 42 participants were run independently. We recruited participants from the local subject pool using ORSEE (Greiner, 2004). Our experiment lasted 30 minutes. 1 point translated into 20

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chose whether the information about player 1's type was displayed and second player 1 decided about the voluntary disclosure (if disclosure was not forced). We observed almost identical behavior in the two variants. This is why we pool the two variants in the results section.

[10] For a discussion on imperfect testing devices see e.g. Caplin and Eliaz (2003) or Rosar and Schulte (2010).

[11] Note that predictions 1 and 2 also hold for risk-averse players.

[12] A copy of translated instructions can be found in the appendix.

cents. Participants in our experiment received a 2 euro show-up fee and earned 6.62 euros on average ($9.94 at that point in time).

Experimental Results

We first report testing frequencies across treatments (*Automatic Dissemination*, *Perfect Privacy*, and *Imperfect Privacy*) and shed light on voluntary disclosure behavior of our participants. Prediction 1 states that not more tests will occur in *Automatic Dissemination* than in *Perfect Privacy or Imperfect Privacy*. Figure 1 presents the frequencies of tests in all treatment conditions. Indeed, the testing frequency in *Perfect Privacy* is significantly higher than in *Automatic Dissemination* (χ^2-test, p-value < 0.001). Also, the testing frequency in *Imperfect Privacy* is significantly higher than in *Automatic Dissemination* (χ^2-test, p-value < 0.001). Testing frequencies in *Perfect Privacy* and *Imperfect Privacy* do not significantly differ (χ^2-test, p-value = 0.645). Note that contrary to the theoretical prediction, not all players in *Perfect Privacy* and *Imperfect Privacy* had themselves tested. Five percent of participants decided not to do so in *Perfect Privacy* and 7 percent in *Imperfect Privacy*. We summarize this finding in result 1.

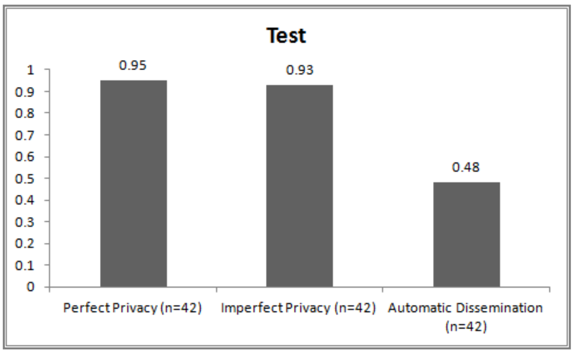


Figure 1: Test frequencies across treatments

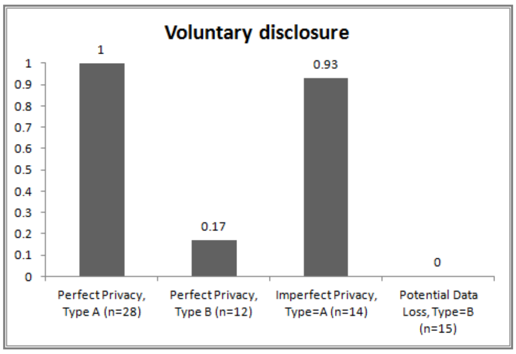


Figure 2: Disclosure frequencies when tested (in Perfect Privacy and Imperfect Privacy)

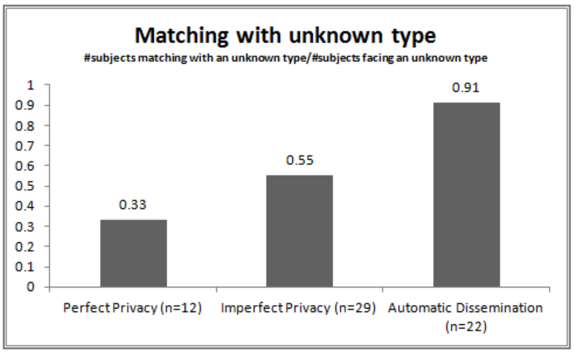


Figure 3: Matching with unknown type

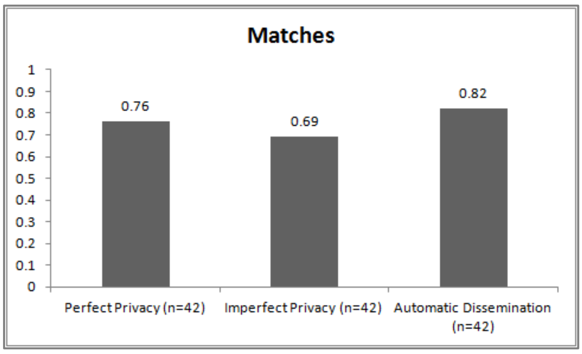


Figure 4: Total frequencies of matches

Result 1 *Perfect Privacy* and *Imperfect Privacy* lead to more information acquisition than *Automatic Dissemination*.

Figure 2 shows that all tested type G's disclose their type in *Perfect Privacy* and 13 out of 14 tested good types do so in *Imperfect Privacy,*[13] whereas voluntary disclosure of bad types is rare. Following, all players in *Perfect Privacy* and (almost all players in) *Imperfect Privacy* who did not disclose their type, are type *B* or untested players. According to Prediction 2 we thus should observe less matching with unknown types in *Perfect Privacy* and *Imperfect Privacy* than in *Automatic Dissemination*. Indeed, as Figure 3 shows, this is exactly what we find: Compared to *Automatic Dissemination* fewer players match with unknown types in *Perfect Privacy* (Fisher's exact test, p-value =0.001) and in *Imperfect Privacy* (Fisher's exact test, p-value = 0.006). There is no significant difference with respect to matches with unknown types between *Perfect Privacy* and *Imperfect Privacy* (Fisher's exact test, p-value =0.306).

