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Preferences for Data Privacy: Sharing Personal Information with Close and Distant Peers

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Preferences for Data Privacy:

Sharing Personal Information with Close and Distant Peers

Simeon Schudy* Verena Utikal**

This version: May, 2014

Abstract

We provide evidence that people have preferences for data privacy and show that these preferences partly reflect people's interest in controlling who receives their private information. Participants of an experiment face the decision to share validated personal information with peers. We compare preferences for sharing potentially embarrassing information (body weight and height) and non-embarrassing information (address data) with geographically proximate or distant peers. We find that i) participants are willing to give up substantial monetary amounts in order to keep both types of information private, ii) data types are valued differently, and iii) prices for potentially embarrassing information tend to be higher for geographically proximate than distant peers.

JEL Classification: C91, D80, D82

Keywords: preferences, data privacy, information transmission, experiment.

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1 Introduction

In the light of extensive social network use, data privacy has been subject to an emotional public debate. The NSA affair and data breaches in several business sectors have intensified the ongoing discussion.¹ To judge the economic importance of data privacy, a better understanding of preferences for data privacy is important. Few incentivized studies have focused on eliciting preferences for data privacy. One recent exception is work by Beresford et al. (2012) demonstrating that people may be unwilling to pay for privacy in purchase decisions, although people claim to have preferences for data privacy.² This so-called “privacy paradox” (see also Spiekermann et al., 2001) constitutes an important inconsistency of stated privacy preferences and behavior, that is particularly relevant considering self-control problems and other behavioral biases.³ However, the “privacy paradox” may reflect a partial neglect of an important aspect in the discussion about preferences: People may not only care about privacy in general, i.e. care about “the right to be left alone” (Schoeman, 1984; Turner and Dasgupta, 2003; Warren and Brandeis, 1890), but instead have a more differentiated idea of privacy in mind. They may care about when, how, and to what extent information about them is communicated (Turner and Dasgupta, 2003). Hence people may state they care about data privacy in general but nevertheless care differently about sharing different data *types* with different *recipients*. This article focuses on these two aspects and investigates people’s willingness to share personal information explicitly. It provides evidence that people are willing to give up substantial monetary amounts in order to

¹ For a scientific discussion on data privacy in social networks see e.g. Warren (2008). For news about the NSA affair, see e.g. <http://www.economist.com/news/briefing/21579473-americas-national-security-agency-collects-more-information-most-people-thought-will> (downloaded: September 2013). Recent data breaches are documented e.g. at http://news.bbc.co.uk/2/hi/uk_news/7158019.stm (downloaded: September 2013), or <http://www.theguardian.com/business/2013/dec/19/target-breach-credit-card-accounts> (downloaded: December 2013).

² Another insightful exception is provided by Acquisti et al. (2013), documenting an endowment effect in data privacy valuation.

³ See e.g. Acquisti (2004) as well as Acquisti and Grossklags (2007).

avoid sharing personal information with others and indicates that privacy preferences depend on what information is shared with whom.

2 Experimental design and procedure

We elicit people's willingness to accept (WTA) sharing their personal information in an experimental 2x2 between-subjects design (see Table 1). As noted already by Varian (1997), as soon as personal information has been shared with others, individuals have little control over the secondary use of their personal information. We mirror this fact by focusing on sharing personal information with 50 unidentified recipients. To study whether people care about *who* receives personal information, we vary the likelihood of knowing or meeting the recipients.⁴ Recipients are either geographically proximate peers, i.e. peers from the same city, or geographically distant peers, i.e. from a different city.⁵ Further, we investigate whether individuals value different *types* of personal information differently. Participants either decide about sharing potentially embarrassing personal information (body weight and height) or non-embarrassing personal information (full address). In both treatments sharing information includes the participant's full name and all information is verified.

- Place Table 1 here -

The experiment was structured in three parts, such that the elicitation and verification of personal information was distinct from the decision to non-anonymously share personal information. Participants knew upfront that i) in Part 1, information about them would be collected in order to

⁴ Recipients were students who signed up for participation in economic experiments at two German universities (Nuremberg and Konstanz). Recipients did not participate in the experiment. Mails were sent to recipients within six months. Travel distance between the two locations is about 4 hours by car. Thus the likelihood of knowing or meeting geographically distant peers is low.

⁵ We speak of peers, because, participants and recipients were students of the same age who signed up for participation in economic experiments.

be analyzed anonymously by the research team, ii) in Part 2 they would be offered the option to decide if and for which monetary amount they would share the collected data in a non-anonymous way and iii) they could earn additional money by filling in a questionnaire in Part 3. Participants were allowed to abort the experiment at any time (without receiving payment) or to take part without participating in the data collection stage (consequently making only unpaid, hypothetical decisions in Part 2). No participant decided to leave before the end of the experiment. Out of 132 participants, three participants refused data collection in Part 1.⁶

In Part 1, a research assistant collected the personal information in the experimenter room individually. In the address treatments the assistant asked for the ID card of the participant and noted the participant's street, postal code and city as well as the participant's seat number (but not the participant's name) on a form.⁷ In the weight and height treatment the research assistant measured body weight and height and noted the measures as well as the seat number of the participant (but not the participant's name) on the form. Thus, collected data was not connected to the participants name in Part 1.

