Experimental Economics in Law & Economics

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and... ESNIE class '04, ESNIE class '05

First an experiment

- You can win real money!
- Imagine you all have 10 euro. You have to choose whether to take 10 euro from another individual in the room.
- Your action is monitored. With a given probability of error you can be sanctioned for 10 euro whether you take or not.
- At the end of the experiment one potential taker and one potential victim will be picked and paid in accordance with the choices they have made.

First situation

- You have 10 euro. If you take 10 euro from the other subject, you have to pay a fine of 10 euro with probability 100%. Therefore if you take, you will gain 10 euro.
- If you don't take 10 euro from the other subject, you will have to pay a fine of 10 euro with prob. 0%. Therefore if you don't take you will gain 10 euro.
- Do you want to take 10 euro?

Second situation

- You have 10 euro. If you take 10 euro from the other subject, you have to pay a fine of 10 euro with probability 50%. Therefore if you take you will gain
  - 10 euro with prob. 50%
  - 20 euro with prob. 50%
- If you don't take 10 euro from the other subject, you will have to pay a fine of 10 euro with prob. 0%. Therefore if you don't take you will gain 10 euro.
- Do you want to take 10 euro?

Third situation

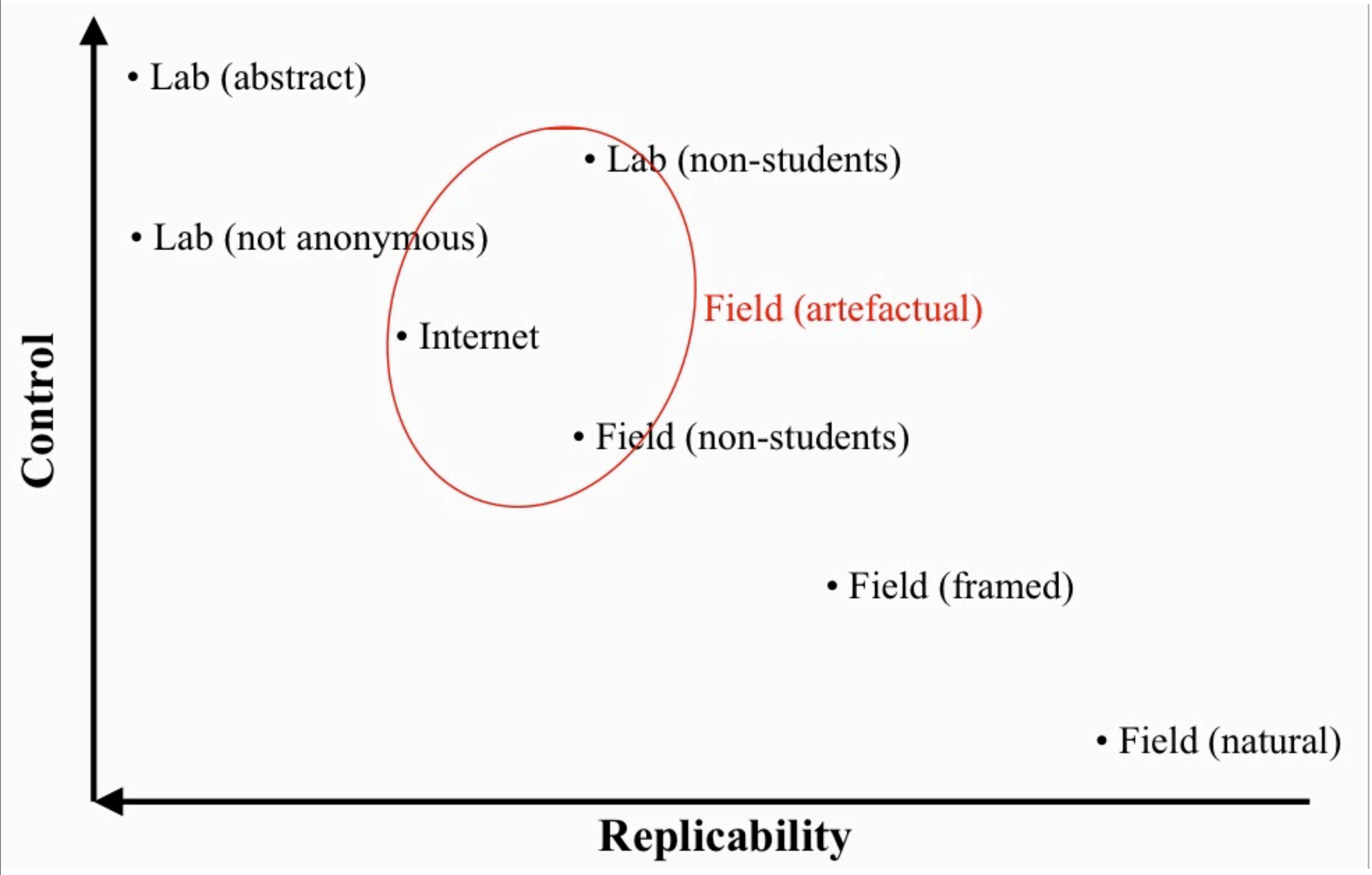
- You have 10 euro. If you take 10 euro from the other subject, you have to pay a fine of 10 euro with probability 100%. Therefore if you take you will gain 10 euro.
- If you don't take 10 euro from the other subject, you will have to pay a fine of 10 euro prob. 50%. Therefore if you don't take you will gain 10 euro all together.
  - 0 euro with prob. 50%
  - 10 euro with prob. 50%
- Do you want to take 10 euro?

Agenda

- What is the purpose of doing experiments?
- Experiments in L&E (general, and brief)
- Use my own experiment as an excuse to talk about building an experiment.
- And yes... pay up to 20 euros to some of you
- Black & White slides

What is an economic lab-experiment

- Very roughly these are the ingredients of lab experiments:
  - real-world incentives (usually **cash**)
  - **students**, gathered **together** for interaction over a **short time** (<2h)
  - asked to, take decisions, make effort
  - lab vs field vs online


Control
• Lab (abstract)
• Lab (non-students)
• Lab (not anonymous)
Field (artefactual)
• Internet
• Field (non-students)
• Field (framed)
• Field (natural)
Replicability

Experiments for... Testing theories

- From theory we draw predictions of causation
- The independent variable is manipulated with different treatments and the dependent variable is observed

Experiments for... Stress testing

- We can test whether previous empirical results supporting a theory hold when some restrictions in the experimental design are changed/relaxed.
- This in order to see whether and how theory's predictions are robust

Experiments for... regularities/anomalies

- A behavior not consistent with theory can be accidentally (or intuitively) found and explored
- Once the anomaly is replicated, other treatments may be added to explore what influences the anomaly

Experiments for... testbed policies

- Policy prescriptions can be tested in the lab.
- However, be prepared to face endless discussions about external validity
- Better -if possible- use field experiments
- Or at least be very modest with your claims

Interpreting results

- What if varying the independent variable does not produce any change in the independent variable?
  - Well, it might be that the experimental design is wrong or not well tuned
- Let us suppose we tune it well (more on this later on)...
- Again, what can we conclude if the expected effect is not observed?
  - The theory is not able to predict behavior in simple setting, let alone more complicated ones.

Interpreting results

- And what can we conclude if the treatment effect is indeed observed?
  - Not much, the result could be consistent with other theories (remember Popper?)
    - However, we should be happy to find lab evidence not in contradiction with our prediction
- It is useful to design an experiment to test conflicting predictions of two different theories. It helps to discard one of the two

Principal areas of experiments in L&E

- Arlen & Talley (2008); Croson (2009); Zeiler, K.. (2010)
- Testing the Coase Theorem
- Bargaining under different (legal) rules
- Litigation and Settlements
- Agency in contracts
- Institutions: How property, impersonal exchange, markets emerge
- Fundations of Law: ....deterrence theory

Judicial errors and deterrence
Theory and experimental evidence

Matteo Rizzolli & Luca Stanca

Find a good topic

- I'll try to convince that my own topic
  - is interesting and relevant
  - theory is still not settled
  - experimental evidence calls for further theoretical work
  - What kind of experiment is it? Spotting an anomaly from testing a theory.

General topic

- There exists a common (across cultures) and enduring (in time) social resistance to see innocents wrongfully convicted, even when this is instrumental to achieve deterrence
- This applies to many adjudicative procedures but especially to criminal procedure

Criminal procedure

- Two principles are widely accepted
- In dubio pro reo
  - Standard of proof requested to reach a conviction verdict must be beyond any reasonable doubt

What's a judicial error?

- wrongful acquittals of guilty individuals (ε_2)
- wrongful convictions of innocents (ε_1)

Better that ten guilty persons escape,
than that one innocent suffer

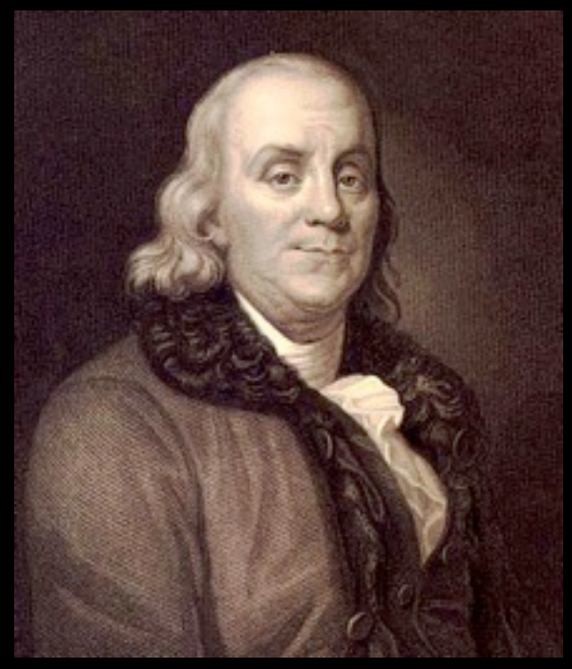
(W. Blackstone 1723 - 1780)

- $\varepsilon_2/\varepsilon_1=10$

It is better one hundred guilty persons should escape than that one innocent person should suffer.

