UiO : Department of Special Needs Education
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Economics of education and quasi-experimental methods

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What is economics of education?

- Economics: What is the best possible use of limited resources?
- Trade off between sector – health or education?
- Trade off within sectors – what is the best way to increase learning?

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- Why do we care about this? Human capital theory

- Learning (human capital accumulation) depends on…
  - Student characteristics
  - Family characteristics
  - Individual skills
  - Resources
  - Institutions

What can we influence through policy?

Educational policy

School size

Class size

School choice

School privatization

Tracking $\Longrightarrow$ Student outcomes

Teacher pay

School resources

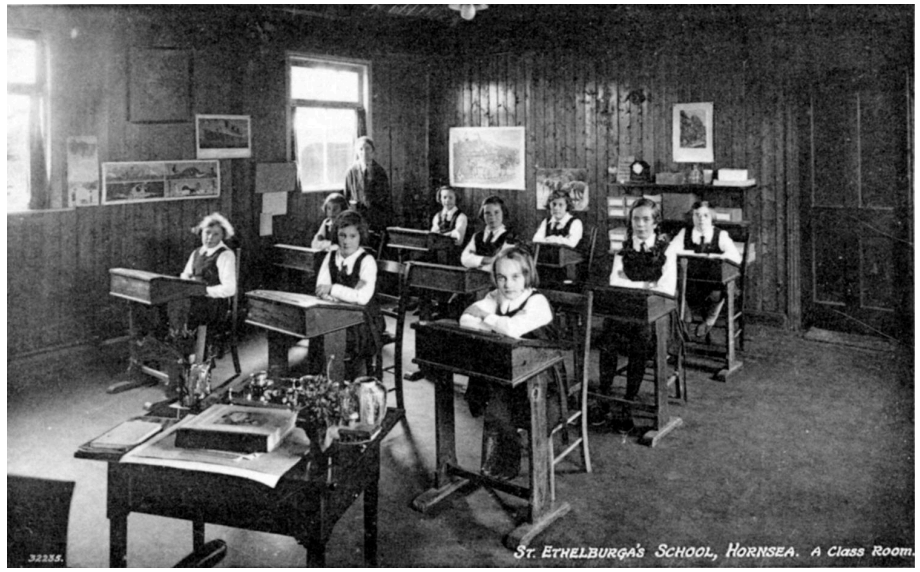
Accountability

Autonomy

Fundamental questions (Angrist & Pischke, 2009)

- What is the causal relationship of interest?
- What experiment could ideally be used to capture the causal effect of interest?
- What is your identification strategy?
- What is your mode of statistical inference?

Do smaller classes increase test scores?



Bradford Timeline, Flickr; nifu.no

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Do smaller classes increase test scores?

Bradford Timeline, Flickr; nifu.no

What would my test scores be if I was in a small class compared to what they would be if I was in a large class? (Potential outcomes)

The perfect experiment

Boston Public Library , Flickr; nifu.no

Do smaller classes increase test scores?

Bradford Timeline, Flickr; nifu.no

We can never observe the same people at the same time both in small and large classes: we never directly observe the counterfactual

The perfect experiment

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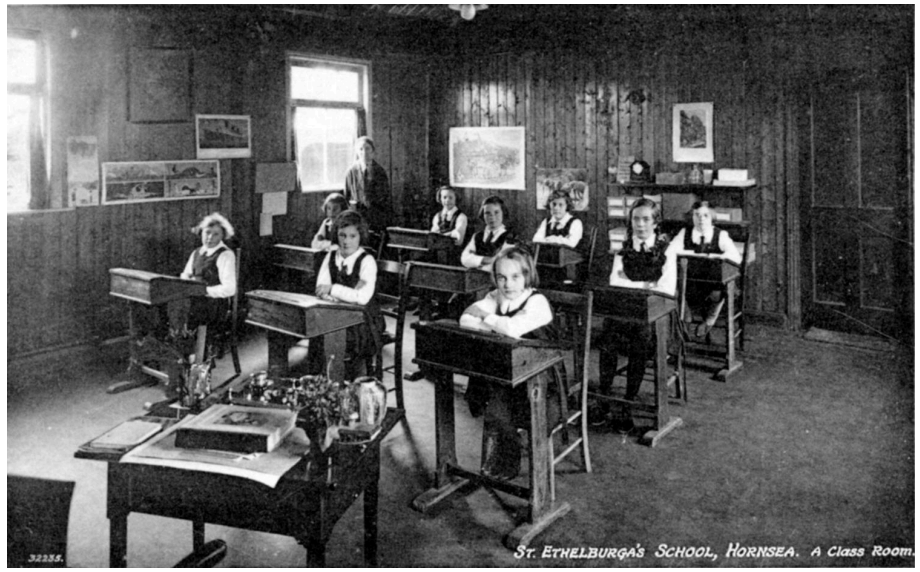
Do smaller classes increase test scores?



Bradford Timeline, Flickr; nifu.no

Selection bias:

- What will a comparison of people in small and large classes capture?
- Who is more likely to be in a larger class?

