Difference in difference

INFO/STSCI/ILRST 3900: Causal Inference

31 Oct 2023

Learning goals for today

At the end of class, you will be able to:

1. Study effects of policies in a spooky setting: when there is no matching control unit

Card, D., & Krueger, A. B. (1994).
Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania.
The American Economic Review, 84(4), 772-793.

Economic theory

When the minimum wage rises, how might employment change?

Economic theory

When the minimum wage rises, how might employment change?

- employees cost more

Economic theory

When the minimum wage rises, how might employment change?

- employees cost more
- employers might get by with fewer employees

The setting

The setting

- Federal minimum wage
  - $3.80 on April 1, 1990
  - $4.25 on April 1, 1991

The setting

- Federal minimum wage
  - $3.80 on April 1, 1990
  - $4.25 on April 1, 1991
- New Jersey minimum wage
  - $5.05 on April 1, 1992

NJ introduces a high minimum wage.

How would you study the effect on employment?

Source: Wikimedia

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BURGER
KING

KFC

Roy
Rogers

Wendy's

171 stores

80 stores

99 stores

60 stores

171 stores

80 stores

99 stores

60 stores

Phone interview: Feb-Mar 1992 before minimum wage rose

Nov-Dec 1992 after minimum wage rose

171 stores

80 stores

99 stores

60 stores

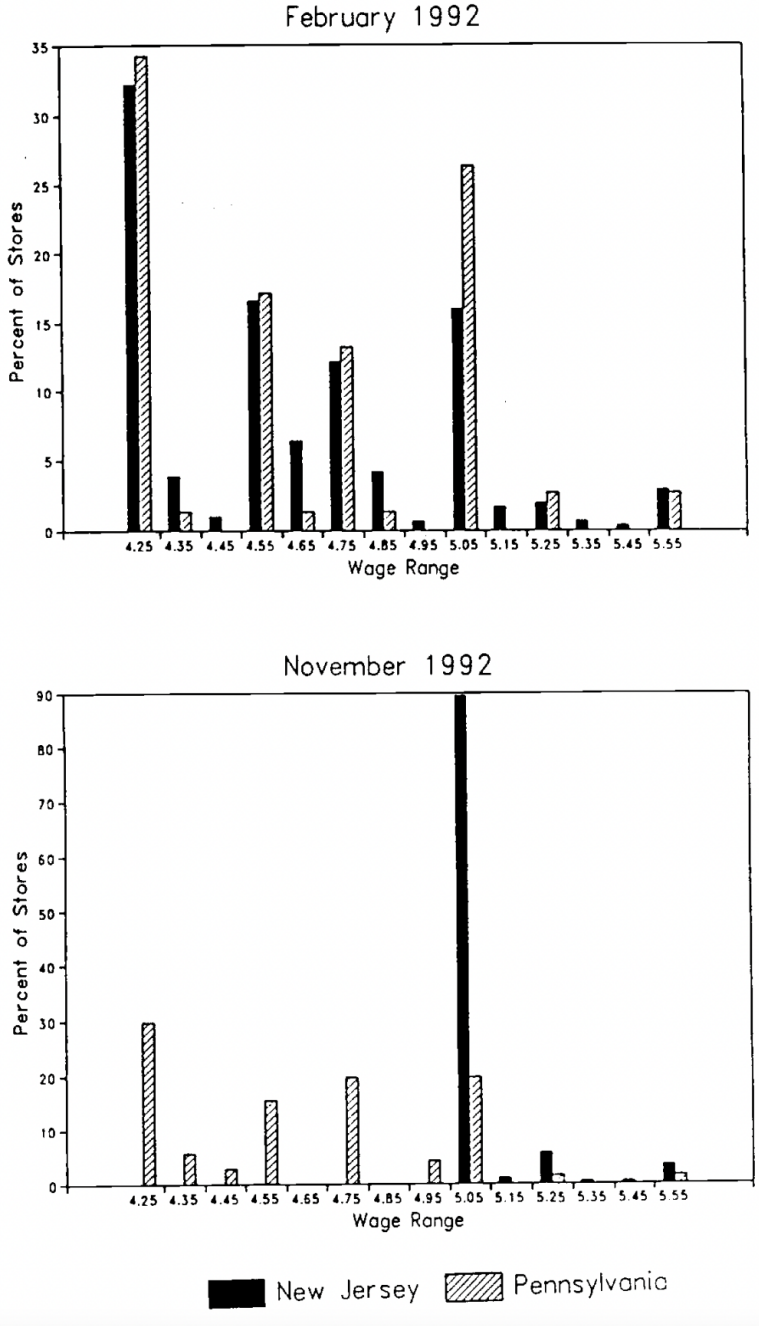
Phone interview: Feb-Mar 1992 before minimum wage rose

