

# Quasi-experimental Methods

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Evaluation Fund

# Outline

1. General Introduction
2. Difference in Differences
3. Regression Discontinuity
4. Encouragement Design



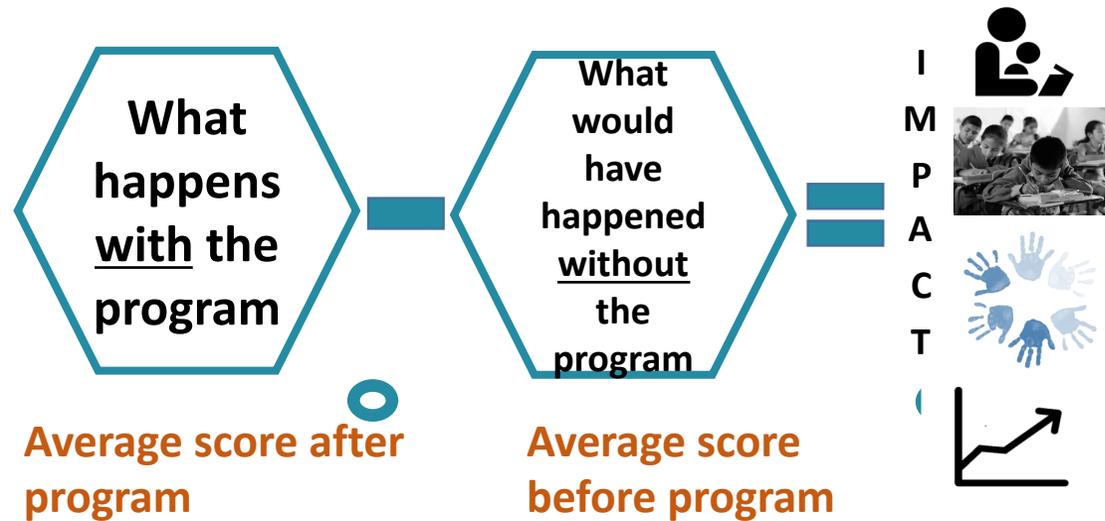
# Randomization is a powerful technique, but can we always use it?

- A program or policy that has to be offered to every single person within a defined target population.
  - Antipoverty programs, pensions programs, compulsory schooling
- A program or policy that occurred in the past
  - Past school constructions, parenting program no longer in existence
- At times, then, it is logistically impossible to randomize

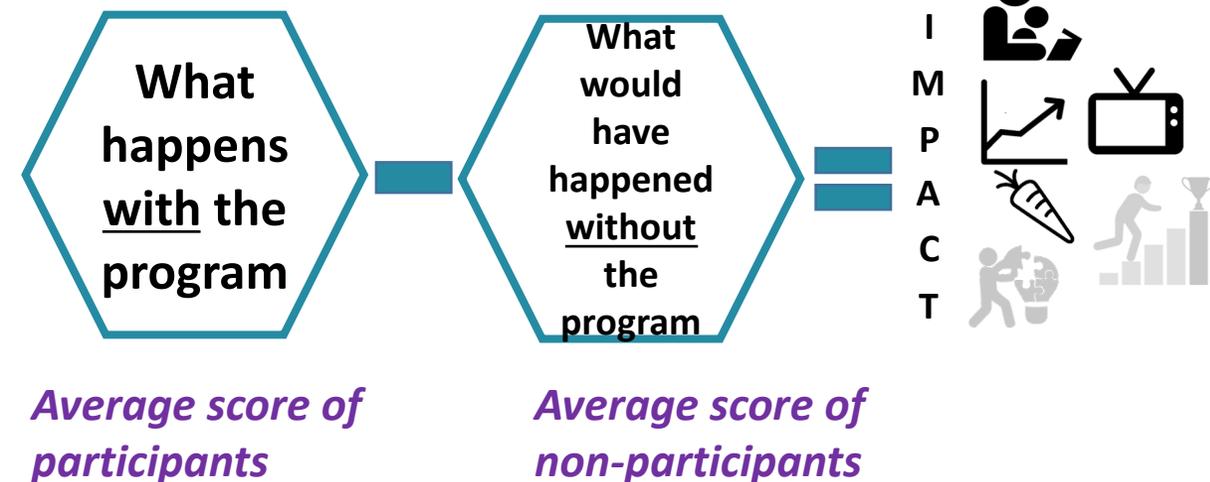
# So if we can't randomize, what should we do?

- We try to mimic the method and attempt to come as close as possible to *satisfy the conditions* that make it powerful.
- This is where quasi-experimental methods come in.
- *Quasi* meaning “having some resemblance usually by possession of certain attributes” (Merriam-Webster Dictionary).

# What do experiments do so we can mimic them?



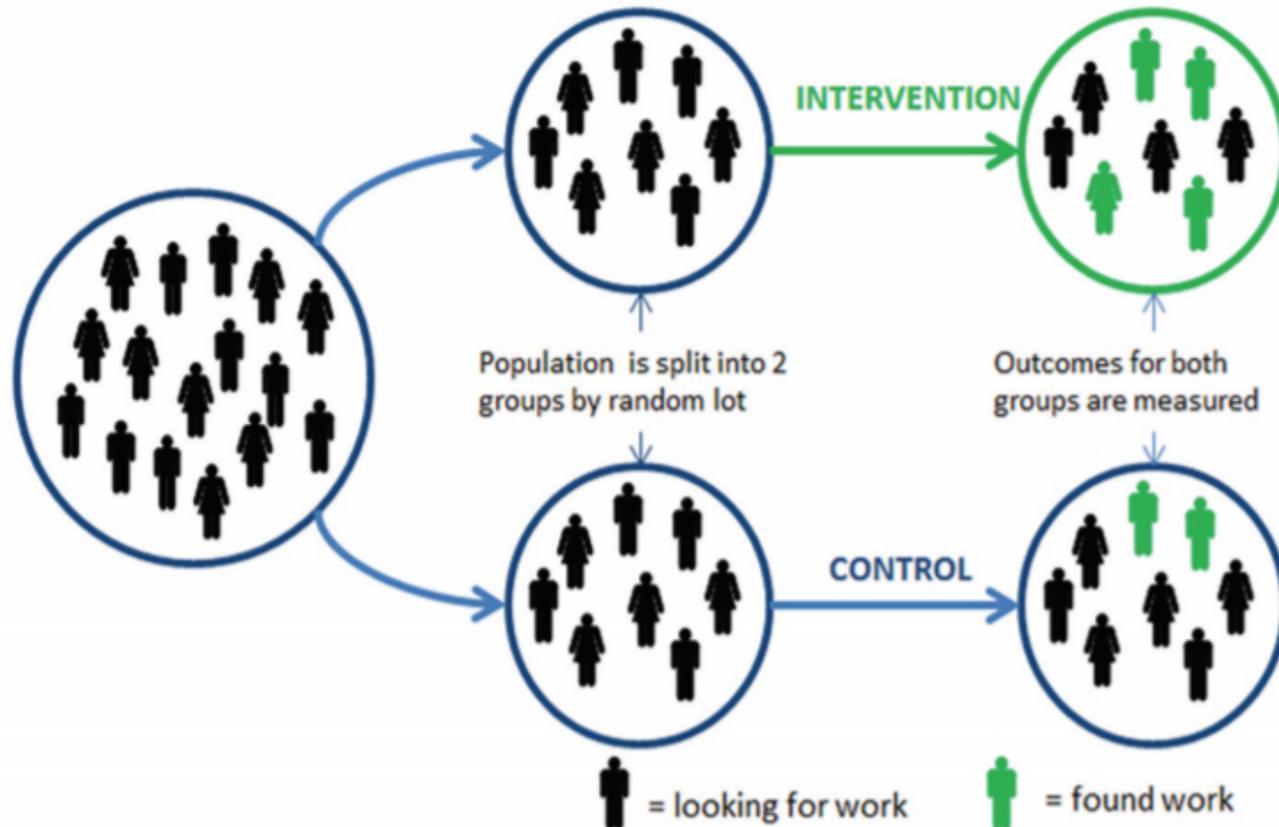
- (Typically) use a before-after comparison



