University of Oxford
Research Methods in Politics: Lecture Three

Raymond M. Duch

Nuffield College Oxford
www.raymondduch.com
raymond.duch@nuffield.oc.ac.uk
@RayDuch

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Today's Lecture: Overview

- Causality

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- The True Experiment: Randomised Assignment to Treatment and Control

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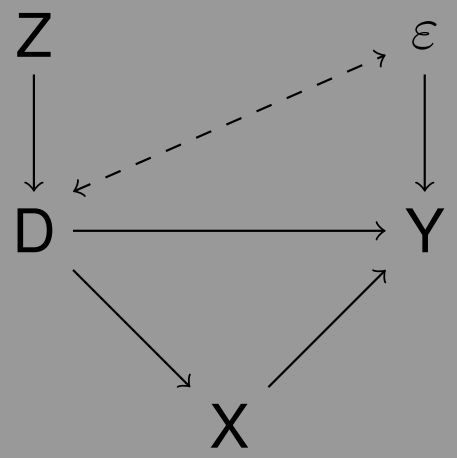
- Example: Social Pressure and Voter Turnout
- Example: Duch on Responsibility Attribution (if time)

Causal Inference

Hypothesis: "If D, then Y"
E.g., the higher a person's education, the higher is this person's income.



How can we isolate the effect of D on Y?
$\rightarrow$ Methodical "arsenal" to approach counterfactual ideal

The Counterfactual Model

$$\delta_i = Y_i^y - Y_i^c$$

Y^t: potential outcome in treatment (e.g., income with degree)
Y^c: potential outcome in control (e.g., income without degree)
δ: treatment effect

Assuming $\bar{Y}^t_{i \in T} = \bar{Y}^t_{i \in C}$ and $\bar{Y}^c_{i \in T} = \bar{Y}^c_{i \in C}$

Average treatment effect can be calculated

$$\bar{\delta} = \bar{Y}^t_{i \in T} - \bar{Y}^c_{i \in C} \text{ where } T \not\subseteq C$$

(Problem: Above assumptions are mostly violated in observational studies.)

Average Treatment Effect is Biased if (1)

$\bar{Y}^t_{i\in T} = \bar{Y}^t_{i\in C}$ and $\bar{Y}^c_{i\in T} \neq \bar{Y}^c_{i\in C}$

$$\begin{aligned} \bar{\delta} &= \bar{Y}^t_{i\in T} - [\pi \bar{Y}^c_{i\in T} - (1-\pi)\bar{Y}^c_{i\in C}] \\ &= \bar{Y}^t_{i\in T} - \bar{Y}^c_{i\in C} - \pi(\bar{Y}^c_{i\in T} - \bar{Y}^t_{c\in C}) \\ \bar{Y}^t_{i\in T} - \bar{Y}^c_{i\in C} &= \bar{\delta} + (\pi)(\bar{Y}^c_{i\in T} - \bar{Y}^c_{i\in C}) \end{aligned}$$

(π = proportion in treatment)
Outcome difference = Average treatment effect of the control (ATC)

$$\bar{Y}^t_{i\in T} - \bar{Y}^c_{i\in C} = \bar{Y}^t_{i\in C} - \bar{Y}^c_{i\in C} = \bar{\delta}_{i\in C}$$

E.g., attendees of private school would score higher in a GAT had they attended a public school than attendees of a public school, e.g., because of family background

Average Treatment Effect is Biased if (2)

$\bar{Y}^t_{i\in T} \neq \bar{Y}^t_{i\in C}$ and $\bar{Y}^c_{i\in T} = \bar{Y}^c_{i\in C}$

$$\begin{aligned}\bar{\delta} &= [\pi\bar{Y}^t_{i\in T} - (1-\pi)\bar{Y}^t_{i\in C}] - \bar{Y}^c_{i\in C} \\ &= \bar{Y}^t_{i\in T} - \bar{Y}^c_{i\in C} - (1-\pi)(\bar{Y}^t_{i\in T} - \bar{Y}^t_{i\in C}) \\ \bar{Y}^t_{i\in T} - \bar{Y}^c_{i\in C} &= \bar{\delta} + (1-\pi)(\bar{Y}^t_{i\in T} - \bar{Y}^t_{i\in C})\end{aligned}$$

(π = proportion in treatment)
Outcome difference = Average treatment effect of the treated (ATT)

$$\bar{Y}^t_{i\in T} - \bar{Y}^c_{i\in C} = \bar{Y}^t_{i\in T} - \bar{Y}^t_{i\in C} = \bar{\delta}_{i\in T}$$

(E.g., attendees of public school would score lower in GAT had they attended a private school than attendees of a private school, e.g., because of family background.)