The main problem…

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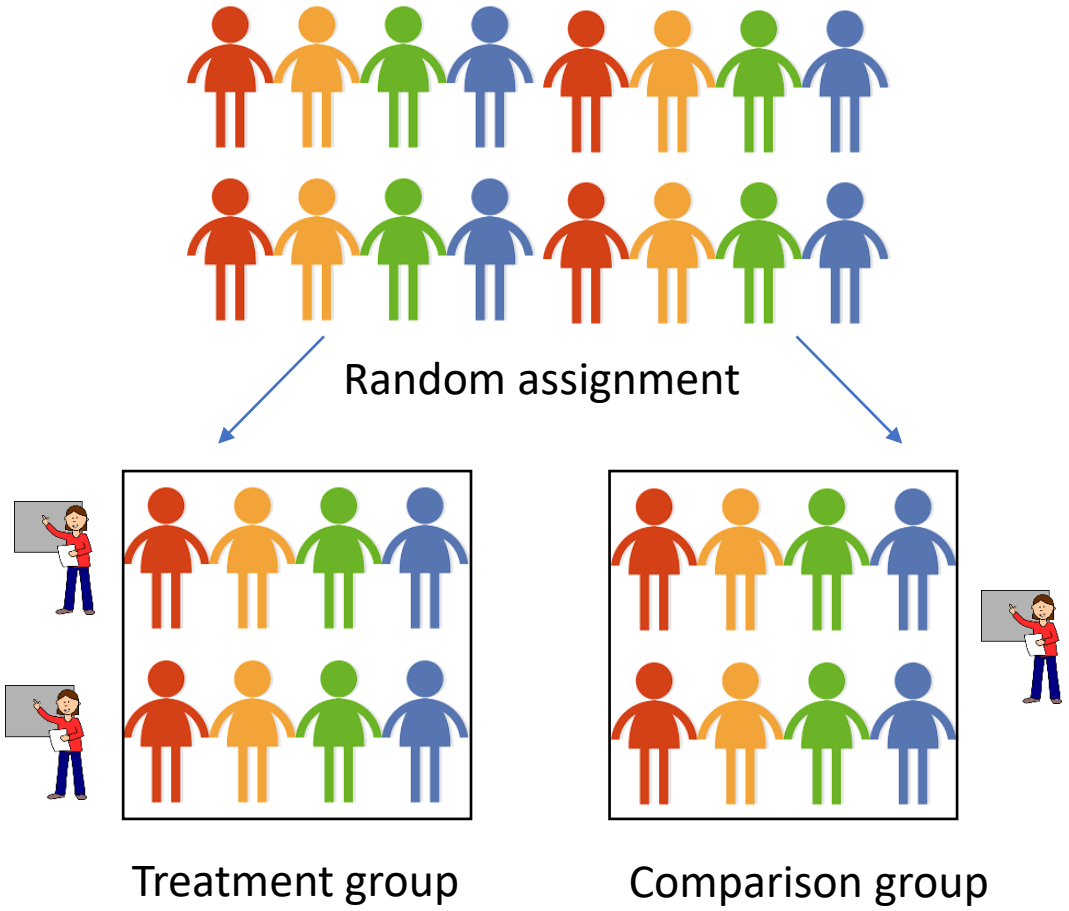
The next best thing: a Randomized Controlled Trial



Causal impact of smaller classes

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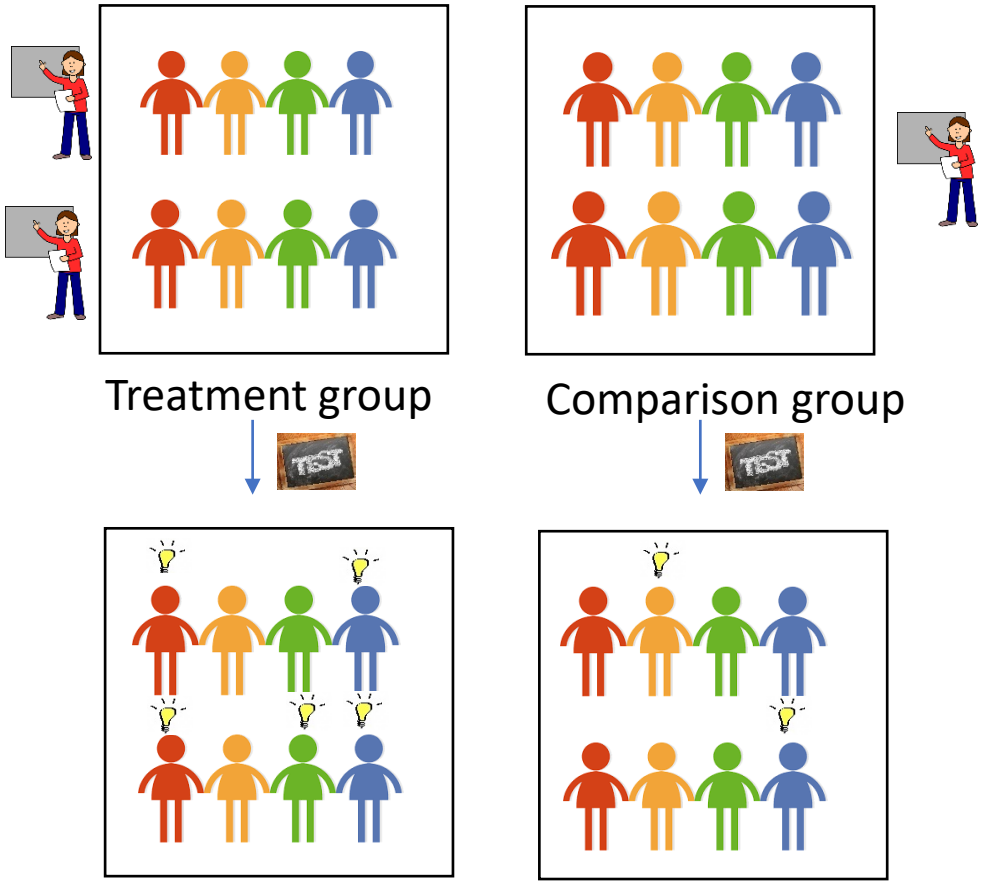
The next best thing: a Randomized Controlled Trial



Causal impact of smaller classes

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Randomized Controlled Trial

- People who have access to the program are selected randomly into treatment
- Ensures that there are no systematic differences between those who receive program (treatment group) and those who serve as comparison group
- Observable characteristics (e.g. family background) are balanced across groups
- Unobservable characteristics (e.g. motivation, talent) are also balanced across groups
- On average, treatment and comparison groups are comparable when program starts, and would have followed the same development in the absence of a program
- Comparing the outcomes of the two groups gives us the causal effect of treatment

The next-next best thing: a quasi-experiment

Similarities between true and quasi-experiments:

- Aim to estimate effects free of confoundedness, reverse causality or simultaneous causality
- Study participants are subjected to some type of treatment or condition
- Some outcome of interest is measured
- The researchers test whether differences in this outcome are related to the treatment

