Experimental economics

Lecture 2: Economic experiments

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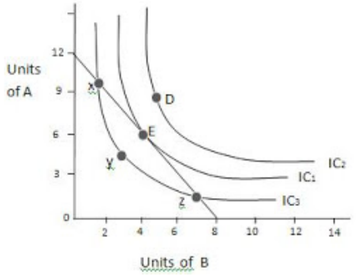
References:

- Weimann, J., & Brosig-Koch, J. (2019). Methods in experimental economics. Springer International Publishing. Chicago
- Jacquemet, N., & l'Haridon, O. (2018). Experimental economics. Cambridge University Press.

Decision-making categories

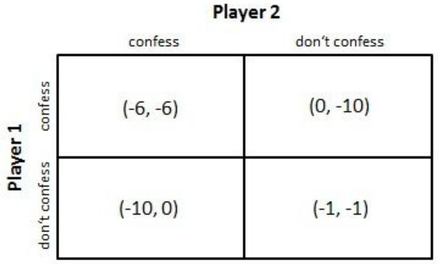
Individual decisions

>> preferences
>> incentives



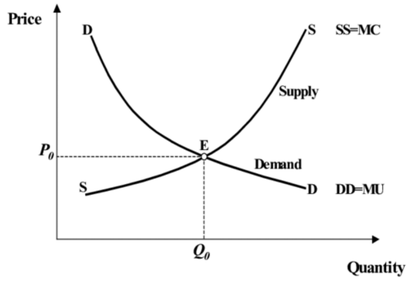
Strategic interactions

+ social norms



Market interactions

+ market rules



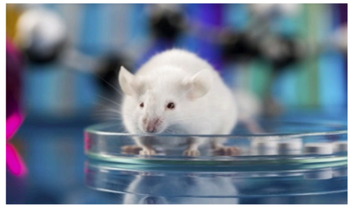
Lab? Field? Natural?

- Experiments can be done in the laboratory or in the field. These may be experimental setups designed by scientists (in the laboratory or the field); they may also be experimental designs that arise naturally..

Experimental Research

→ Medicine

- Lab research

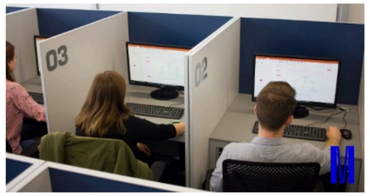


- Clinical Trials

- Confirmatory Studies

→ Economics / Behavioral Science

- Lab Experiments



- Field Experiments

- “Natural” Experiment

CONTROL EXTERNAL VALIDITY

Laboratory experiments

- Volunteers are recruited, they come to the laboratory and are randomly assigned to roles within the experiment.

- They read the instructions and learn about how the environment works, usually they also need to pass control questions to assure common understanding.

- Interactions are strictly anonymous. Participants are more likely to behave fairly, altruistically, or generously when there might be a way for the experimenter to observe their behavior.

- We never lie. Not deciving subjects is an essential factor that increases the credibility of the research and the experimentalist. The discipline made a choice, and it is strictly forbidden to deceive subjects and lie to them.

- Participants are paid in cash according to their decisions.

Why not just use survey?

- Say you want to study altruism… how about to use a survey?
- But… do respondents tell truth? How can we know that they are not lying?
- Economists are sceptical when it comes to data from surveys.
- They rather look on what people do than what people say.

What do you need to know in order to collect useful data?

- Elicitation procedures = mechanisms that force agents to reveal something about themselves, such as risk or intertemporal preferences, or beliefs about what others will do.

- Experimental games = games structured with specific theoretical properties that are widely used and studied in experimental economics. These key games include the prisoners' dilemma, the trust game, the stag hunt game, the dictator game, the guessing game, the ultimatum bargaining game, the voluntary-contribution mechanism, the minimum effort game and many others.

- Psychological questionnaires can be used to gather data on how people think through their decisions and how they consider different situations. Psychometric questionnaires include, for instance, measures of cognitive and non-cognitive skills, personality traits or emotions.

Experimental design

- Experimental design = Method of research in the social sciences in which a controlled experimental factor is subjected to special treatment for purposes of comparison with a factor kept constant (treatment vs. control)

- Treatment - a particular condition of the experiment. A treatment is a completely specified set of procedures, which includes instructions, incentives and rules of play.

- Within vs. Between subject design

  - Within: 1 subject : N treatments

    - uses the same subjects for different treatments, but randomize the ordering of treatments across different experimental sessions

  - Between: 1 subject : 1 treatment

    - use of different subjects for different treatments, where subjects are randomly assigned to different treatments. With sufficiently many subjects (based on law of large numbers) one can obtain a relatively precise measure of treatment effect.

- Pre – Post treatment (field-natural exp.)

Treatment effects

- Treatment ⟹ Outcome
  - exogenously controlled set of procedures, instructions, incentives, rules and parameter values ⟹ endogenous variable capturing some aspect of subject behavior
- Change in treatment ⟹ Change in outcome
- Change in outcome is called Treatment Effect
- Between treatments, an experimenter only changes variables which are directly relevant to a hypothesis being tested, holding other variables constant.