Nov-Dec 1992 after minimum wage rose

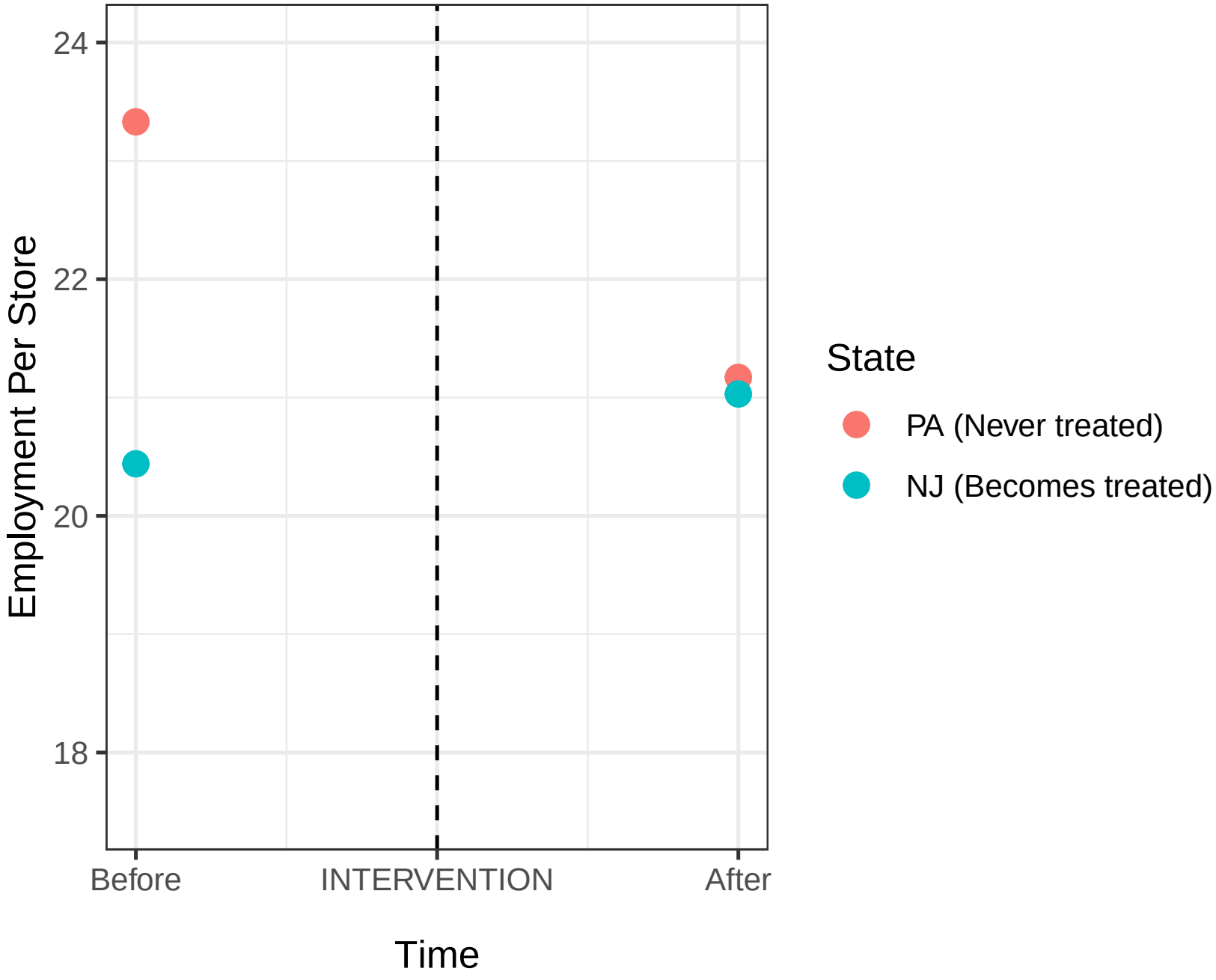
Recorded: How many full-time equivalent employees?