- Compare participants and non-participants

- Quasi-experiments (*typically*) use these two approaches as well!

# What else do experiments do so we can mimic them?

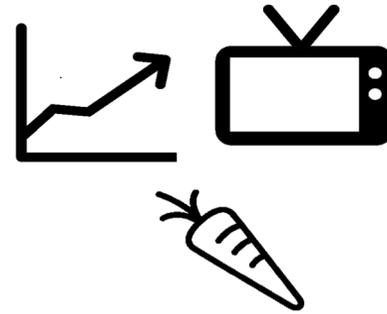


- Individuals are randomly assigned to be participants (treatment) and non-participants (control).
- They do not determine whether they get the program or not

# Quasi-experiments try to mimic this as well!

- Quasi-experiments try to come up with a good counterfactual by comparing individuals who also don't determine in which group they end up.
- The mechanism that is behind is as-good-as random or reasonably so.
- This condition will help ensure participants and non-participants don't differ on unobservables like motivation or willingness to try new things.

## • Observables



## • Unobservables



# What could be as-good-as-random assignment?

- New school construction program?
- Sudden change in (or end of) scholarship program?
- Rules on how large classrooms can be before an additional teacher is assigned?
- Remediation program based on diagnostic exam?

# Difference in Differences



# Difference-in-Differences (Dif-in-Dif) Method

- 1<sup>st</sup> Difference: Before-and-after difference (time)
- 2<sup>nd</sup> Difference or Difference in Differences: Difference (in gains) between participants (treatment group) and non-participants (comparison group)
- Key Assumption  
Before treatment starts, trends in outcome between treatment and comparison groups are *parallel*

# Example: Difference in Differences

## Goal

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Improve enrollment of girls in secondary school

## Target

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State of Bihar in India with large secondary-school dropout of girls

## Intervention

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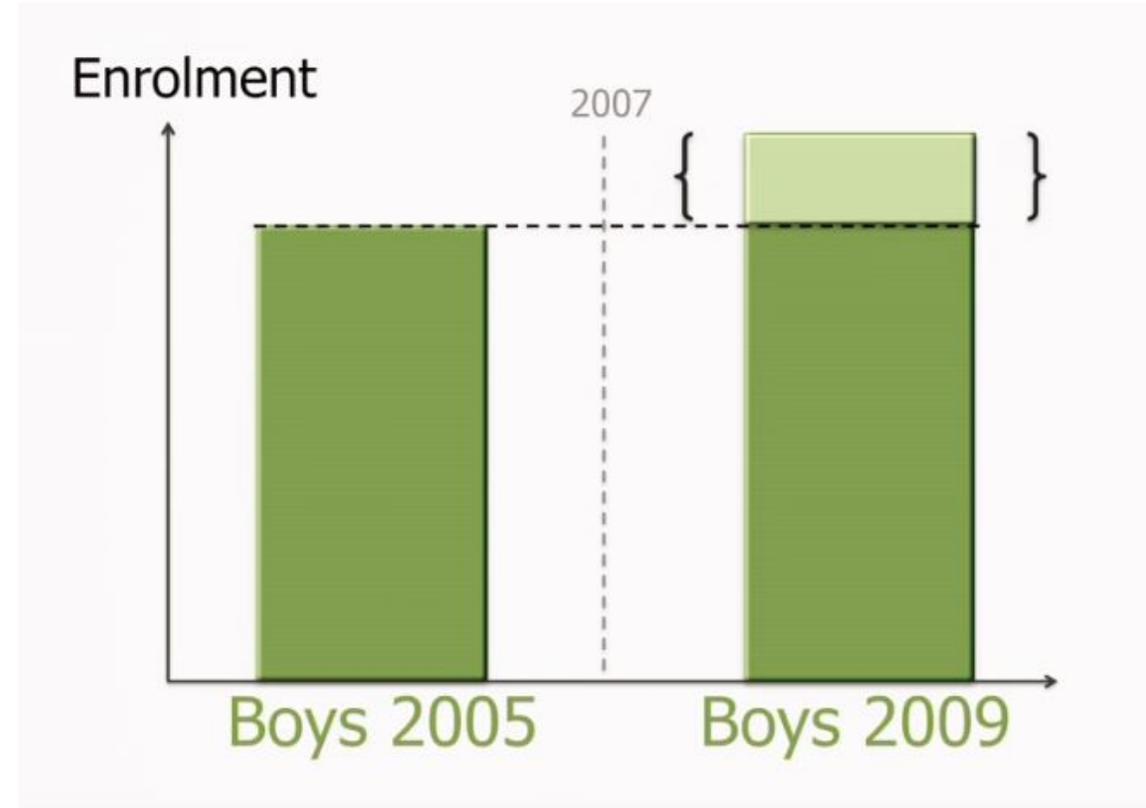
Provide free bikes to every girl age 14 in the state

