The Value of Personal Data: Revealed Privacy Decision-Making in Controlled Laboratory Environments

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DATA POLICIES

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MOTIVATION

Consumers face privacy decisions on an almost daily basis

Google · Instagram · amazon · facebook

Methodological challenges of research on privacy decisions

Surveys ("Experimental scenarios")

Field studies

Privacy *Body of Knowledge*

Laboratory experiments

Challenges:
- Hypothetical scenarios
- Stated preferences & intentions
- Confounding effects

- Induced value theory
- Revealed preferences
- Isolation of behavioral effects
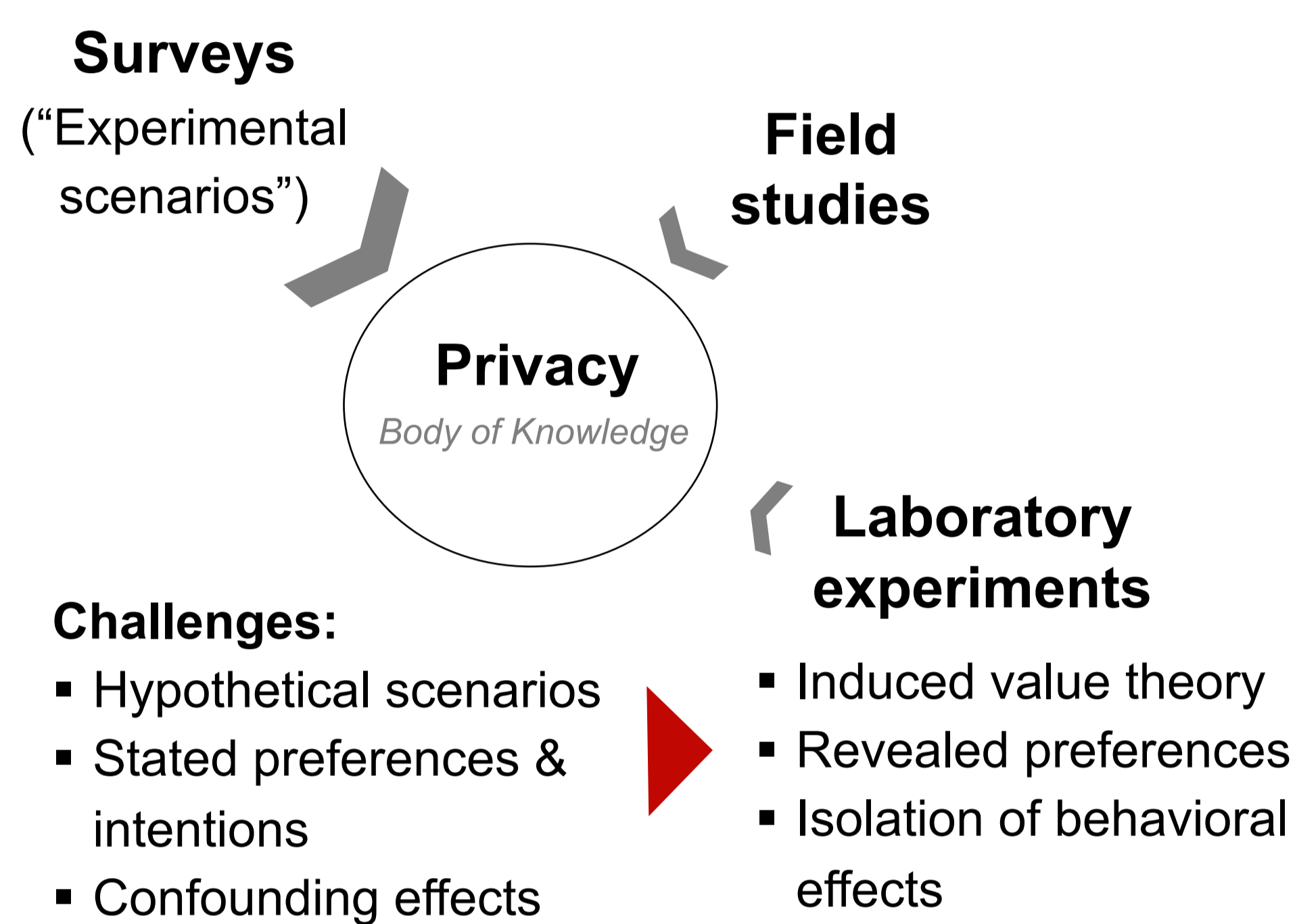
How to induce value for data in the lab?
Which data to use in the lab?