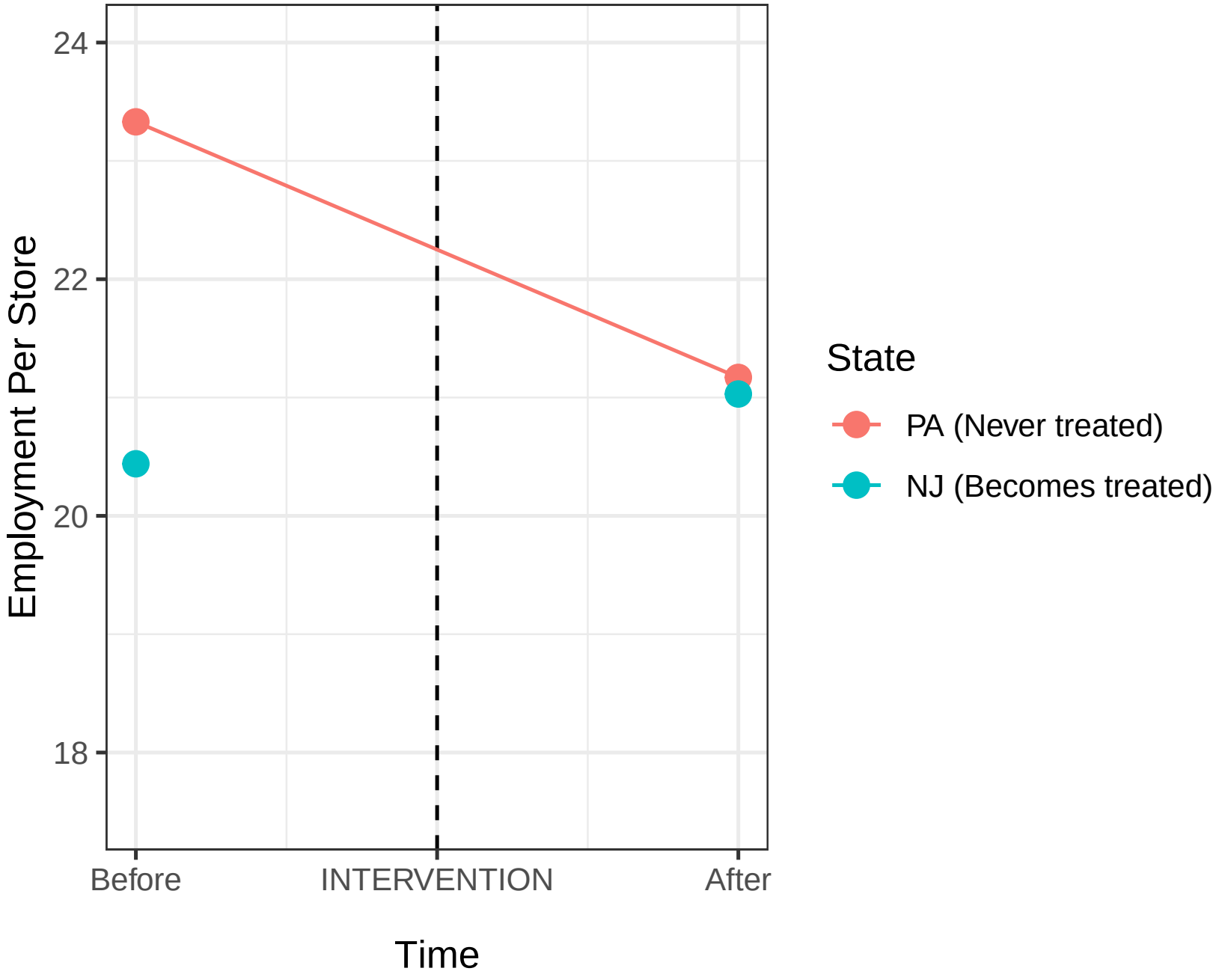
Did starting wages rise in NJ?

Figure 1
Distribution of Starting Wage Rates



How did employment change?