Average Treatment Effect is Biased if (3)

$\bar{Y}^t_{i\in T} \neq \bar{Y}^t_{i\in C}$ and $\bar{Y}^c_{i\in T} \neq \bar{Y}^c_{i\in C}$

$$\begin{aligned}\bar{\delta} &= [\pi\bar{Y}^t_{i\in T} - (1-\pi)\bar{Y}^t_{i\in C}] - [\pi\bar{Y}^c_{i\in T} - (1-\pi)\bar{Y}^c_{i\in C}] \\ &= \bar{Y}^t_{i\in T} - \bar{Y}^c_{i\in C} - (\bar{Y}^c_{i\in T} - \bar{Y}^c_{c\in C}) - (1-\pi)(\bar{\delta}_{i\in T} - \bar{\delta}_{i\in C}) \\ \bar{Y}^t_{i\in T} - \bar{Y}^c_{i\in C} &= \bar{\delta} + (\bar{Y}^c_{i\in T} - \bar{Y}^c_{i\in C}) + (1-\pi)(\bar{\delta}_{i\in T} - \bar{\delta}_{i\in C})\end{aligned}$$

(π = proportion in treatment)

$$\bar{Y}^t_{i\in T} - \bar{Y}^c_{i\in C} =$$
$$\bar{\delta} + \pi(\bar{Y}^c_{i\in T} - \bar{Y}^c_{i\in C}) + (1-\pi)(\bar{Y}^t_{i\in T} - \bar{Y}^t_{i\in C}) + 2(1-\pi)\bar{\delta}_{i\in C}$$

(Most likely, family background determines both potential outcomes in the control (public school) and the treatment state (private school). Open question: Does it pay to send one's kids to a private school?)

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- What are confounding variables?
- What is the counterfactual?

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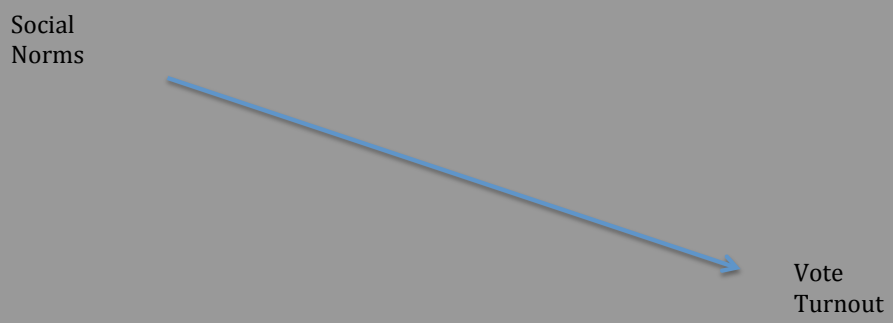

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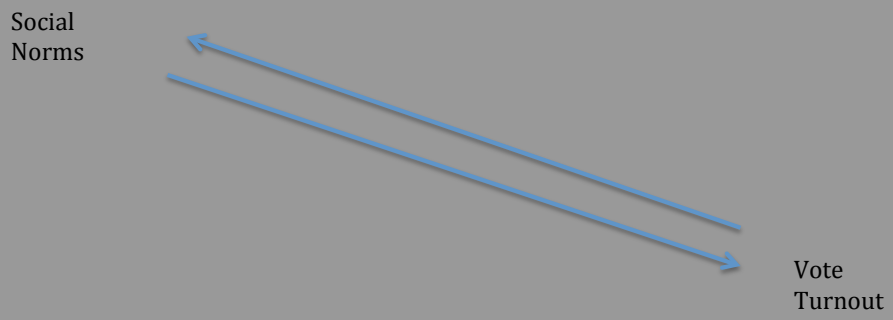

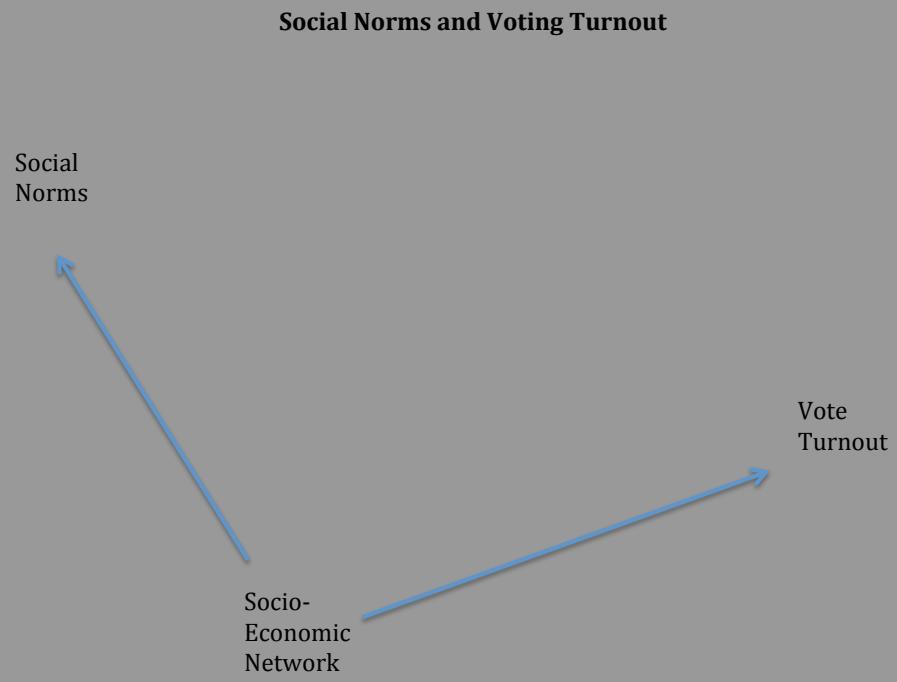
Social Norms and Voting Turnout
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Vote Turnout
Socio-Economic Network

