

Causal Inference in the Social Sciences: Some Recent Trends

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The Opportunity

- A rapid growth in randomized experiments
- Explosion of data sources: administrative, electronic medical records, online behavior
- Population data is becoming more common and precise
- How can it be used?
- Policy makers/firms:
“let’s just use the new data to evaluate programs”
- Tension between identifying causal effects vs. prediction

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CEO: [Alan Mulally](#)

Headquarters: Dearborn, Michigan

Founder: [Henry Ford](#)

Founded: June 16, 1903

Awards: Car and Driver's "Most Reliable" (2011-2012)

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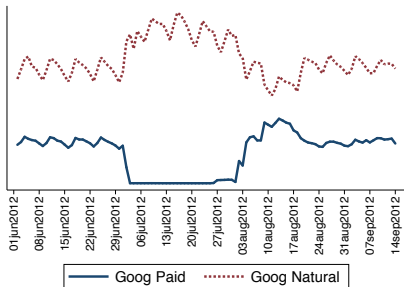
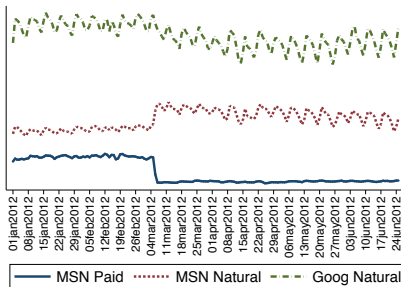
Founder: [Pierre Omidyar](#)

Founded: September 1995

Headquarters: San Jose, California

CEO: [John Donahoe](#)

A Modest Experiment



From: Blake, Nosko, and Tadelis (2013)

Randomized Field Experiments

- Randomized Control Trials (RCTs) or field experiments are becoming more common in the social science
- Recovering from the dominance of statistical models in the post-war era
- First use of regression for causal inference in social sciences goes back to Yule's 1899 study of pauperism
- RCTs have a surprisingly long history in political science going back to Gosnell's 1924 Get-Out-the-Vote experiments

Neighbors mailing

3 0 4 2 3 - 3



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Dear Registered Voter:

WHAT IF YOUR NEIGHBORS KNEW WHETHER YOU VOTED?

Why do so many people fail to vote? We've been talking about the problem for years, but it only seems to get worse. This year, we're taking a new approach. We're sending this mailing to you and your neighbors to publicize who does and does not vote.

The chart shows the names of some of your neighbors, showing which have voted in the past. After the August 8 election, we intend to mail an updated chart. You and your neighbors will all know who voted and who did not.

DO YOUR CIVIC DUTY — VOTE!

MAPLE DR
9995 JOSEPH JAMES SMITH
9995 JENNIFER KAY SMITH

Aug 04
Voted

Nov 04
Voted
Voted

Aug 06

Selection

- Large effects versus small ones: Salk Vaccine trials versus Sabine vaccine. Live virus versus killed virus.
- Human being self-select to a large extent. Most large correlations are self-selection. This isn't physics.
- Dartmouth Health Atlas versus Doyle (2013): visitors to Florida who experienced a health shock.
- Mayo is cheaper than UCLA, but....

A Thought Experiment

You are probably not estimating a causal effect if you can't answer Dorn's (1953) Question: "what experiment would you have run if you were dictator and had infinite resources?"

e.g.: Can we estimate the causal effect of race on SAT scores?

e.g.: Effect of obesity on mortality and morbidity

e.g.: marriage and crime

e.g.: democracy and war

Manipulation and Reductionism

- A good Mantra: “No causation without manipulation”
- Dispense with the common Dogma of reductionism
- Classic Example:
 - **Incoherent:** “What is the causal effect of being white on income/grades/happiness?”
 - But this does not imply that race does not play a role in generating these outcomes
- Reductionism, each scientific concept has:
 - its own separate estimate
 - its own separate empirical content

Keep the Mantra; Drop the Dogma

- The central issue is key parts of a scientific theory may not touch data in the way reductionism suggests.
- The Mantra should be kept: we need to be clear about what we are estimating.
- But our theories can have quantities that are not manipulatable, even in theory.
- We make progress the way science always has: finding cases where the theories make different predictions, falsification, triangulate, etc.