## Source

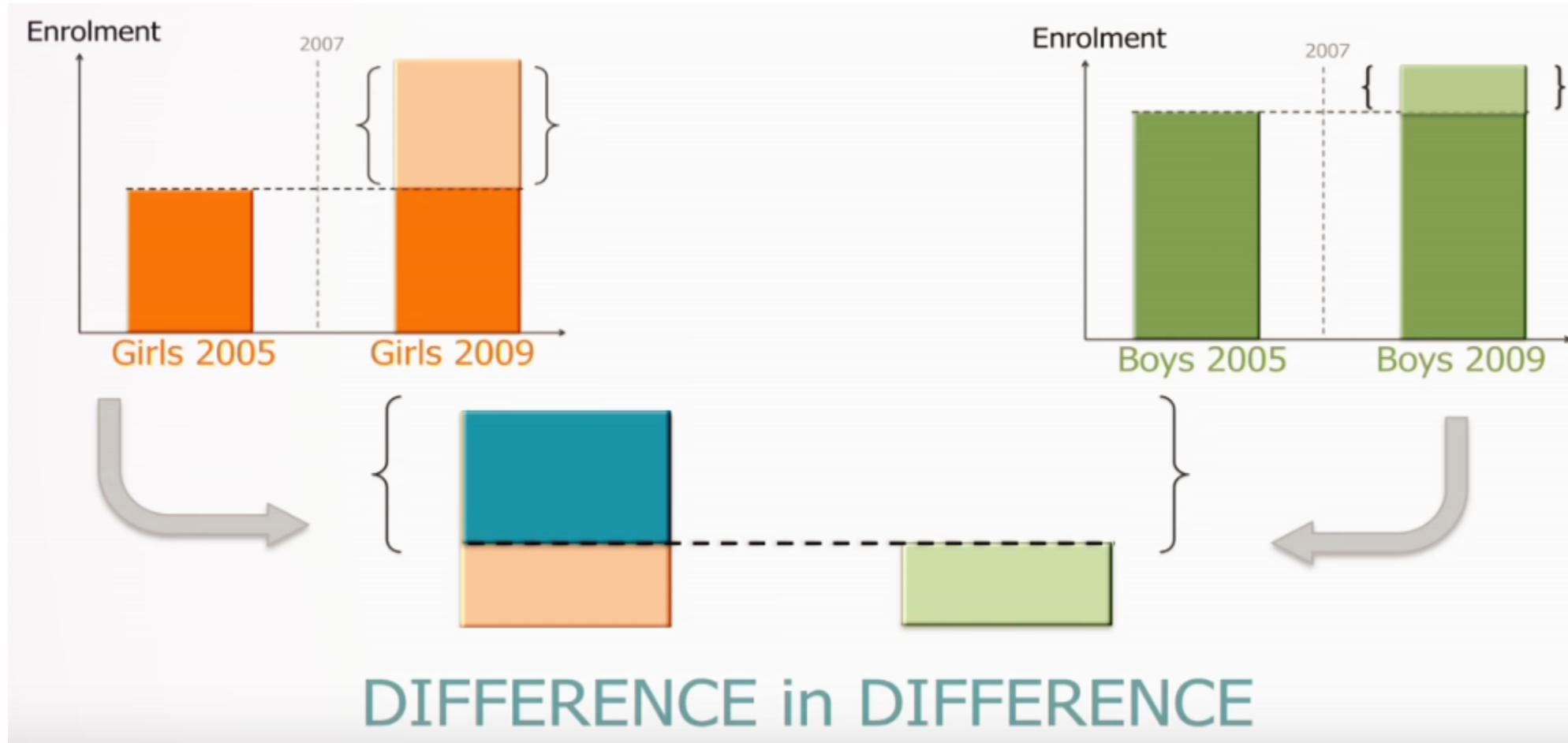
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Muralidharan and Prakash 2017