But since treatment is no longer randomized quasi-experiments exploit existing circumstances in which treatment assignment has a sufficient element of randomness

Also called natural experiments because of using «natural» random variation

The next-next best thing: a quasi-experiment

- Difference-in-differences (DD)
- Regression discontinuity (RD)
- Instrumental variables (IV)

- Angrist, J. D., & Pischke, J. S. (2008). *Mostly harmless econometrics: An empiricist's companion*. Princeton university press. https://www.researchgate.net/publication/51992844_Mostly_Harmless_Econometrics_An_Empiricist's_Companion
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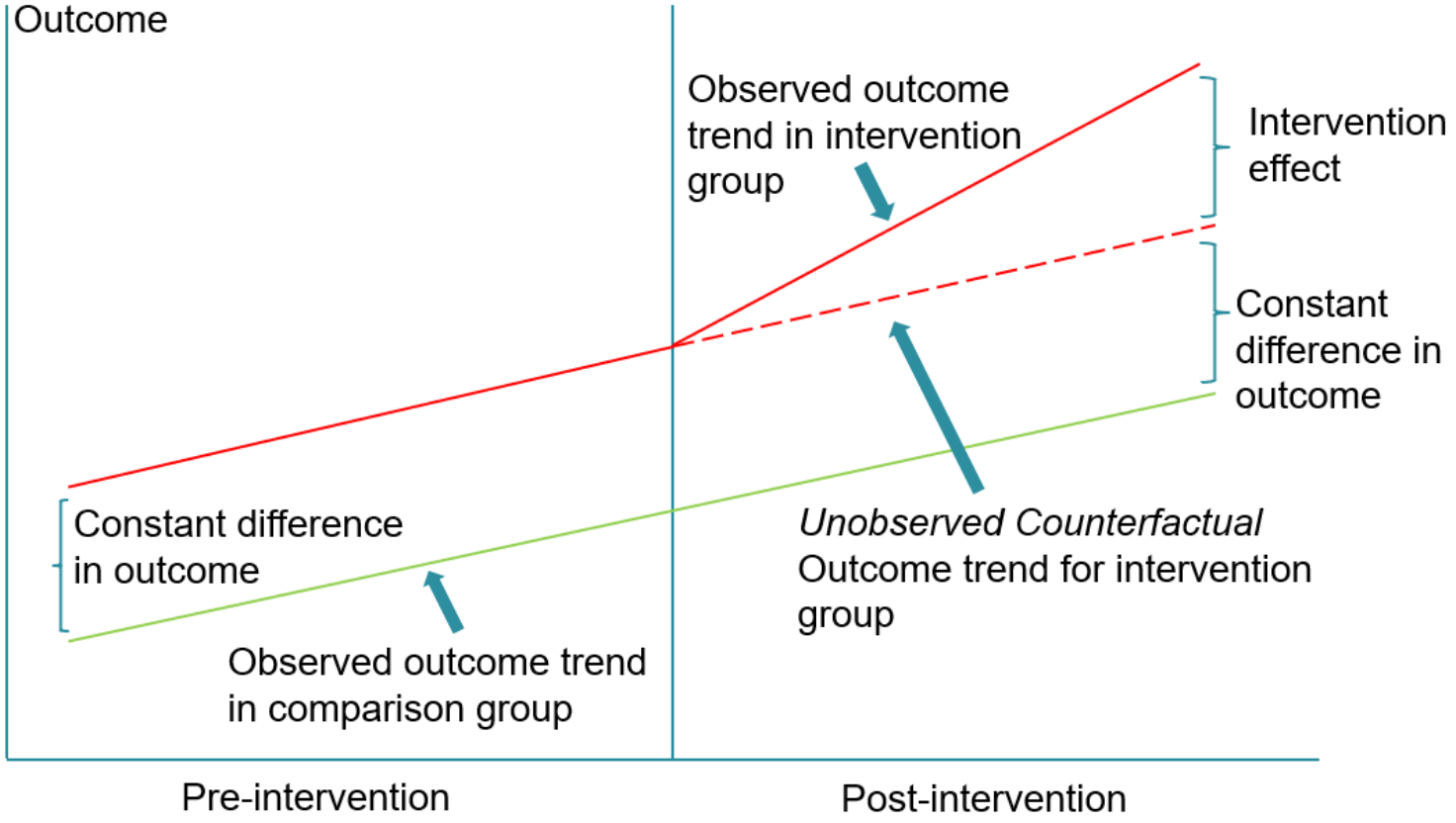
- Cunningham, S. *Causal inference: The Mixtape*. YALE University Press. https://scunning.com/cunningham_mixtape.pdf

Difference-in-differences (DD)

- Compare average change between treatment and control group (first difference) over time (second difference)
- Common trends assumption