(B. Franklin 1706-1790)

- $\varepsilon_2/\varepsilon_1=100$



Oh let not the Lord be angry, and I will speak yet but this once: Peradventure ten shall be found there. And he said, I will not destroy it for ten's sake.

(Genesis 18:23-32)

- $\varepsilon_2/\varepsilon_1=n-10/10$

We are willing to acquit many guilty individuals in order to avoid the conviction of an innocent

Deterrence theory

- Becker (1968) contribution
- Scope of criminal law (and all the law in a broader sense) is to deter socially costly behavior by letting individuals internalize the social costs through sanctions.
- Detection is costly and thus it is efficient to rise sanctions and decrease detection

Deterrence theory

- The implications of Becker work were vast and profund
- The extensions to the model are countless. See Polinsky & Shavell (2009)
- Among many other, it offers prediction on
  - the role of judicial errors on individual's propensity to commit crime

A simplified deterrence model

w_0 initial endowment of criminal

g gains from crime

f monetary sanction

p probability of detection

ε_1 Probability of wrongful conviction

$1 - \varepsilon_2$ Probability of correct conviction

Deterrence model with errors

Individual payoff for crime

$$(1-p)(w_0+g)+p\varepsilon_2(w_0+g)+p(1-\varepsilon_2)(w_0+g-f)$$

Individual payoff for innocence

$$(1-p)w_0+p\varepsilon_1(w_0-f)+p(1-\varepsilon_1)w_0$$

Commit the crime if

$$g > p(1-\varepsilon_2-\varepsilon_1)f$$

Png 1986 Errors' Symmetry Result

- ε_1 and ε_2 have the same detrimental impact on deterrence
- Hence, they have the same social costs
- The theoretical prediction that we want to test:
- Do ε_1 and ε_2 induce the same amount of crime?
- From the very beginning, I was skeptical...

Research Question

- Why test this prediction with an experiment?
- Typically only the number of crimes and of convictions are observed
  - an increase in convictions may be due to more ε_1 or less ε_2 (at least in the short run)
  - Scant information on the number of innocents convicted. Possible when you have exogenous shocks

Research Question

- The lab is thus ideal to test the prediction because you can manipulated the probability of errors with precision.
- From previous studies that only focus on ε_2 we know that the deterrence hypothesis (kind of) works. Does it also work with ε_1? If yes, how do they compare?

Choosing the right game

- We need a design where
  - Crime is mimicked
  - Detection by an authority is possible
  - Detection generates both ε_1 and ε_2 so we can exogenously vary them in order to observe differences between treatments

Choosing the right game

- Many games imply some form of detection:
  - Agent's effort provision and principal's monitoring (Falk&Fehr 2003, Falk & Gächter 2008)
  - Corruption (Schulze & Frank 2003, Abbink, 2006)
  - Tax avoidance (Torgler 2002)
  - Public good provision (Fehr & Gächter 2000, AAVV)

Choosing the right game

- Public good games and detection
  - Second and third party punishment (Fehr)
  - Expressive function of law (Galbiati & Vertova 2009)
  - Reciprocity & crime (Falk and Fischbacher 2002)
  - General vs specific deterrence (Engel and Irlenbusch, 2010)
  - Uncertainty and deterrence (Grechening et al 2010)

Choosing the right game

- Many other games resemble more a crime and imply some form of detection:
  - Backer et al (2003): take from the experimenter (no crime frame, only risky choice)
  - De Angelo & Charness (2009): violate traffic law (crime frame but no real externality)
  - Visser et al (2006) and Hoerisch and Strassmair (2008) use a "theft game" with detection

Choosing the right game

- What do we know of the theft game (alone)?
- Very little...
  - Inverse Dictator game (List, 2007; Bardsley, 2008)
- Different from
  - Dictator (AAVV). Focus: *sharing norms*
  - Power-to-take game (Bosman et al., 2005). Focus: *vengeance*
  - Moonlighting game (Falk et al., 2008). Focus: *trust & vengeance*
  - Lost wallet game (Dufwenberg and Gneezy, 2000). Focus: *Fairness*
  - Public bad game (Sonnemans et al., 1998). Focus: *framing*

Our design choice

- We settled on the Theft Game because it closely resembles crime. It is actually a case of petty larceny

Assigning the endowment

- Effort vs windfall money (manna)
  - Gaining endowment through effort changes substantially the theft game and other games as well.
    - Effort makes endowment as “earned property right"
    - Effort rises issues of distribution, ability, IQ etc.
    - With effort you cannot vary endowment
- Potential alternatives?
  - use subjects' real property...

- List (2007)