24
22
20
18
Employment Per Store
Before
INTERVENTION
After
Time
State
PA (Never treated)
NJ (Becomes treated)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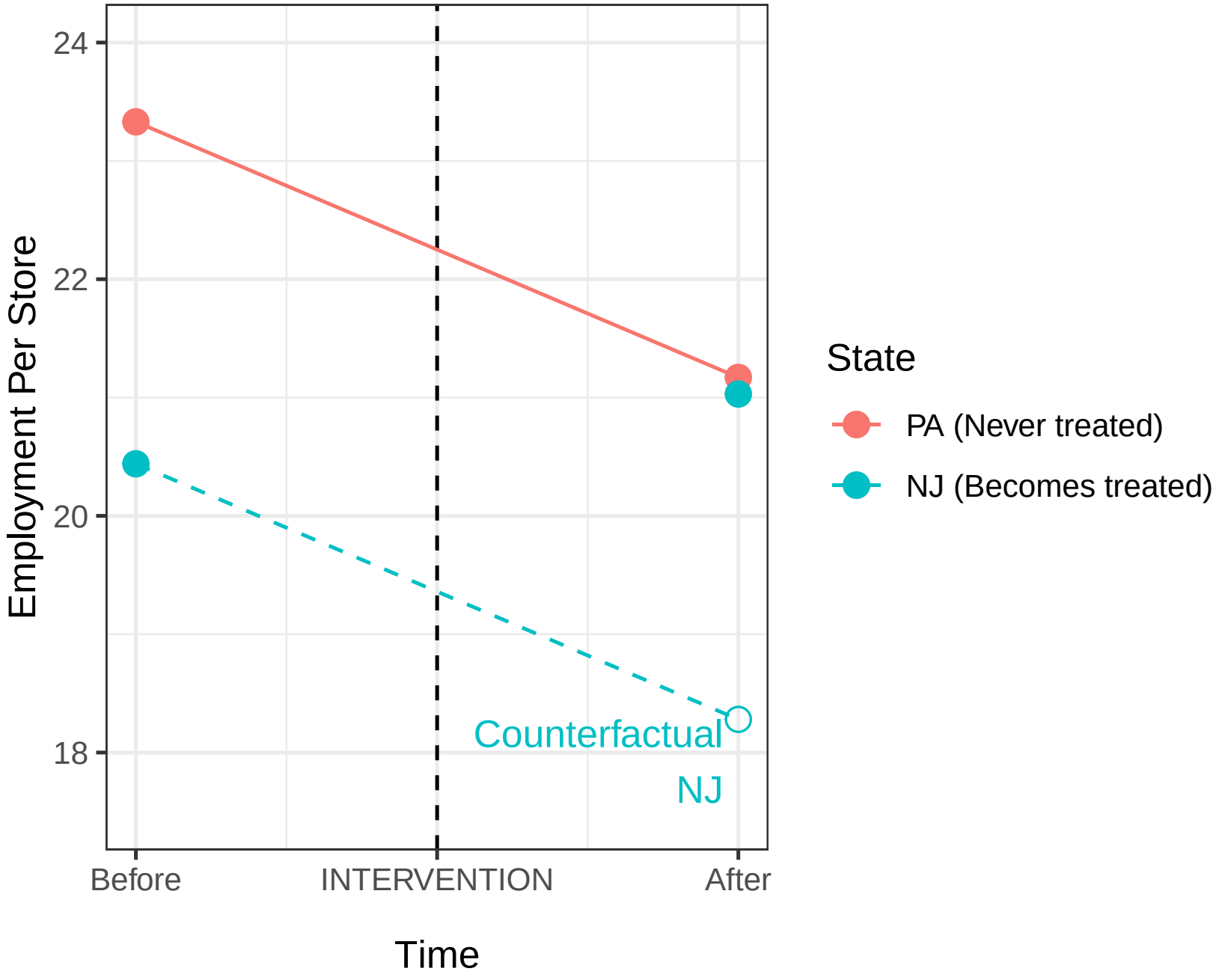
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PA (Never treated)