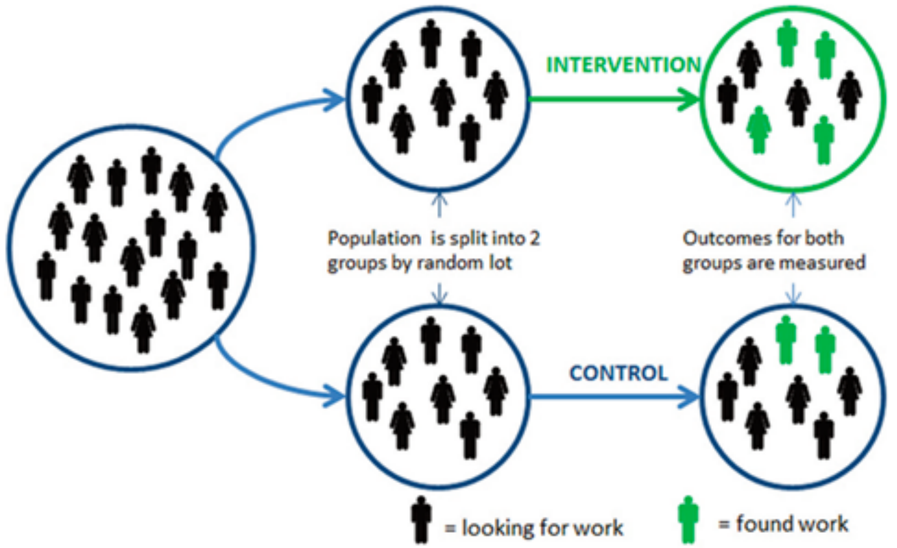


Figure 1. The basic design of a randomised controlled trial (RCT), illustrated with a test of a new 'back to work' programme.

Causality

- In an ideal situation, treatment effects are identied by systematically varying the relevant treatment, each time observing and recording the corresponding outcome, holding all other relevant factors/variables constant (ceteris paribus).

- Control + Change in treatment $\Longrightarrow$ Causality

- That way any observed change in the outcome can be attributed to corresponding changes in the treatment, and hence causality can be established.

- Most important rule of experimental design is: change only the treatment, holding all other potentially relevant factors constant. What needs to be kept constant?

  - 1. Other features of experimental design and implementation (including the physical location of the experiment for dierent treatments)

  - 2. Experimenter and his/her attitude

  - 3. Subjects and their mindset

Precepts of experimental economics

- As researchers we can control the environment and the institutions and then observe behavior. The key idea of the theory is that the proper use of a reward will allow the research to induce specific characteristics in the subject, that he or she impersonates them and that his or her personal characteristics become irrelevant.

- Subjects perceive incentives according to experimenter not own preferences. Participants understand the connection between their decision making and payoffs. Incentives are significant enough to be taken in mind.

- Principles for rewards

  - Non-Satiation = agents strictly prefer any increase in reward medium

  - Saliency = rewards are increasing in the good and decreasing in the bad outcomes of the experiment

  - Dominance = rewards dominate any subjective costs associated with participation in the experiment

  - Privacy = each subject in an experiment receives information only about own payoffs

  - Parallelism = behavior is the same in and out of the lab as long as the ceteris paribus assumptions hold

External validity

- Internal validity deals with whether an experiment does in fact test the model or theory it is supposed to test. External validity concerns the question of whether what is observed in the laboratory can be translated to the real world outside the laboratory.

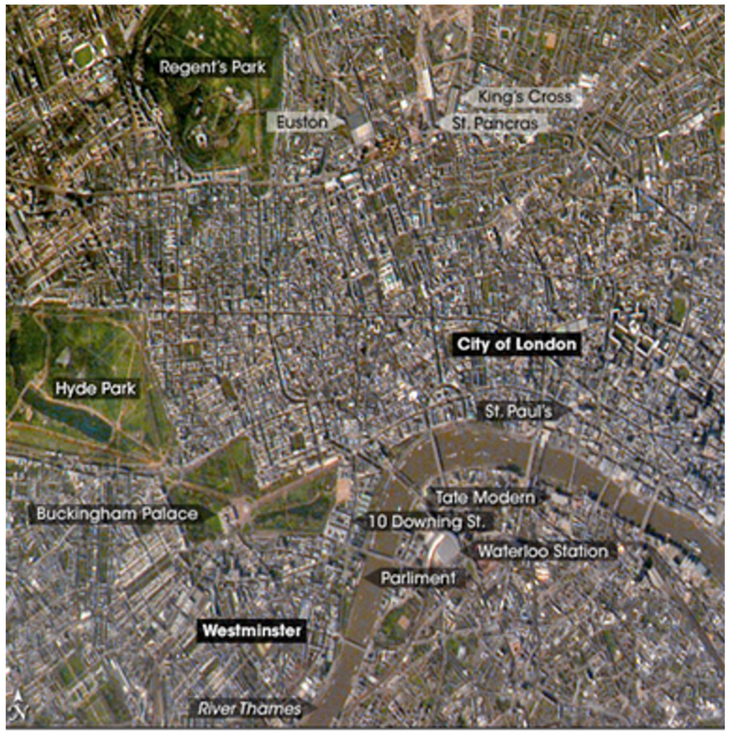
- The empirical testing of theories really only makes sense if the aim of the research is ultimately to explain real-world phenomena. This means, however, that issues of internal and external validity always occur together. Successful research requires that the experiment does in fact test the theory it wants to test, and that this results in observations that contribute to a better understanding of real phenomena.

- Economic theory is very careful to derive as general statements as possible. Specific assumptions concerning utility functions or production functions are therefore only made if statements that are even more general are not possible without them. This goal of modeling is very useful in its own right. It does also mean, however, that almost all economic models function without any context. They are not limited to particular conditions that have to be fulfilled in the “setting” of the phenomenon being studied, since this setting is considered irrelevant. Experimenters take advantage of this. If the context does not play a role, then a theory can also be tested in the artificial environment of a laboratory, since it claims to be valid there too.

