Field Experiments II

POLSCI 4SS3

Winter 2023

Last time

- We learned about implementing field experients
- Lots of details!
- Sometimes cannot simply randomly assign `(stepped-wedge design)`
- **Today:** Thinking about how to do better

Why do better?

- Conducting research is expensive
- Field experiments are **very** expensive
- Even if you had the resources, we have a mandate to do better

Research ethics

- **Belmont report:** Benefits should outweigh costs
- 📄**:** Researchers have duties beyond getting review board approval
- At a minimum, participating in a study takes time
- **Mandate:** Find the most efficient, ethical study before collecting data
- Sometimes that means doing more with a *smaller sample*

Improving Precision

Pre-post design

- Similar to panel studies
- Outcomes are measured *at least* twice
- Once before treatment, once after treatment

Condition	**$t=1$**	**Treatment**	**$t=2$**
$Z_i=1$	$Y_{i, t=1}$	X	$Y_{i, t=2}(1)$
$Z_i=0$	$Y_{i, t=1}$		$Y_{i, t=2}(0)$

AKA repeated measures design

How does this work?

- Standard ATE estimator:

$$ E[Y_i(1) | Z_i = 1] - E[Y_i(0) | Z_i = 0] $$

- Pre-post ATE estimator:

$$ E[(Y_{i,t=2}(1) - Y_{i,t=1}) | Z_i = 1] - E[(Y_{i,t=2}(0) - Y_{i,t=1}) | Z_i = 0] $$

How does this work?

- Standard ATE estimator:

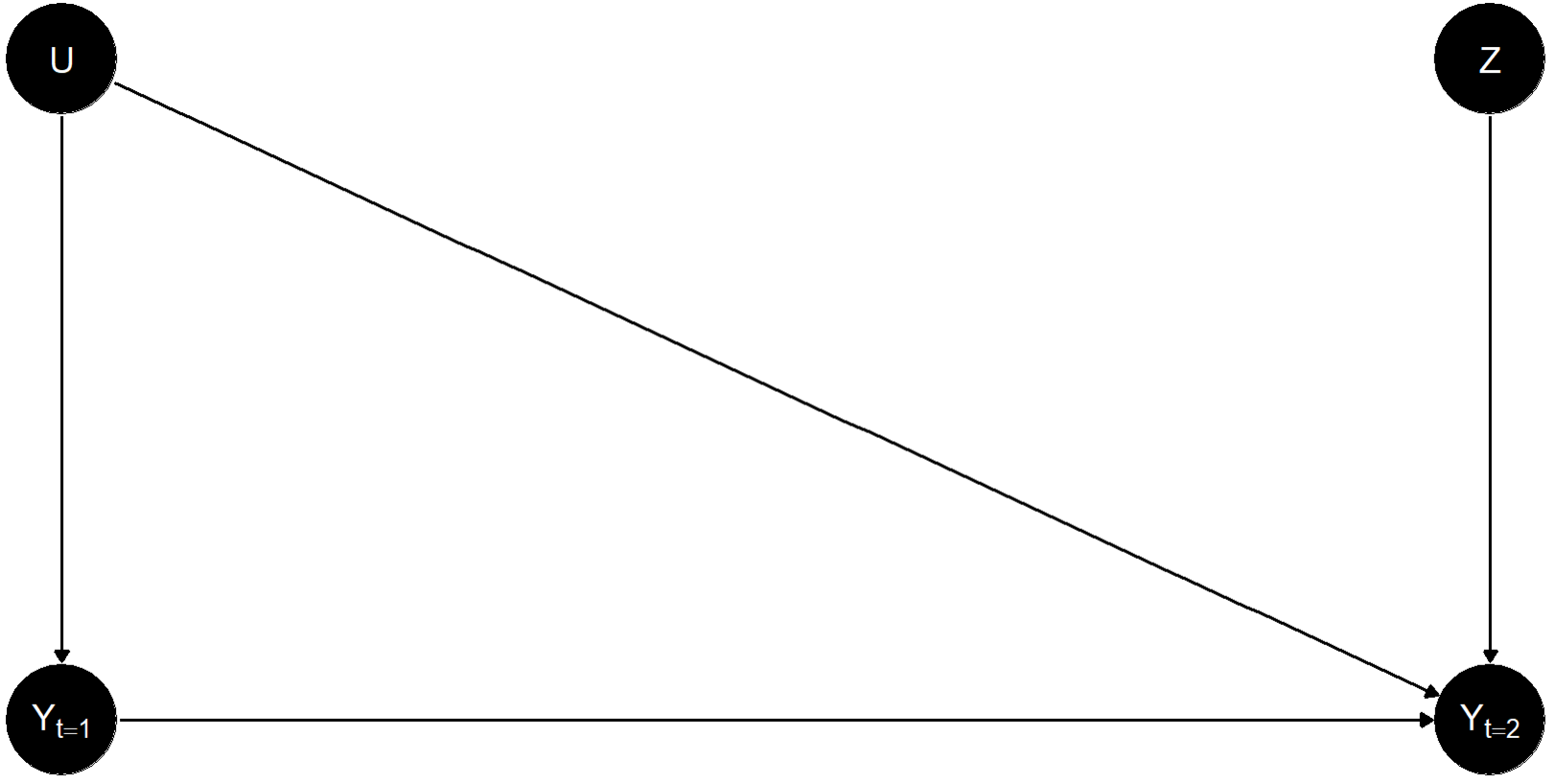
$$ E[Y_i(1) | Z_i = 1] - E[Y_i(0) | Z_i = 0] $$