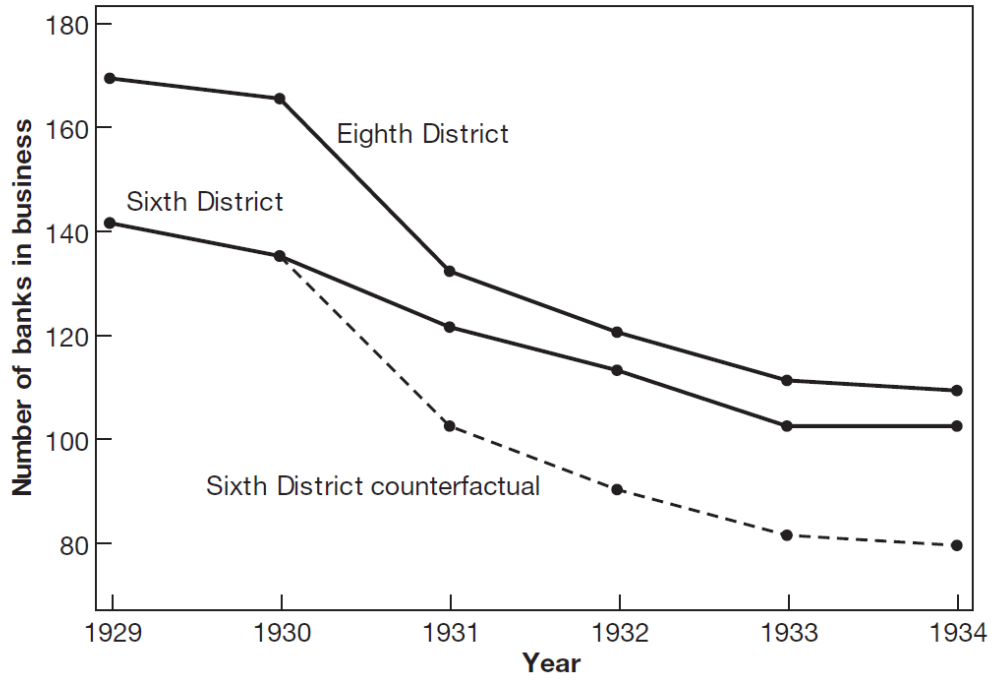


Difference-in-differences (DD)

- Example: Lending vs. credit rationing during a recession
- First difference:
  - 6th district favored lending (treat)
  - 8th district favored restricting credit (non-treat)
- Second difference:
  - Before crisis (pre)
  - After crisis (post)
- More lending caused fewer bank closures…
- … and fewer firm bankruptcies

Border between 6th and 8th district ran smack through middle of Mississippi

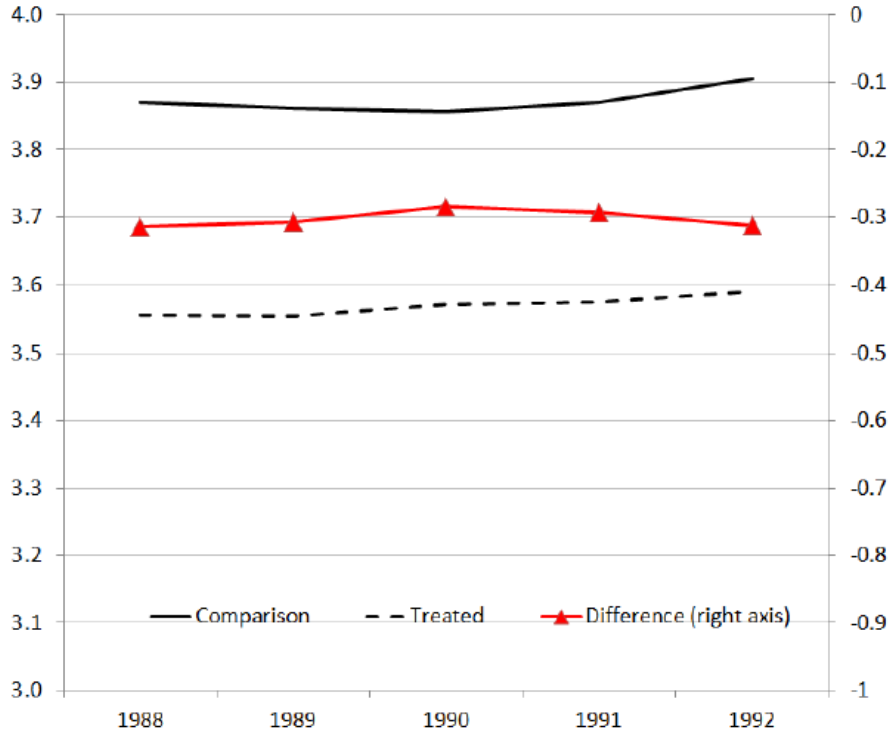
FIGURE 5.3
Trends in bank failures in the Sixth and Eighth Federal Reserve Districts, and the Sixth District's DD counterfactual



Richardson, G., & Troost, W. (2009). Monetary intervention mitigated banking panics during the great depression: quasi-experimental evidence from a federal reserve district border, 1929–1933. *Journal of Political Economy*, *117*(6), 1031-1073. https://doi.org/10.1086/649603

Difference-in-differences (DD)

- Example: Effect of Reform 97 (Drange, Havnes & Sandsør, 2016)
- First difference:
  - Children who otherwise would have had informal care (treat)
  - Children who otherwise would have been in pre-school (non-treat)
- Second difference:
  - Before reform (pre)
  - After reform (post)
- No effect on grades of Reform 97



(b) Exam performance

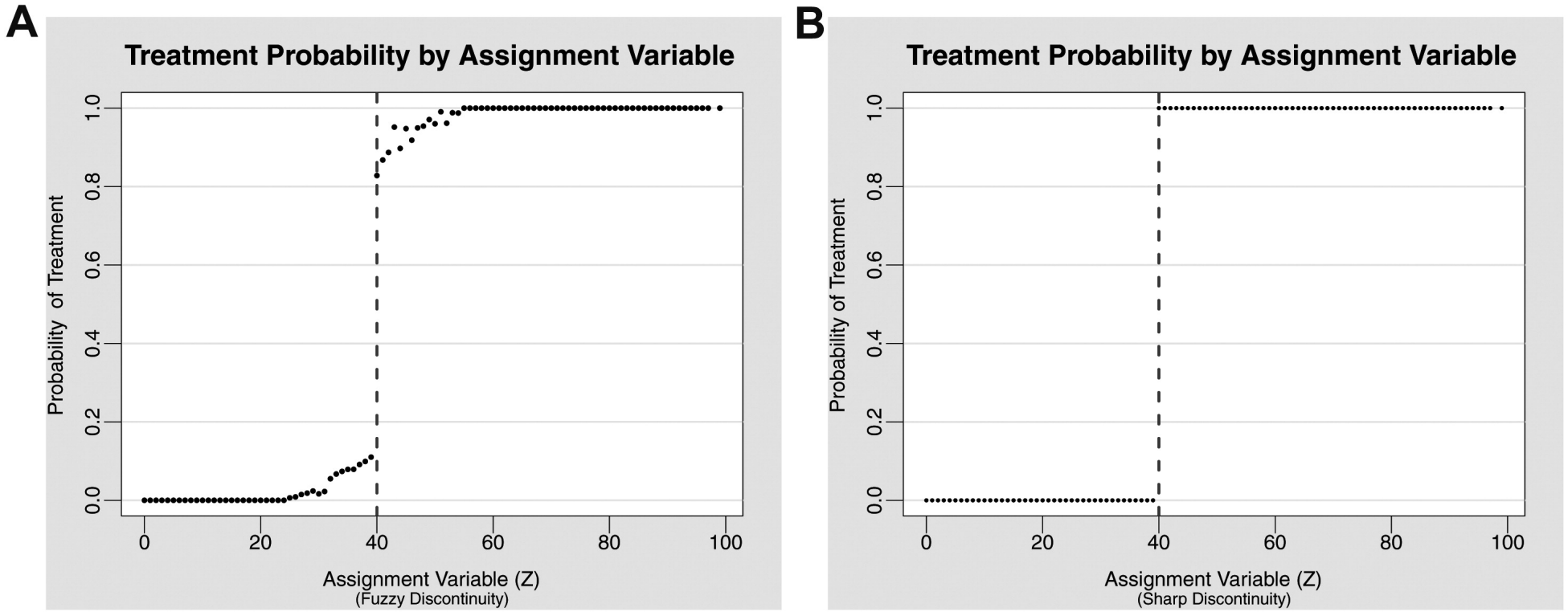
Difference-in-differences (DD)