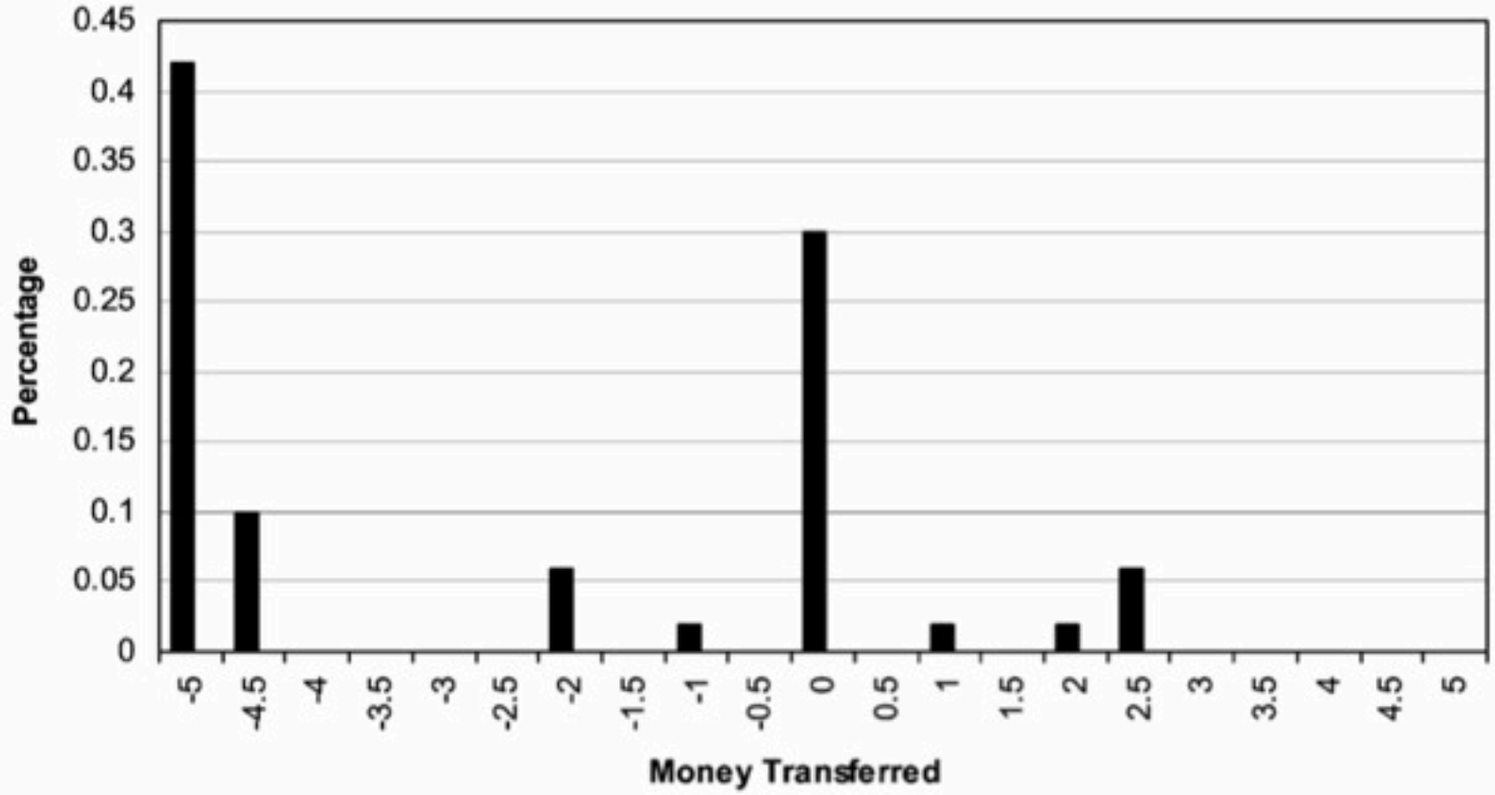
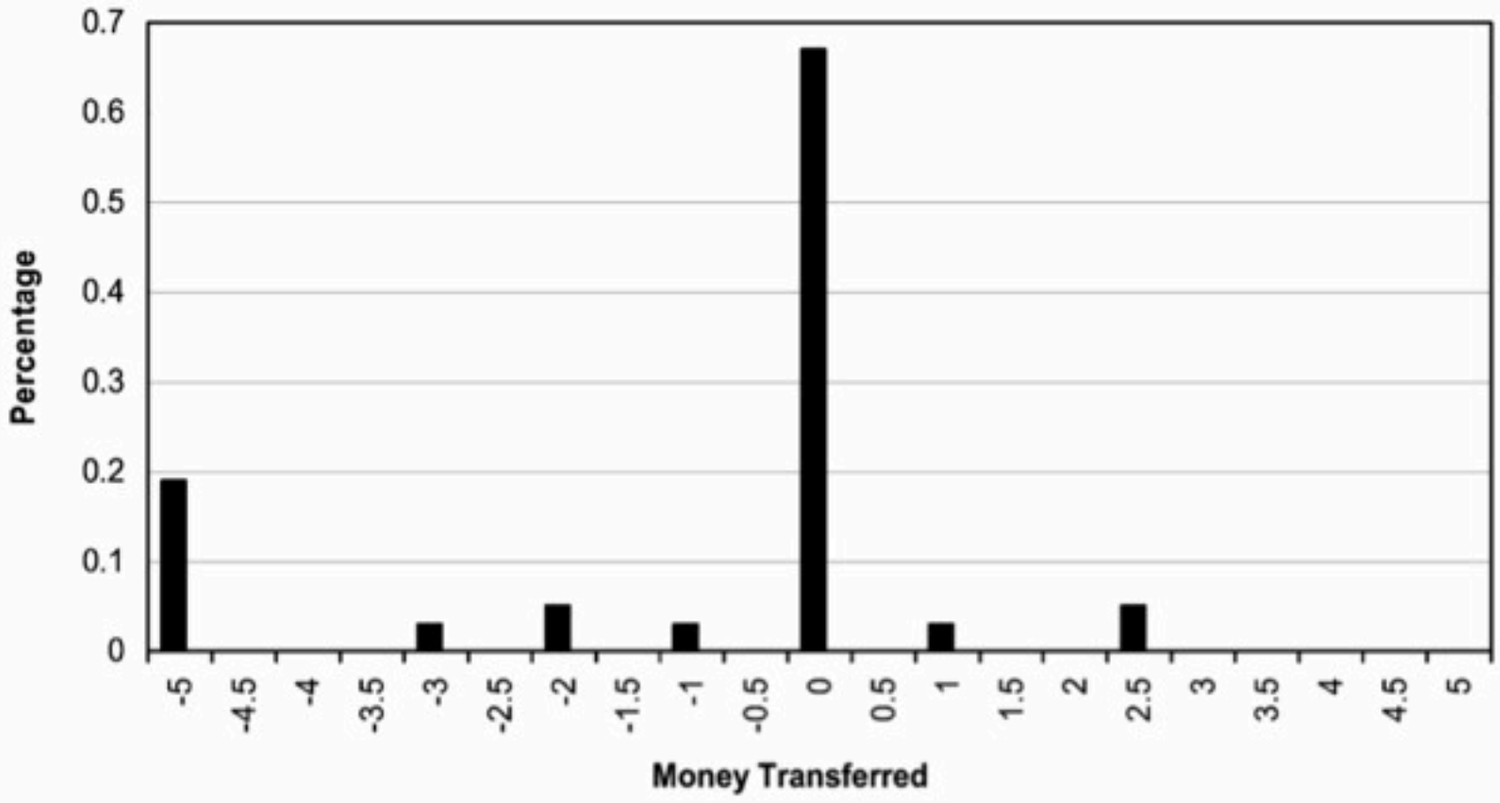
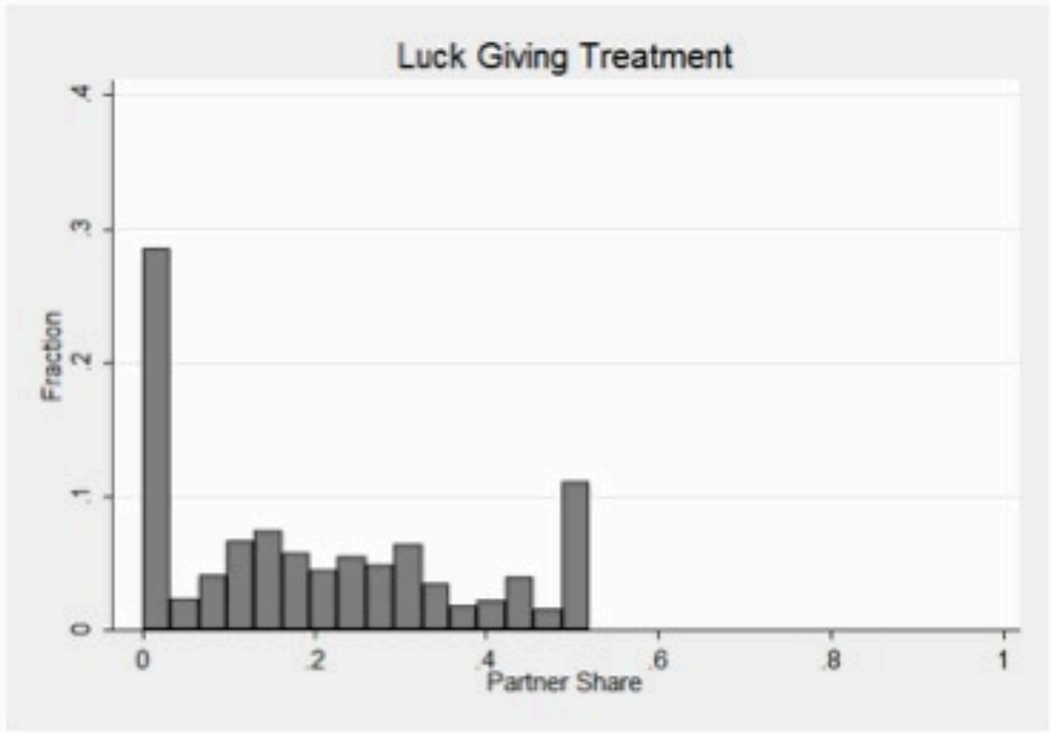
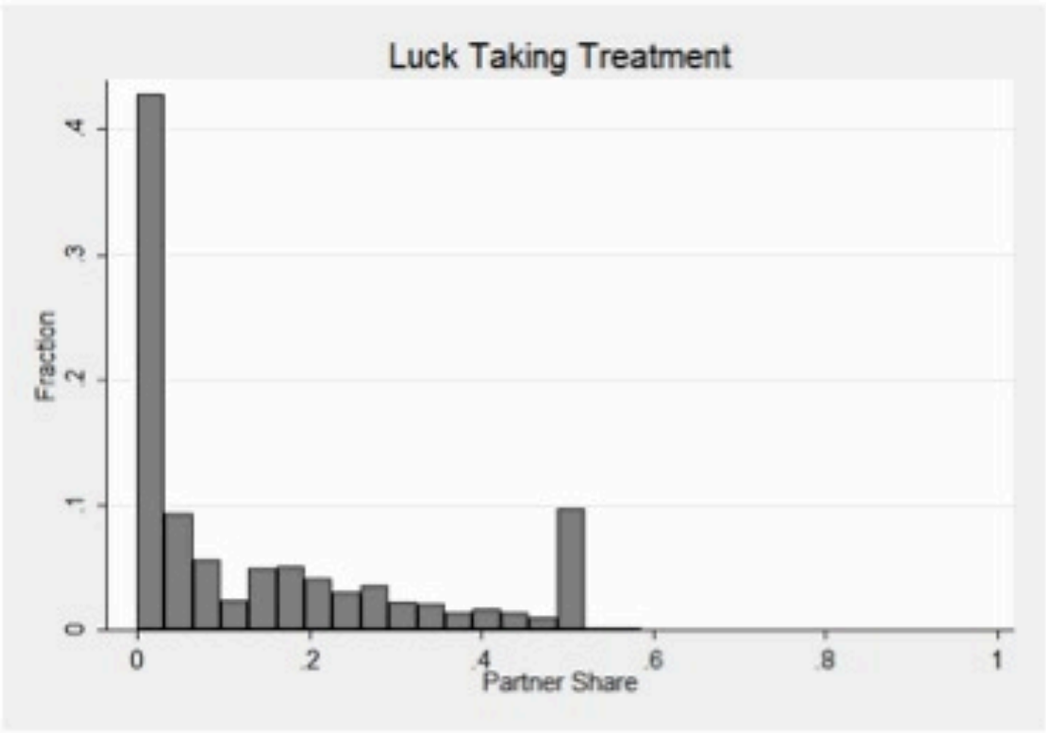
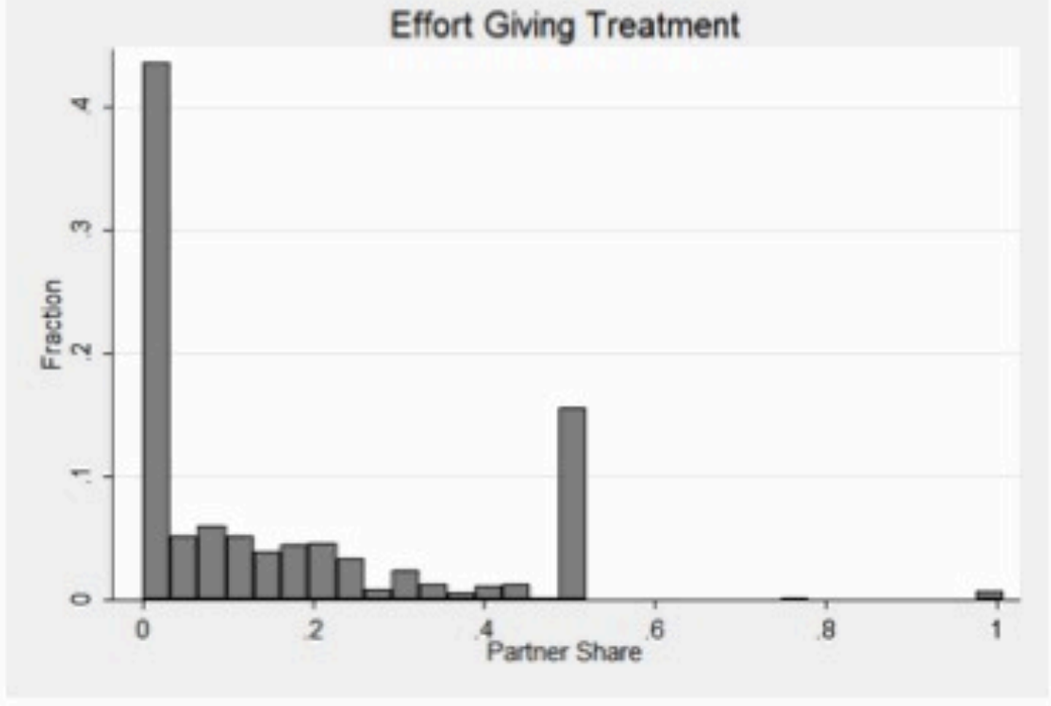