Result 2 *Perfect Privacy* and *Imperfect Privacy* lead to fewer matches with unknown types than *Automatic Dissemination.*

Discussion

There are at least two different ways to measure "performance" across treatments. One way to think of the experimental setup is an insurance market. From a perspective of equal opportunities, a social planner might be interested in maximizing the number of insured persons: As Figure 4 shows, in *Automatic Dissemination* 83% of the subjects matched, whereas in *Perfect Privacy* 76% and in *Imperfect Privacy* 69% of the subjects decided to match. This suggests that under the goal of maximizing the number of matches an environment where test results are made public performs best. However, the differences fail to be statistically significant (χ^2-test, p-value >0.1).

Another goal may be to increase the number of tests or preventive doctoral visits. First, early detection of diseases mitigates treatment costs and second infectious diseases may spread if they are not detected early enough. For instance let us consider a matching market in which (un)infected persons look for sexual partners. In such a market, a reasonable goal may be to maximize the number of tests or to minimize the frequency of infections

[13] We cannot reject the hypotheses that disclosure behavior of tested type Gs is identical in *Privacy* and *Imperfect Privacy* (Fisher's exact test, p-value=0.333).

("mismatches").[14] Since the probability of being a bad type and the number of subjects was constant across treatments, the number of matches with Type *B* players crucially depends on the number of implemented matches in general, and on the number of matches with unknown types in particular. Because the shares of actual matches are not significantly different across treatments and the number of matches with unknown types increases with the probability of information dissemination, the probability to be matched for player 1 of type *B* in *Automatic Dissemination* is 57%, in *Perfect Privacy* 25% and in *Imperfect Privacy* 41%.[15] This shows that an environment with perfect data privacy leads to the fewest "mismatches". However, in a setup considering HIV testing social preferences may matter for the testing and the respective disclosure decision. While people with strong social preferences[16] should always test and report their result in the game presented, irrespective of the institutional setup, the results from our (non-framed) laboratory experiment suggest that social preferences play a minor role in our game of persuasion.

Finally, we note that at first glance Result 1 is surprising from a behavioral point of view. Basic intuition would say that a potential loss of personal data (e.g. health data) reduces the willingness to acquire such information (i.e. to test). In the experiment, however, this is not the case. Judging from subjects' matches with unknown types in the Imperfect Privacy treatment (55 percent of potential matches with unknown types are realized) it seems as if subjects overestimate the share of untested players. Consequently, although data protection does not seem to matter much for testing behavior in our experiment, it seems to matter when it comes to matching. A possible explanation lies in the fact that taking the effects of imperfect data privacy into account requires more cognitive effort in the testing than in the matching decision.[17] When participants decide on a match, people have to consider how large the share of good types among unknown types is which implicitly includes thinking about the share of people who have acquired information about their status. However, when deciding on whether or not to acquire information, participants may in a first step perceive the acquisition of information as a lottery concerning whether or not their information will be revealed and

[14] For instance, Engelhardt et al. (2010) argues that on internet platforms for semi-anonymous encounters provision of information about the own HIV status might result in a directed search and reduce the transmission rate by separating the uninfected and infected, e.g. through the use of condoms.
[15] χ^2-test, *Privacy* vs. *Automatic Dissemination-value:* p<0.1, *Privacy* vs. *Imperfect Privacy & Imperfect Privacy* vs. *Automatic Dissemination* p>0.3.
[16] For instance a large beta value in the model by Fehr and Schmidt (1999).
[17] This intuition is similar to the idea of Eliaz and Rubinstein (2011, p. 95) who assume that second mover matchers in matching pennies games have to execute a less complicated mental operation than first-moving guessers.

only in a second step think about the externality of their testing behavior on those who refrain from acquiring information.

5 Conclusion

While in public debate most people agree that data privacy is an important issue, behavioral evidence on the willingness to transfer personal information is mixed. For instance, Beresford et al. (2010) measure people's willingness to provide personal information (e.g. monthly income) in order to receive a price discount in online shops. They find that people are even willing to transfer their data without receiving any discount. On the other hand, experimental results by Huberman et al. (2005) suggest, that the willingness to transfer personal information also depends on how embarrassing or stigmatizing the type of information is perceived. We argue that it is not only important to investigate how different privacy regulations affect the transmission but also the acquisition of personal information. Information acquisition matters in particular in health markets, in which information about personal health has direct and indirect implications for patients and insurers. In this paper, we focus on a simplified game of persuasion, in which acquiring and transferring information about personal health affects the likelihood of a desired action by a third party. In particular, we show that imperfect data privacy may theoretically discourage people from information acquisition in such a strategic interaction. However, the behavioral results from our laboratory experiment suggest that people acquire information irrespective of whether data privacy is perfect or imperfect. Consequently, people do not seem to take into account that testing for diseases and medical check-ups may affect their future prospects for insurance contracts.

6 Appendix A – Proofs of propositions 1 to 5

We provide proofs of propositions 1 to 5 for risk-neutral players. However, note that proposition 1 holds also for risk-averse players. Propositions 2 to 5 hold as long as expected utility of matches with unknown types are sufficiently high or the utility function is not too concave.