In Part 2, we used the Becker-DeGroot-Marschak mechanism (Becker et al., 1964) to elicit participants' WTA sharing the collected data in a non-anonymous way. Participants indicated on a decision sheet for 26 different amounts (0.50€ to 13€ in steps of 0.50€) whether or not they were willing to share the collected data in combination with their full name with 50 unidentified students via email. Participants were informed that at the end of the experiment, they themselves would have to draw (randomly) one out of 26 cards from a bag, each showing one amount from

⁶ One participant refused data collection of body measures in the proximate peers treatment; two in the address treatment with distant peers. The procedure was identical to the procedure for all other subjects (except for decisions in Part 2, which were hypothetical). Data collection took place individually, in a separate room, and all participants were instructed to state their wish to abstain from the data collection when they were in this room. Thus, their decision was unnoticed by other participants.

⁷ The appendix includes a translated version of instructions and forms used in the experiment.

the decision table.⁸ After a participant completed the decision sheet, the experimenter collected the sheet and started the questionnaire on the computer (Part 3).⁹ Individual draws took place after completion of the questionnaire. The experimenter compared the randomly selected amount with the participant's decision table. If the participant had decided to accept data sharing for the drawn amount, the experimenter verified the participant's name using her ID card and paid the amount. In turn, the participant signed a consent form for the non-anonymous data transmission. Irrespective of the decision in Part 2, participants received 3€ for answering the questionnaire.

We conducted 10 sessions at the Laboratory for Experimental Research in Nuremberg (LERN), Germany, in June and July 2013 and recruited 132 participants (using ORSEE, Greiner, 2004) from the LERN subject pool which consists of undergraduate and graduate economics students. Session lasted 45 minutes. Average earnings were 8.35€. Subjects participated only once. The questionnaire and parts of instructions were presented using z-Tree (Fischbacher, 2007). Decisions were elicited paper-based.

3 Results

Out of the 129 participants who allowed us to elicit their data, 23 (18 %) were willing to share the collected information for all positive amounts offered. Nineteen participants (15 %) were even not willing to share information for the maximum amount (13€). The other 87 participants accepted sharing data above some threshold amount. The median minimum WTA was 5€. Figure 1 shows the cumulative distribution functions (cdfs) of the (minimum) WTA data sharing across treatments. Address data is clearly considered more valuable than information on body measures, irrespective of the recipients. The median of participants' request for address data is 7.50€

⁸ Participants were allowed to examine the bag before the draw.

⁹ The main part of the questionnaire included questions on motivations about whether or not to share the personal information in the experiment and questions on attitudes towards data privacy.

whereas it is 4€ for body measures (Wilcoxon rank-sum test, p-value = 0.001). The cdfs for address and body measures differ significantly (Kolmogorov Smirnov test, for same city p=0.070, for different city p=0.007, combined p=0.000).

- Place Figure 1 here -

Result 1: *Participants request a higher (minimum) amount of money to accept sharing address data compared to body measures.*

Figure 2 indicates that participants tend to request more money for sharing potentially embarrassing information (body measures) with recipients from the same city compared to recipients from a different city. However, for both data types, cdfs do not significantly differ (Kolmogorov Smirnov test, for weight and height data, p=0.382; for address data, p=0.548).

- Place Figure 2 here -

As women show a higher dissatisfaction with body shape regardless of ethnicity (Manson et al., 1995), we present the treatment effects for males and females separately in Figure 3. Indeed, females request higher amounts if weight and height data is transferred to recipients from their own city compared to recipients from a different city. The median WTA of women for data transmission to recipients of the same city is 8€ and only 3€ for the transmission to recipients of a different city (Wilcoxon rank-sum test, p=0.002) and cdfs differ significantly (Kolmogorov-Smirnov test, p=0.012) for females.¹⁰

- Place Figure 3 here -

¹⁰ For males the median minimum WTA is 3€ irrespective of recipients (Kolmogorov-Smirnov test, p=0.483).