Consumers' monetary valuation is also a new business issue

DATACOUP — *"Unlock the Value of Your Personal Data"*

people.io — *"Ready to connect with the value of your data?"*

Facebook — *Facebook pays teens to install VPN that spies on them*
TechCrunch (2019)

amazon — *Amazon offers $10 to Prime Day shoppers who hand over their data*
Reuters (2019)

Goal of this paper

To systematically investigate **the impact of different design parameters and personal characteristics** on individuals' data valuation:

1. Comparing the valuation of different **data types** (S1)
2. Determining the impact of **information uncertainty** (S2)
3. Benchmarking different value **elicitation methods** (S3)

	S1	S2	S3
Opinion on controversial topics	●		
Performance in logic test	●	●	●
Sensitive, personal statements	●		
Usage of online service	●		
Ex-post valuation (*base*)		●	●
Ex-ante valuation (*high uncertainty*)		●	
Feedback (*low uncertainty*)		●	
BDM mechanism	●	●	●
Reverse Vickrey auction			●
Hypothetical			●

Figure 1: Overview of studies

METHODOLOGY

General experimental procedure

1. Privacy consent and comprehension questions
2. **(S1)** Data collection
3. **(S2)** Data valuation (WTA)
4. Questionnaires
5. **(S3)** Determination of bid and outcome

S1: DATA TYPE

FG Opinion on 14 contro-versial topics, e.g.:
- Experimentation on animals
- Obligatory vaccination
- Abortion
- Adoption by homosexual couples
- Euthanasia

(Frik & Gaudeul, 2018)

IQ 16 questions of a logic test:
- Verbal reasoning
- Letter and number series
- Matrix reasoning
- Three-dimensional rotation

(ICAR 2014, cf. Feri, Giannetti, & Jentzsch, 2014; Grossklags & Acquisti, 2007)

JAL 15 sensitive, personal statements, e.g.:
- Sex toys
- Smoking marijuana
- Cheating
- Lying
- Drunk driving

(John, Acquisti, & Loewenstein, 2011)

OS Usage of an online service:
- Screenshot of last five orders on Amazon

(cf. Benndorf & Normann, 2018)

RQ: Does the valuation for these types of data differ significantly?

S2: UNCERTAINTY

Base treatment
1. Comprehension test
2. Data collection
   - Questions of a logic test
3. **Data valuation (WTA)**

High uncertainty (WTA before test)
1. Comprehension test
2. **Data valuation (WTA)**
3. Data collection
   - Questions of a logic test

Low uncertainty (with feedback)
1. Comprehension test
2a. Data collection
   - Questions of a logic test
2b. Feedback
3. **Data valuation (WTA)**

RQ: How does information uncertainty impact the distribution of valuations?

S3: ELICITATION METHOD

BDM mechanism:
(Becker, DeGroot, & Marschak, 1964)

Random selection of one participant → Random draw of *bid* between 0 and 50€ → **Comparison of bid and participant's WTA** If $bid \geq WTA$:
- Data disclosure
- Participant receives bid as additional payment

Reverse Vickrey auction:
(Vickrey, 1961)

Selecting participant with lowest WTA → Data disclosure → Participant receives second lowest WTA as additional payment

Hypothetical:
Participants answer the same questions but there is no bid determination, data disclosure or additional payment.

RQ: Do both incentive-compatible mechanisms lead to the same valuations?