CRITICAL QUESTIONS:

- Is the common trends assumption valid?
- Are there compositional changes?

Regression discontinuity (RD)

- Decision rule assigns treatment
- Comparing outcomes for students just above and below cut-off gives causal effect of treatment



Regression discontinuity (RD)

Boston Latin School (BLS) exam cut-off scores

FIGURE 4.6
Enrollment at BLS

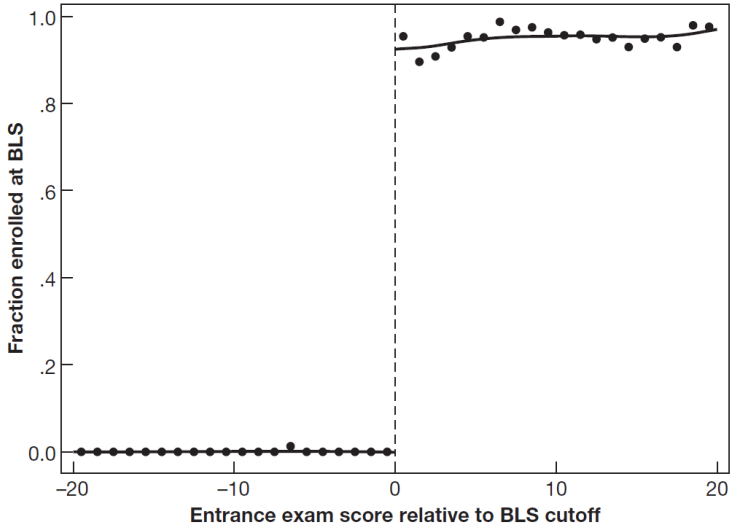


FIGURE 4.8
Peer quality around the BLS cutoff

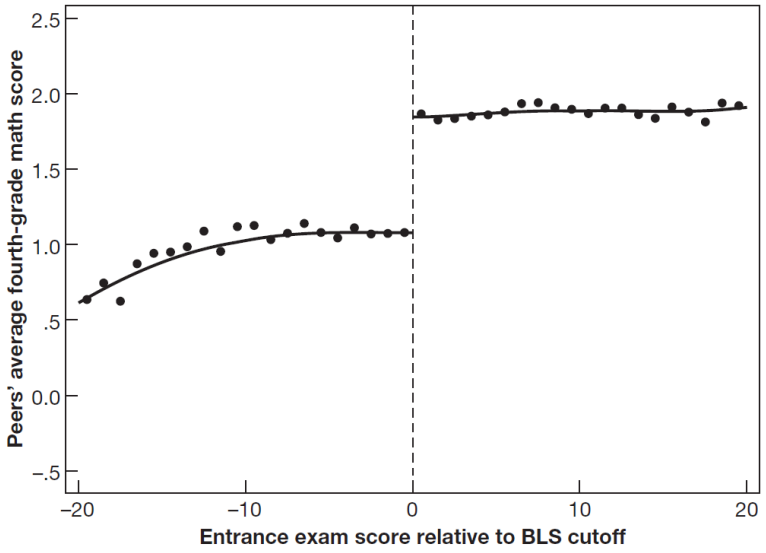
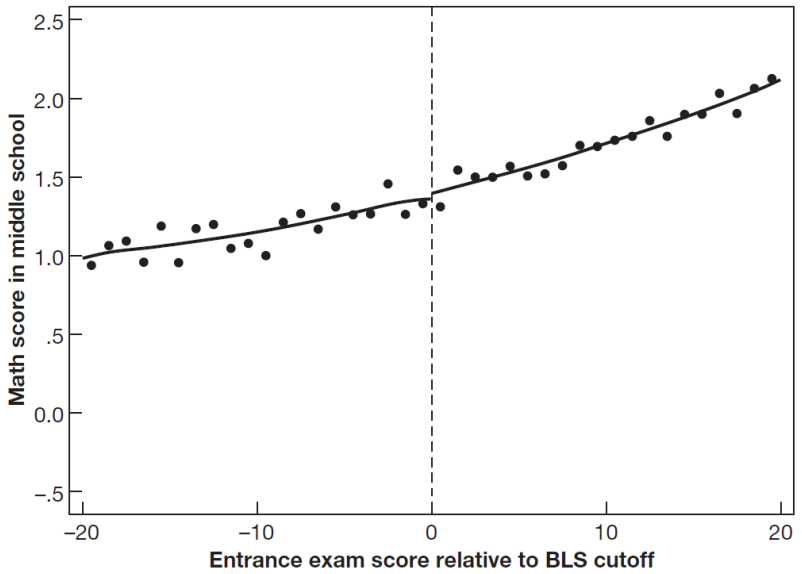