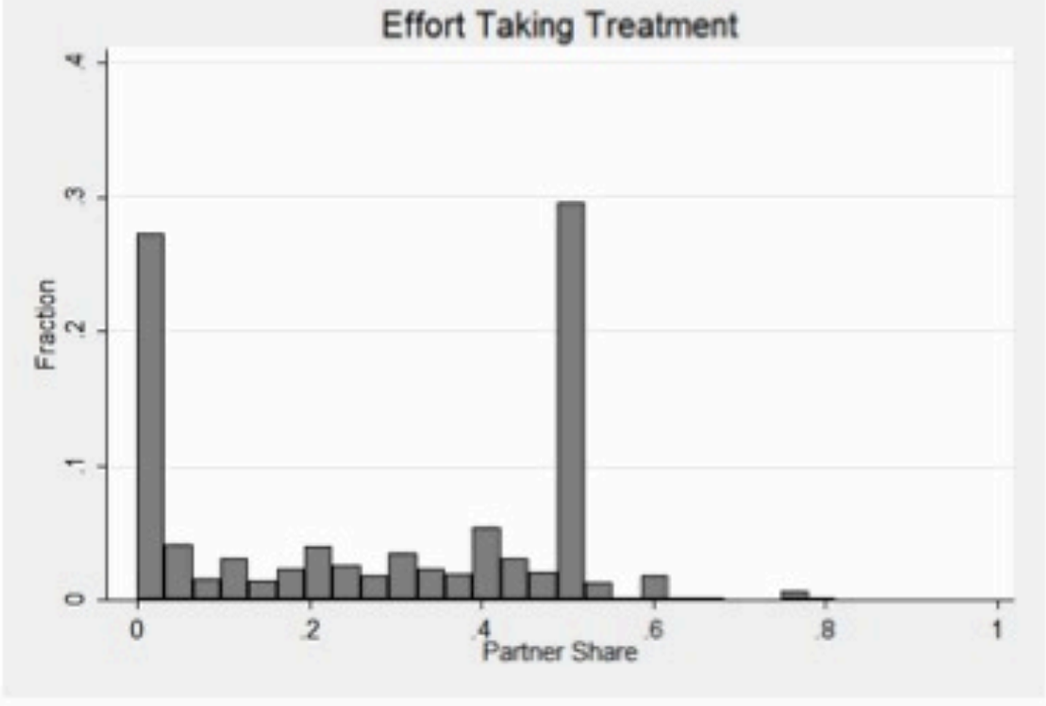
FIG. 3.—Treatment Take ($5) (data online table B3)











- Jakiela (2011)

Our design choice

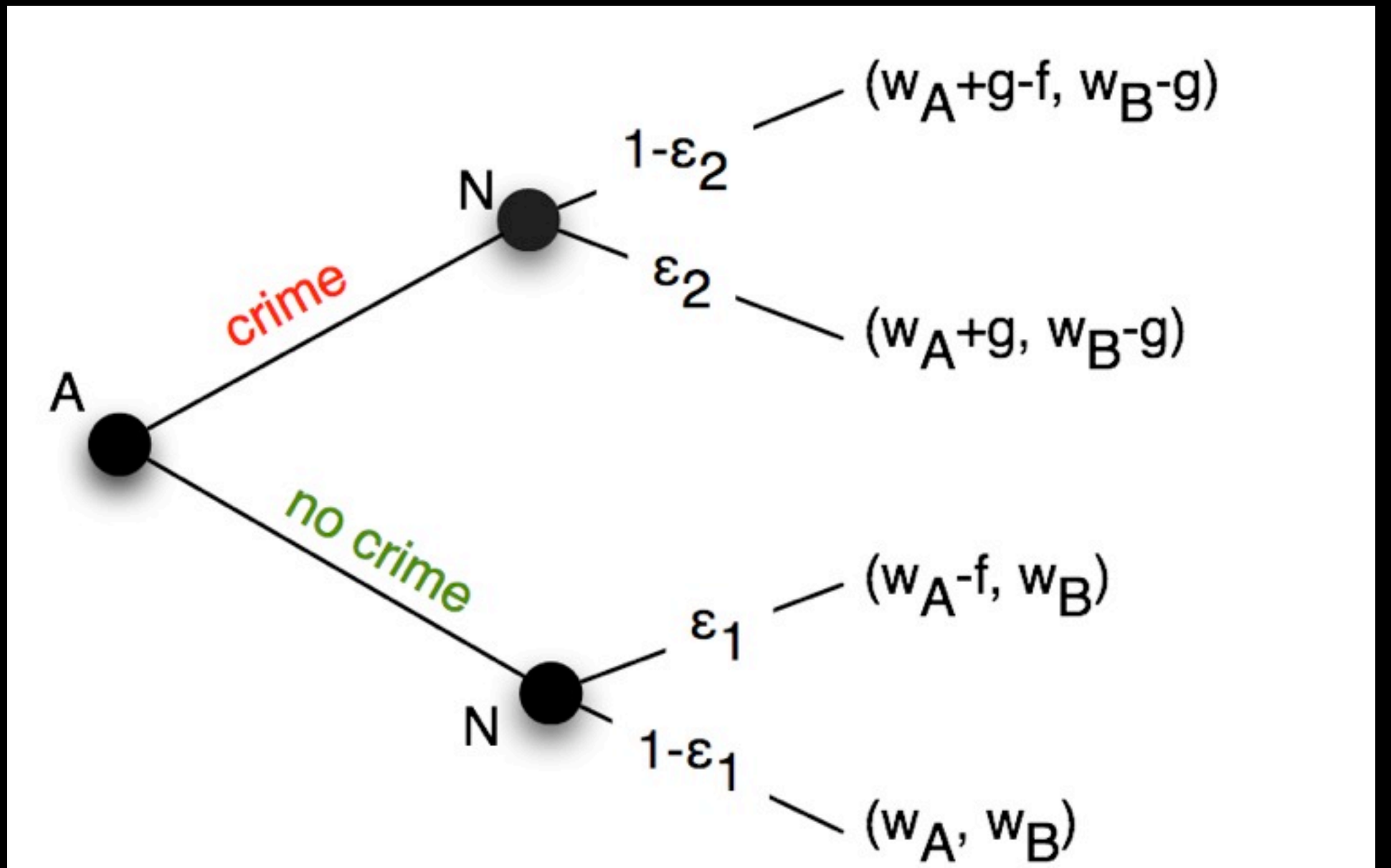
- We opted for using windfall money, especially because we wanted to vary endowment

Sanctioning mechanism

- Some papers explore expected sanctions:
  - Mild sanctions (Tyran & Feld 2006)
  - Deterring sanctions, small prob. (Visser et al 2006)
  - expected sanctions and social preferences (Hoerisch and Strassmair 2008)
- Nobody considers ε_1
- So we pick very simple sanction schemes and we introduce ε_1