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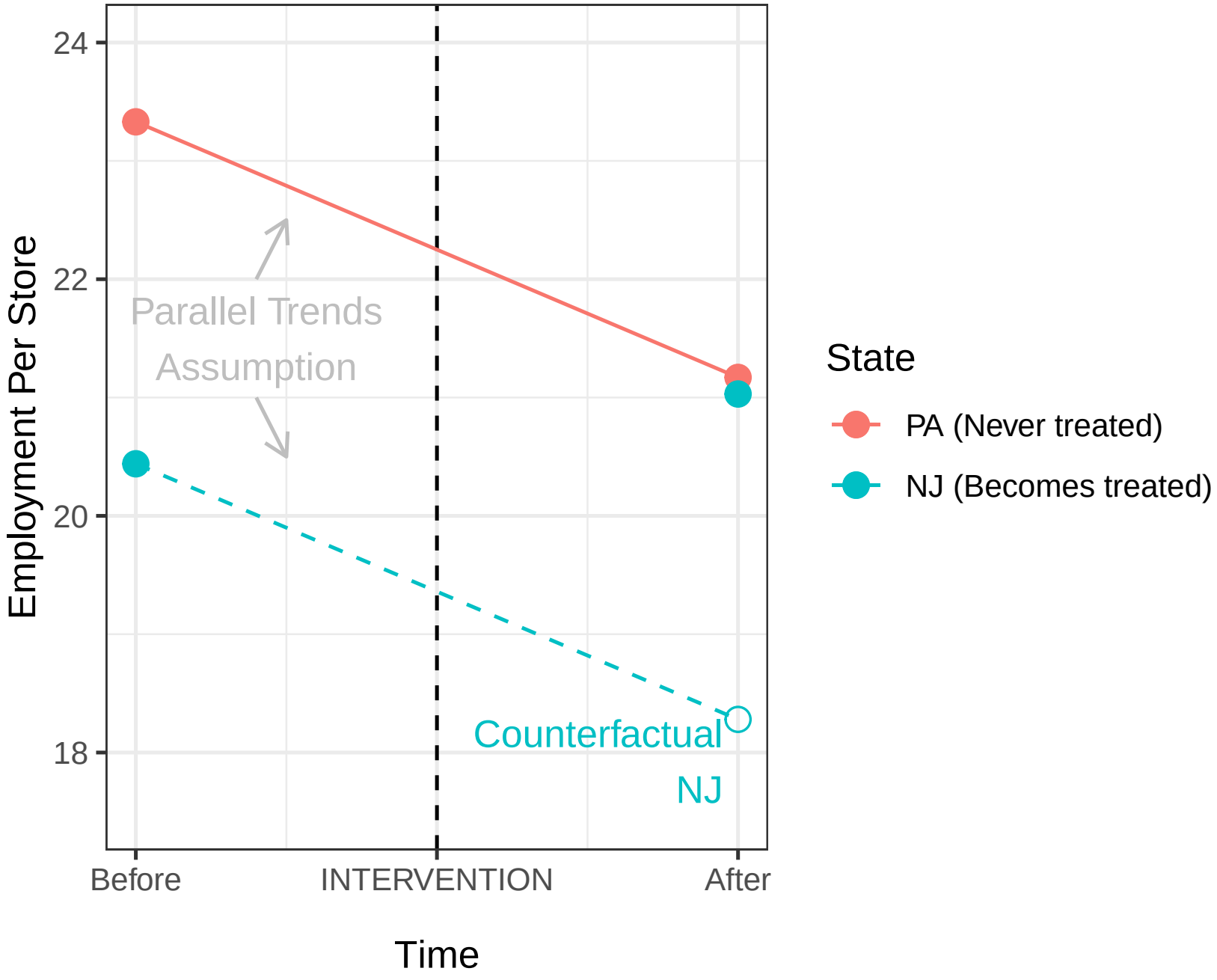
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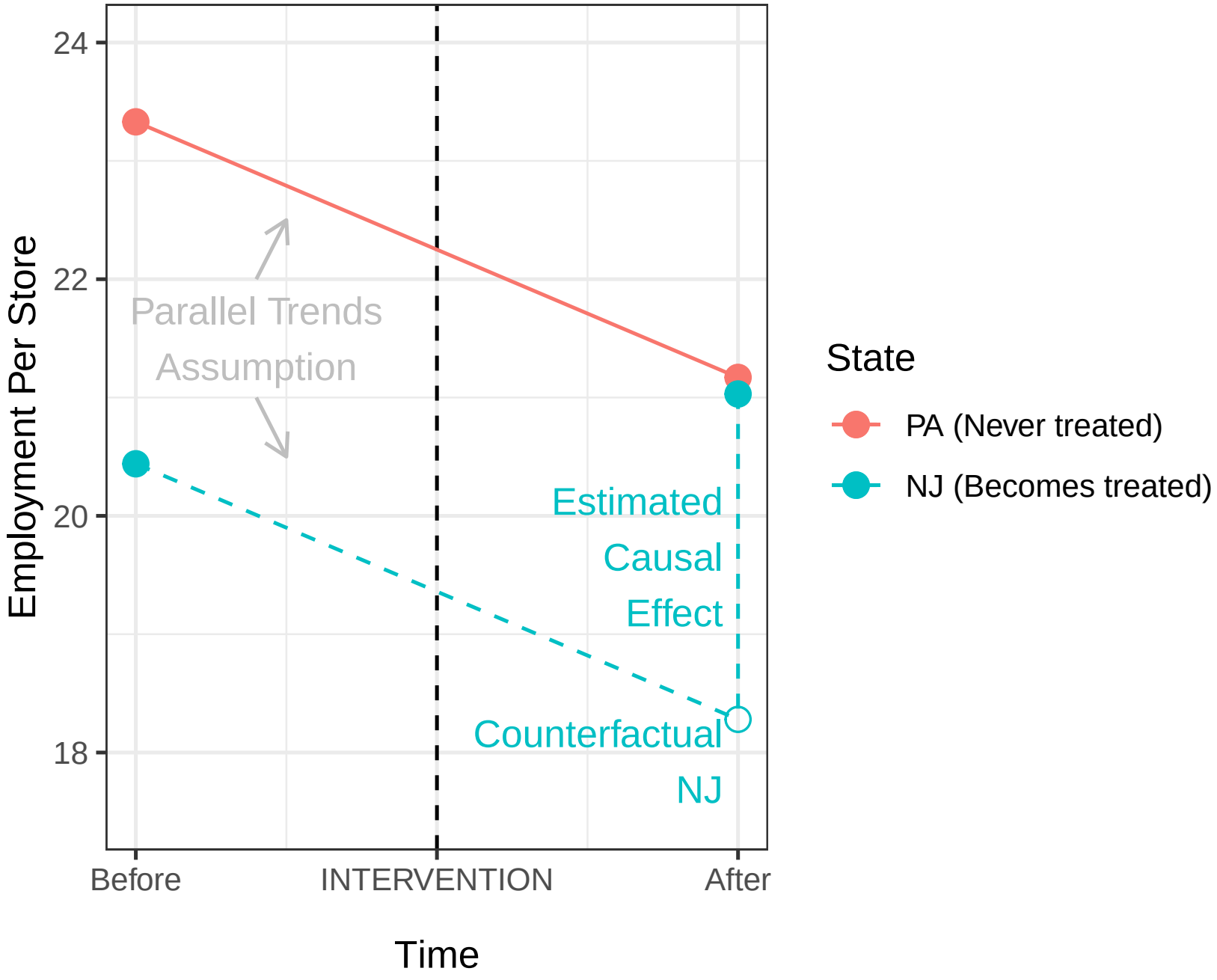
Employment Per Store
Parallel Trends
Assumption
Counterfactual
NJ
Before
INTERVENTION
After
Time
State
PA (Never treated)
NJ (Becomes treated)