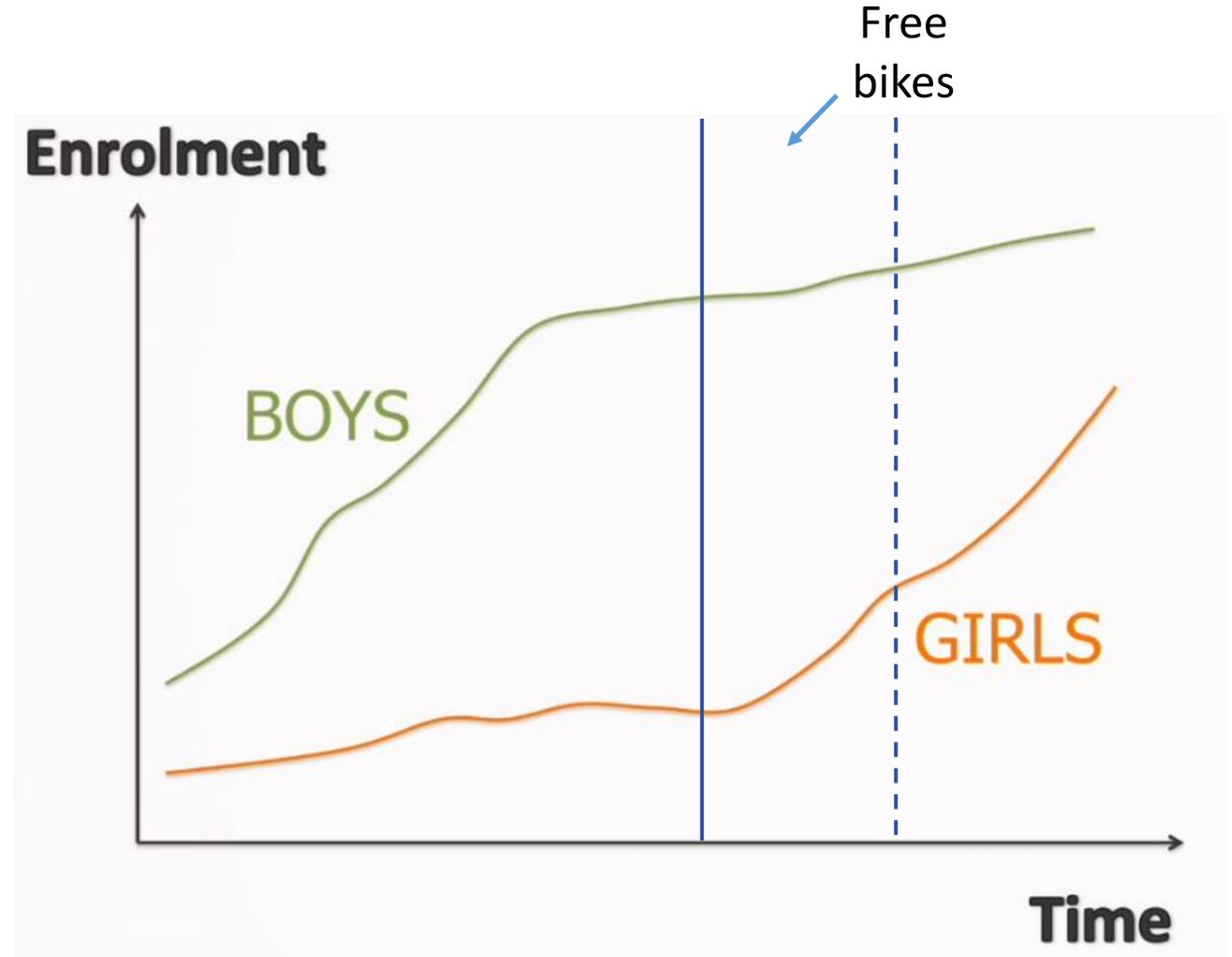
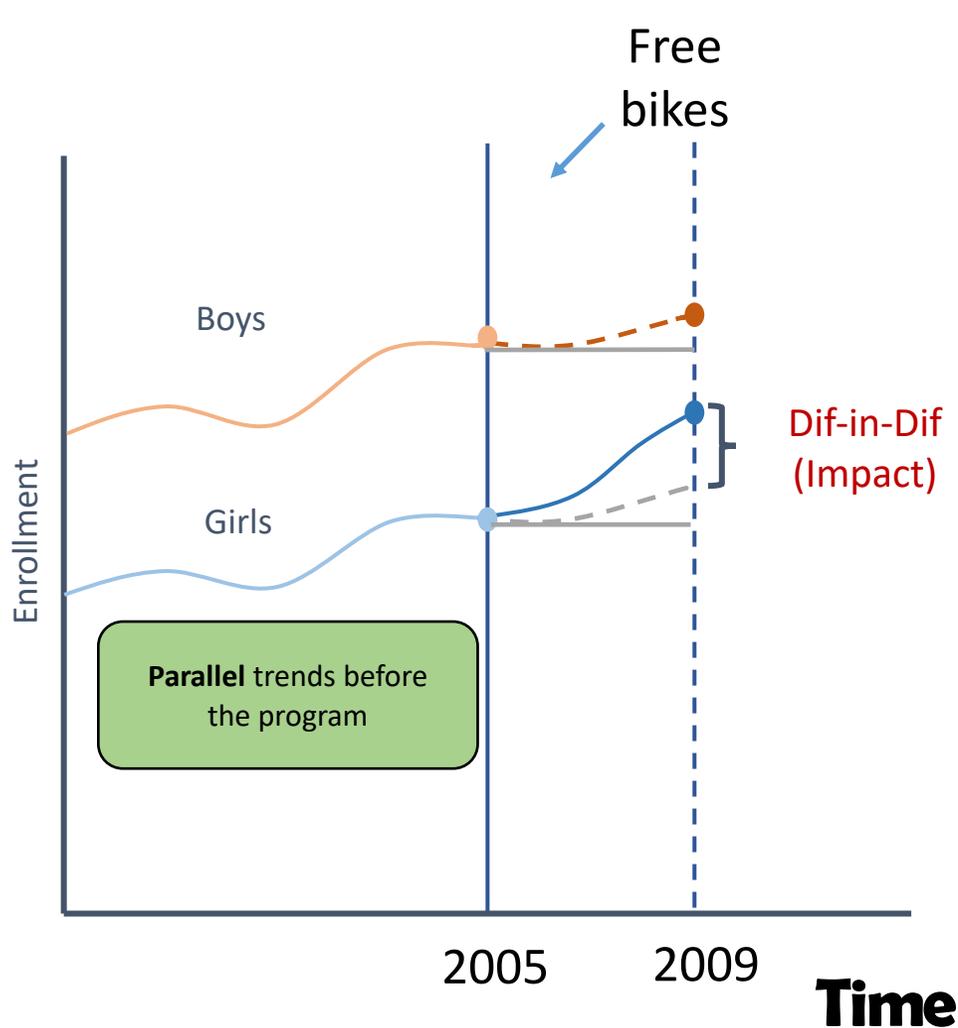
# 1<sup>st</sup> Difference: Before-and-After Difference