Our design choice

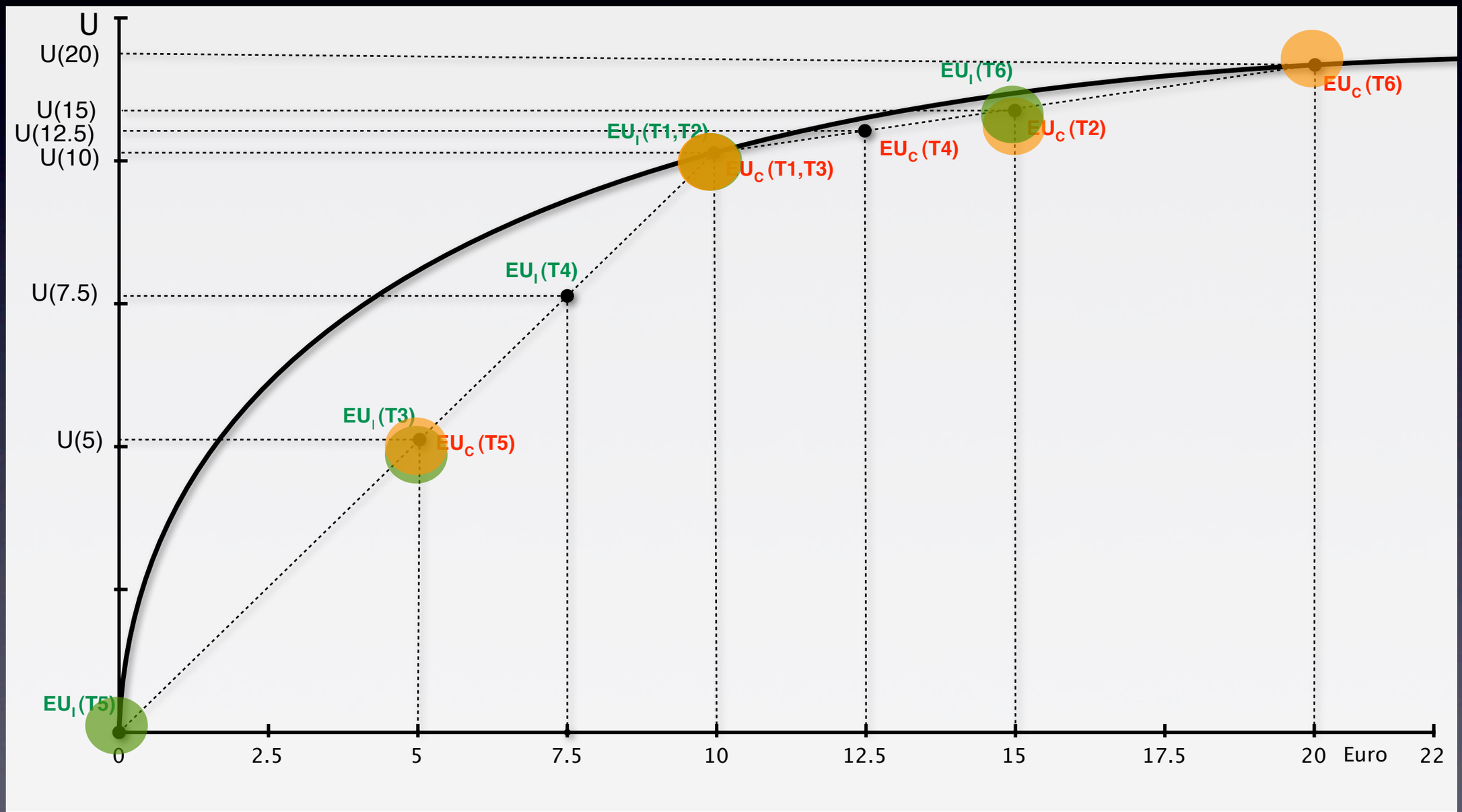
- Baseline game :Theft game with windfall money
- Sanctioning mechanism: Simple monetary sanction with
  - ε1 and ε2
  - sanctions=gain from crime


A
crime
no crime
N
N
1-ε2
ε2
ε1
1-ε1
(wA+g-f, wB-g)
(wA+g, wB-g)
(wA-f, wB)
(wA, wB)

	T1	T2	T3	T4	T5	T6
ε_1	0	0	0.5	0.25	0	0.5
ε_2	0	0.5	0	0.25	0.5	0
w_A	10	10	10	10	0	20
$E\pi_I$	10	10	5	7.5	0	15
$E\pi_C$	10	15	10	12.5	5	20
EU_I	$U(10)$	$U(10)$	$\frac{U(0)+U(10)}{2}$	$\frac{U(0)+3U(10)}{4}$	$U(0)$	$\frac{U(10)+U(20)}{2}$
EU_C	$U(10)$	$\frac{U(10)+U(20)}{2}$	$U(10)$	$\frac{3U(10)+U(20)}{4}$	$\frac{U(0)+U(10)}{2}$	$U(20)$
ΔEU	0	$\frac{U(20)-U(10)}{2}$	$\frac{U(10)-U(0)}{2}$	$\frac{U(20)-U(0)}{4}$	$\frac{U(10)-U(0)}{2}$	$\frac{U(20)-U(10)}{2}$

- $g=10$ euro and $f=10$ euro
- Theft is always convenient except than in T1
- B is always passive (no strategic interaction)

Comparison of treatments



Building the experiment ...Within subject design

- Same subjects get different parameters
- + Controls for individual characteristics
- + Allows the use of more powerful statistical analysis
- + Less subjects are needed
- - Demand effect
- - Must control for sequence effects (learning, tiring etc)
- - Does not work for some treatment variations (e.g. different frames, different earned endowments)

Building the experiment ...Within subject design

- Between-subjects: different subjects get different parameters
  - + Avoids 'contamination' between treatments
- - Must trust the randomization procedure
- - Takes many more subjects
- On between vs within see Charness, Gneezy, Kuhn 2011

Building the experiment ...Strategy method

- A very much used trick to mitigate sequence effect, is the use of strategy method
- Ask hypothetical choices under different treatment conditions before the condition actually happens. Then pay according to just one randomly choosen treatment
- Hot vs Cold Design: Brants & Charness (2000); Casari and Cason (2009)

Building the experiment Other design choices

- Study 1:
  - Within-subject: Each subject plays T2, T3, T5 and T6 twice for a total of 10 treatments
    - Strategy method: we pay only one phase randomly chosen
- Study 2:
  - Between subject design: we test only T2 T3 and T6
- Each subject plays as potential taker and at the end only half are paid as thieves

Building the experiment
Subjects

- Subjects: 48 subjects in Study 1 and 108 in Study 2, recruited online. None participated to theft games before
- No significantly differences in socio-economic data between sessions

Building the experiment
Anonymity

- Blind procedure (people did not know who they were stealing/stolen from)
- The experimenter was not blind (although the expected sanction made final payoff more blurry)

Building the experiment
Randomization

Table 2: Sequence of treatments within sessions, study 1

Phase	1	2	3	4	5	6	7	8	9	10
Session 1	1	4	2	3	5	6	2	3	5	6
Session 2	4	1	3	2	6	5	3	2	6	5

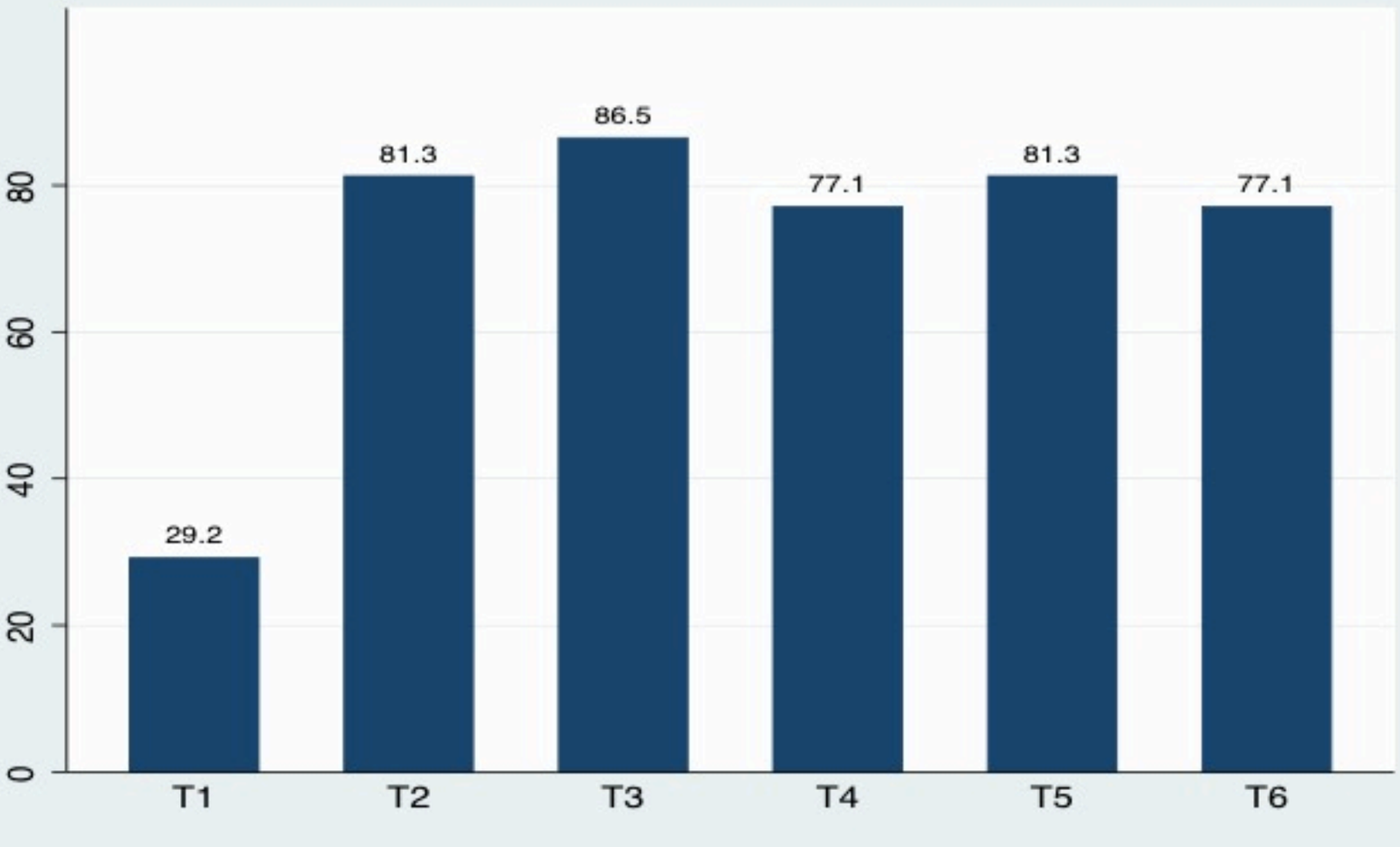
Building the experiment ...Role reversal

- Our design works with matched pairs where one partner is passive
- In order to produce more observations, all subjects played as active, but they knew they could be eventually paid according to their passive outcome.
- This may induce some role reversal and alter behaviour (anticipating regret for instance)

Results

Do errors impact deterrence?