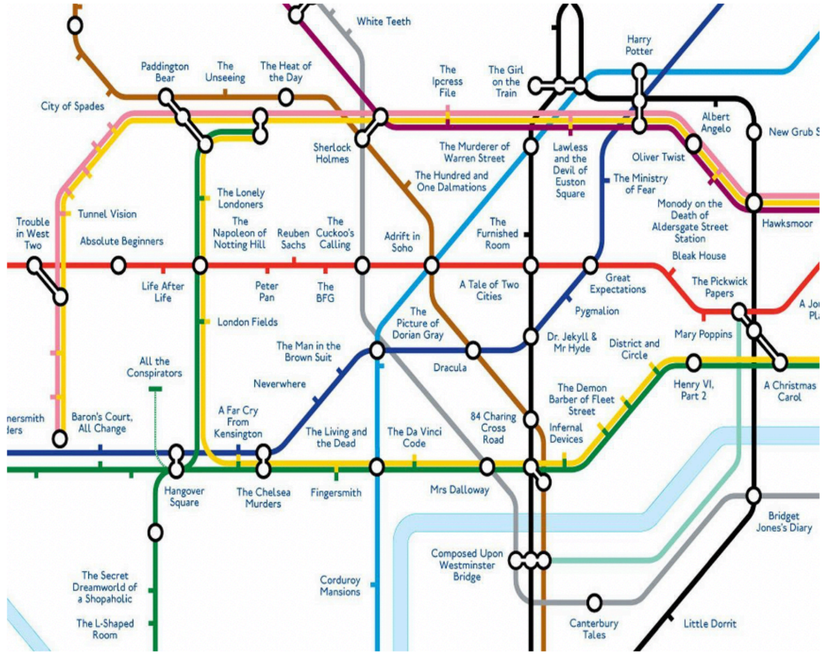
- Should a theory be refuted in the laboratory, however, then the theoreticians are certain to counter by pointing out that they constructed the model for a real economic context and not for the laborarory. This problem can be described using a very nice metaphor. Theories can be understood as maps that do not provide any details so as to highlight the generally valid abstract context. If you want to go from A to B, the context of the streets, the building development along the streets and the number of trees on the sides of the streets are all irrelevant as long as the streets you need are shown.

- The level of abstraction, i.e. the degree of generality of the model, depends on the context. Subway map is a nice example. Such maps are well known, showing only straight lines but neither streets nor public squares. They are extremely helpful if you want to know which line to take to get from A to B and where you have to change lines. But they are only useful to the subway rider; they are totally unsuitable for pedestrians. So, if an experimenter comes up with the idea of testing the subway map on a pedestrian, he will come to the conclusion that the map is no good. This test, however, neglects the context in which the map should be seen.

Real world



Experiment



External validity

- It certainly is valid to criticize experimenters that their observations come from an artificial environment and therefore cannot readily be extrapolated to the real world.

- For a time, experimental economists provided quite a clever reply to this criticism. They pointed out that decisions made by people in the laboratory are not artificial at all, but that they are most definitely real! That is indeed true. Subjects in economic experiments are faced with “real” decisions involving “real” money that they receive as a real payoff. They are not just pretending to make decisions in the laboratory; they really are making decisions.

- The fact that experiments in economics always operate with real incentives makes this effort particularly evident. This means that the subjects’ decisions have very real consequences for them – due to the more or less generous payoff they can pocket at the end of the experiment.

  - "*The trick is to notice that economies created in the laboratories might be very simple relative to those found in nature, but they are just as real. Real people motivated by real money make real decisions, real mistakes and suffer real frustrations and delights because of their real talents and real limitations.” — Charlie Plott*

Michael Kremer story

- In 2019, UChicago economist Michael Kremer (then at Harvard) was awarded the Nobel Prize alongside Abhijit Banerjee and Esther Duflo of MIT for their groundbreaking work using field experiments to help reduce poverty. In the 1990s and 2000s, Kremer conducted several randomized controlled trials in Kenyan schools testing potential interventions to improve student performance.

- In the 1990s, Kremer worked alongside an NGO to figure out if buying students new textbooks made a difference in academic performance. Half the schools got new textbooks; the other half didn't. The results were unexpected—textbooks had no impact.

- In the early 2000s, Kremer returned to Kenya to study a school-based deworming program. He and a colleague found that providing deworming pills to all students reduced absenteeism by more than 25%. After the study, the program was scaled nationwide by the Kenyan government. From there it was picked up by multiple Indian states—and then by the Indian national government.

Field experiments

- A field experiment is a research method that uses some controlled elements of traditional lab experiments, but takes place in natural, real-world settings. This type of experiment can help scientists explore questions like: Why do people vote the way they do? Why do schools fail? Why are certain peoples hired less often or paid less money?

- Field experiments bridge the highly controlled lab environment and the messy real world. Social scientists have taken inspiration from traditional medical or physical science lab experiments. In a typical drug trial, for instance, participants are randomly assigned into two groups. The control group gets the placebo—a pill that has no effect. The treatment group will receive the new pill. The scientist can then compare the outcomes for each group. The key to cleaning up the mess is randomization—or assigning participants randomly to either the control group or the treatment group.

- Field experiments, if well designed, directly tackle the pervasive counterfactual problem—by which we mean establishing what would have happened in the absence of the intervention (or treatment) under investigation. By creating correct counterfactuals, unobservable influences can be balanced, allowing the researcher to overcome confounding issues that have plagued other empirical approaches attempting to go beyond correlations to establish causality. Thus an important advantage of field experiments is their ability to provide the researcher with causal relationships in naturally occurring settings.

- Field experiments in economics are relatively new, yet they have become one of the fastest growing and ‘fashionable’ methodologies in economics and the social sciences in recent years. There are several reasons for this. One is the increasing emphasis among policy-makers on ‘evidence-based policy’: field experiments offer the prospect of determining what ‘works’, and what does not work.

- Field experiments have been used to address some important public and economic policy challenges. There are a number of areas in economics that have attempted to use field experiments., including education, environmental conservation, taxation, charitable giving, personal finance, and labour supply.