# Difference in Differences!



# Difference-in-Difference: Is Assumption Met?

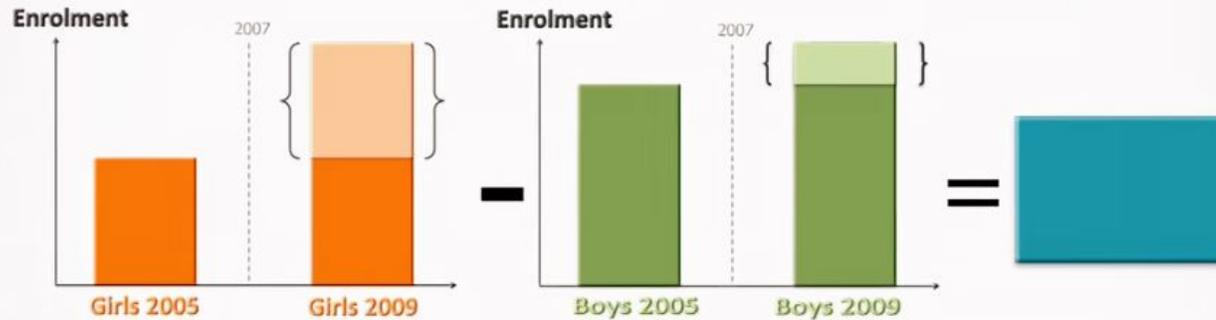


# Difference in Difference-in-Difference



# Difference in Difference-in-Difference

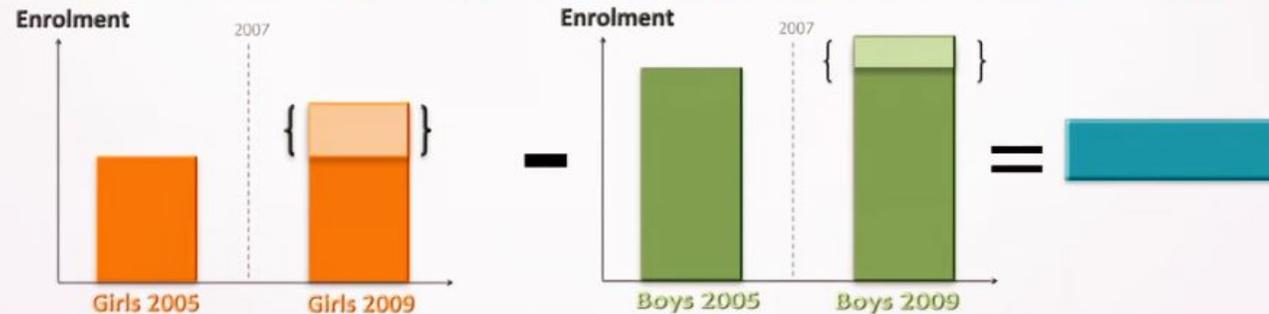
## Bihar Difference-in-Difference



## Difference-in-Difference-in-Difference



## Jharkhand Difference-in-Difference



Difference -



in-Difference -



in-Difference



Impact reduces dropout by roughly 15% and reduces gender gap by about 25%

# Regression Discontinuity Designs



# Regression Discontinuity Design (RDD)

- Relies on comparing individuals who are on either side of a cutoff or threshold used to assign a program or other treatment.
- The intuition behind it is that those who are barely below or barely above this cutoff are virtually identical.
- Key Assumptions
  - Individuals don't determine on which side of the cutoff or threshold they fall.
  - The assignment variable is measured imperfectly.

# Example: RDD

## Goal

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Promote computer skills for low-income students

## Target

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Low-income households with students enrolled in public schools in Romania

## Intervention

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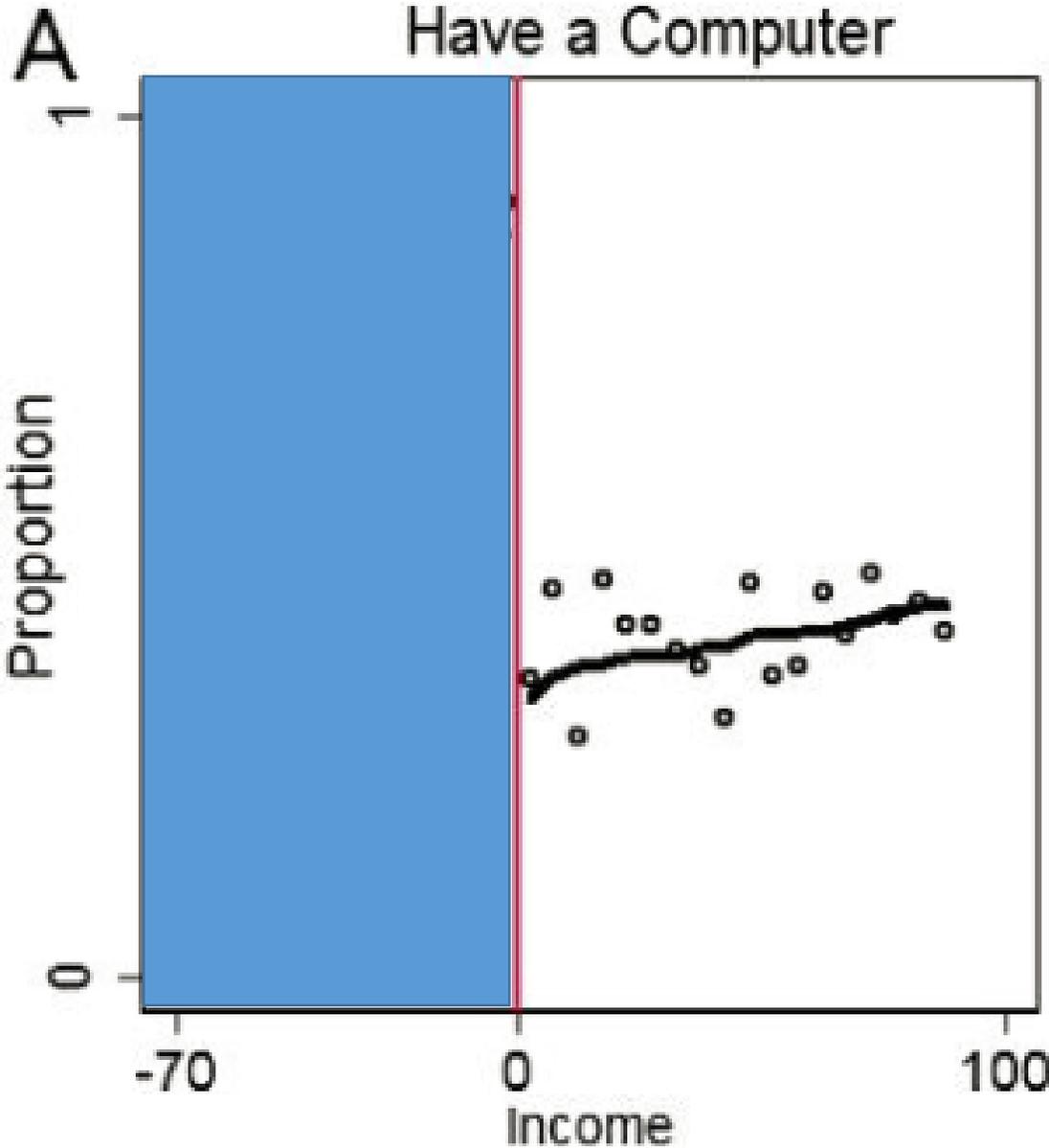
Provide voucher (subsidy) to buy a computer worth roughly 200 euros