Figure 5: Percentage of subjects opting for crime, study 1



Results

Do errors impact deterrence?

There is a strong and significant effect of both ε_1 and ε_2 on deterrence.

Result I: Crime increases as the expected sanction becomes suboptimal (either because of ε_1 or ε_2)

Results

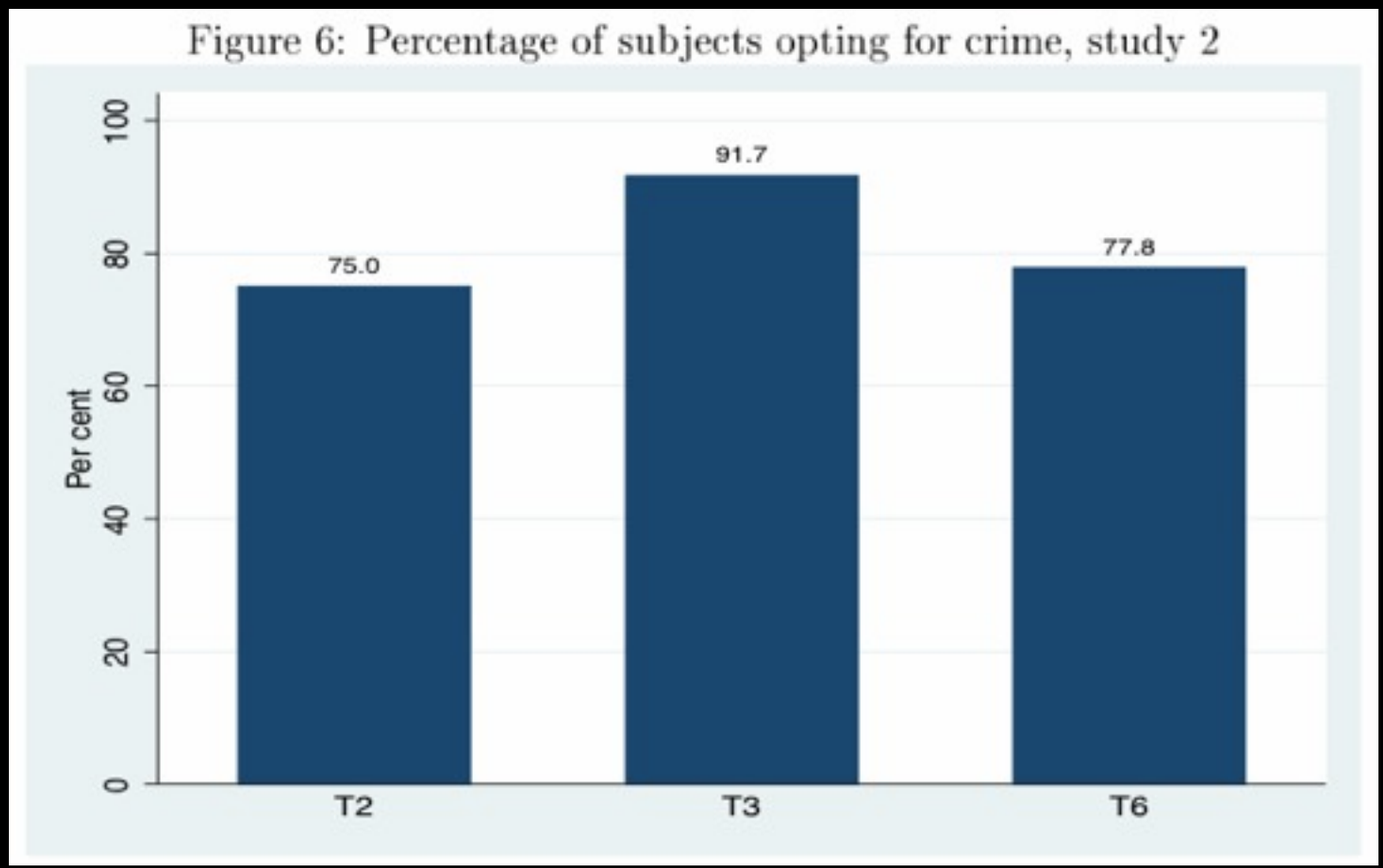
- Do ε1 and ε2 have the same impact on deterrence?
- In study 1, averaging across phases there is not statistically significant difference in the effects of ε1 (T3) and ε2 (T2)
- However if we focus on last four phases....

Table 6: Percentage of criminals by treatment, sessions 1 and 2

	T1	T4	T2	T3	T5	T6
Overall	29.2	77.1	81.2	86.4	81.2	77.1
Phases 3-6			85.4	83.3	77.1	72.9
Phases 7-10			77.1	89.6	85.4	81.2

Results

- Do ε_1 and ε_2 have the same impact on deterrence?



Between-subject design emphasize the difference between ε_1 and ε_2

Results

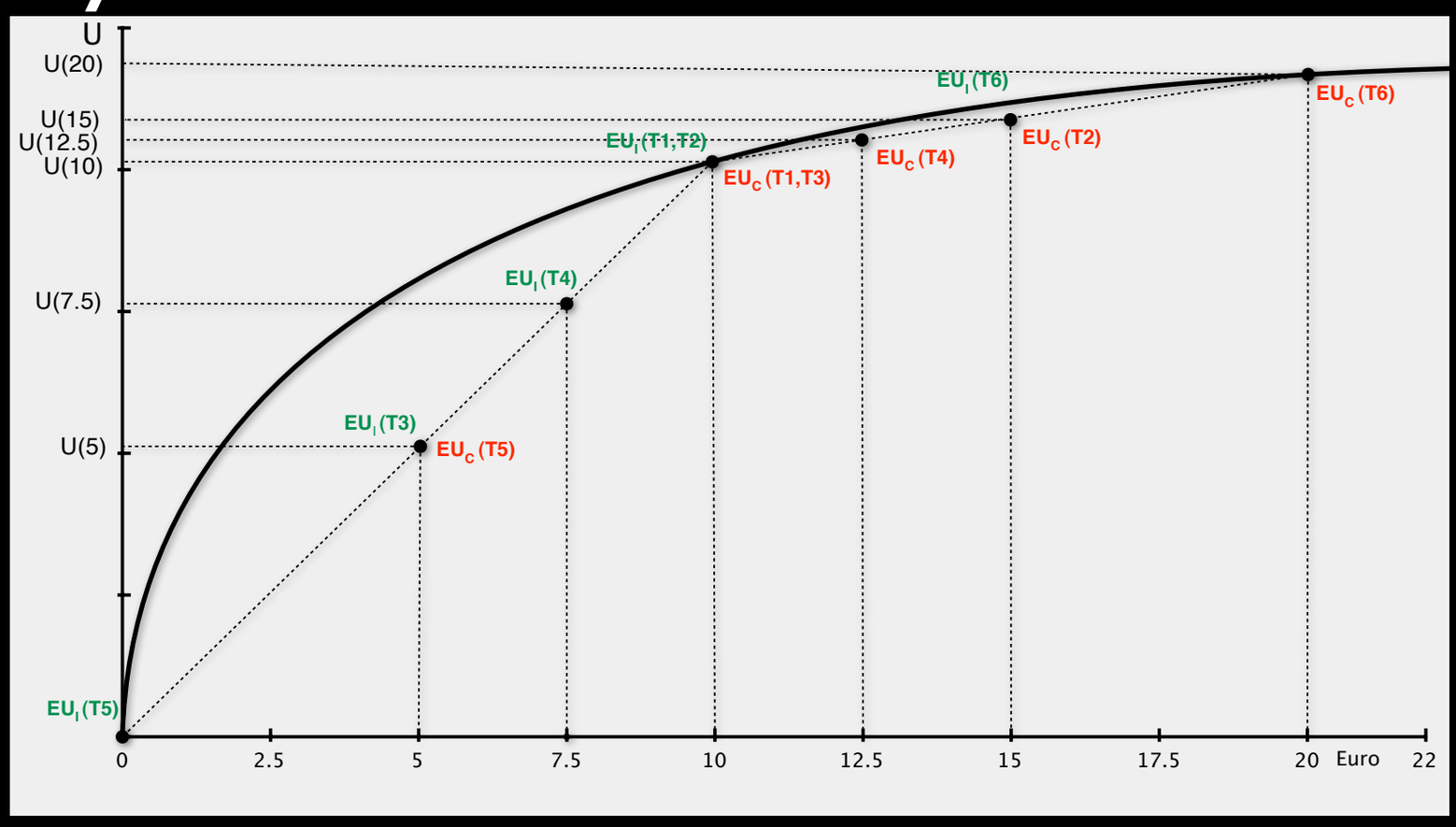
- In study 1, the difference between crime rates in presence of either ε_1 (T3, T6) or ε_2 (T2, T5) is more than 12% and strongly statistically significant

- In study 2, the difference is 17% and strongly statistically significant

- The probability of type-I errors has a larger impact on deterrence than the probability of type-II errors.