Theory of Voting Turnout

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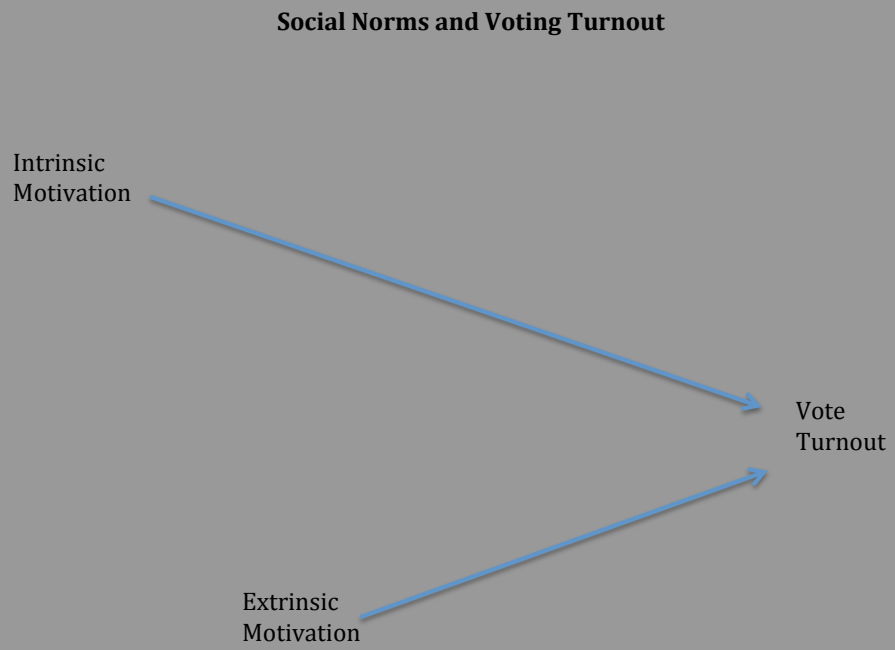
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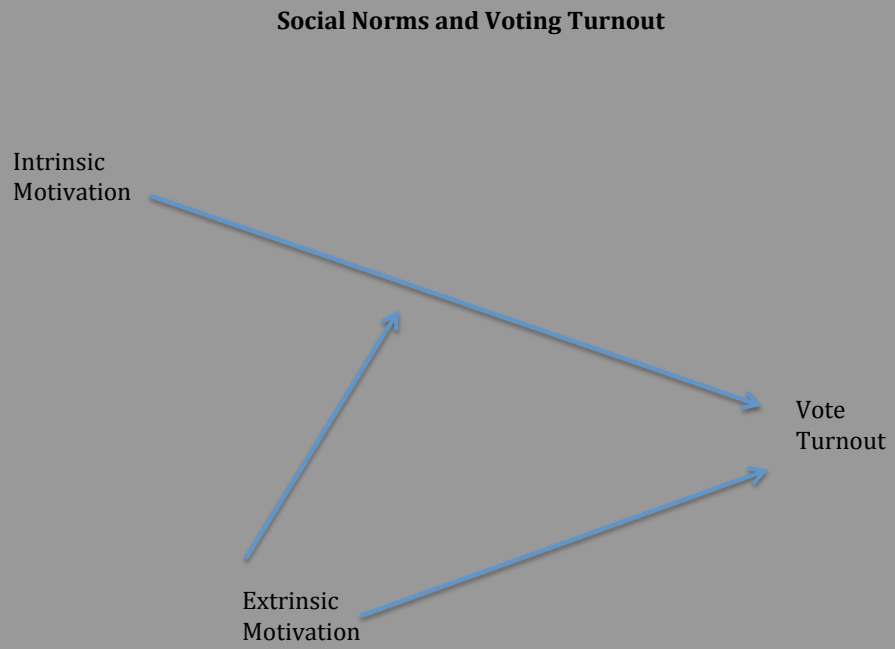
Intrinsic Motivation
Vote Turnout
Extrinsic Motivation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Voting Turnout Experimental Design

Treatment	Pre-	Treatment	Post
Control Group (no mailing)	Y_{01}		Y_{02}
Civic Duty Treatment	Y_{11}	X_1	Y_{12}
Hawthorne Treatment	Y_{21}	X_2	Y_{22}
Self Treatment	Y_{31}	X_3	Y_{32}
Neighbour Treatment	Y_{41}	X_4	Y_{42}

Effects of Four Mail Treatments

Experimental Group	% Voting	Number of Individuals
Control	29.7%	191,243
Civic Duty	31.5%	38,218
Hawthorne	32.2%	38,204
Self	34.5%	38,218
Neighbors	37.8%	38,201