## Source

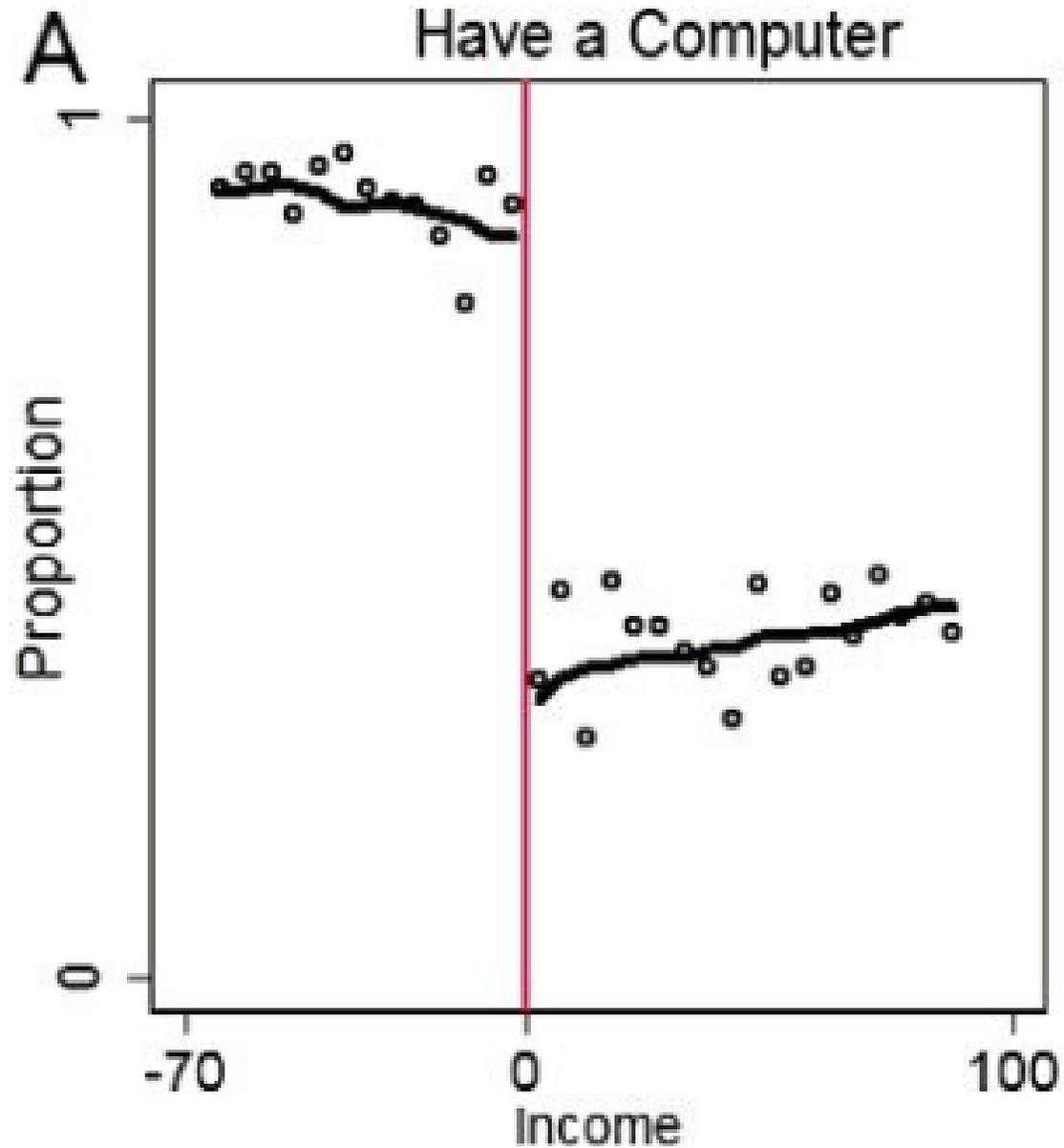
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Malamud and Pop-Eleches 2011

