Experimental Economics in Law & Economics

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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
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.
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 ($\varepsilon_2$)
- wrongful convictions of innocents ($\varepsilon_1$)
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)

\[ \frac{\varepsilon_2}{\varepsilon_1} = \frac{n - 10}{10} \]
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 profound
- 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

\( \varepsilon_1 \) Probability of \textbf{wrongful} conviction

\( 1 - \varepsilon_2 \) Probability of \textbf{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

\[g > p(1 - \varepsilon_2 - \varepsilon_1)f\]
• $\varepsilon_1$ and $\varepsilon_2$ have the same detrimental impact on deterrence

• Hence, they have the same social costs

• The theoretical prediction that we want to test:
  • Do $\varepsilon_1$ and $\varepsilon_2$ 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 $\varepsilon_1$ or less $\varepsilon_2$ (at least in the short run)
  • Scant information on the number of innocents convicted. Possible when you have exogenous shocks
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 $\varepsilon_2$ we know that the deterrence hypothesis (kind of) works. Does it also work with $\varepsilon_1$? 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 $\varepsilon_1$ and $\varepsilon_2$ 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 $\varepsilon_1$
• So we pick very simple sanction schemes and we introduce $\varepsilon_1$
Our design choice

- Baseline game: Theft game with windfall money
- Sanctioning mechanism: Simple monetary sanction with
  - $\varepsilon 1$ and $\varepsilon 2$
  - sanctions = gain from crime
• \( g = 10 \) 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 chosen 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>
<thead>
<tr>
<th>Phase</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
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<tr>
<td>Session 1</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Session 2</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>5</td>
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</tbody>
</table>
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

T1: 29.2
T2: 81.3
T3: 86.5
T4: 77.1
T5: 81.3
T6: 77.1
Results

Do errors impact deterrence?

There is a strong and significant effect of both $\varepsilon_1$ and $\varepsilon_2$ on deterrence.

**Result I: Crime increases** as the **expected sanction becomes suboptimal** (either because of $\varepsilon_1$ or $\varepsilon_2$)
• 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

<table>
<thead>
<tr>
<th></th>
<th>T1</th>
<th>T4</th>
<th>T2</th>
<th>T3</th>
<th>T5</th>
<th>T6</th>
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</thead>
<tbody>
<tr>
<td>Overall</td>
<td>29.2</td>
<td>77.1</td>
<td>81.2</td>
<td>86.4</td>
<td>81.2</td>
<td>77.1</td>
</tr>
<tr>
<td>Phases 3-6</td>
<td>85.4</td>
<td>83.3</td>
<td>77.1</td>
<td>72.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phases 7-10</td>
<td>77.1</td>
<td>89.6</td>
<td>85.4</td>
<td>81.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Results

• Do $\varepsilon_1$ and $\varepsilon_2$ have the same impact on deterrence?

Between-subject design emphasize the difference between $\varepsilon_1$ and $\varepsilon_2$
Results

• In study 1, the difference between crime rates in presence of either $\varepsilon_1 (T3,T6)$ or $\varepsilon_2 (T2, T5)$ 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 $\varepsilon_1$ and $\varepsilon_2$ impact deterrence asymmetrically.
Common objections

• No external validity of probabilities
• Monetary incentives are not appropriate
• Wording and framing is key
• Subject pool is limited
Common Objections

• The experiment has no "external validity"

• Experiments take place in the real world 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

Theory → Predictions → Experimental results → Policy prescriptions
Common Objections: External Validity

- Theory
- Predictions
- Experimental results
- Model
- Policy prescriptions
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 with 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?

- Take: 29.2% (70.8%)
- Don't take: 22.2% (77.8%)

Monday, May 23, 2011
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 likely 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.