Result 2: *Females request a higher (minimum) amount of money to share their body measures with recipients of the same city compared to recipients of a different city.*

What is it that makes people care more about their address data than their body measures? Is it that recipients matter for females, because females are afraid that people they know might receive potentially embarrassing information about them? And, do we observe a “privacy paradox”? In our questionnaire participants indicated by how much they agree with the statement “People I do not know may use the collected data to the disadvantage of myself” on a Likert Scale from 1 to 7. Participants agreed with this statement more strongly for address data than body measures (Fisher exact test, $p=0.001$). Thus, potential misuse of address data matters more than potential embarrassment from sharing body measures. Further, females in the body measure treatment agree more strongly with the statement “I do not want that people I know may learn anything about the collected data” (Fisher exact test, $p=0.02$) than men. Concerning the data privacy paradox, we find that more than half of subjects strongly agreed with the statement “Data privacy is important to me” (indicating a 6 or 7). Agreement correlates positively with actual behavior (Spearman correlation between stated importance and minimum WTA $\rho=0.375$, $p=0.000$) but the relation depends on data type and recipients. For data shared with close peers, the correlation amounts to $\rho=0.492$ ($p=0.006$) for address data and to $\rho=0.327$ ($p=0.060$) for body measures. For sharing data with distant peers, we find $\rho=0.295$, $p=0.153$ in the address treatment and $\rho=0.294$, $p=0.065$ in the body measures treatment.

4 Conclusion

Our findings show that people are willing to give up substantial monetary amounts in order to protect their privacy. This seems to contradict earlier findings by Beresford et al. (2012), whose results do not indicate a strong willingness to pay for privacy. However, our setup differs

substantially. Beresford et al. (2012) focus on purchasing decisions at two online DVD shops, of which both requested the full name and address data for the order but one shop asked for additional personal information on the order form.¹¹ In contrast, we elicit people's willingness to non-anonymously share their address data or body measures with unidentified recipients. Our elicitation method is explicit, elicited data is verified and transferred to a number of unidentified recipients rather than one (potentially trusted) shop. Hence, differences between the results may reflect differences in i) the economic value of information disclosed, ii) trust with respect to the recipients, iii) the number of recipients, iv) the limited attention people pay to privacy when signing contracts, or v) the verification of data. Future research may show which of these explanations are most relevant.

¹¹ Their treatments contrast self-stated information on income and date of birth vs. favorite color and year of birth.

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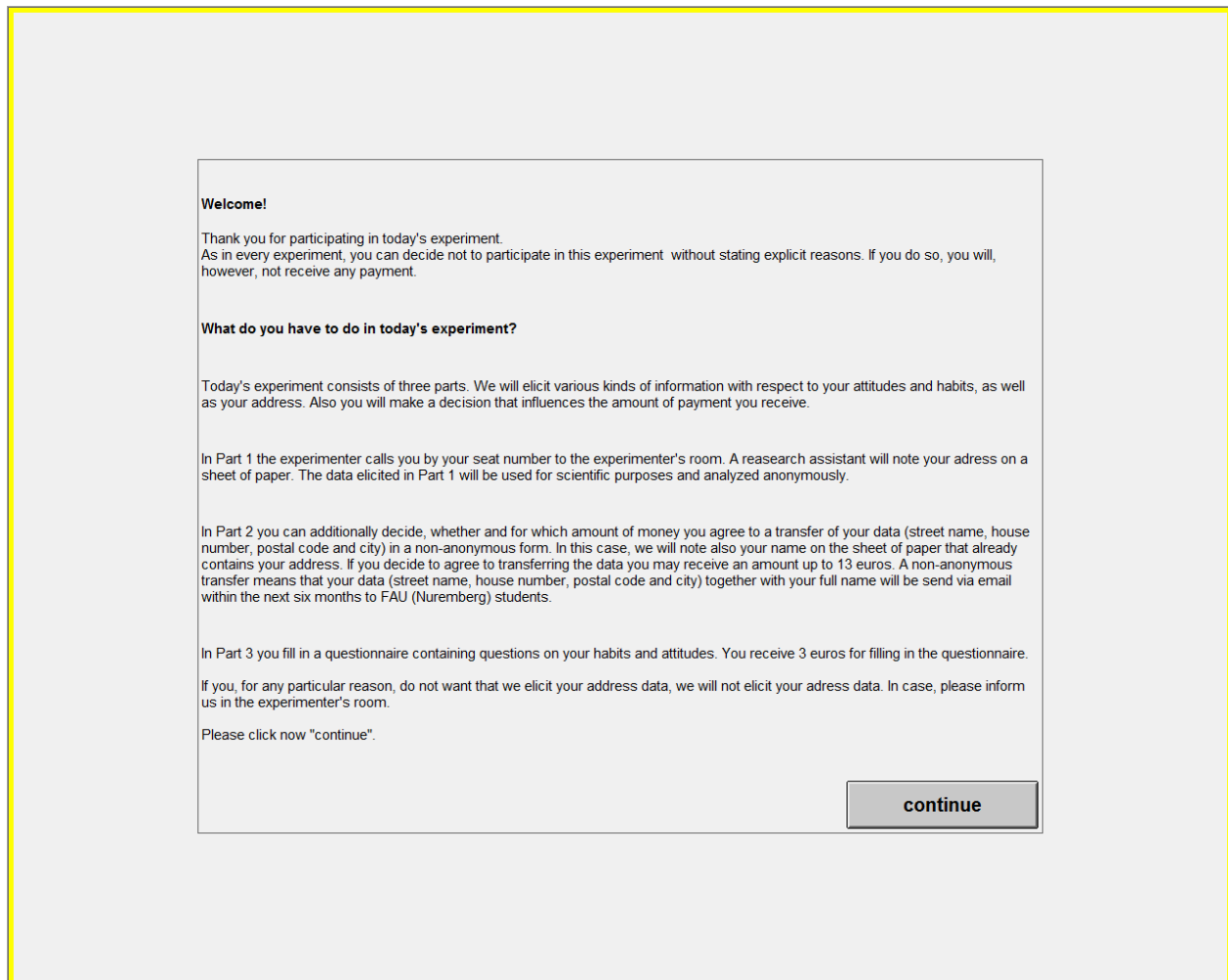
We thank Urs Fischbacher, Martin Kocher, Florian Lindner, Irenaeus Wolff as well as Seminar participants at the Thurgau Institute of Economics for helpful thoughts and comments. We thank Anne Warziniak for excellent research assistance. Financial support from the Thurgau Institute of Economics is gratefully acknowledged. This research was approved by the University of Nuremberg's ethics committee.