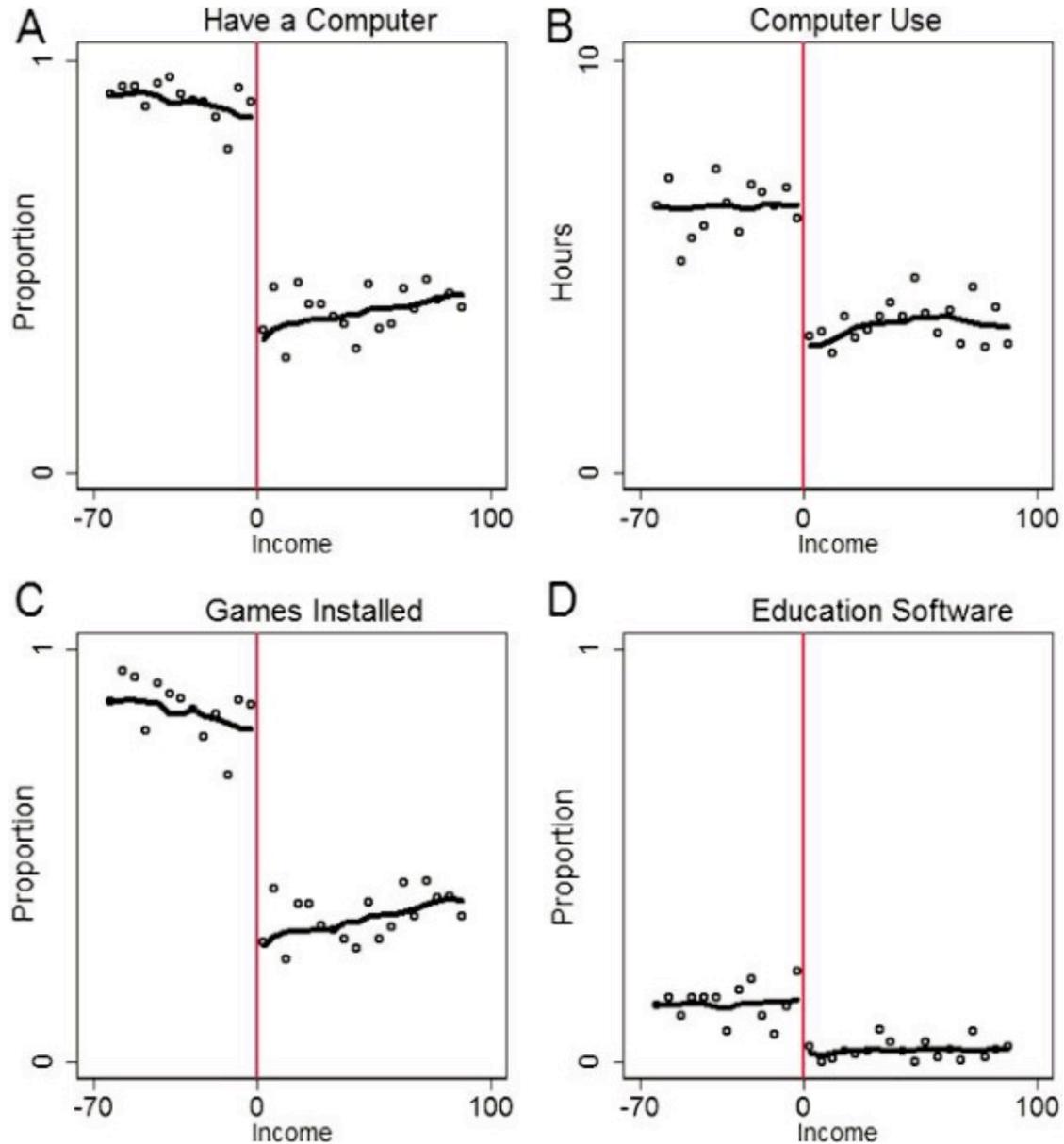
# RDD: Income and Computer Ownership



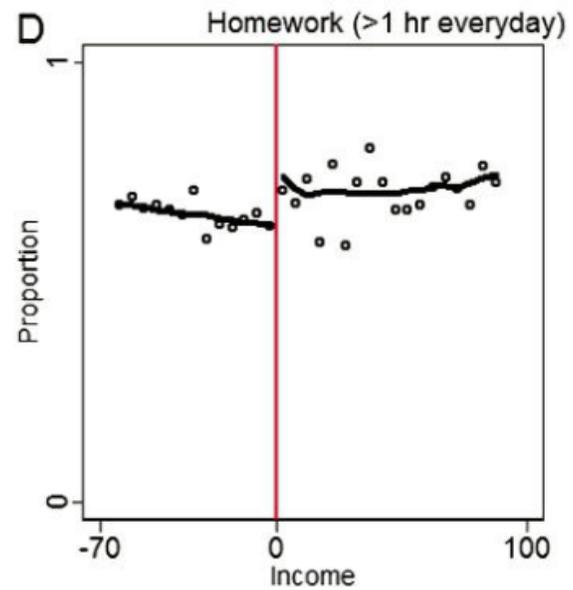
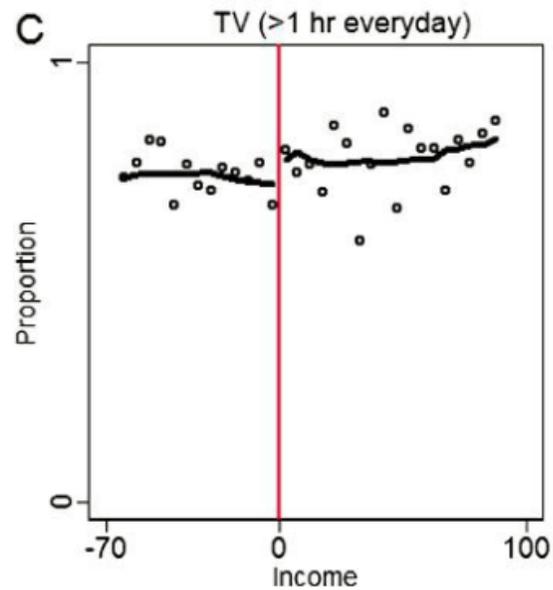
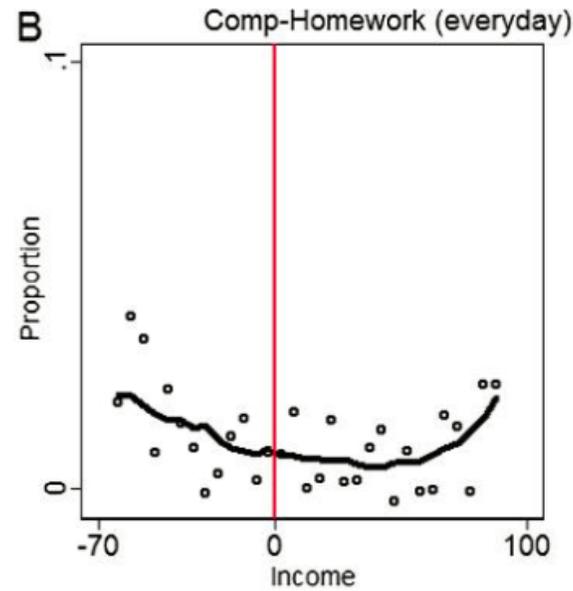
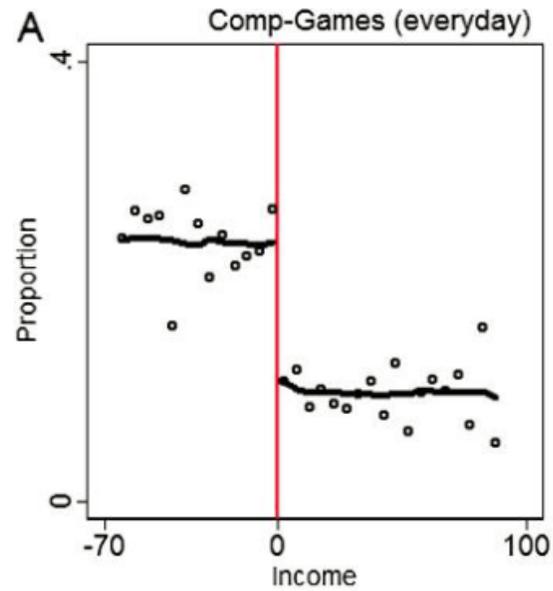
# RDD: Big jump at Cutoff of Computer-voucher Receipt!



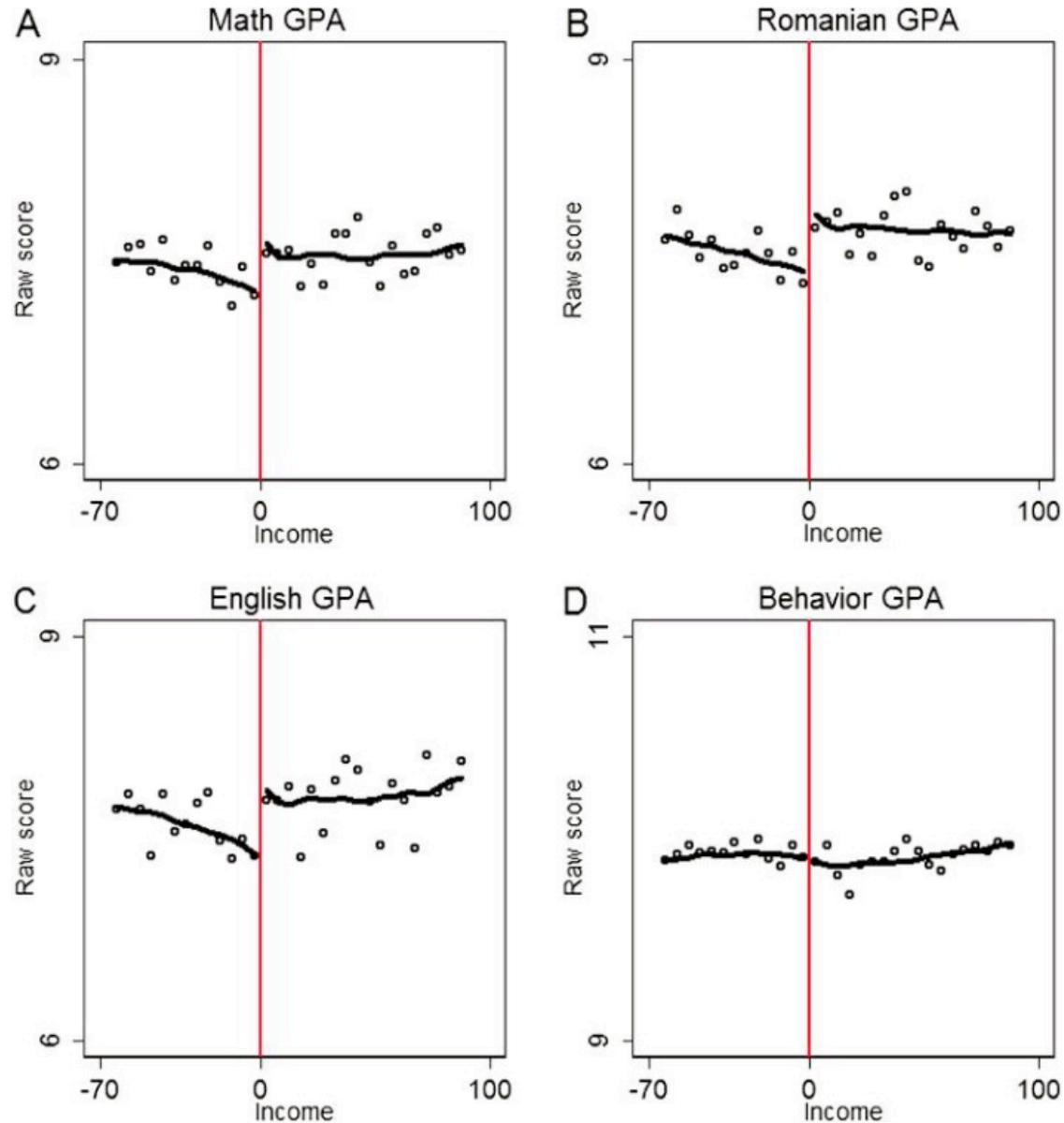
# RDD: Discontinuities in Related Inputs