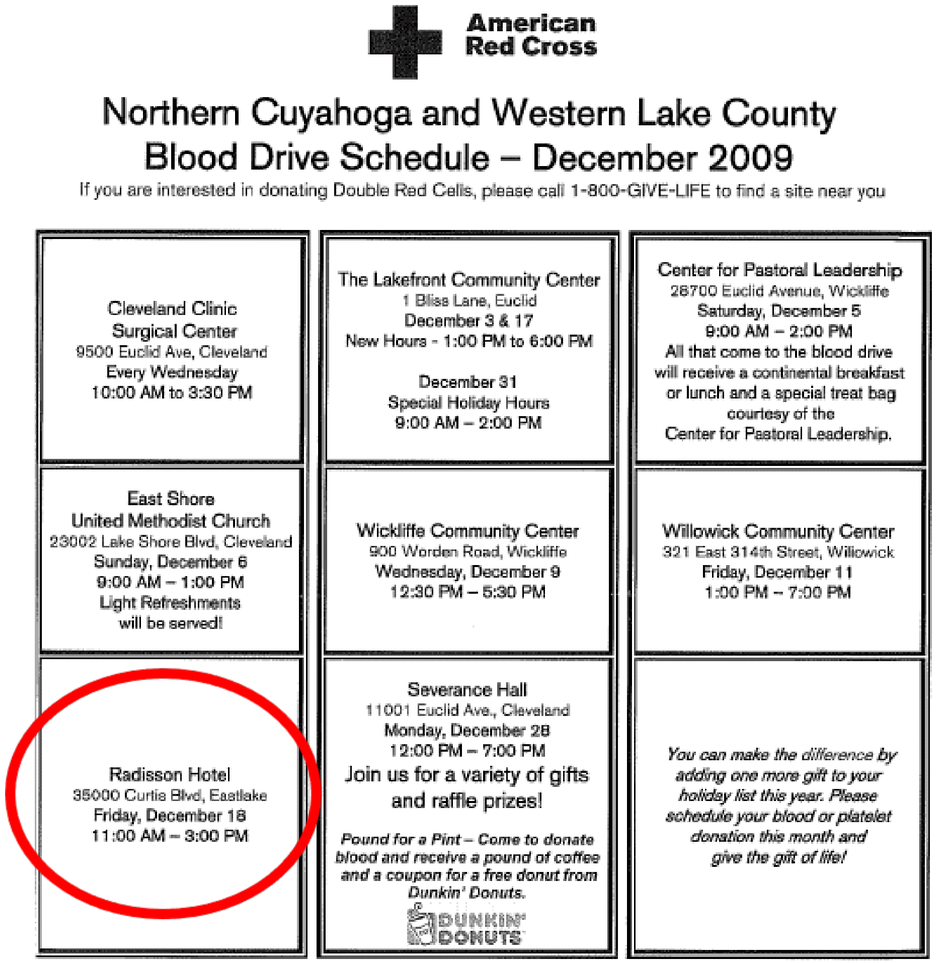
Advantages and disadvantages of field experiments

- Advantages
  - external validity
  - outcomes hard to measure otherwise (education outcomes, health outcomes…)
  - can use specific cohorts in society, can precisely measure time, and effect magnitudes
  - most direct policy relevance
- Disadvantages
  - limited external validity - What conclusions are actually externally valid? How is this actually different from a lab study?
  - hard to test theory, ensure robustness and replication, and design precise measure mechanisms

Case study: A Field Experiment with the American Red Cross: Example of Possible Contamination

- Lacetera, Macis, Slonim (Management Science, 2014)
- Research question: Can Rewards increase donations? Or do they “Crowd Out” Altruism-Intrinsic Motives?
- Extensive survey & lab studies (from the late 1960s to the present) tends to support “Crowding Out”
- Design: rewarding volunteers with $5, $10, and $15 gift cards for blood donation

Case study: A Field Experiment with the American Red Cross: Example of Possible Contamination

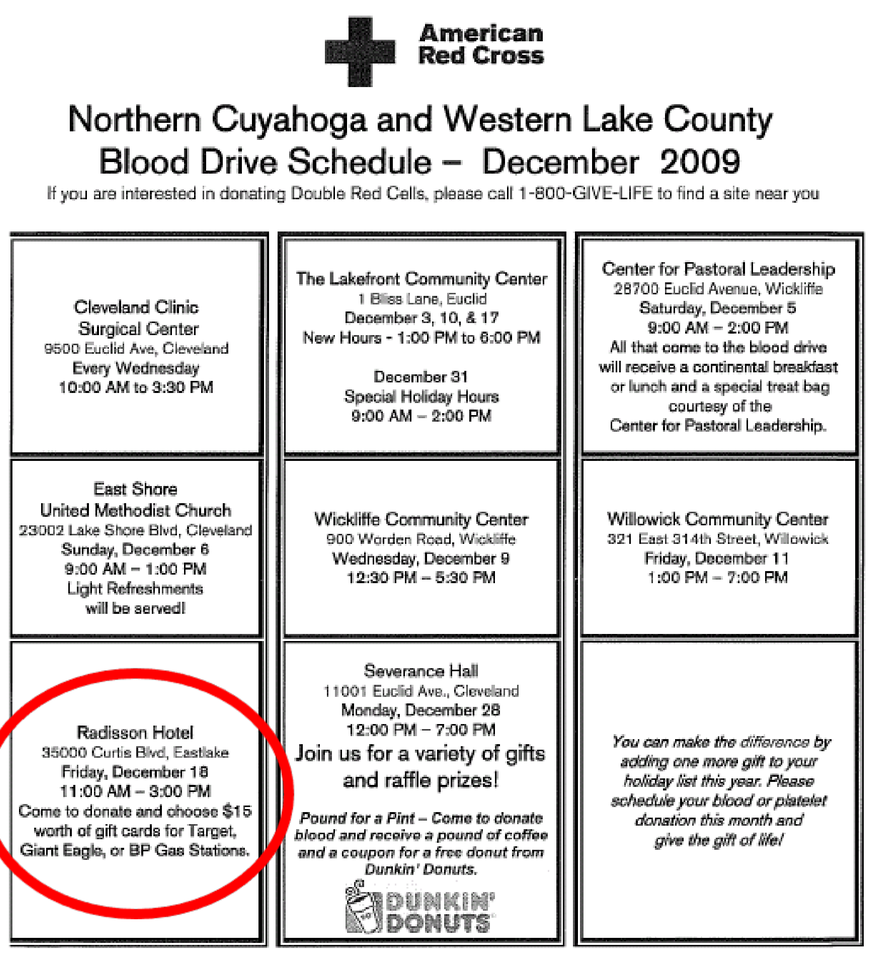


American Red Cross

Northern Cuyahoga and Western Lake County
Blood Drive Schedule – December 2009

If you are interested in donating Double Red Cells, please call 1-800-GIVE-LIFE to find a site near you