24
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Employment Per Store
Parallel Trends
Assumption
Estimated
Causal
Effect
Counterfactual
NJ
Before
INTERVENTION
After
Time
State
PA (Never treated)
NJ (Becomes treated)

Variable	Stores by state		
	PA (i)	NJ (ii)	Difference, NJ − PA (iii)
1. FTE employment before, all available observations	23.33 (1.35)	20.44 (0.51)	−2.89 (1.44)
2. FTE employment after, all available observations	21.17 (0.94)	21.03 (0.52)	−0.14 (1.07)
3. Change in mean FTE employment	−2.16 (1.25)	0.59 (0.54)	2.76 (1.36)

"Contrary to the central prediction of the textbook model of the minimum wage,...we find no evidence that the rise in New Jersey's minimum wage reduced employment at fast-food restaurants in the state."

Card & Krueger 1994, p. 792

- simple study
- well-executed
- upended conventional wisdom

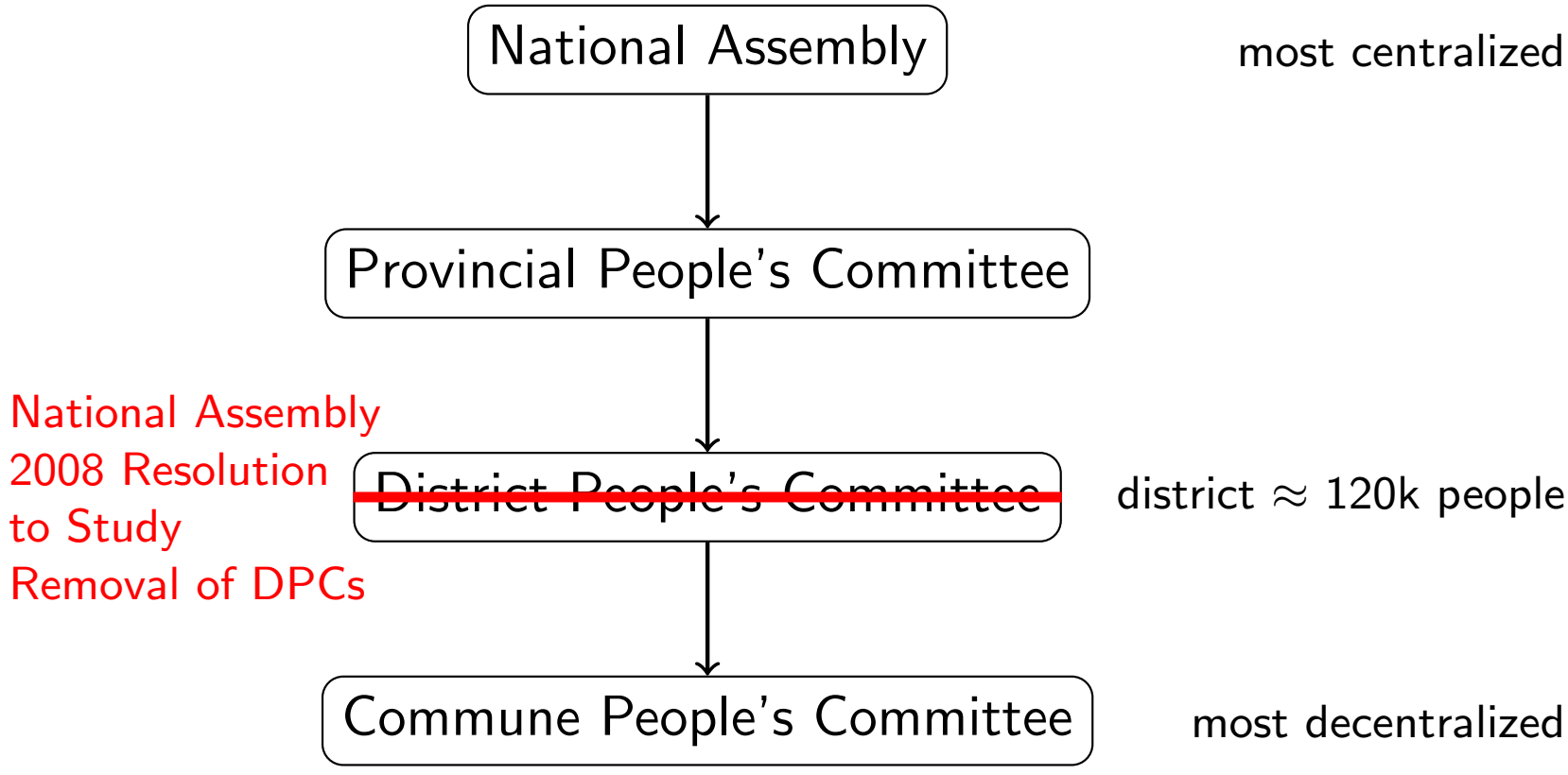
- simple study
- well-executed
- upended conventional wisdom