Proof of proposition 1

Assume [$p<1$] or [$p=1$ and $M<bI$] and assume player 2 does not match with unknown types and type B:

$$s_2(G) = X \quad (1)$$

$$s_2(B) = \overline{X} \quad (2)$$

$$s_2(U) = \overline{X} \quad (3)$$

where G (B) denotes that player 2 knows player 1 is of type G (B) and U denotes that player 1's type is unknown to player 2.

If $p<1$, after a good test result, player 1 will disclose her type:

$$s_1(G \mid T) = D \quad (4)$$

After a bad test result, player 1 is indifferent whether to disclose her type:

$$s_1(B \mid T) \in \{\overline{D}, D\} \quad (5)$$

because the expected payoffs of good (π_1^G) and bad (π_1^B) types are

$$\pi_1^G(\overline{D} | T) = pM < \pi_1^G(D | T) = M \quad (6)$$

$$\pi_1^B(\overline{D} | T) = 0 = \pi_1^B(D | T) \quad (7)$$

This means, if $p<1$, a player 1 with type G will always disclose her type, whereas a player 1 with type B is indifferent whether to disclose her type. As a result, all undisclosed, but tested players will be of type B. Having determined the optimal disclose strategy, we can now look at the decision whether to test for the type.

$$s_1 = T \quad (8)$$

because

$$\pi_1(T) = (1-b)M > \pi_1(\overline{T}) = 0.$$

(9)

Player 2's best response with respect to the different possible types *G*, *B* and to an unknown player *U*:

$$s_2(G) = X \quad (10)$$

$$s_2(B) = \overline{X} \quad (11)$$

$$s_2(U) = \overline{X} \quad (12)$$

Because

$$\pi_2(X|G) = M > 0,\ \pi_2(X|B) = M - I < 0 \text{ and } \pi_2(X|U) = M - I < 0.$$

Thus, we have shown that

$$s_1 = T, s_1(G|T) = D, s_1(B|T) \in \{\overline{D}, D\}, s_2(G) = X, s_2(B) = \overline{X}, s_2(U) = \overline{X}$$

is an equilibrium for p<1.

If *p=1*, player 1 will test ($s_1 = T$), because $\pi_1(T) = (1-b)M > \pi_1(\overline{T}) = 0$.

Player 2's best response is:

$$s_2(G) = X \quad (13)$$

$$s_2(B) = \overline{X} \quad (14)$$

$$s_2(U) = \overline{X} \textit{ if } M \le bI \quad (15)$$

because $\pi_2(X|G) = M > 0$, $\pi_2(X|B) = M - I < 0$ and $\pi_2(X|U) = M - bI \le 0 \Leftrightarrow M \le bI$.

We have thus shown the existence of the equilibrium for *p=1* and *M<bI*.

Proof of proposition 2

Assume *p>0* and *M>bI*. Further, assume player 2 will match with type G and unknown types:

$$s_2(G) = X \quad (16)$$

$$s_2(B) = \overline{X} \quad (17)$$

$$s_2(U) = X \quad (18)$$

If *p<1*, a tested player 1's best response will be:

$$s_1(G|T) \in \{\overline{D}, D\} \quad (19)$$

$$s_1(B \mid T) = \overline{D} \quad (20)$$

because

$$\pi_1^G(\overline{D}|T) = M = \pi_1^G(D|T) = M \quad (21)$$

$$\pi_1^B(\overline{D}|T) = (1-p)M > \pi_1^B(D|T) = 0 \quad (22)$$

This means, if p<1, a type *B* player 1 will never disclose her type, whereas a type *G* player 1 is indifferent whether to disclose her type. Having determined the optimal disclosure strategy, we can now look at the decision whether to test for the type:

$$s_1 = \overline{T} \ if \ p > 0 \quad (23)$$

$$s_1 = \{\overline{T}, T\} \ \ if \ \ p = 1 \quad (24)$$

because $\pi_1(T) = (1-b)M + b(1-p)M \ \le \pi_1(\overline{T}) = M$. Thus as long as p>0 players 1 will not have themselves tested. (This includes $p = 1$ where player 1 can only decide on whether to get herself tested or not. A tested player 1 will automatically be disclosed.) If $p = 0$ players are indifferent whether to test.

If *p>0*, player 2's best response is

$$s_2(G) = X \quad (25)$$

$$s_2(B) = \overline{X} \quad (26)$$

$$s_2(U) = X \ if \ M > bI \quad (27)$$

because $\pi_2(X \mid G) = M > 0$, $\pi_2(X \mid B) = M - I < 0$ and $\pi_2(X|U) = M - bI > 0 \Leftrightarrow M > bI$.