Cleveland Clinic Surgical Center 9500 Euclid Ave, Cleveland Every Wednesday 10:00 AM to 3:30 PM	The Lakefront Community Center 1 Bliss Lane, Euclid December 3 & 17 New Hours - 1:00 PM to 6:00 PM December 31 Special Holiday Hours 9:00 AM – 2:00 PM	Center for Pastoral Leadership 28700 Euclid Avenue, Wickliffe Saturday, December 5 9:00 AM – 2:00 PM All that come to the blood drive will receive a continental breakfast or lunch and a special treat bag courtesy of the Center for Pastoral Leadership.
East Shore United Methodist Church 23002 Lake Shore Blvd, Cleveland Sunday, December 6 9:00 AM – 1:00 PM Light Refreshments will be served!	Wickliffe Community Center 900 Worden Road, Wickliffe Wednesday, December 9 12:30 PM – 5:30 PM	Willowick Community Center 321 East 314th Street, Willowick Friday, December 11 1:00 PM – 7:00 PM
Radisson Hotel 35000 Curtis Blvd, Eastlake Friday, December 18 11:00 AM – 3:00 PM	Severance Hall 11001 Euclid Ave., Cleveland Monday, December 28 12:00 PM – 7:00 PM Join us for a variety of gifts and raffle prizes! *Pound for a Pint – Come to donate blood and receive a pound of coffee and a coupon for a free donut from Dunkin' Donuts.* DUNKIN' DONUTS	*You can make the difference by adding one more gift to your holiday list this year. Please schedule your blood or platelet donation this month and give the gift of life!*



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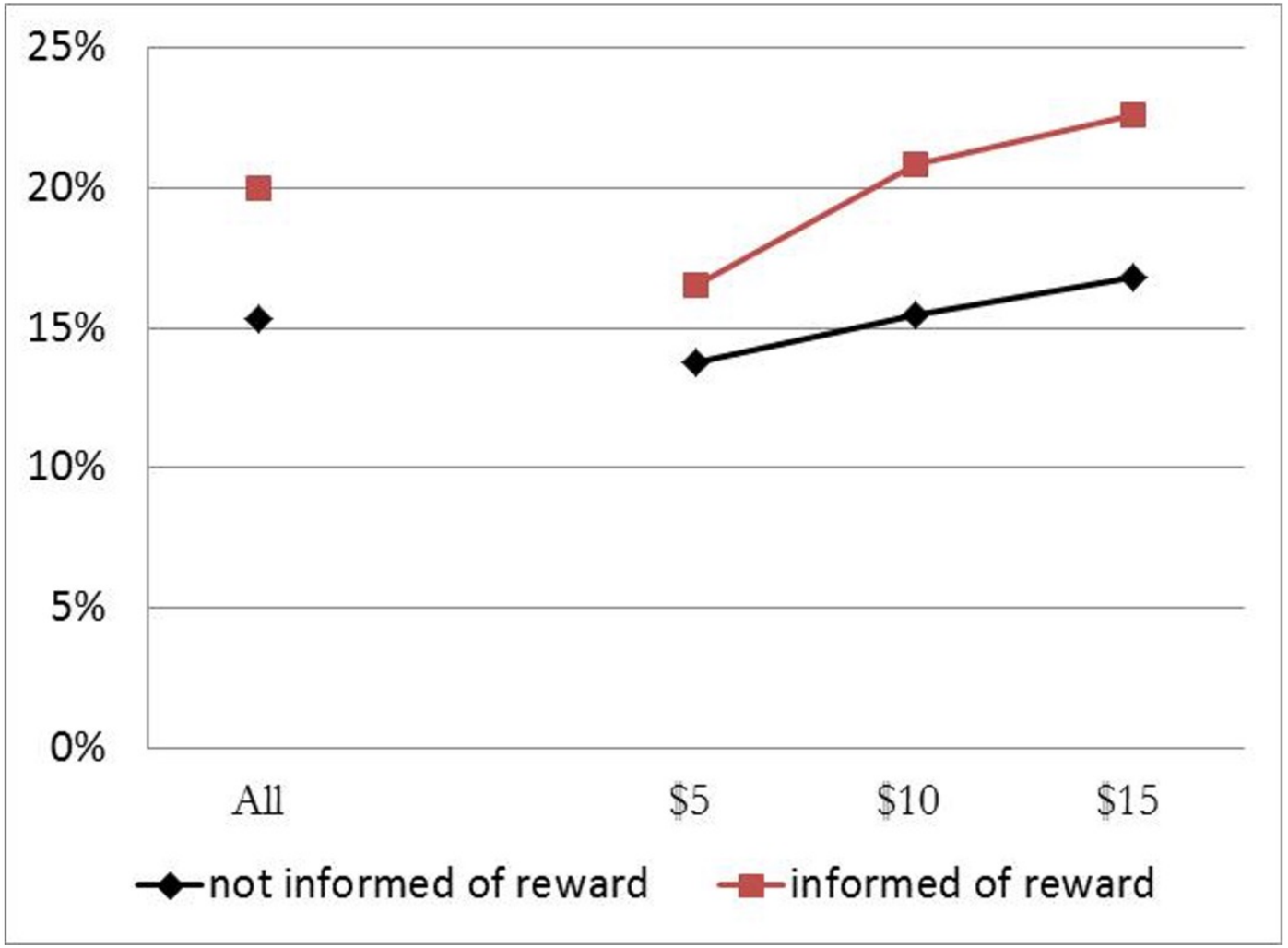


- Robustness: Lacetera, Macis and Slonim (Science, 2013)
- Over 19 rewards. 5 research teams, 4 countries
- Results
  - 18 rewards had positive, significant effect on donations; 1 had no effect
  - deferrals did not change significantly, though directionally decreased with rewards.