Appendix

The appendix contains all material from the address treatment with close peers (translated from German).

A1. On screen instructions (translated from German)

Screen 1



Welcome!

Thank you for participating in today's experiment.
As in every experiment, you can decide not to participate in this experiment without stating explicit reasons. If you do so, you will, however, not receive any payment.

What do you have to do in today's experiment?

Today's experiment consists of three parts. We will elicit various kinds of information with respect to your attitudes and habits, as well as your address. Also you will make a decision that influences the amount of payment you receive.

In Part 1 the experimenter calls you by your seat number to the experimenter's room. A research assistant will note your address on a sheet of paper. The data elicited in Part 1 will be used for scientific purposes and analyzed anonymously.

In Part 2 you can additionally decide, whether and for which amount of money you agree to a transfer of your data (street name, house number, postal code and city) in a non-anonymous form. In this case, we will note also your name on the sheet of paper that already contains your address. If you decide to agree to transferring the data you may receive an amount up to 13 euros. A non-anonymous transfer means that your data (street name, house number, postal code and city) together with your full name will be sent via email within the next six months to FAU (Nuremberg) students.

In Part 3 you fill in a questionnaire containing questions on your habits and attitudes. You receive 3 euros for filling in the questionnaire.

If you, for any particular reason, do not want that we elicit your address data, we will not elicit your address data. In case, please inform us in the experimenter's room.

Please click now "continue".

continue

Screen 2

Instructions (continued)

You will be called to the experimenter's room shortly. Your address will be noted there. To shorten the process of elicitation, we kindly ask you to have your ID card ready.

If you, for any particular reason, do not want that we elicit your address data we will not elicit your address data. In case, please inform us in the experimenter's room. By doing so, other participants of the experiment will not notice your decision. If you decide against the elicitation of your address data, you will decide hypothetically in Part 2 and consequently earn not up to 13 euros in Part 2. In Part 3 every participant receives 3 euros for filling in the questionnaire.

After the elicitation of your address, you will receive further instructions.

Please click now "continue".

continue

Screen 3

Please have your ID card ready.

You will soon be called to the experimenter's room.

As long as you wait, you may occupy yourself, e.g. read a book or journal.

If you return from the experimenters room, read the instructions you received in the experimenter's room. After you answered all comprehension questions raise your hand. The experimenter will come to your seat immediately.

You have already returned from the experimenters room and answered all comprehension questions? Please raise your hand. The experimenter will come to your seat immediately.