What explains this asymmetry?

- We control risk-a by manipulating endowment
- Two couples (T2-T6 and T3-T5) have the same difference in utility between crime and honesty but differ for the kind of error



What explains this asymmetry?

- Controlling for the effect of risk aversion, the effect of type-I errors is still stronger than that of type-II errors, but the difference is no longer statistically significant
- We are no longer able to reject the null hypothesis that ε_1 and ε_2 impact deterrence asymmetrically.

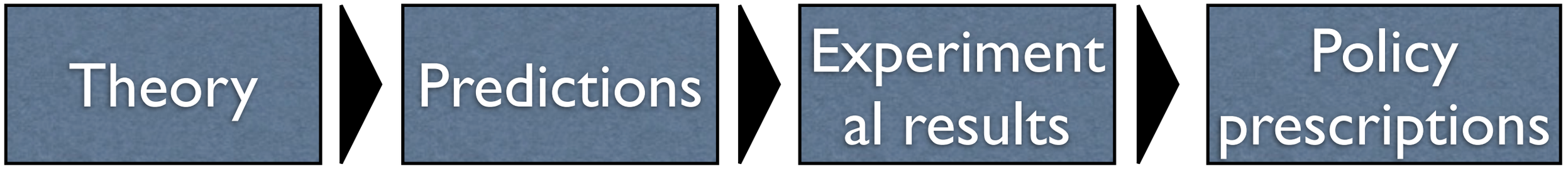
Common objections

- No external validity of probabilities
- Monetary incentives are not approriate
- Wording and framing is key
- Subject pool is limited

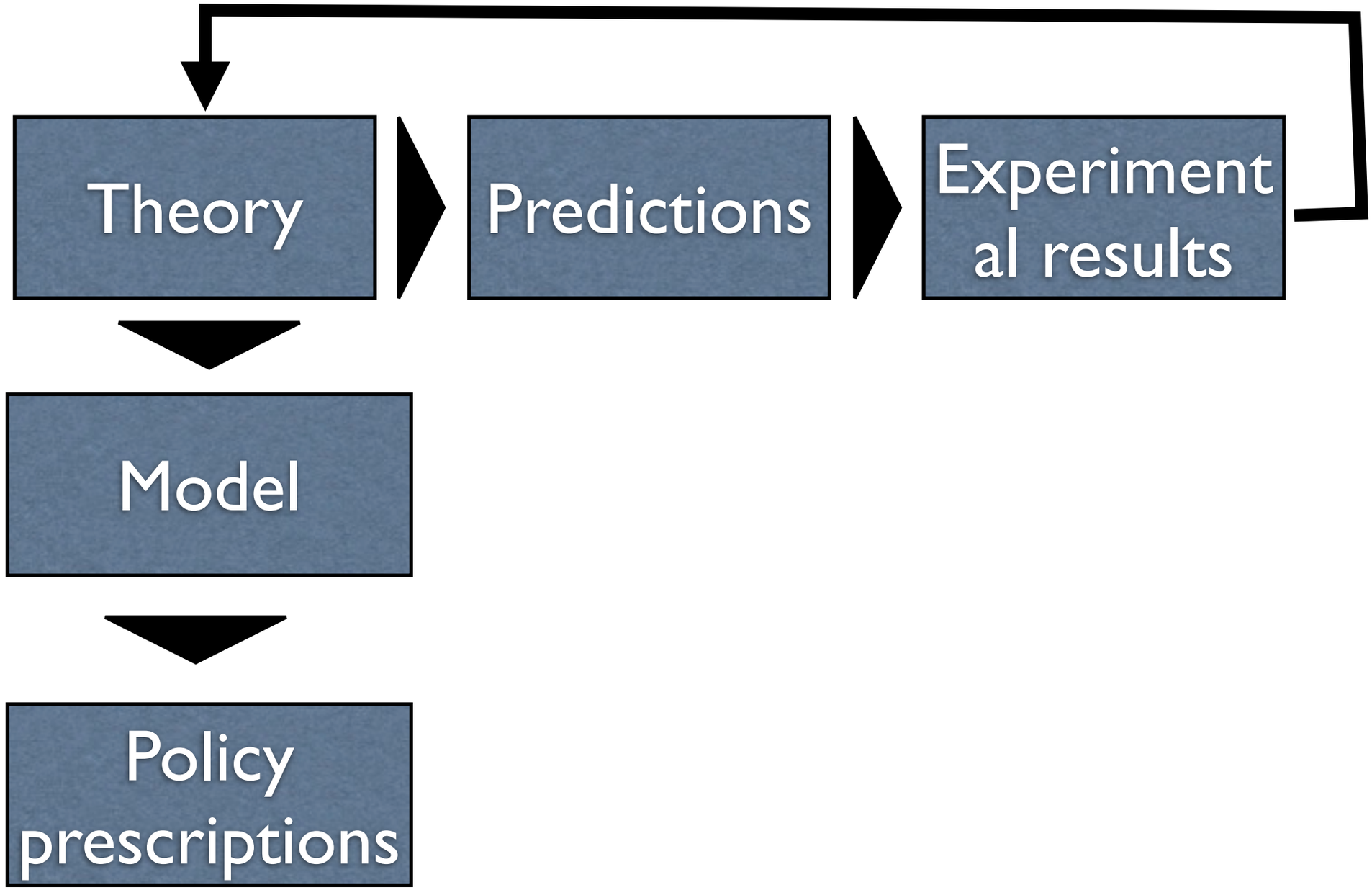
Common Objections

- **The experiment has no "external validity"**
- Experiments take place in the real word with real people, although in simplified setting.
- We must go back to the question of what is the purpose of the experiment. If it is "to test theories" then the issue of external validity is irrelevant.

Common Objections: External Validity



Common Objections: External Validity



Common Objections: External Validity

- In general, experiments need to be coherent with the theory, not plausible.
- Better sacrifice verisimilitude to testability.

Common Objections Monetary incentives

- in Economics the norm is to use monetary incentives
- Monetary incentives are too little to drive behavior (petty crime, petty sanction)
  - True, but this works against our hypothesis
- Monetary incentives crowd out intrinsic motivations and other regarding preferences
  - True, but this can be tested and controlled, and it is a subfield on its own
  - However more experiments use non-monetary rewards and sanctions

Common Objections
Wording and framing

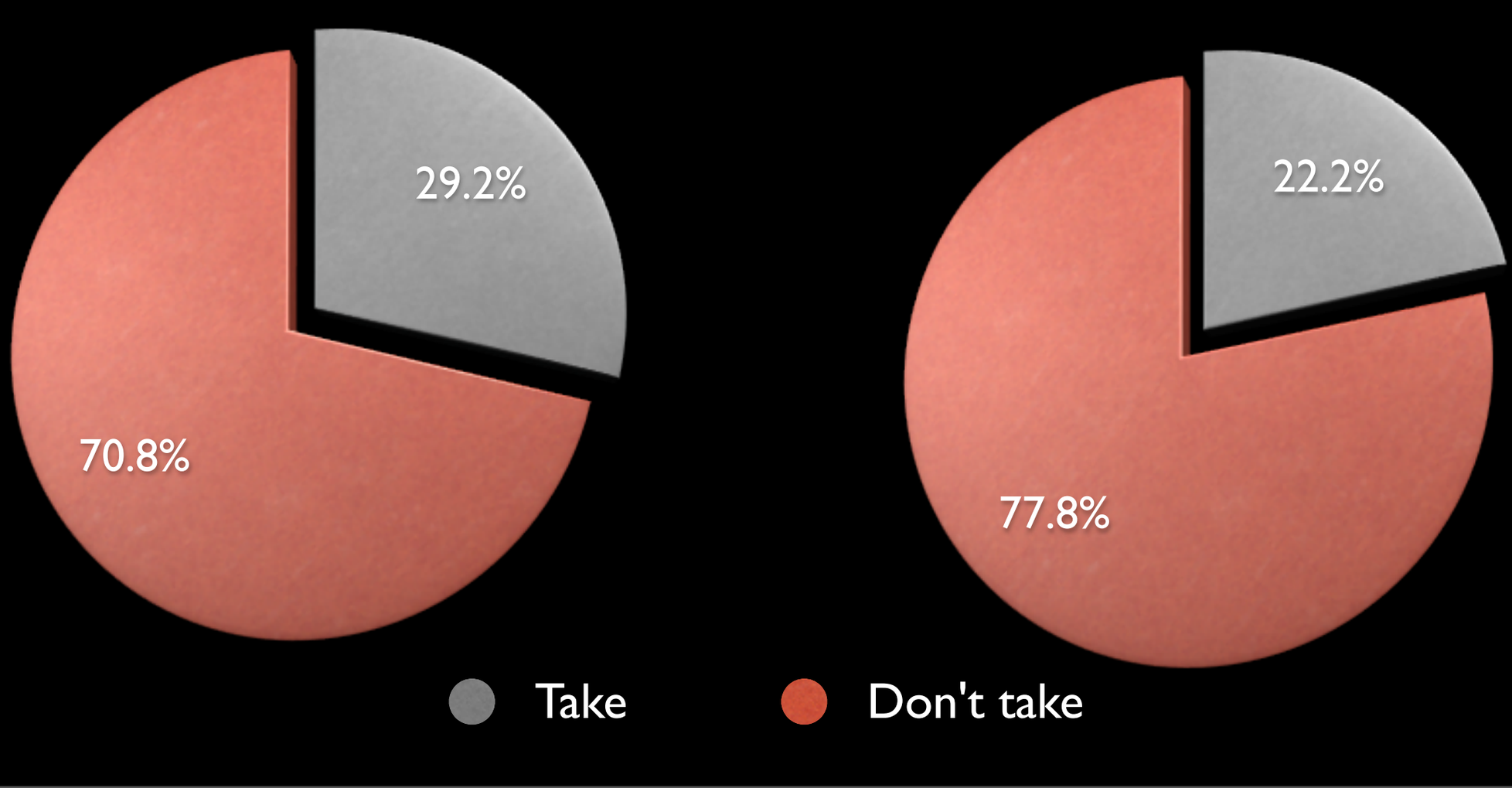
- In Economics the norm is to use neutral language.
- Framed language
  - + Can help with understanding of the experiment
  - + Can bring the experiment closer to research question
  - - You don't know how subjects perceive their role
- In L&E experiments, framing is more common (probably because law has to do with expressive functions)

What would I do it differently?