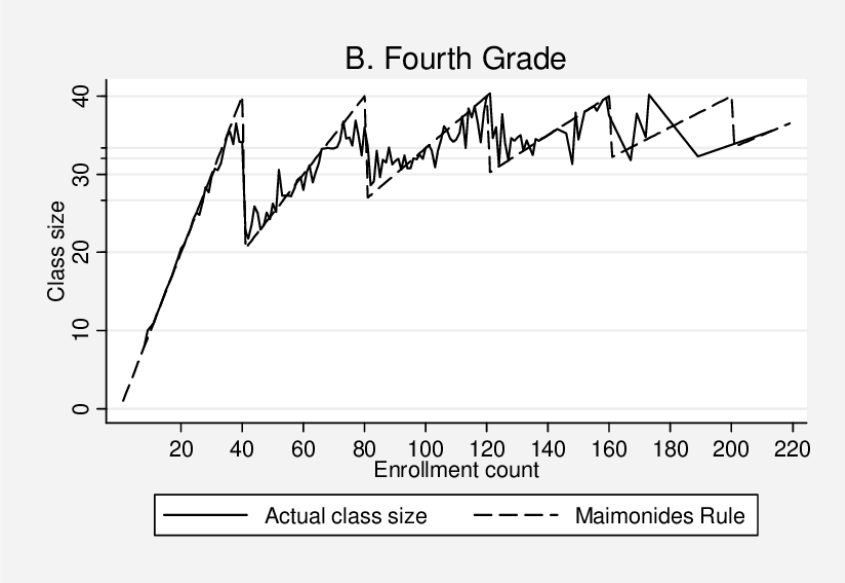
FIGURE 4.9
Math scores around the BLS cutoff



Abdulkadiroğlu, A., Angrist, J. and Pathak, P. (2014), The Elite Illusion: Achievement Effects at Boston and New York Exam Schools. Econometrica, 82: 137-196. https://doi.org/10.3982/ECTA10266

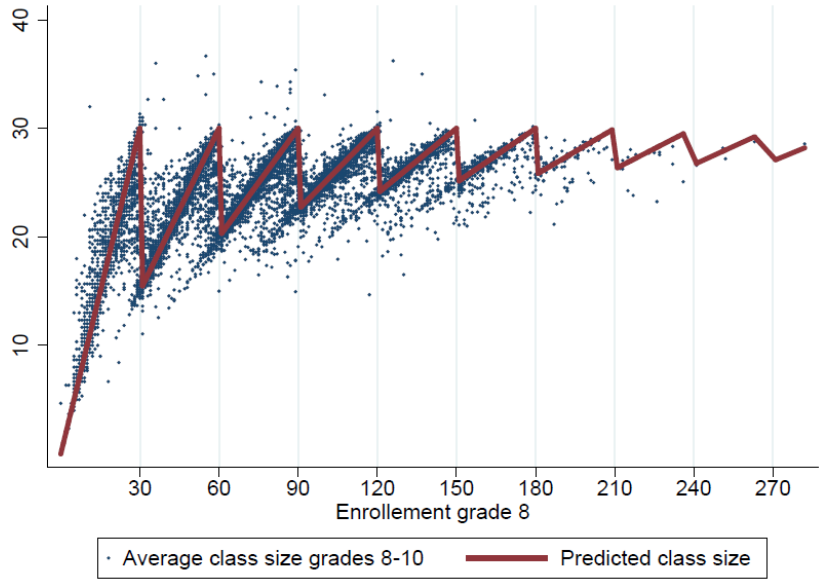
Regression discontinuity (RD)

- Effect of class size, Israel
  - Angrist Lavy (1999)
  - Angrist, J. D., Lavy, V., Leder-Luis, J., & Shany, A. (2019)
- Class size cut-off: 40



Angrist Lavy (1999)

- Effect of class size, Norway
  - Leuven, Oosterbeek & Rønning (2008): Grades
  - Falch, Sandsør & Strøm (2017) and Leuven & Løkken (2018): Income and years of education
- Class size cut-off: 30



Falch, Sandsør & Strøm (2017)

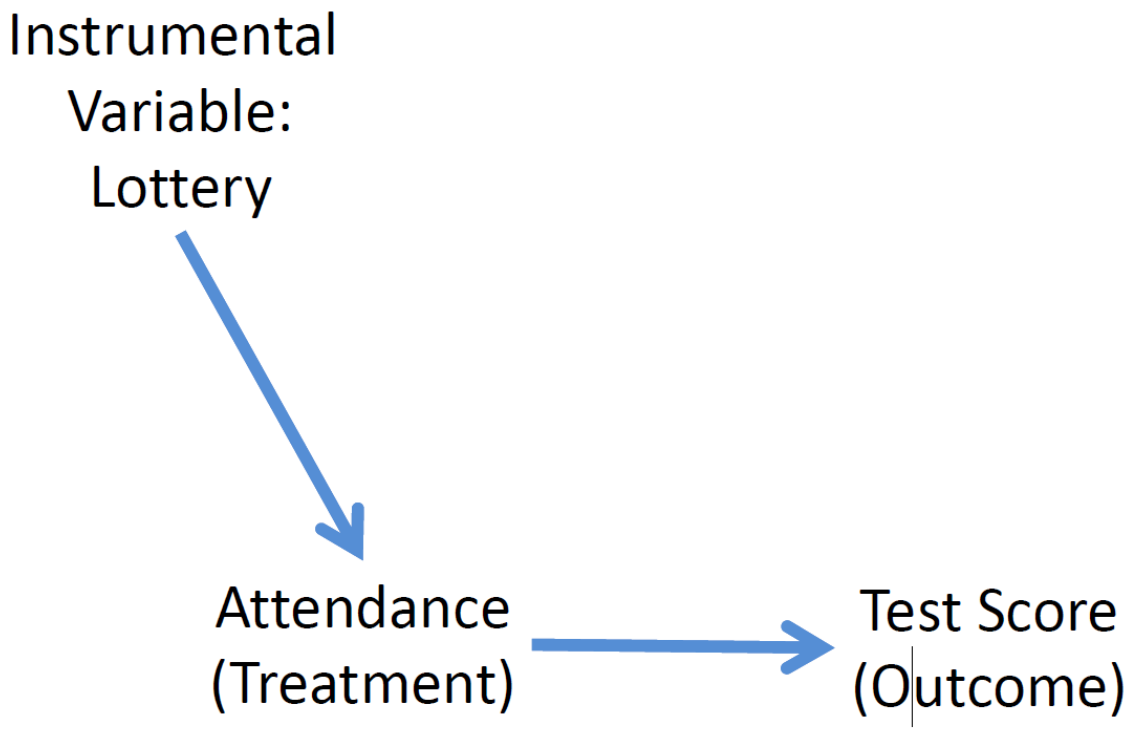
Regression discontinuity (RD)