CODE

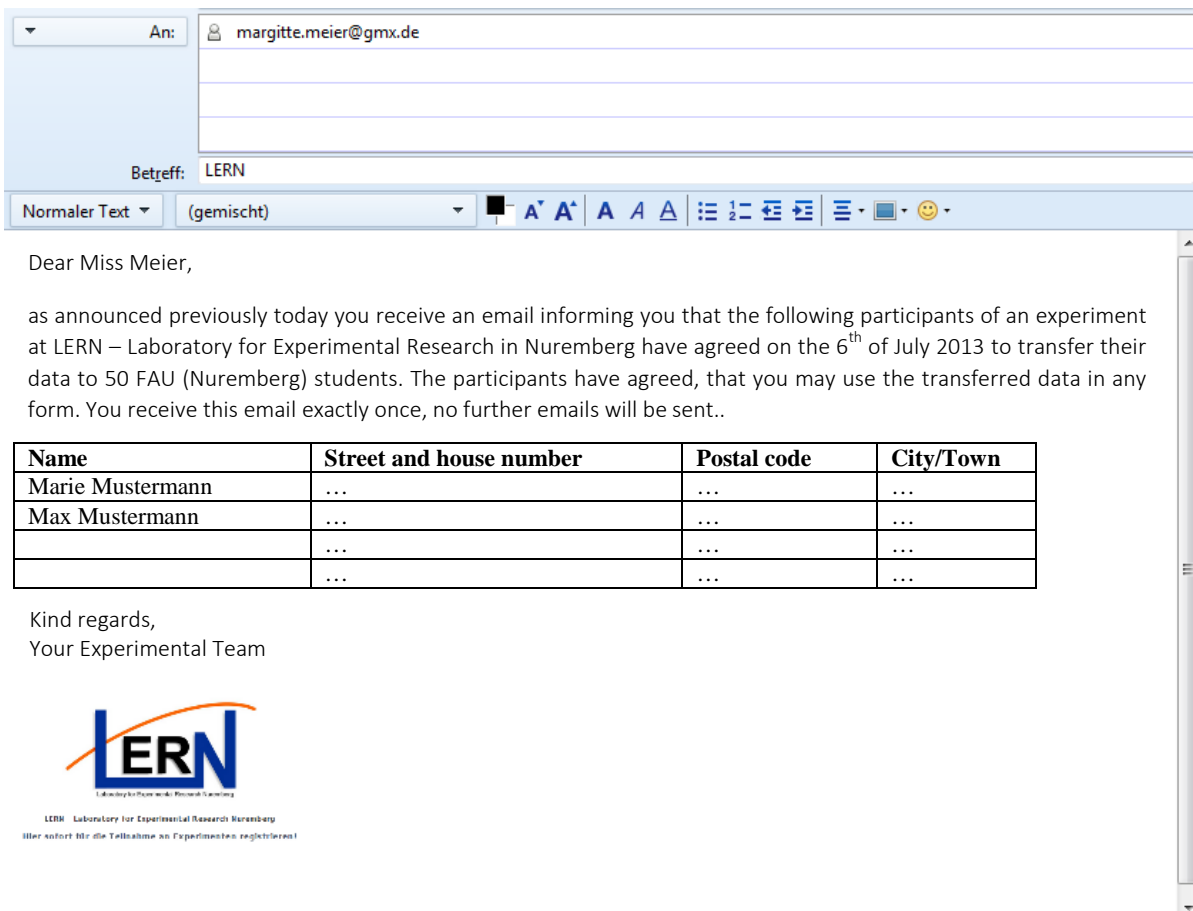
continue

A2. Written instructions (translated from German). These instructions were handed to the participants after the elicitation of their address data or body measures.

Instructions

In the following you will decide if you agree to transferring the data that has just been elicited including your first and family name. You decide yourself, for which monetary amount you are willing to agree to transmit the data.

If you agree to the transfer, the data will be sent within the next six months via email to 50 FAU (Nuremberg) students (the picture below illustrates such an email as an example). The recipients will be informed that they can use the transferred data in any form. If you do not agree to a transfer, the elicited data (as well as all other data we elicit in this experiment) will only be used for scientific purposes and analyzed anonymously as part of this scientific study.



Procedures

You decide by filling in a decision table. You receive this table from us once you finish reading the instructions and the comprehension questions answered correctly. In the table, there are 24 amounts of money (between 0.50 euros and 13.00 Euro), each accompanied by a "yes"- and "no"-column. For every amount in the table, you decide whether you accept ("yes") or refuse ("no") transfer of the data, given you receive this amount. Thus, please tick for each amount "yes" or "no".

If you have filled in the table, raise your hand. The experimenter will come to your seat and collect your decision table. Afterwards, you answer an on screen questionnaire. If you are finished with answering the questionnaire, come to the seat number shown to you on screen. At this seat number, a raffle takes place in which you draw one out of the 24 amounts randomly.

If you ticked “yes“ in your decision table for the drawn amount (i.e. you agreed to transfer the data for this amount) we will verify your first and last name using your ID card and write your first and last name next to the elicited data on the form. Then, you receive the drawn amount (in addition to the 3 euros you receive for filling in the questionnaire) and the data will be transferred including your first and last name via email.

If you ticked “no” for the drawn amount, you did not agree to transfer the data for the respective amount. In this case, you will not receive the amount and your data will not be transferred.

In both cases, you will receive the 3 euros for filling in the questionnaire.

In the following we present you different examples in order to clarify the procedure.