- Pre-post ATE estimator:

$$ E[(Y_{i,t=2}(1) \color{#ac1455} {- Y_{i,t=1}}) | Z_i = 1] - E[(Y_{i,t=2}(0) \color{#ac1455} {- Y_{i,t=1}}) | Z_i = 0] $$

- We improve precision by subtracting the variation in the outcome that is unrelated to the treatment

Pre-post design as a graph



Block randomization

- Change how randomization happens
- Group units in *blocks* or *strata*
- Estimate average treatment effect within each
- Aggregate with a weighted average

How does it work?

- Within-block ATE estimator:

$$\widehat{ATE}_b = E[Y_{ib}(1) \mid Z_{ib} = 1] - E[Y_{ib}(0) \mid Z_{ib} = 0]$$

- Overall ATE estimator:

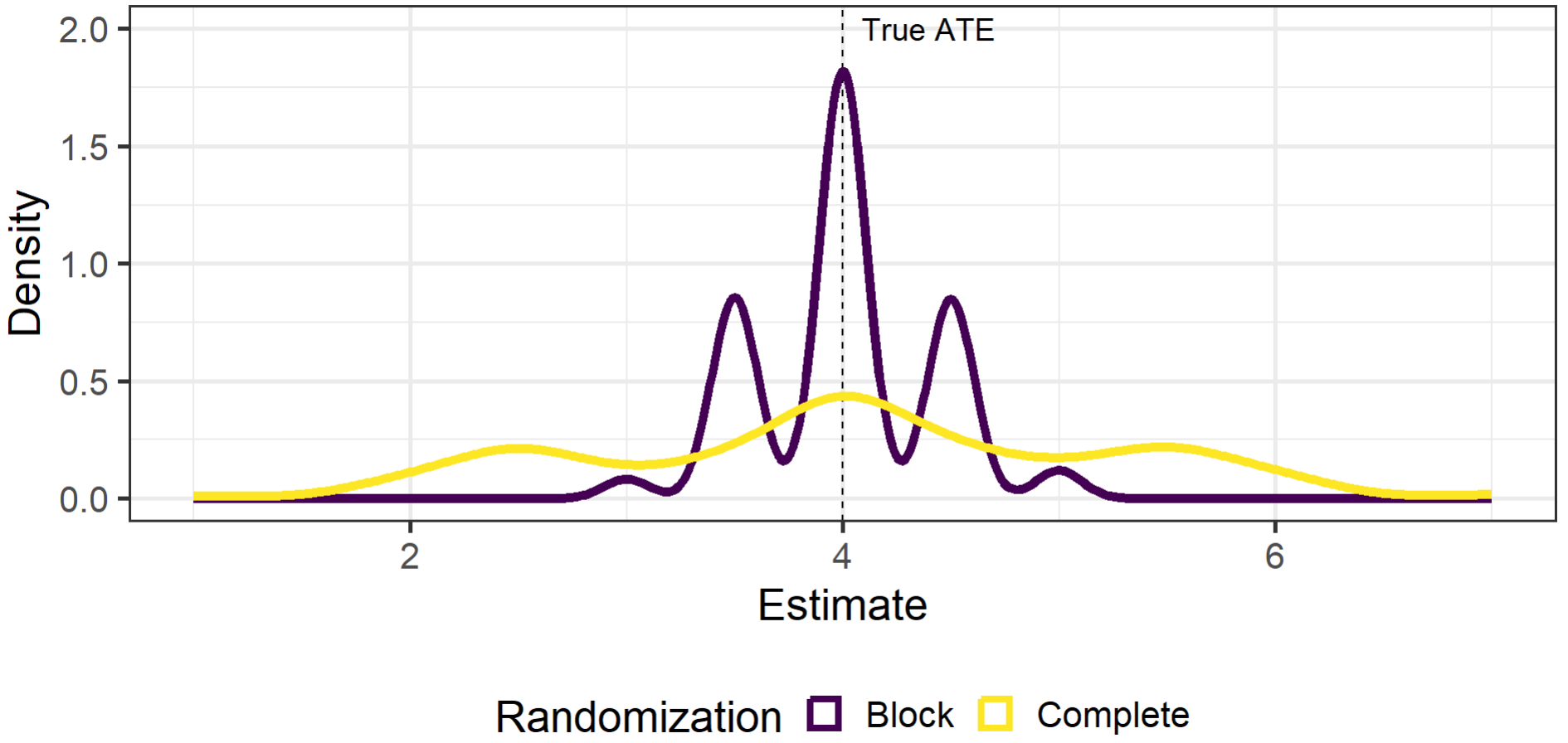
$$\widehat{ATE}_{\text{Block}} = \sum_{b=1}^B \frac{n_b}{N} \widehat{ATE}_b$$

Illustration

ID	Block	\(Y_i(0)\)	\(Y_i(1)\)
1	1	1	4
2	1	2	5
3	1	1	4
4	1	2	5
5	2	3	8
6	2	4	9
7	2	3	8
8	2	4	9

- Potential outcomes *correlate* with blocks
- True \(ATE = 4\)
- Do 500 experiments
- Compare complete and block-randomized experiment

Simulation



Block randomization yields a narrower distribution of estimates

Reasons to block randomize

1. To increase precision in ATE estimates
2. To account for possible heterogeneous treatment effects

- The more blocking variables correlate with potential outcomes, the more useful block randomization is
- And it rarely hurts when they do not correlate! `(more in the lab!)`