CRITICAL QUESTIONS:

- Is there manipulation around the cutoff?
- What is the counterfactual?

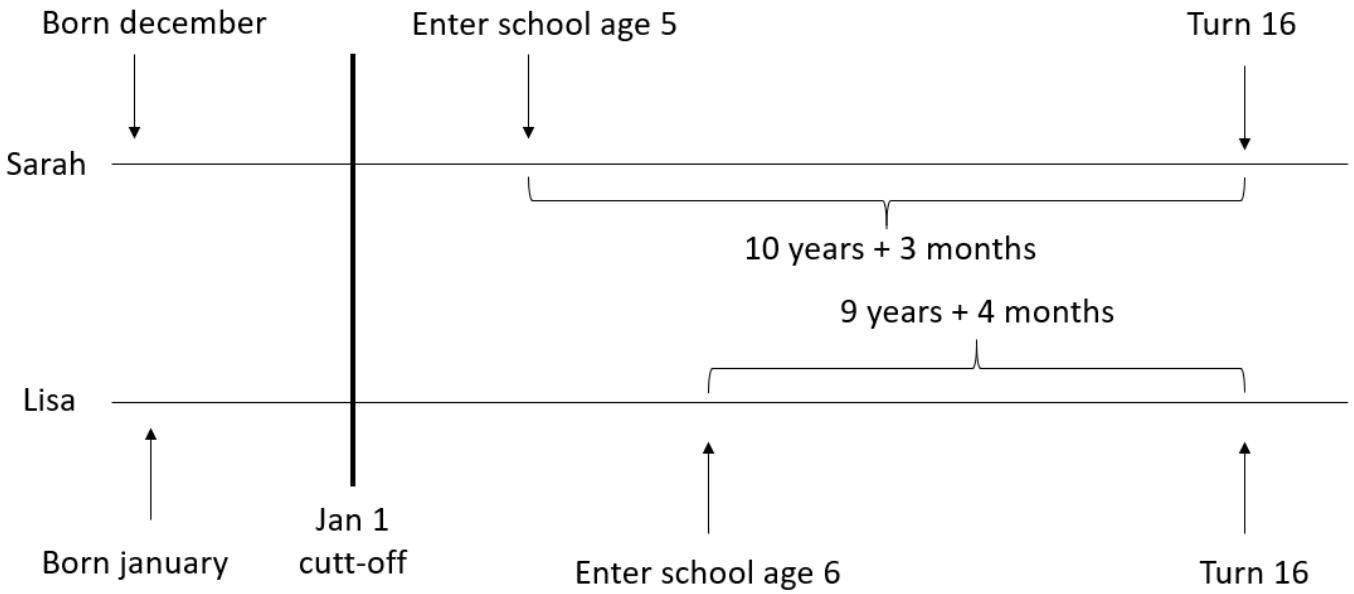
Instrumental variables (IV)

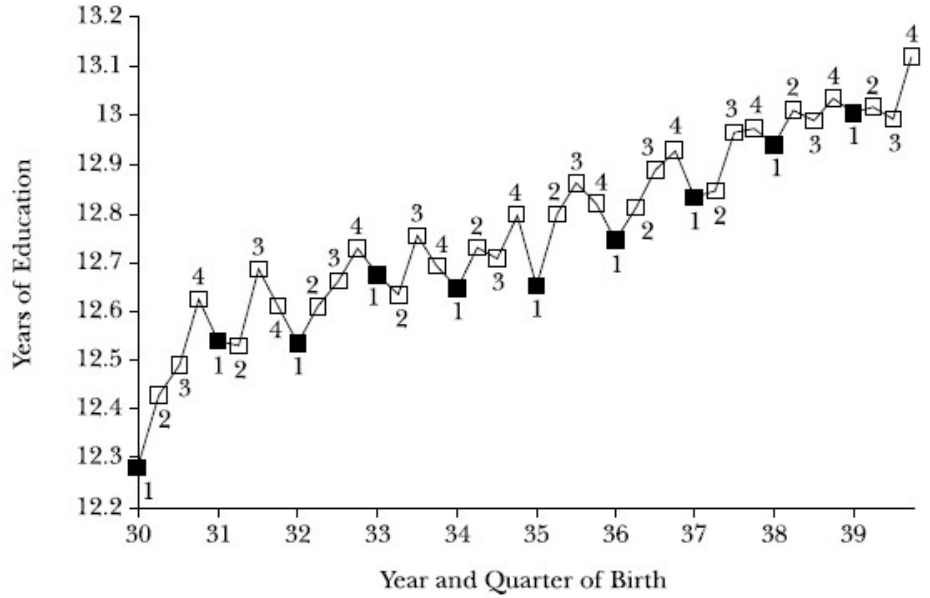
- Variable that is correlated with the causal variable and not correlated with other variables that might affect the outcome variable
- Instrumental variable should not have an effect on outcome variable though any other channel than through the causal variable