Decades of papers followed suit. Here is one.

Malesky, E. J., Nguyen, C. V., & Tran, A. (2014).
The impact of recentralization on public services:
A difference-in-differences analysis of the abolition of elected councils in Vietnam.
American Political Science Review, 108(1), 144-168.

Does government work better when it is centralized or decentralized?

Vietnam setting: A study of recentralization



Vietnam setting: A study of recentralization

Input from social scientists

Vietnam setting: A study of recentralization

Input from social scientists

1. Enough treated units to study

Vietnam setting: A study of recentralization

Input from social scientists

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2. Sampling stratified by region

Vietnam setting: A study of recentralization

Input from social scientists

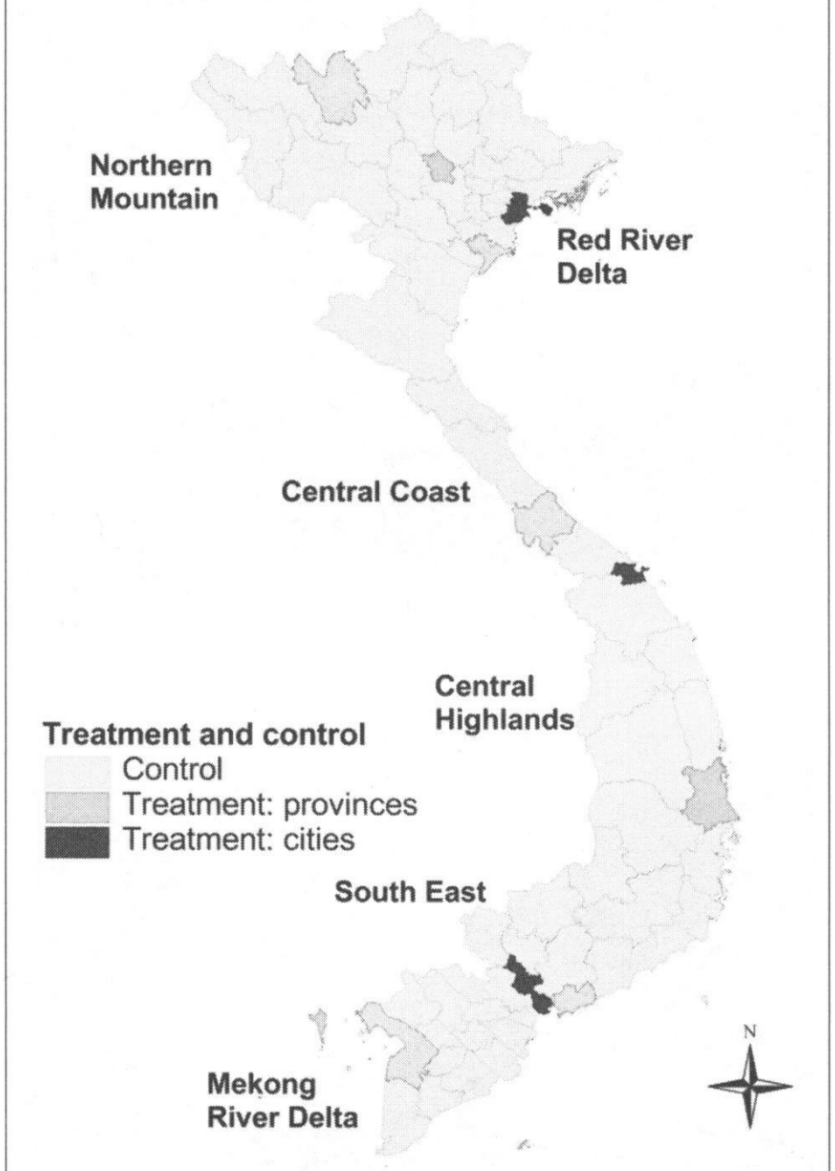
1. Enough treated units to study
2. Sampling stratified by region
3. Sampling stratified by
   - city versus rural
   - lowland versus highland
   - midland versus inter-nationally bordered land