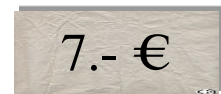
Example 1

Let us assume you agree to transfer the data for an amount larger or equal to 3 euros. In this case, you tick “no” for rows one to five (0.50€ to 2.50€) and you tick “yes” in the left column from row 6 (i.e. from 3.00€) onwards. The table on the left illustrates this example.

At the end of the experiment, you draw one of 26 lots. Each of the 26 lots is labeled with one of the 26 amounts. This way, every amount of money has the same likelihood to be drawn. After you have drawn one lot, we compare the number written on the lot with your decisions in your table.

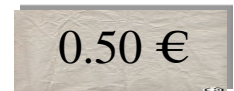
Yes	Amount of money	No
	0,50 €	X
	1,00 €	X
	1,50 €	X
	2,00 €	X
	2,50 €	X
X	3,00 €	
X	3,50 €	
X	4,00 €	
X	4,50 €	
X	5,00 €	
X	5,50 €	
X	6,00 €	
X	6,50 €	
X	7,00 €	
X	7,50 €	
X	8,00 €	
X	8,50 €	
X	9,00 €	
X	9,50 €	
X	10,00 €	
X	10,50 €	
X	11,00 €	
X	11,50 €	
X	12,00 €	
X	12,50 €	
X	13,00 €	

Case 1: On the drawn lot it is written 7.- €



In this case, (see illustration on the left), “yes” has been ticked for 7.-€ This means the participant in the example receives 7.-€ and the data will be transferred including her first and last name.

Case 2: On the drawn lot it is written 0.50€



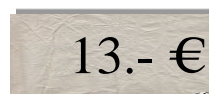
In this case, (see illustration on the left), “no” has been ticked for 0.50€ This means the participant does not receive the amount and the data will not be transferred.

Example 2

Let us assume, the participant does not agree with a data transfer for any offered amount. In this case, the participant ticks “no” for every amount of money. The table below illustrates this example.

Yes	Amount of money	No
	0,50 €	X
	1,00 €	X
	1,50 €	X
	2,00 €	X
	2,50 €	X
	3,00 €	X
	3,50 €	X
	4,00 €	X
	4,50 €	X
	5,00 €	X
	5,50 €	X
	6,00 €	X
	6,50 €	X
	7,00 €	X
	7,50 €	X
	8,00 €	X
	8,50 €	X
	9,00 €	X
	9,50 €	X
	10,00 €	X
	10,50 €	X
	11,00 €	X
	11,50 €	X
	12,00 €	X
	12,50 €	X
	13,00 €	X

Assume that the drawn lot shows 13€



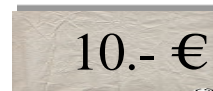
In this example the participant ticked “no” for the amount of 13.- €(see figure above). Thus, the participant does not receive an additional amount of money and the data will not be transmitted. Note, in this example, this would be the case for any amount drawn.

Example 3

Let us assume, the participant does agree with a data transfer for any offered amount. In this case, the participant ticks “yes” for every amount of money. The table below illustrates this example.

Yes	Amount of money	No
X	0,50 €	
X	1,00 €	
X	1,50 €	
X	2,00 €	
X	2,50 €	
X	3,00 €	
X	3,50 €	
X	4,00 €	
X	4,50 €	
X	5,00 €	
X	5,50 €	
X	6,00 €	
X	6,50 €	
X	7,00 €	
X	7,50 €	
X	8,00 €	
X	8,50 €	
X	9,00 €	
X	9,50 €	
X	10,00 €	
X	10,50 €	
X	11,00 €	
X	11,50 €	
X	12,00 €	
X	12,50 €	
X	13,00 €	

Assume that the drawn lot shows 10€



In this example, “yes” has been ticked for 10.- € (see illustration above). This means the participant in the example receives 10.- € and the data will be transferred including her first and last name.

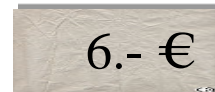
Comprehension questions

Yes	Amount of money	No
	0,50 €	X
	1,00 €	X
	1,50 €	X
	2,00 €	X
	2,50 €	X
	3,00 €	X
	3,50 €	X
	4,00 €	X
	4,50 €	X
	5,00 €	X
	5,50 €	X
	6,00 €	X
	6,50 €	X
X	7,00 €	
X	7,50 €	
X	8,00 €	
X	8,50 €	
X	9,00 €	
X	9,50 €	
X	10,00 €	
X	10,50 €	
X	11,00 €	
X	11,50 €	
X	12,00 €	
X	12,50 €	
X	13,00 €	

Let us assume a participant has filled in the table on the left as follows:

Please indicate for question A and B, which amount of money the participant receives in addition to the three euros that are paid for filling in the questionnaire.

Question A



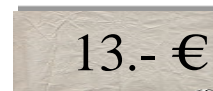
The drawn lot shows:

Which amount of money does the participant receive in addition to the 3€?