We have shown the existence of the equilibrium

$$s_1 = \overline{T}, s_1(G \mid T) \in \{\overline{D}, D\}, s_1(B \mid T) = \overline{D}, s_2(G) = X, s_2(B) = \overline{X}, s_2(U) = X$$

for *p>0* and *M>bI.*

Proof of proposition 3

Assume 0<*p<1* and *M≥bI*. Further, assume player 2 will match with player 1 of unknown type with probability $0 \le m \le 1$. This implies the following strategy for player 2:

$$s_2(G) = X \quad (28)$$

$$s_2(B)=\overline{X} \tag{29}$$

$$s_2(U)=m \tag{30}$$

Thus, for $p<1$, the best response of player 1 is

$$s_1(G\,|\,T)=D \tag{31}$$

$$s_1(B\,|\,T)=\overline{D} \tag{32}$$

because

$$\pi_1^G(D|T)=M>\ \pi_1^G(\overline{D}|T)=pM+(1-p)mM \tag{33}$$

$$\pi_1^B(D|T)=0<\ \pi_1^B(\overline{D}|T)=(1-p)mM\,. \tag{34}$$

This means, if $p<1$, a player 1 with type B will never disclose her type, whereas a player 1 with type G will disclose her type. As a result, all undisclosed, but tested players will be of type B. Having determined the optimal disclose strategy, we can now look at the decision whether to test for the type.

$$\pi_1(T)=b(1-p)mM+(1-b)M \tag{35}$$

$$\pi_1(\overline{T})=mM \tag{36}$$

Hence

$$\left.\begin{array}{l}\pi_1(T)>\pi_1(\overline{T})\\ \pi_1(T)=\pi_1(\overline{T})\\ \pi_1(T)<\pi_1(\overline{T})\end{array}\right\}\text{ if }\left\{\begin{array}{l}m<\dfrac{1-b}{1-b(1-p)}\\ m=\dfrac{1-b}{1-b(1-p)}\\ m>\dfrac{1-b}{1-b(1-p)}\end{array}\right.\quad\text{and thus}\quad\begin{array}{l}t=1\ \ if\ \ m<\dfrac{1-b}{1-b(1-p)}\\ t\in[0,1]\ \ if\ \ m=\dfrac{1-b}{1-b(1-p)}\\ t=0\ \ if\ \ m>\dfrac{1-b}{1-b(1-p)}\end{array}\,. \tag{37}$$

To determine player 2's best response, we calculate expected payoffs for player 2.

$$\pi_2(X\,|\,G)=M \tag{38}$$

$$\pi_2(X\,|\,B)=M-I \tag{39}$$

$$\pi_2(X\,|U)=M-\frac{(1-t)+t(1-p)}{1-t+t(1-p)b}bI \tag{40}$$

$$\left.\begin{array}{l}\pi_2(X|U)>\pi_2(\overline{X}|U)\\ \pi_2(X|U)=\pi_2(\overline{X}|U)\\ \pi_2(X|U)<\pi_2(\overline{X}|U)\end{array}\right\}\text{ if }\begin{cases}t<\dfrac{M-bI}{pbM+M-bM-pbI}\\ t=\dfrac{M-bI}{pbM+M-bM-pbI}\\ t>\dfrac{M-bI}{pbM+M-bM-pbI}\end{cases} \tag{41}$$

$$\begin{array}{llll} & m=1 & & t<\dfrac{M-bI}{pbM+M-bM-pbI}\\ \text{and thus} & m\in[0,1] & if & t=\dfrac{M-bI}{pbM+M-bM-pbI}\;.\\ & m=0 & & t>\dfrac{M-bI}{pbM+M-bM-pbI}\end{array} \tag{42}$$

We can show that

$$0\le t=\frac{M-bI}{pbM+M-bM-pbI}\le 1\Leftrightarrow M-bI\ge 0 \tag{43}$$

Because

$$pbM+M-bM-pbI\ \ge M-bI\Leftrightarrow M\le I \tag{44}$$

Thus, we have shown that

$$s_1: t=\frac{M-bI}{pbM+M-bM-pbI}, s_1(G\,|\,T)=D, s_1(B\,|\,T)=\overline{D}, s_2(D\,|\,G)=X, s_2(D\,|\,B)=\overline{X}, s_2(\overline{D}): m=\frac{1-b}{1-b(1-p)}, 0<m<1$$

is an equilibrium for $0<p<1$ and $M\geq bI$.

Proof of proposition 4

Assume $p=1$ and $M=bI$.

The expected payoffs for player 1 when testing ($\pi_1(T)$) and not testing ($\pi_1(\overline{T})$) are:

$$\pi_1(T)=(1-b)M \tag{45}$$

$$\pi_1(\overline{T})=mM \tag{46}$$

$$\left.\begin{array}{l}\pi_1(T)>\pi_1(\overline{T})\\ \pi_1(T)=\pi_1(\overline{T})\\ \pi_1(T)<\pi_1(\overline{T})\end{array}\right\} if \begin{cases}m<1-b\\ m=1-b\\ m>1-b\end{cases}\text{ and thus }\begin{array}{l}t=1\\ t\in[0,1]\\ t=0\end{array}\quad if\quad\begin{array}{l}m<1-b\\ m=1-b\\ m>1-b\end{array} \tag{47}$$

The expected payoffs for player 2 for a match are

$$\pi_2(X \mid G) = M \tag{48}$$

$$\pi_2(X \mid B) = M - I \tag{49}$$

$$\pi_2(X \mid U) = M - bI \tag{50}$$

$$\left.\begin{array}{l} \pi_2(X|U) > \pi_2(\overline{X}|U) = 0 \\ \pi_2(X|U) = \pi_2(\overline{X}|U) = 0 \\ \pi_2(X|U) < \pi_2(\overline{X}|U) = 0 \end{array}\right\} \; if \; \begin{cases} M < bI & \\ M = bI & \text{and thus} \\ M > bI & \end{cases} \begin{array}{lll} m = 0 & & M < bI \\ m \in [0,1] & if & M = bI \\ m = 1 & & M > bI \end{array} \tag{51}$$

Thus,

$$s_1 : t \in [0,1], s_1(G \mid T) = D, s_1(B \mid T) = \overline{D}, s_2(G) = X, s_2(B) = \overline{X}, s_2(U) : m = 1 - b, 0 < m < 1$$

for *p=1* and *M=bI* is an equilibrium.

