Lecture 19

11-01-2021

What did we do last week?

We discussed fixed effects

We clarified the point of including fixed effects from a design perspective

We saw that TWFE can present some challenges for interpretation and estimation of causal effects

What are we covering this week?

Natural Experiments

There is a checkpoint and WP due this week.

PS4 is due *next* Friday (11/12). This is a change from the syllabus.

What is a natural experiment?

A natural experiment (Titiunik 2020) is a study in which the assignment mechanism satisfies the following properties:

$Pr(Z|X, Y(O), Y(1))$ is neither designed nor implemented by the researcher

$Pr(Z|X, Y(0), Y(1))$ is unknown to the researcher

$Pr(Z|X, Y(0), Y(1))$ is probabilistic by virtue of an external event outside of the experimental units' direct control

Natural Experiments vs Experiments

Loosely: an experiment is a study in which the researcher executes a direct controlled intervention over some process in order to test a hypothesis

A natural experiment claims that the assignment mechanism based on an external factor.

This condition is not directly verfiable or falsifiable.

Natural Experiments v. Observational Studies

The difference in ex ante risk of taking treatment

In both the exact probabilities with which each possible treatment allocation could have occurred are fundamentally unknown

The timing of treatment is clearer in a natural experiment than a regular observation study.

Verifying the Externality of Treatment Assignment

From a design based perspective, without equiprobable treatment assignments we cannot identify the causal effect of treatment.

The most credible natural experiments will offer a clear justification for the assumption that assignment is unconfounded given some observable predetermined covariates.

We can test the equiprobability assumption. We cannot test the unconfoundedness assumption.

What Questions should we ask about a natural experiment?

1. Is the assignment probabilistic?

2. Is the assignment equiprobable?

3. Is the assignment unconfounded?

4. Is the natural experiment of substantive interest?

Is the assignment probabilistic?

Researchers must establish this first. A natural experiment is not plausible if it does not clear this bar.

There must be an external event that is outside of units' direct control.

There must be overlap in the "treatment" assignment.

Is the assignment equiprobable?

Researchers should then test the hypothesis that relevant pre-treatment covariates are equal in the treatment and control group If we clear the covariate balance test, then we can analyze the research exactly like we analyze RCTs

Is the assignment unconfounded?

If we clear the equiprobable assumptions then we are fine.

If not, researchers should explore whether it is plausible to assume that there exists a covariate based adjustment that renders treated and control groups comparable.

The justification should be based on objective and verifiable information about the treatment assignment mechanism that identifies covariates that were explicitly used in the assignment scheme.

Do we care about the natural experiment?

Natural experiments are not controlled by the researcher, which means that treatment is not exactly what we would have liked if we had been in charge.

The treatment effect that we can identify might not be an effect that we substantively care about.

All research, observational or experimental, should be able to clear this hurdle. Otherwise, don't do it.

Snow on Cholera

Cholera was epidemic in mid nineteenth century London (and elsewhere)

John Snow hypothesized in contrast that cholera was a water or waste-born disease

His primary evidence came from a natural experiment

Snow on Cholera

Water came from the Thames River, and was provided by private contractors.

One (The Lambeth water company) moved their intake pipe upstream to a pure water source

The Southwark and Vauxhall company left their intake pipe in place.

The Broad Street pump of the S&V company was the source of much of the cholera outbreak

Rates of death per 10,000 between the S&V and Lambeth pipe were 315 to 37