Will the data be transferred in this case?

- Yes No

Question B



The drawn lot shows:

Which amount of money does the participant receive in addition to the 3€?

Will the data be transferred in this case?

- Yes No

If you have answered all comprehension questions, raise your hand. The experimenter will come to your seat and check your answers and, in case of problems, explain the procedure in more detail. Then, the decision table will be given to you.

A3. Decision Table (from address data treatment with close peers)

Decision Table

Please fill in the following table. You may take as much time as you need. Decide for each amount, this means tick a box (“Yes” or “No”) for each amount. If you tick “Yes”, you indicate that you are ready to agree that your address data (street name, house number and postal code) will be sent to 50 FAU (Nuremberg) students via email if you receive the respective amount. If you tick “No”, you indicate that you do not agree that your data is sent when being offered the respective amount. After you filled in the table please raise your hand. The experimenter will collect the form and start the questionnaire on your computer. If we did not elicit your data, please fill in the table hypothetically.

Yes	Amount	No
<input type="checkbox"/>	0,50 €	<input type="checkbox"/>
<input type="checkbox"/>	1,00 €	<input type="checkbox"/>
<input type="checkbox"/>	1,50 €	<input type="checkbox"/>
<input type="checkbox"/>	2,00 €	<input type="checkbox"/>
<input type="checkbox"/>	2,50 €	<input type="checkbox"/>
<input type="checkbox"/>	3,00 €	<input type="checkbox"/>
<input type="checkbox"/>	3,50 €	<input type="checkbox"/>
<input type="checkbox"/>	4,00 €	<input type="checkbox"/>
<input type="checkbox"/>	4,50 €	<input type="checkbox"/>
<input type="checkbox"/>	5,00 €	<input type="checkbox"/>
<input type="checkbox"/>	5,50 €	<input type="checkbox"/>
<input type="checkbox"/>	6,00 €	<input type="checkbox"/>
<input type="checkbox"/>	6,50 €	<input type="checkbox"/>
<input type="checkbox"/>	7,00 €	<input type="checkbox"/>
<input type="checkbox"/>	7,50 €	<input type="checkbox"/>
<input type="checkbox"/>	8,00 €	<input type="checkbox"/>
<input type="checkbox"/>	8,50 €	<input type="checkbox"/>
<input type="checkbox"/>	9,00 €	<input type="checkbox"/>
<input type="checkbox"/>	9,50 €	<input type="checkbox"/>
<input type="checkbox"/>	10,00 €	<input type="checkbox"/>
<input type="checkbox"/>	10,50 €	<input type="checkbox"/>
<input type="checkbox"/>	11,00 €	<input type="checkbox"/>
<input type="checkbox"/>	11,50 €	<input type="checkbox"/>
<input type="checkbox"/>	12,00 €	<input type="checkbox"/>
<input type="checkbox"/>	12,50 €	<input type="checkbox"/>
<input type="checkbox"/>	13,00 €	<input type="checkbox"/>

You made a decision for each amount of money?

Please raise your hand. We will come to you cubicle such that you can continue the experiment.

Seat number: _____

A.4 Consent form (translated from German)

Your Data

Seat number:	_____
Street, house number:	_____
Postal code, City:	_____

The lower part of this form will be filled in at the end of the experiment

Consent for data transfer

I give my consent that LERN links my data (street, house number, postal code and City) to my full name and sends them to 50 students at the University of Nuremberg. I confirm that I received _____Euro for my consent. I know that the recipients of my data may use this data as they wish.

Name of participant: _____

Signature: _____

Tables

Table 1: Treatments and number of participants (68 females, 64 males).

Recipients \ Data Type	Potentially embarrassing data	Non-embarrassing data
Proximate Peers	Share body measures with 50 students from the same city (f=18, m=17)	Share address data with 50 students from the same city (f=16, m=14)
Distant Peers	Share body measures with 50 students from a different city (f=21 m=19)	Share address data with 50 students from a different city (f=14, m=13)