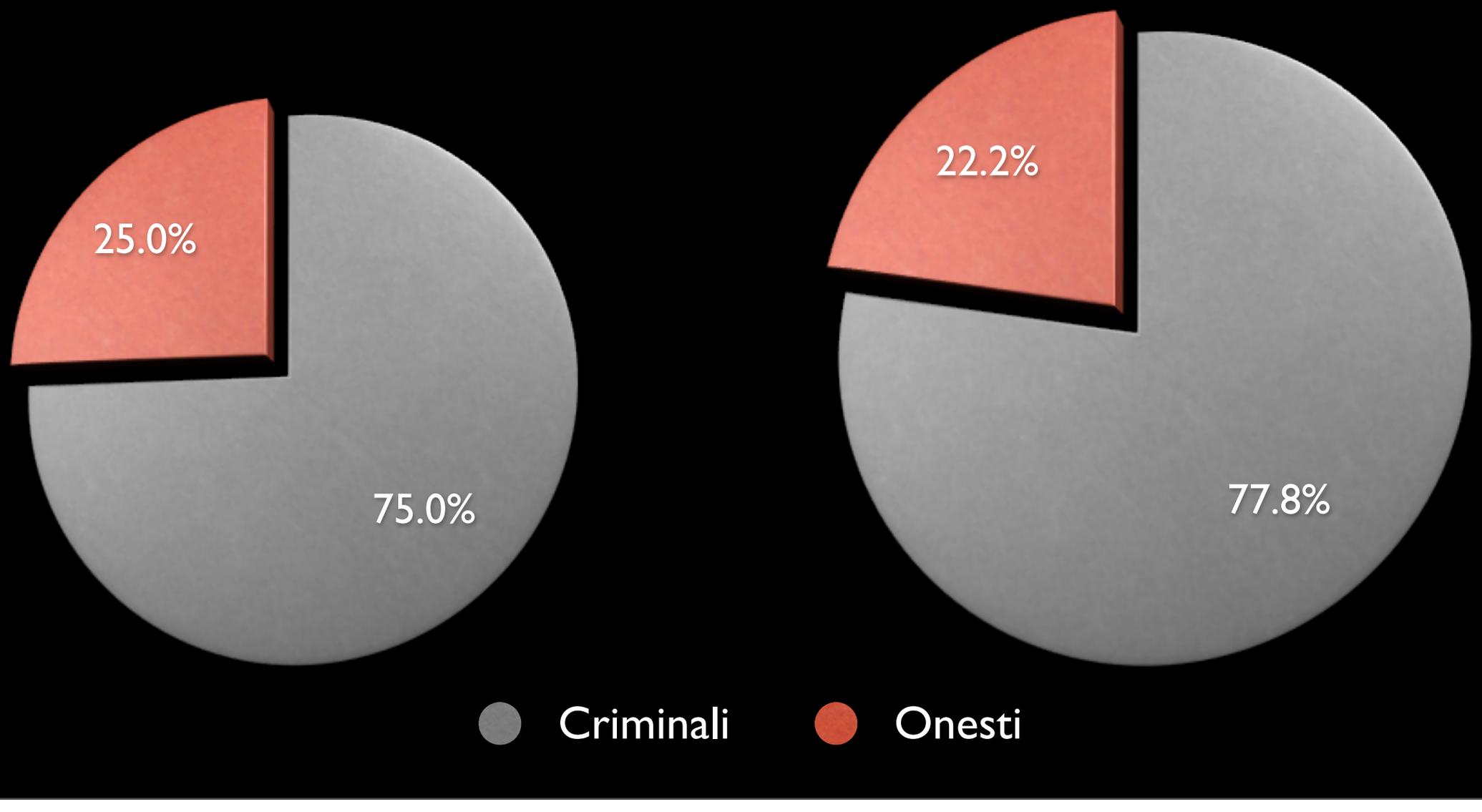
- Better tuning in order to increase salience of crime. This in order to increase treatment effect.
  - Use earned endowment
  - No role reversal
- More salience in errors
  - Change in probabilities

How did it go today?

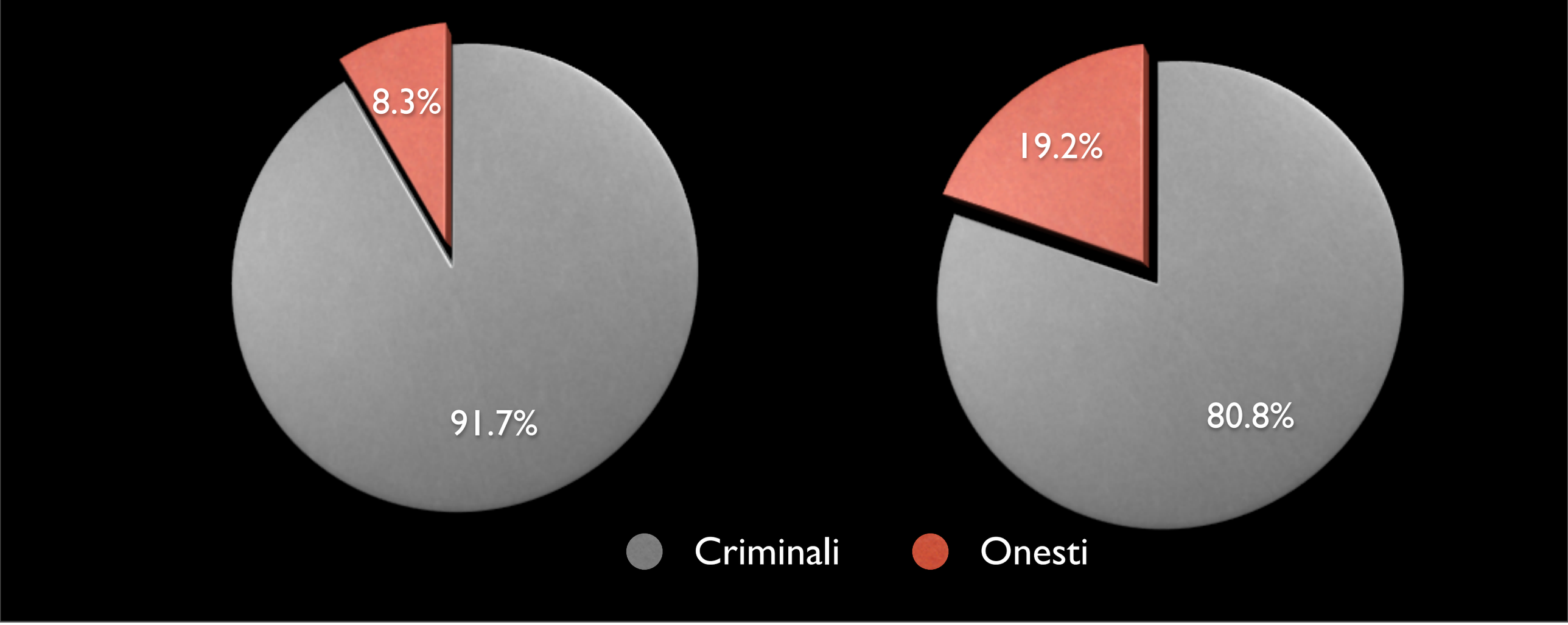
T1: If you take 10 euro from the other subject, you have to pay a fine of 10 euro qith probability 100%. If you don't take 10 euro from the other subject, you will have to pay a fine of 10 euro with prob. 0%. Do you want to take 10 euro?



T2. If you take 10 euro from the other subject, you have to pay a fine of 10 euro with probability 50%. If you don't take 10 euro from the other subject, you will have to pay a fine of 10 euro with prob. 0%. Do you want to take 10 euro?



T3. If you take 10 euro from the other subject, you have to pay a fine of 10 euro with probability 100%.If you don't take 10 euro from the other subject, you will have to pay a fine of 10 euro prob. 50%. Do you want to take 10 euro?



Conclusions

- Experimental evidence shows an asymmetric impact of errors currently overlooked by deterrence models
- Some explanations to the theory (risk preferences, expressive function of law) are likley candidates to explain this anomaly
- Further treatments will be needed to test their robustness

Conclusions

- Experimental tests of Law & Economic propositions is still in its infancy.
- There are a lot of theories/models to test and very few people doing it
- L&E is usually inclined to draw too quickly policy implications.
- Please, use experiments with caution and grain of salt