Reductionism

- **Extreme Reductionism:** every scientific sentence has a full translation in sense-datum
- **Moderate Reductionism:** each scientific sentence has its own separate empirical content
- **Moderate Holism:** a scientific sentence need not imply empirical consequences by itself. A bigger cluster is usually needed.
- Classic Example: Copernican vs. Ptolemaic system. Better example: **Āryabhaṭa** (500CE)—diurnal motion of the earth, elliptic orbits calculated relative to the sun, correct explanation of lunar and solar eclipses, but still geocentric.

Mobilizing Religious Identities

Can Hindus and Muslims be mobilized by direct appeals to their identities? Does it vary by political context?

- Do co-religious leaders evoke greater confidence?
 - Outside of temples/mosques
 - Random surveys
- Do mosques play a different role than temples?
 - Outside of temples/mosques
- Can religious symbols politically mobilize supporters?
 - Get-Out-The-Vote mobilization experiments

Observational Data: Mosques and Temples

| | Attended Religious Activities | | | |
|------------------------------|-------------------------------|--------|--------------|-------|
| | Daily | Weekly | On Festivals | Never |
| Attended Election Meetings % | | | | |
| Muslims | 25.9 | 25.6 | 20.6 | 8.4 |
| Hindus | 20.0 | 20.4 | 19.7 | 15.8 |
| Attended Election Rallies % | | | | |
| Muslims | 18.6 | 17.0 | 13.7 | 5.2 |
| Hindus | 14.0 | 12.9 | 14.1 | 12.4 |
| Campaigning % | | | | |
| Muslims | 14.7 | 15.1 | 11.5 | 6.1 |
| Hindus | 13.6 | 11.9 | 12.3 | 11.9 |
| Validated Vote Turnout % | | | | |
| Muslims | 69.3 | 73.2 | 70.4 | 67.7 |
| Hindus | 73.3 | 75.7 | 75.9 | 72.1 |

Simple Experiment, India

At a recent meeting celebrating India's democracy this leading politician (show photo) said:

“Politicians like me from different political parties try hard to represent the interests of the people who support us and vote for us.”

Do you have confidence [*Vishwas*] in what this person is saying? [yes,no,dk]

Example Photos: Tamil Nadu



Get-Out-the-Vote (GOTV) Experiments

For Hindus, GOTV results vary by electoral interests:

- Hindus **can be** mobilized using religious symbols, but only in states where it is in their electoral interest

Muslims **can be** mobilized using religious symbols, even where they do not have an electoral interest to highlight their identity:

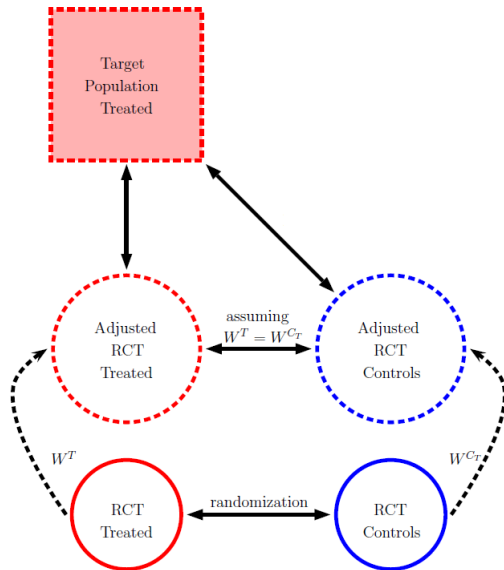
- Tamil Nadu: communal divisions are not politicized
 - Muslims: **are** mobilized by direct appeals
 - Hindus: **are not** mobilized by direct appeals
- Karnataka: communal divisions are beginning to be politicized
 - Muslims: **are** mobilized by direct appeals
 - Hindus: **are** mobilized by direct appeals
- Uttar Pradesh: communal divisions are highly politicized
 - Hindus and Muslims are both mobilized

Conclusion

- People keep trying to try to come up with a unified language for causality
- Incentives are wrong: creators of methods and applied users who don't think clearly make natural allies
- Very pragmatic: validation and testing

The Problem

- Most Randomized Controlled Trials (RCTs) are small, especially a problem with medical experiments
- RCTs are usually not conducted on the population
- We can now combine information from both RCTs and population data to estimate treatment effects in the population
- Goal: precision medicine, precise targeting of treatments



Pulmonary Artery Catheterization (PAC)

- PAC is an invasive cardiac monitoring device for critical ill patients (ICU)—e.g., myocardial infarction (ischaemic heart disease)
- Widely used for the past 30 years: spend \$2 billion in U.S. per year

Population Treatment Effects on Cost-Effectiveness