Figures

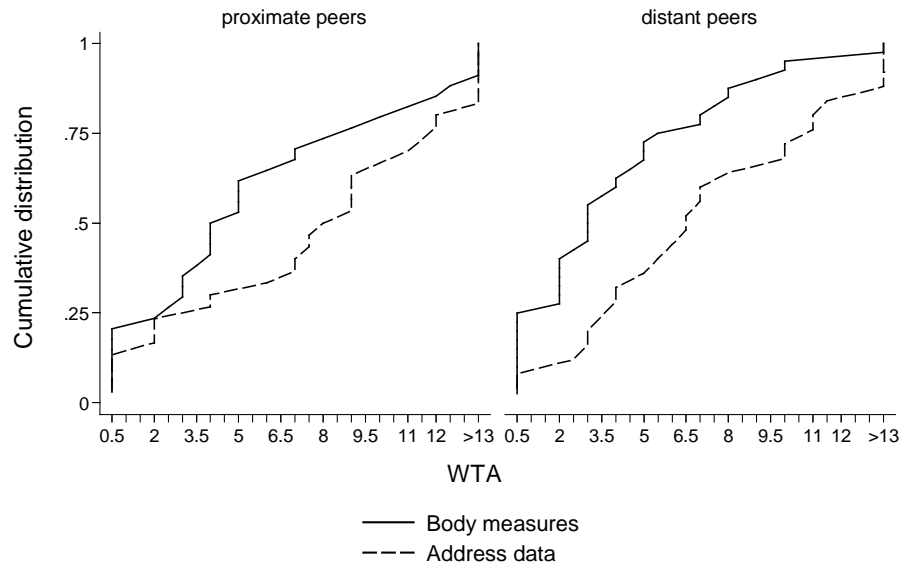


Figure 1: Minimum willingness to accept (WTA) data sharing, by recipients (n=129, excluding hypothetical decisions).

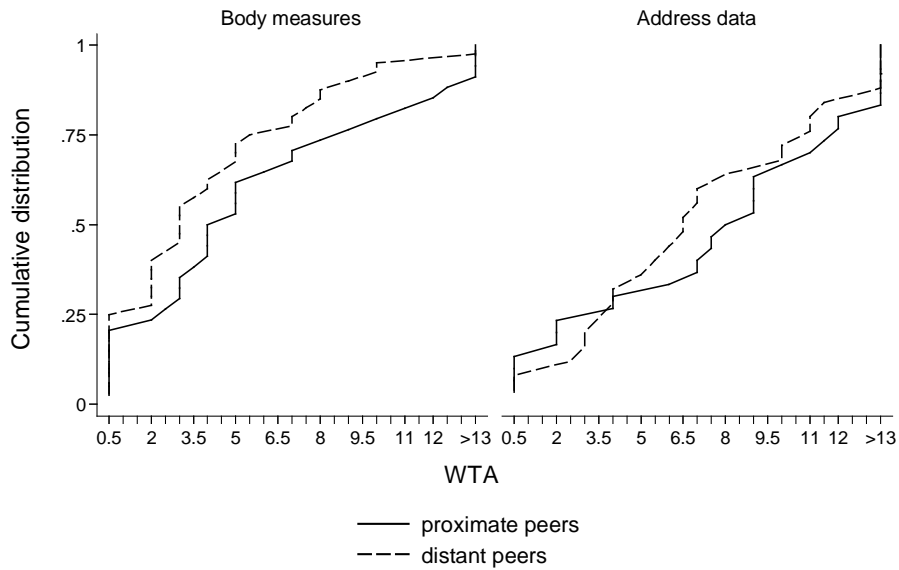


Figure 2: Minimum willingness to accept (WTA) data sharing, by data type (n=129, excluding hypothetical decisions).

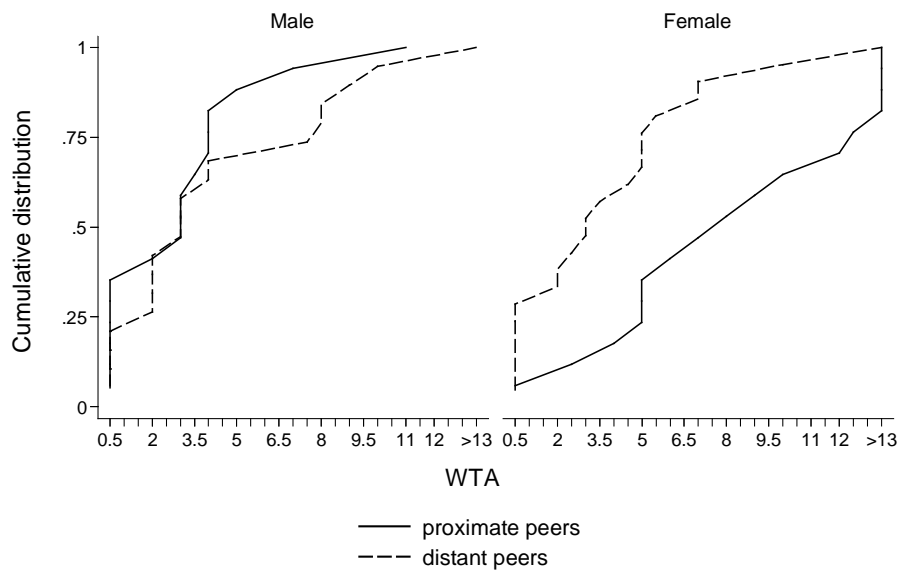


Figure 3: Minimum willingness to accept (WTA) sharing of body measures, by gender (n=75, excluding hypothetical decisions).