Data disclosure procedure

In case of disclosure, the name, photo and answers of the selected participant are presented in front of the other participants in the lab.
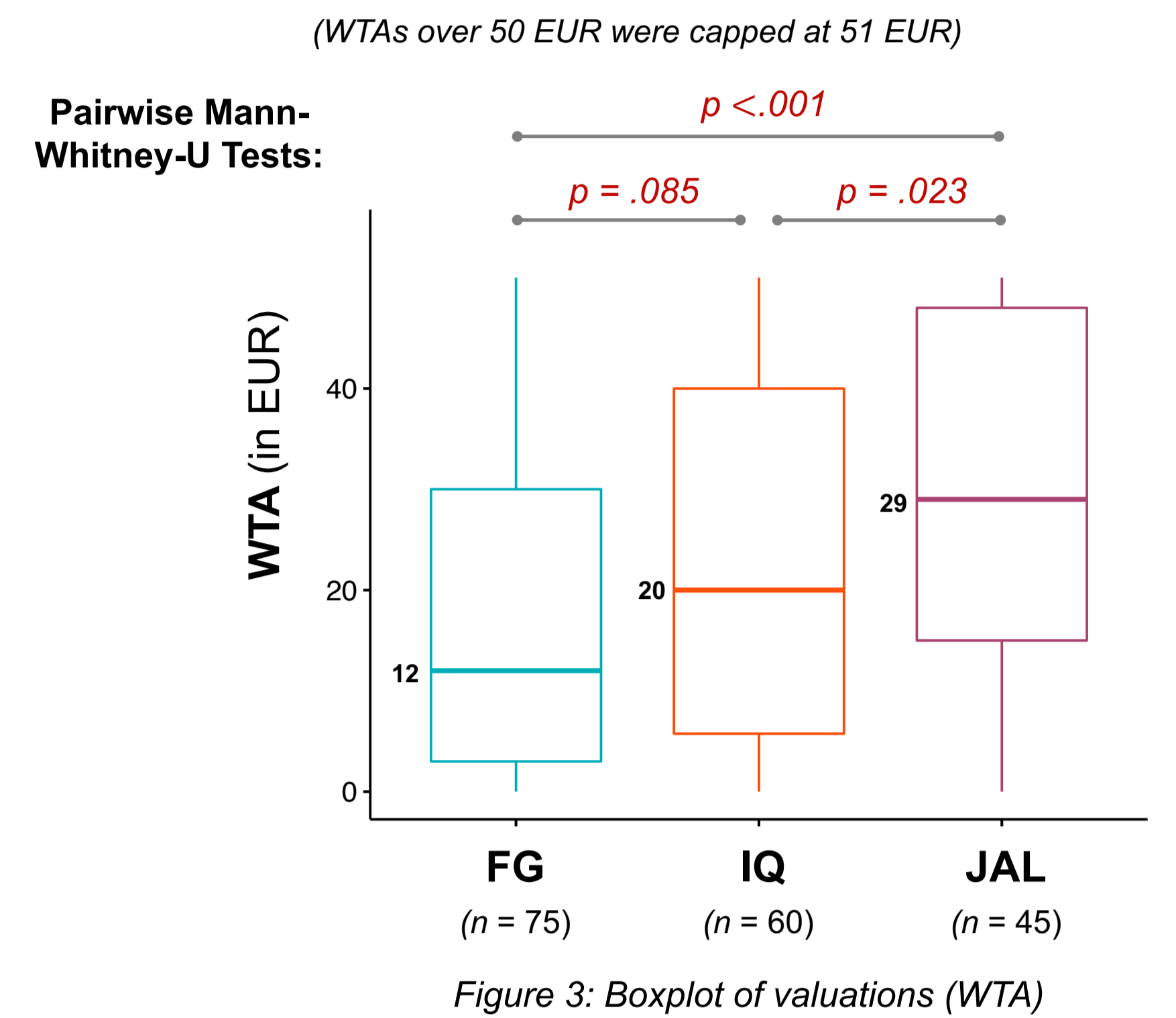
Responses by John Doe
- Are you in favour or against the legislation of prostitution?
Response of the participant: **In favour.**
Share „In favour": x % of the participants
Share „Against": (100-x) % of the participants

(Further questions and answers analogously...)

Figure 2: Mock-up of disclosure screen

PRELIM. RESULTS (S1)

Treatment differences
(WTAs over 50 EUR were capped at 51 EUR)

Pairwise Mann-Whitney-U Tests:
p <.001
p = .085
p = .023

Figure 3: Boxplot of valuations (WTA)

Participants have significantly different WTAs for the different types of data.

Subjects' performance and WTA in treatment IQ

Simple OLS regression:

$\beta_{perceived\ IQ} = -1.62^*$
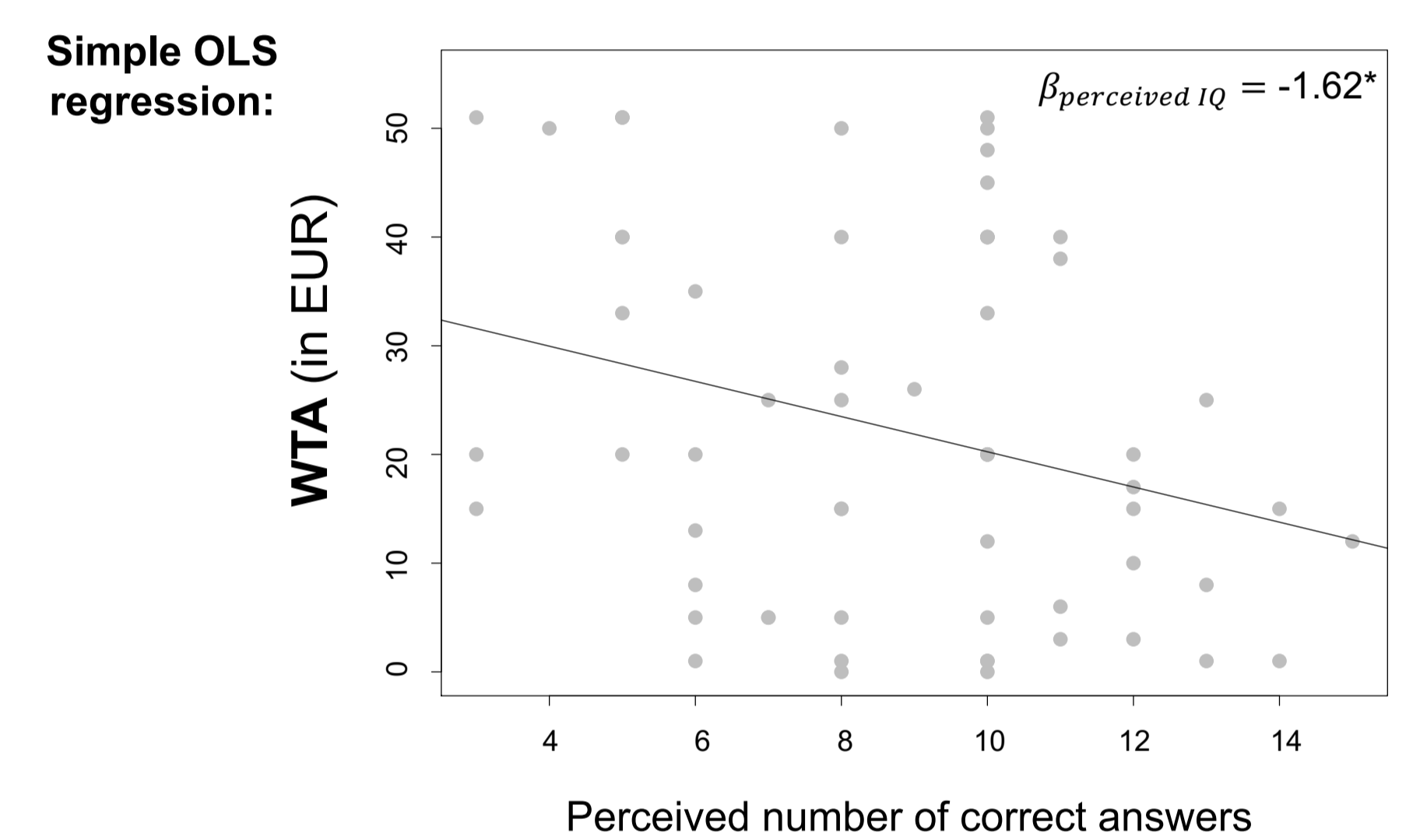
WTA in treatment IQ depends on participants' type, i.e., the number of perceived correct answers.

The impact of personal characteristics on WTA

Measurement of privacy attitudes: Model shows convergent and discriminant validity (based on data collected in first five sessions):

Constructs based on Xu et al. (2011)	CR	AVE	MSV
Disposition to value privacy	.74	.50	.11
Internet privacy concerns	.78	.55	.43
Privacy risks	.88	.65	.43
Privacy control	.84	.57	.02

But: No statistically significant effect of privacy attitudes on subjects' WTA evident in regression analyses.

Effect of personal traits on WTA (Tobit regression model):

$$WTA_i = \beta_{IQ}IQ_i + \beta_{JAL}JAL_i + \beta_{Age}Age_i + \beta_{Gender}Gender_i + \beta_{Risk}Risk_i + \beta_0 + \epsilon_i$$

- $\beta_{IQ} = 5.67^*$
- $\beta_{JAL} = 14.14^{***}$
- $\beta_{Age} = 1.44^{***}$
- $\beta_{Gender} = 5.58^{**}$
- $\beta_{Risk} = -1.54^{***}$

*** p<.01, ** p<.05, *p<.1

There seems to be no statistically significant impact of stated privacy attitudes, but of personal traits, on WTA.

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