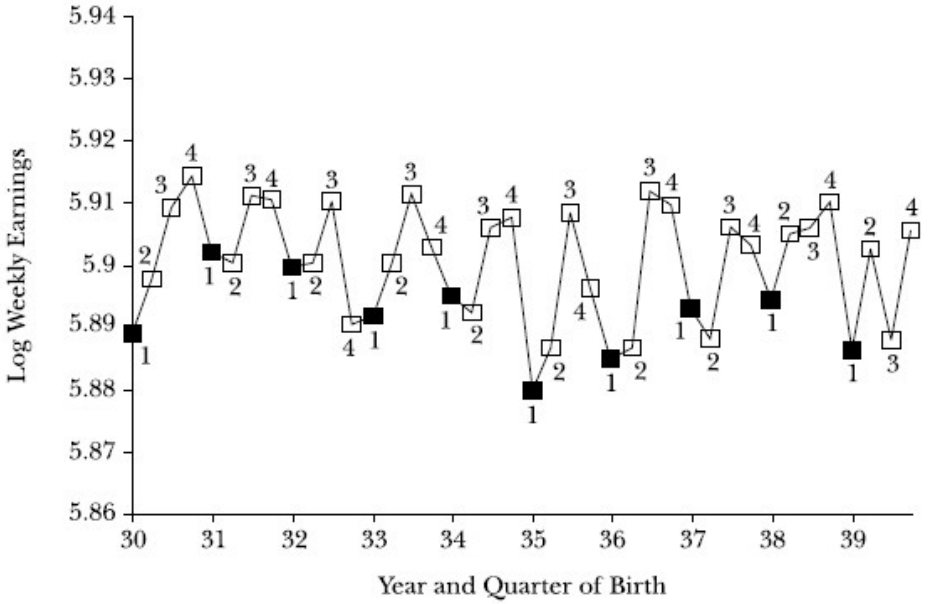


Instrumental variables (IV)

- Effect of years of education on income using school laws
- Quarter of birth as an instrument for years of education







Angrist, J. D., & Keueger, A. B. (1991). Does compulsory school attendance affect schooling and earnings?. *The Quarterly Journal of Economics*, *106*(4), 979-1014. https://doi.org/10.2307/2937954

Instrumental variables (IV)

CRITICAL QUESTIONS:

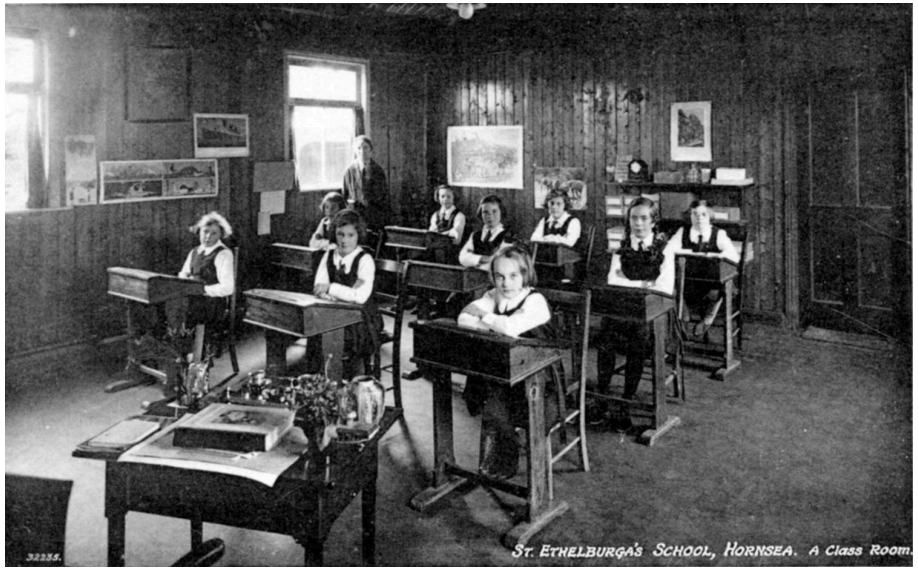
- Is the IV variable predictive enough? (correlation between IV and causal variable)
- Are there any other ways in which the IV variable affects the outcome variable than through the causal variable?

"Because an individual's date of birth is probably unrelated to his or her innate ability, motivation or family connections, it seems credible to assert that the only reason for the up-and-down pattern in earnings is the up-and-down quarter-of-birth pattern in schooling" (Angrist and Krueger, 1991, p. 119).

- Are birthdays random?
- Do birthdays affect income in any another way than through years of education?

Back to class size (or teacher density)…

- RCT
- Quasi-experiments
- (Correlational studies)



- Tennessee STAR experiment (RCT)
- Class size rules (RD/IV)
- Strict criteria for receiving resources to hire more teachers (RD)
- Comparing municipalities receiving resources to hire more teachers to comparable municipalities over time (DD)

What do we agree on in economics of education?

- Human capital is important…
- … but it is hard to increase human capital
- Teachers are very important…
- … but it is hard to improve teacher education or teacher quality
- The effect of increasing resources varies
- The effect of institutional changes varies
- We depend on causal studies to be able to tell us what works, when it works and how well it works

Take home message:

- You do not need to know how to do quasi-experiments
  - Each of these methods takes time to understand and years to master
  - Requires detailed knowledge of register data and regression analyses using R/Stata
  - Robustness checks are a big part of it
  - Typical paper has one table with results and 12 tables with robustness

- You should be able to understand the essence of the method
  - Does the story seem credible?
  - Are any critical assumptions violated?
  - Have they understood the reform/policy change in the right way?
  - Is the interpretation of the results correct?

Literature/references:

- Abdulkadiroğlu, A., Angrist, J. and Pathak, P. (2014), The Elite Illusion: Achievement Effects at Boston and New York Exam Schools. Econometrica, 82: 137-196. https://doi.org/10.3982/ECTA10266
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Discussion:

- Norwegian teacher density reform
  - Grant given to the 100 (out of 428) municipalities with the lowest teacher density
  - Did the grant lead to an increase in teachers?
- What could have happened?
  - Make your hypotheses
  - Are they testable?
- How do we find out?
  - Can we evaluate this using a quasi-experiment?