Vietnam setting: A study of recentralization

Input from social scientists

1. Enough treated units to study
2. Sampling stratified by region
3. Sampling stratified by
   - city versus rural
   - lowland versus highland
   - midland versus inter-nationally bordered land
4. Sampling stratified by socioeconomic and public administration performance

FIGURE 2. Map of Treatment Provinces and National-Level Cities

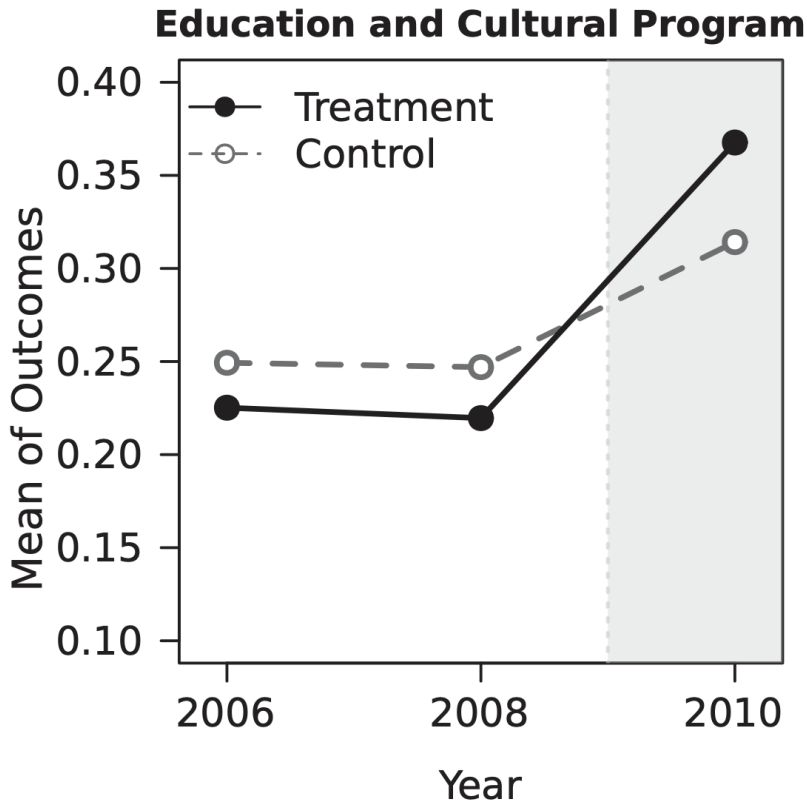


Vietnam Household Living Standards Survey
Reports by each local commune by commune leaders

- 2006 and 2008: Before DPC abolition
- 2010: After DPC abolition

One outcome we will examine:
Is there the following project in the commune?

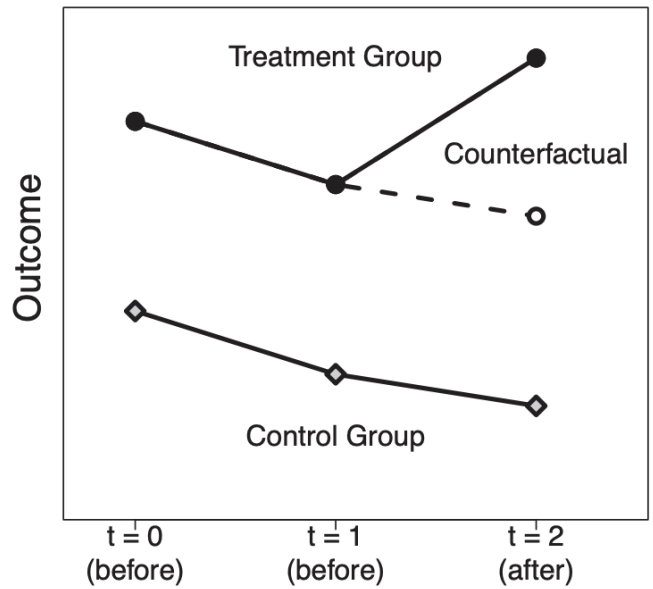
- Investment on culture and education



Screenshot of re-analysis by Egami & Yamauchi 2023, Fig 3

Difference in difference

When no control unit is comparable to a treated unit, we might assume a control unit and treated unit share the same trend in the potential outcome under control



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