Proof of proposition 5

Assume *p=0* and *M>bI*. Further, assume player 2 will match with player 1 of unknown type. This implies the following strategy for player 2:

$$s_2(D \mid G) = X \tag{52}$$

$$s_2(D \mid B) = \overline{X} \tag{53}$$

$$s_2(U) = X \tag{54}$$

Player 1's expected payoffs are:

$$\pi_1^G(\overline{D}|T) = M \tag{55}$$

$$\pi_1^G(D|T) = M \tag{56}$$

$$\pi_1^B(\overline{D}|T) = M \tag{57}$$

$$\pi_1^B(D|T) = 0 \tag{58}$$

Thus, player 1's best response will be the following:

$$s_1(G \mid T) = d_G \in [0,1] \tag{59}$$

$$s_1(B|T)=\overline{D} \tag{60}$$

Having determined the optimal disclose strategy, we can now look at the decision whether to test for the type:

$$\pi_1(T)=(1-b)M+bM=M \tag{61}$$

$$\pi_1(\overline{T})=M\,. \tag{62}$$

Player 1 will be indifferent whether to test, i.e. test with probability $t\in[0,1]$, and disclose her type in case she is type *G* with probability $d_G\in[0,1]$.

Player 2's expected payoffs are is:

$$\pi_2(X\,|G)=M \tag{63}$$

$$\pi_2(X\,|B)=M-I \tag{64}$$

$$\pi_2(X|U)=M-\frac{b}{b+(1-t)(1-b)+t(1-d_G)(1-b)}I \tag{65}$$

With $\pi_2(X\,|U)\geq\pi_2(\overline{X}\,|U)=0$ if $t\leq\frac{M-bI}{d_GM(1-b)}$ (66)

Therefore, we have shown that

$$s_1:t\in\left[0,\frac{M-bI}{d_GM(1-b)}\right],s_1(G|T)=D,s_1(B|T)=\overline{D},$$
$$s_2(G)=X,s_2(B)=\overline{X},s_2(U)=X$$

is an equilibrium for *p=0* and *M>bI.*

7 Appendix B - Instructions (Translated from German)

General Instructions

We cordially welcome you to this economic experiment. Your decisions and possibly other participants' decisions in this experiment influence your payoff. It is therefore very important that you read these instructions very carefully. **For the entire length of the experiment, communication with other participants is not allowed.** We therefore request that you do not speak with one another. Should you not understand something, please look again at the experiment instructions. If you still have questions, please raise your hand. We will then come to you and answer your question privately.

During the experiment we will not speak of euros, but of points. Your entire income will at first be calculated in points. The total number of points that you earn in the experiment will then at the end be exchanged into euros with the exchange rate **10 points = 2 euros.** On the following pages we will explain the exact procedure of the experiment.

The Experiment

Summary

In this experiment two participants (participant 1 and participant 2) will be randomly assigned to each other. Each of the two participants receives 10 points. Participant 1 is either a type A or type B. Whether participant 1 is a type A or type B depends on chance. For each participant 1 the probability of being a type A is exactly 2/3 (or 66.66%). The probability of being a type B for participant 1 is exactly 1/3 (or 33.33%). Participant 2 has no special type.

Participant 2 can decide whether he would like to enter into an interaction with participant 1. An interaction changes both participants' number of points.

- An interaction gives an extra 10 points for participant 1.
- How participant 2's points change depends on what type participant 1 is. If participant 1 is a type A, participant 2 receives an extra 10 points. If participant 1 is a type B, participant 2's points are reduced by 5 points.

If no interaction takes place then points do not change.

Procedure in detail

- One participant 1 and one participant 2 will be randomly assigned to each other. At the beginning participant 1 as well as participant 2 receive 10 points. Participant 1 does not know whether he is of type A or of type B. Participant 2 also does not know of what type participant 1 is.
- Participant 1 decides whether he wants to learn his type.