Example

Kalla et al (2018): Are You My Mentor?

- Correspondence experiment with \(N = 8189\) legislators in the US
- Send email about fake student seeking advice to become politician
- Cue gender with student's name

Also called *audit* experiments since they were originally designed to audit how responsive

Sample email

From: [Treatment: Student Sex]
To: [Legislator's email]
Subject: Help on a class project?

Dear [LEGISLATOR],

My name is [MALE/FEMALE] and I am a college sophomore. I'm interviewing politicians for a class project to learn about how they entered their field and what advice they might have for students interested in politics. As someone who really cares about my community, one day I hope to be a politician. What advice would you give to me?

Sincerely, [MALE/FEMALE]

Figure 1. Treatment wording

Data strategy

- Block-randomize by legislator's gender `(why?)`
- **Outcomes:** Reply content and length

Findings

Outcome	Male Sender	Female Sender	p-value
Received reply	0.25	0.27	0.15
Meaningful response	0.11	0.13	0.47
Praised	0.05	0.06	0.17
Offer to help	0.03	0.05	0.09
Warned against running	0.01	0.02	0.14
Substantive advice	0.07	0.08	0.33
Word count (logged)	1.00	1.10	0.06
Character count	145.00	170.00	0.04

- Why not much difference by gender?

Adapted from Table 1