More case studies

- **Studying bias and discrimination:** A 2004 study published by UChicago economists Marianne Bertrand and Sendhil Mullainathan (then at MIT) examined racial discrimination in the labor market. They sent over 5,000 resumes to real job ads in Chicago and Boston. The resumes were exactly the same in all ways but one—the name at the top. Half the resumes bore white-sounding names like Emily Walsh or Greg Baker. The other half sported African American names like Lakisha Washington or Jamal Jones. The study found that applications with white-sounding names were 50% more likely to receive a callback.

- **Examining voting behavior:** Political scientist Harold Gosnell, PhD 1922, pioneered the use of field experiments to examine voting behavior while at UChicago in the 1920s and ‘30s. In his study “Getting out the vote,” Gosnell sorted 6,000 Chicagoans across 12 districts into groups. One group received voter registration info for the 1924 presidential election and the control group did not. Voter registration jumped substantially among those who received the informational notices. Not only did the study prove that get-out-the-vote mailings could have a substantial effect on voter turnout, but also that field experiments were an effective tool in political science.

- **Testing ways to reduce crime and shape public policy:** Researchers at UChicago’s Crime Lab use field experiments to gather data on crime as well as policies and programs meant to reduce it. For example, Crime Lab director and economist Jens Ludwig co-authored a 2015 study on the effectiveness of the school mentoring program Becoming a Man. Developed by the non-profit Youth Guidance, Becoming a Man focuses on guiding male students between 7th and 12th grade to help boost school engagement and reduce arrests. In two field experiments, the Crime Lab found that while students participated in the program, total arrests were reduced by 28–35%, violent-crime arrests went down by 45–50% and graduation rates increased by 12–19%.

- More interesting studies: https://academic.oup.com/oxrep/issue/30/4

But what if randomized trials are not available?

- For many questions of interest, randomized trials are unfortunately not available, because they can be enormously expensive, take a very long time to plan and execute, and often raise difficult ethical issues (e.g new medical procedures). Moreover, even the gold standard of randomized trials has some potential problems. First, the results are only valid for the sample of individuals who volunteer to be either treatments or controls, and this sample may be different from the population at large. For example, those in a randomized trial sample may be less averse to risk or they may be more desperately ill. Thus, the answer we obtain from a randomized trial, while correct for this sample, may not be valid for the average person in the population.

- A second problem with randomized trials is that of attrition: individuals may leave the experiment before it is complete. This is not a problem if individuals leave randomly, since the sample will remain random. Suppose, however, that the experiment has positive effects on half the treatment group and negative effects on the other half, and that as a result the half with negative effects leaves the experiment before it is done. If we focus only on the remaining half, we would wrongly conclude that the treatment has overall positive impacts.

- attrition: reduction in the size of samples over time, which, if not random, can lead to biased estimates.

- If data from randomized trials are not available, we need to work with observational data = data generated by individual behavior observed in the real world, not in the context of deliberately designed experiments. For example, instead of information on a randomized trial of a new medicine, we may simply have data on who took the medicine and what their outcomes were.

- There are several well-developed methods that can be used by analysts to address the problem of bias with observational data, and these tools can often closely approximate the gold standard of randomized trials. In other words, we can use observational data to estimate causal effects instead of just correlations. The major concern is how to overcome any potential bias so that we can measure the causal relationship (if there is one).

Quasi-Experiments

- If randomized control trial is not an option, there may still be a middle-ground between RCT and correlational analyses (e.g., OLS regressions with control variables): the quasi-experiment

- the quasi-experiment is a situation that arises naturally when changes in the economic environment (such as a policy change) create nearly identical treatment and control groups that can be used to study the effect of that policy change. In a quasi-experiment, outside forces (such as those instituting the policy change) do the randomization for us.

- With quasi-experimental studies, unlike true experiments, we can never be completely certain that we have purged all bias from the treatment–control comparison. Quasi-experimental studies use two approaches to try to make the argument that they have obtained a causal estimate. The first is intuitive: trying to argue that, given the treatment and control groups, it seems very likely that bias has been removed. The second is statistical: to continue to use alternative or additional control groups to confirm that the bias has been removed.

Quasi-Experiments

- Difference-in-difference estimator: The technique that tries to combine time series and cross-sectional analyses to address the problems with each. By comparing the change in population A to the change in population B, the estimator controls for other time series factors that bias the time series analysis within population A. Likewise, by comparing the change within each population, rather than just comparing the two populations at a point in time, the estimator controls for omitted factors that bias cross-sectional analysis across the two populations.
- Searching for a change in variable X
  - 2 periods (Y, Z)
  - 2 populations (A,B)
  - In period Y, the policy is the same for A and B
  - In period Z, there is new policy for A, while the policy for B is not changed
- x (population A, year Y) - x (population A, year Z) = Treatment effect + Bias
- x (population B, year Y) - x (population B, year Z) = Bias
- Difference = Treatment effect

■ TABLE 3-1

Using Quasi-Experimental Variation

Arkansas			
	1996	1998	Difference
Benefit guarantee	$5,000	$4,000	–$1,000
Hours of work per year	1,000	1,200	200
Louisiana			
	1996	1998	Difference
Benefit guarantee	$5,000	$5,000	$0
Hours of work per year	1,050	1,100	50

In Arkansas, there is a cut in the TANF guarantee between 1996 and 1998 and a corresponding rise in labor supply, so if everything is the same for single mothers in both years, this is a causal effect. If everything is not the same, we can perhaps use the experience of a neighboring state that did not decrease its benefits, Louisiana, to capture any bias to the estimates.