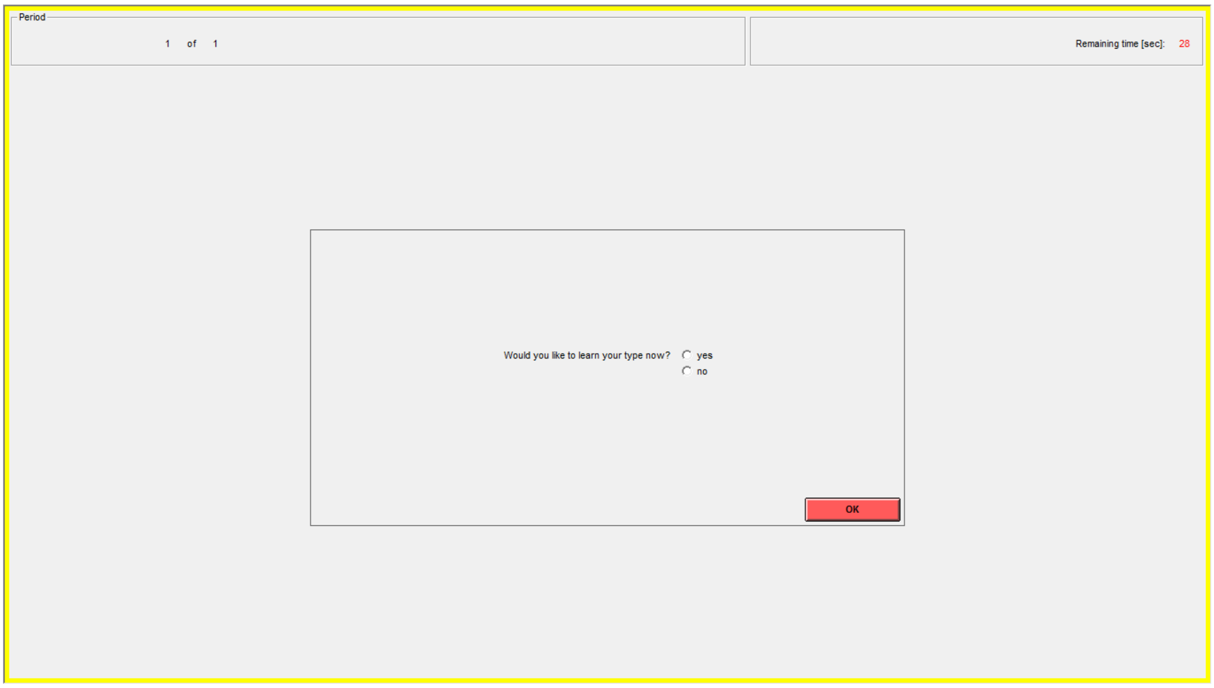
The following section was only included in the *Perfect Privacy* treatment: [If participant 1 has decided to learn his type, he decides whether to tell his type to participant 2. Please take note: If participant 1 decides to reveal his type, participant 2 learns participant 1's actual type. Otherwise participant 2 receives no information before his decision on participant 1's type, and also no information on whether participant 1 knows his type himself.]

- **The following section was only included in the *Imperfect Privacy* treatment:** [If participant 1 decided to learn his type, he decides whether to tell his type to participant 2. If participant 1 decided to learn his type, but did not tell his type to participant 2, a random mechanism determines whether player 2 nevertheless p learns player 1's type. In this case player 2 learns player 1's type with a probability of 50%.]
- **The following section was only included in the *Automatic Dissemination* treatment** [If Participant 1 decides to learn his type, participant 2 will learn participant 1's type too**.** Please take note: If participant 1 knows that his type is type B, participant 2 will know as well that participant 1 is of type B. If participant 1 knows that his type is type A, participant 2 will know as well that participant 1 is of type A. If participant 1 does not know his type, participant 2 will also not know participant 1's type. However, participant 2 knows that participant 1 is of type A with a probability of 2/3 (66.66%) and of type B with probability 1/3 (33.33%**).]**
- Participant 2 decides whether he wants to enter into an interaction with participant 1.
- If participant 2 enters into the interaction, participant 1 receives an extra 10 points. Participant 2's points depend on which type participant 1 is. If participant 1 is of type A, participant 2 receives an extra 10 points. If participant 1 is of type B, participant 2's points are reduced by 5 points. If participant 2 does NOT enter into the interaction, both participants receive no extra points, so each of the participants has the 10 points received at the beginning.

All participants received the same instructions and will be in the role of participant 1 once and in the role of participant 2 once. All participants receive payment for the decisions in each of the two roles. For each role another (new) participant will be randomly assigned to you. After all participants have made a decision in each role you will receive information about your earned points in both roles. At the same time both the type of participant 1 and whether an interaction took place will be shown.

Procedure on-screen

Each participant in the experiment decides once in the role of participant 1 and once in the role of participant 2. First all participants make a decision in the role of participant 1. The screen appears as follows:

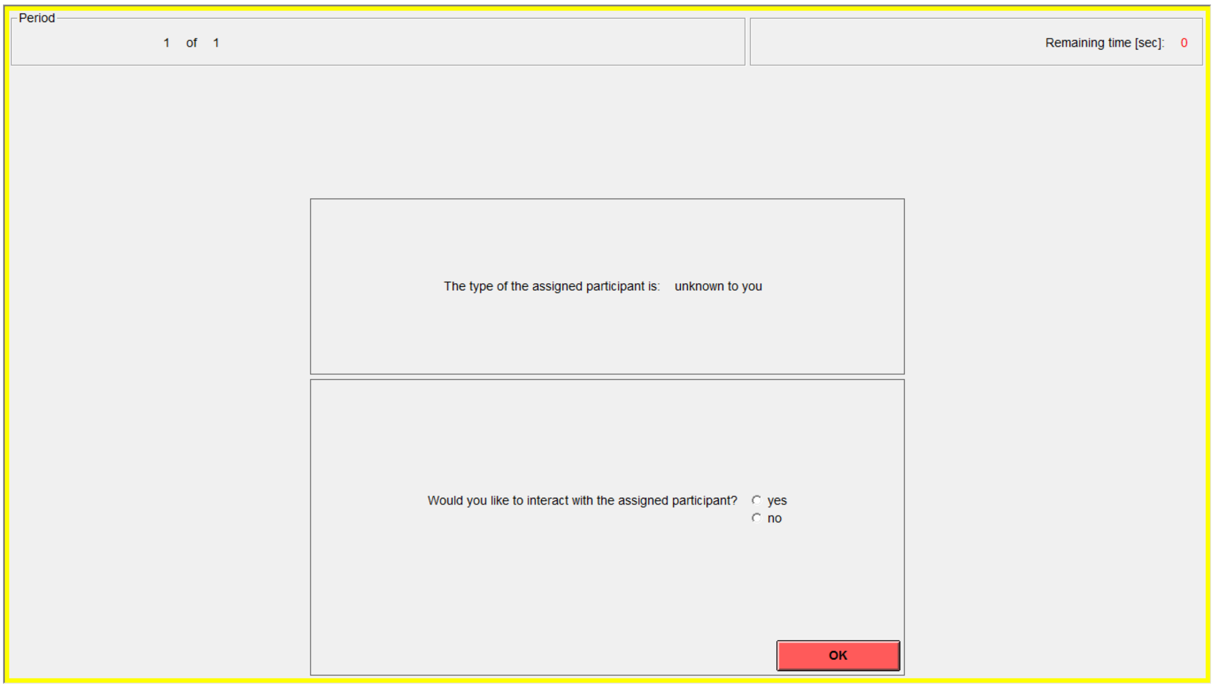


The following section was only included in the privacy and potential loss treatment:
[Let’s assume that participant 1 learned his type. Then he decides whether he wants to tell participant 2 his type. The screen appears as follows (we assume in the example that participant 1 is a type A):]

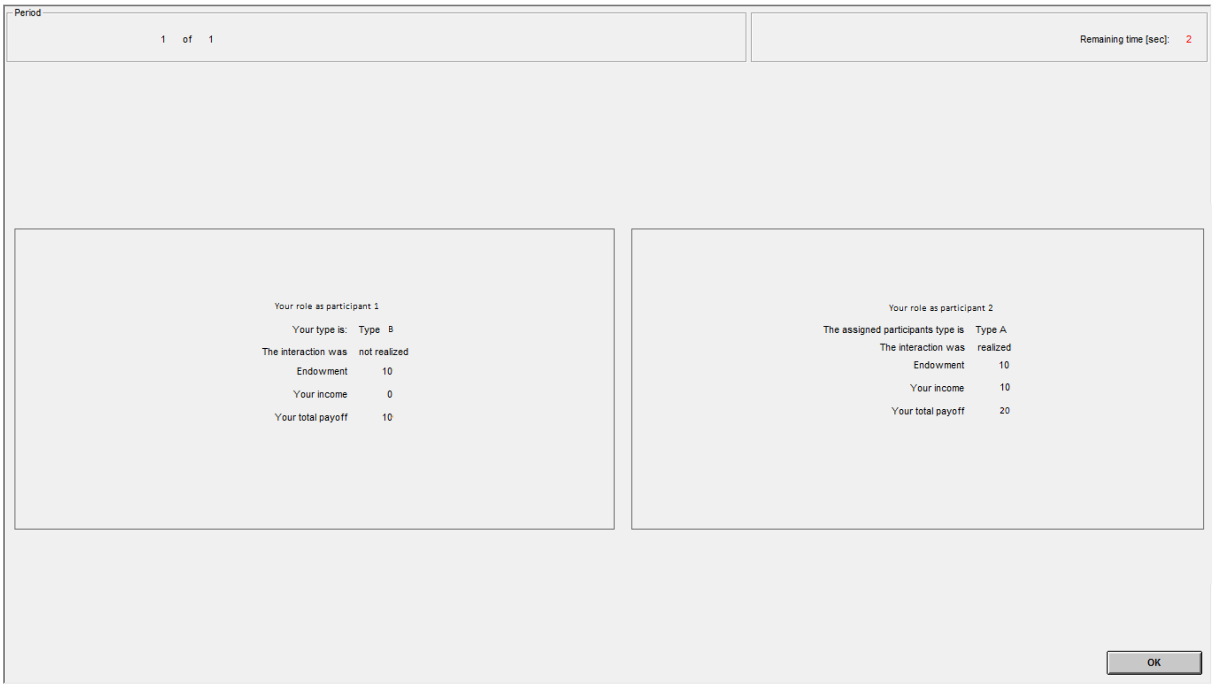
[The following section was only included in the Imperfect Privacy treatment:[If participant 1 knows his type but did not tell participant 2, a random (50% probability) mechanism determines whether participant 2 learns the type. The participant with ID number 1 will roll a die. You will learn the detailed procedure on screen.]

Then all participants make a decision in the role of participant 2.

The screen for this appears as follows. (On the example screen we assume that participant 2 does not know participant 1's type.)



At the end all participants learn their types as participant 1 and participant 1’s type when they were participant 2. In addition, it will be shown whether an interaction took place and how many points each of the two participants received. The screen for this appears as follows.



Comprehension questions:

True or false?

□T □F Participant 1 always learns his type at the beginning of the experiment.

□T □F If participant 1 learned his type, participant 2 learns it as well.

□T □F At the end of the experiment you will always learn which type you were while in the role of participant 1.

□T □F At the end of the experiment you will always learn which type the participant 1 had who was randomly assigned to you.

Further questions:

How many points do you get before each decision?

How high is the probability that participant 1 is type A?

How high is the probability that participant 1 is type B? How high is the probability that a participant 1 who didn't want to learn his type is type A?

How high is the probability that a participant 1 who didn't want to learn his type is type B?