Case study: Reducing Costs
Craig, Garbarino, Heger, Slonim 2020 Management Science, Australian Red Cross Blood Service Data

- Surveys find people are less satisfied and less likely to return after longer wait times (in many contexts)

- But quite surprising, at the time of this study, not a single study had looked at whether wait times actually affect return behaviour

- Survey of blood donors (where they measured the wait time of 1,500 donors at 4 donations centres) indicates, consistent with literature, that the longer they wait:

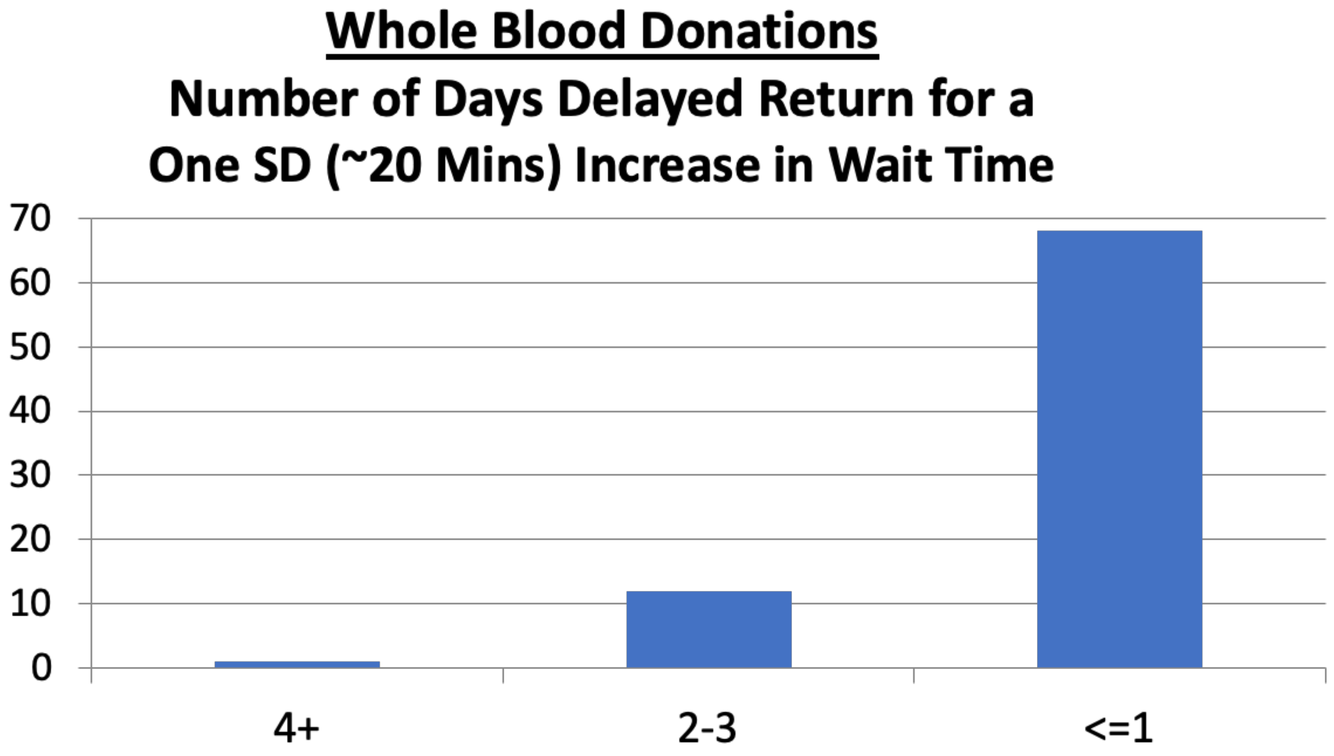
  - the less satisfaction they had with the experience

  - the less intention they state that they will donate again

- 1. But does waiting longer affect actual donor re-patronage?

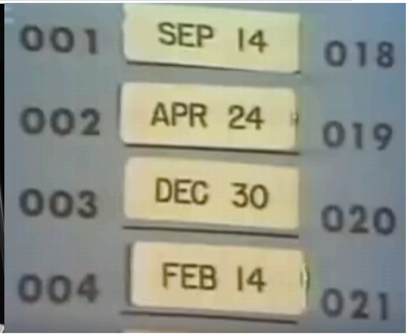
- 2. And if so, why? Dis-satisfaction or higher expected future (time) costs?

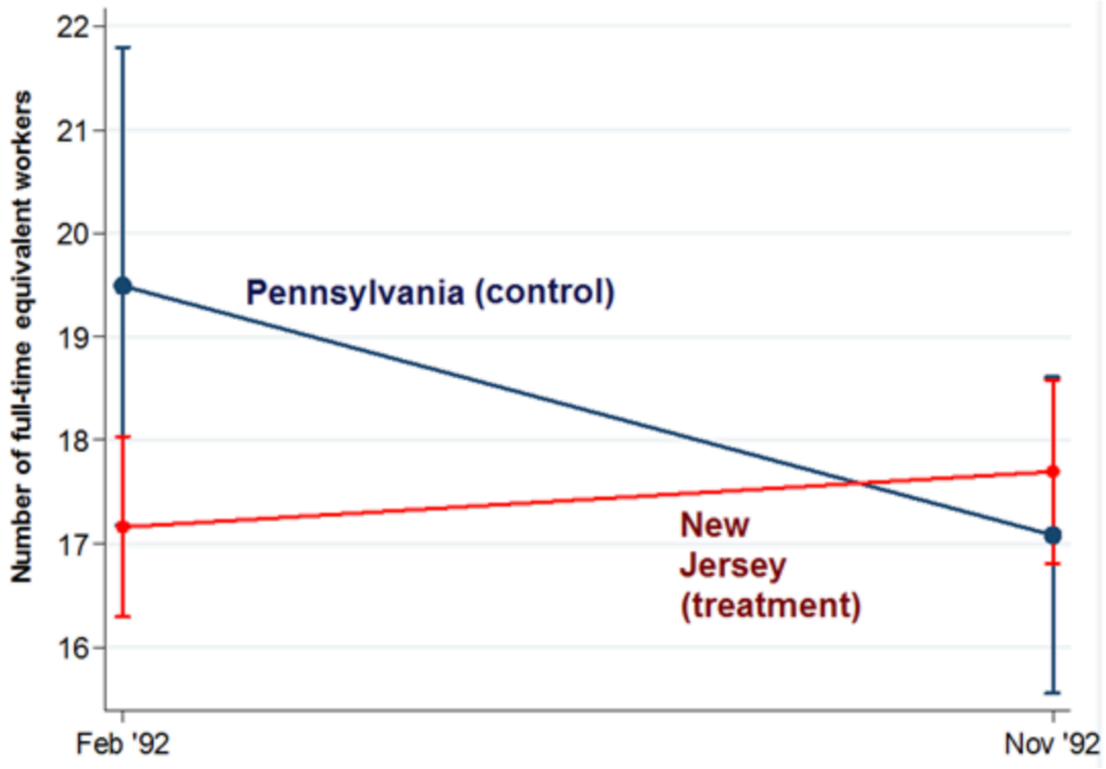
Case study: Reducing Costs
Craig, Garbarino, Heger, Slonim 2020 Management Science, Australian Red Cross Blood Service Data