This section was only included in the *Automatic Dissemination* treatment: Please fill in the blanks: If participant 1's type is unknown and participant 2 decided in favor of the interaction, he receives___in___out of____cases and in___out of___cases____points are deducted from him.

If participant 2 decides for the interaction and participant 1 is a type A, participant 2 receives____

If participant 2 decides for the interaction and participant 1 is a type B, ___ points are deducted from participant 2.

If participant 2 decides for the interaction, participant 1 receives an extra ____ points.

If participant 2 decides against the interaction, participant 1 receives an extra___ points and participant 2 an extra ___ points.

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References

Acquisti, A., L. John and G. Loewenstein, 2009. What is privacy worth? Technical report, Heinz College, Carnegie Mellon University.

Bardey, D. and P. De Donder, 2012. Genetic testing with primary prevention and moral hazard, CEPR Discussion Paper, 8977.

Beresford, A. R., D. Kübler and S. Preibusch, 2010. Unwillingness to pay for privacy: A field experiment, IZA Discussion Paper, 5017.

Brocas, I., J. Carrillo and T. Palfrey Information gatekeepers: theory and experimental evidence. Economic Theory forthcoming;

Caplin, A. and K. Eliaz AIDS policy and psychology: A mechanism-design approach. RAND Journal of Economics 2003; 34; 4; 631-646.

Crémer, J. and F. Khalil Gathering information before signing a contract. The American Economic Review 1992; 82; 3; 566-578.

Doherty, N. A. and P. D. Thistle Adverse selection with endogenous information in insurance markets. Journal of Public Economics 1996; 63; 1; 83-102.

Eliaz, K. and A. Rubinstein Edgar Allan Poe's riddle: Framing effects in repeated matching pennies games. Games and Economic Behavior 2011; 71; 1; 88-99.

Engelhardt, B., M. R. Kurt and P. M. Polgreen, 2010. Directed Search as a Mechanism to Prevent HIV Transmission, Working Paper.

Fehr, E. and K. M. Schmidt A Theory of Fairness, Competition, and Cooperation. Quarterly Journal of Economics 1999; 114; 3; 817-868.

Fischbacher, U. z-Tree: Zurich Toolbox for Ready-made Economic Experiments. Experimental Economics 2007; 10; 2; 171-178.

Forsythe, R., R. M. Isaac and T. R. Palfrey Theories and tests of "blind bidding" in sealed-bid auctions. The Rand Journal of Economics 1989; 20; 2; 214-238.

Gentzkow, M. and E. Kamenica, 2012. Disclosure of Endogenous Information, Working Paper.

Greiner, B. 2004. An Online Recruitment System for Economic Experiments. In: K. Kremer and V. Machos (Eds), Forschung und wissenschaftliches Rechnen GWDG Bericht 63, Gesellschaft für Wissenschaftliche Datenverarbeitung, Göttingen, 2004, p. 79-93.

Grossklags, J. and A. Acquisti, 2007. When 25 cents is too much: An experiment on willingness-to-sell and willingness-to-protect personal information. WEIS, Pittsburg, PA, 7-18.

Grossman, S. J. The informational role of warranties and private disclosure about product quality. Journal of Law and economics 1981; 24; 3; 461-483.

Hall, J., D. G. Fiebig, M. T. King, I. Hossain and J. J. Louviere What influences participation in genetic carrier testing?: Results from a discrete choice experiment. Journal of Health Economics 2006; 25; 3; 520-537.

Hermalin, B. E. and M. L. Katz Privacy, property rights and efficiency: The economics of privacy as secrecy. Quantitative Marketing and Economics 2006; 4; 3; 209-239.

Hoel, M. and T. Iversen Genetic testing when there is a mix of compulsory and voluntary health insurance. Journal of Health Economics 2002; 21; 2; 253-270.

Huberman, B. A., E. Adar and L. R. Fine Valuating privacy. Security & Privacy, IEEE 2005; 3; 5; 22-25.

Hurkens, S. and N. Vulkan Free entry does not imply zero profits. Economics Letters 2003; 81; 3; 285-290.

Kessler, A. S. The value of ignorance. The Rand Journal of Economics 1998; 29; 2; 339-354.

Lyter, D. W., R. O. Valdiserri, L. A. Kingsley, W. P. Amoroso and C. R. Rinaldo Jr The HIV antibody test: why gay and bisexual men want or do not want to know their results. Public Health Reports 1987; 102; 5; 468-474.

Milgrom, P. R. Good news and bad news: Representation theorems and applications. The Bell Journal of Economics 1981; 12; 2; 380-391.

Peppet, S. R. and R. Posner Unraveling privacy: The personal prospectus and the threat of a full-disclosure future. Northwestern University Law Review 2011; 105; 3; 1153-1204.

Persico, N. Information acquisition in auctions. Econometrica 2000; 68; 1; 135-148.

Philipson, T. J. and R. A. Posner A theoretical and empirical investigation of the effects of public health subsidies for STD testing. The Quarterly Journal of Economics 1995; 110; 2; 445-474.

Posner, R. A. The economics of privacy. The American Economic Review 1981; 71; 2; 405-409.

Rosar, F. and E. Schulte, 2010. Imperfect private information and the design of information–generating mechanisms, Working Paper.

Stigler, G. J. An introduction to privacy in economics and politics. The Journal of Legal Studies 1980; 9; 4; 623-644.

Tabarrok, A. Genetic testing: an economic and contractarian analysis. Journal of Health Economics 1994; 13; 1; 75-91.

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