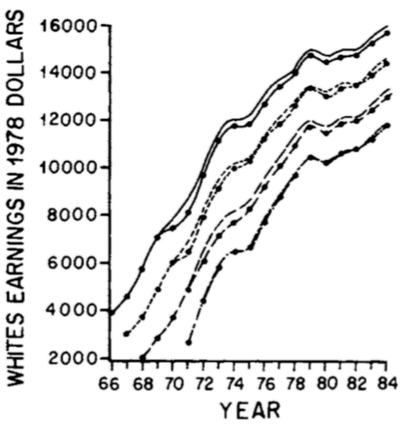


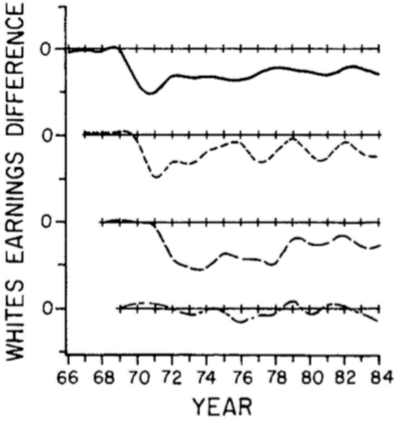
- Implies about 78,000 fewer donations per year (about 7% of annual donations for a 1 SD increase in wait times)
- The Effect was NOT caused by attitudes (e.g., the “hot” emotional state)
- The effect was entirely driven by the actual wait time (e.g., the “cold” state evaluation/expectations)
- Australian Red Cross mean wait time has fallen from ~42 to ~28 mins since data collection

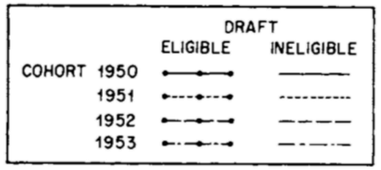
Quasi-Experiments
- Does rise in NJ minimum wage negatively affect employment?
- Draft to Vietnam war by lottery

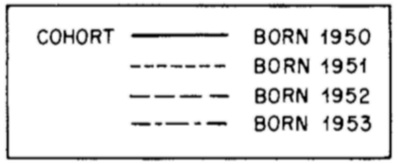






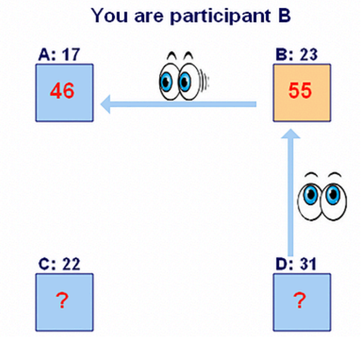






case #1: Peer-Effects

- ***Do we exert more effort when our colleagues are highly productive?***



Lab:

Van Veldhuizen, R., Oosterbeek, H., & Sonnemans, J. (2018).
"Peers at work: Evidence from the lab". *PloS one*, *13*(2), e0192038.

Task: solving problems
Treatments: different peer-monitoring settings

→**result:** positive effect of peer-effect on performance
→**positive aspect:** full control over context variables
→**limitation:** very (!) unnatural setting - limited external validity –

Field:

Falk, A., & Ichino, A. (2006). “Clean evidence on peer effects”. *Journal of Labor Economics,*24(1), 39-57.

Task: filling envelops
Treatments: different peer-monitoring settings

Treatments: Individual / Multiple / Peer

→**result:** positive effect of peer-effect
→**positive aspect:** easy and clean / small
→**limitation:** no employment “relationship”

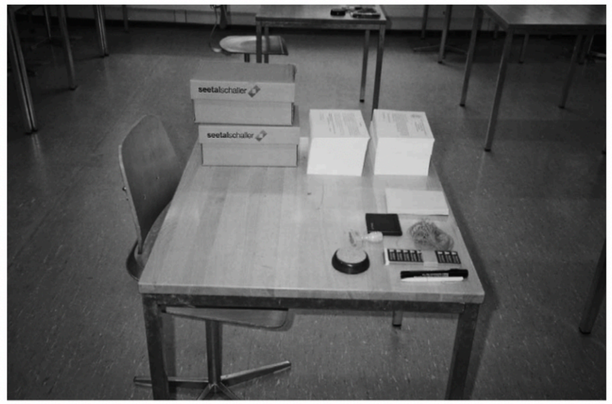


FIG. 1.—One of the desks used for the experiments

“Natural”:

Mas, A., & Moretti, E. (2009). “Peers at work”. *American Economic Review*, 99(1), 112-45.

Treatments: “pseudo” treatments

→**result:** positive effect of peer-effect
→**positive aspect:** long micro-panel dataset
→**limitation:** strong statistical assumptions
mix of advanced methods
demanding data scouting