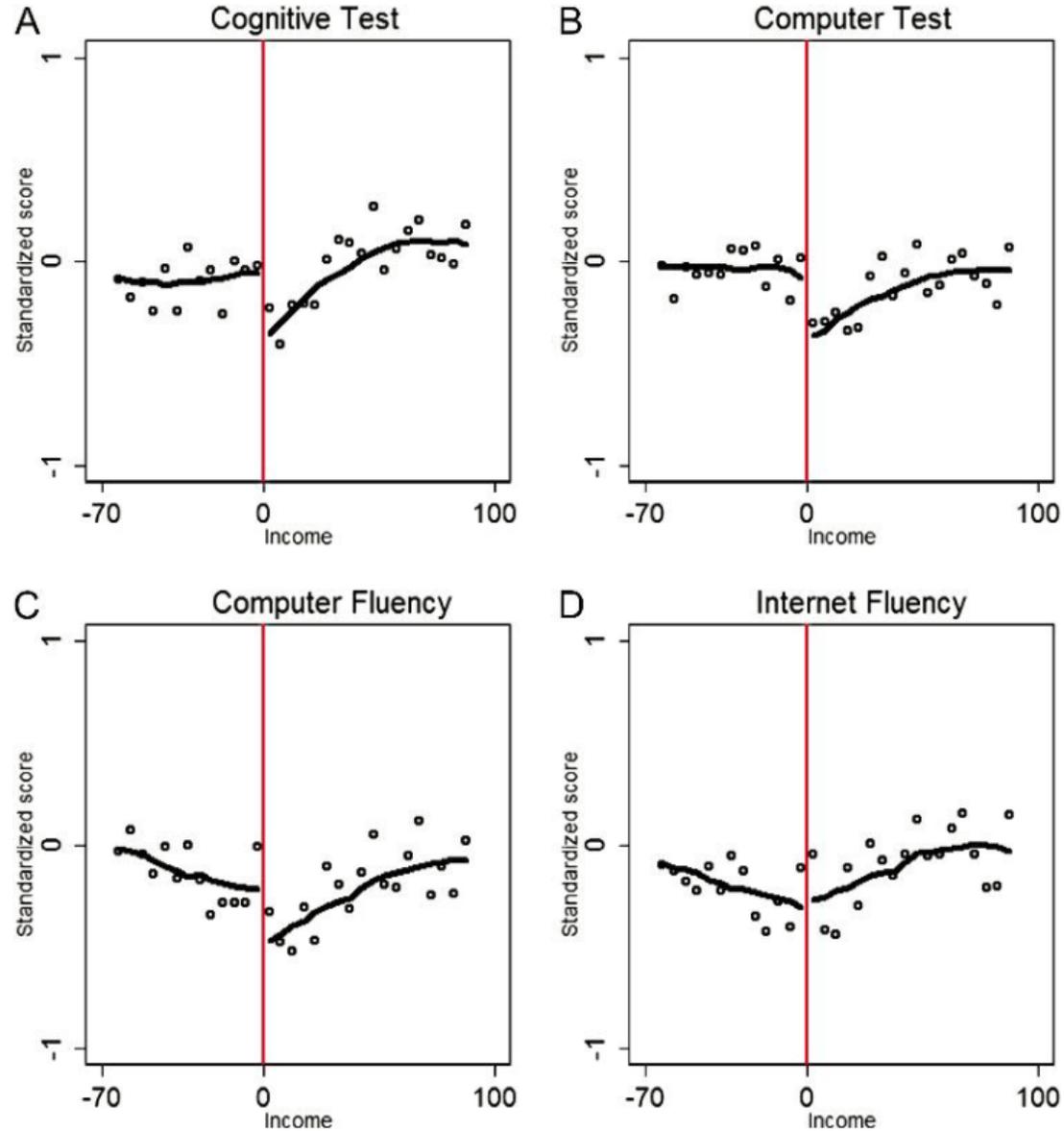
# RDD: Discontinuities in Activities (Process variables)



# RDD: Unintended Consequences of Program!



# RDD: But Some Positive Results



# Encouragement Designs



# Encouragement Design

- Encouragement design is a good option when a program has to be offered to every single person within a defined target population.
- Can't randomize assignment to treatment, but can randomize encouragement to participate in (or take-up) the program among eligible population
- Variation in Participation: Program participation is partly determined through participants' personal choices and attributes. Yet, another part of participation is determined randomly because of the encouragement.
- We can exploit this randomly-determined variation in program participation to assess the effect of the program.

# Example: Encouragement Design

## Goals

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Reduce high rates of iron deficiency anemia in adolescent population, which likely contribute to lower earnings

## Target

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Poor adolescents in rural Peru

## Intervention

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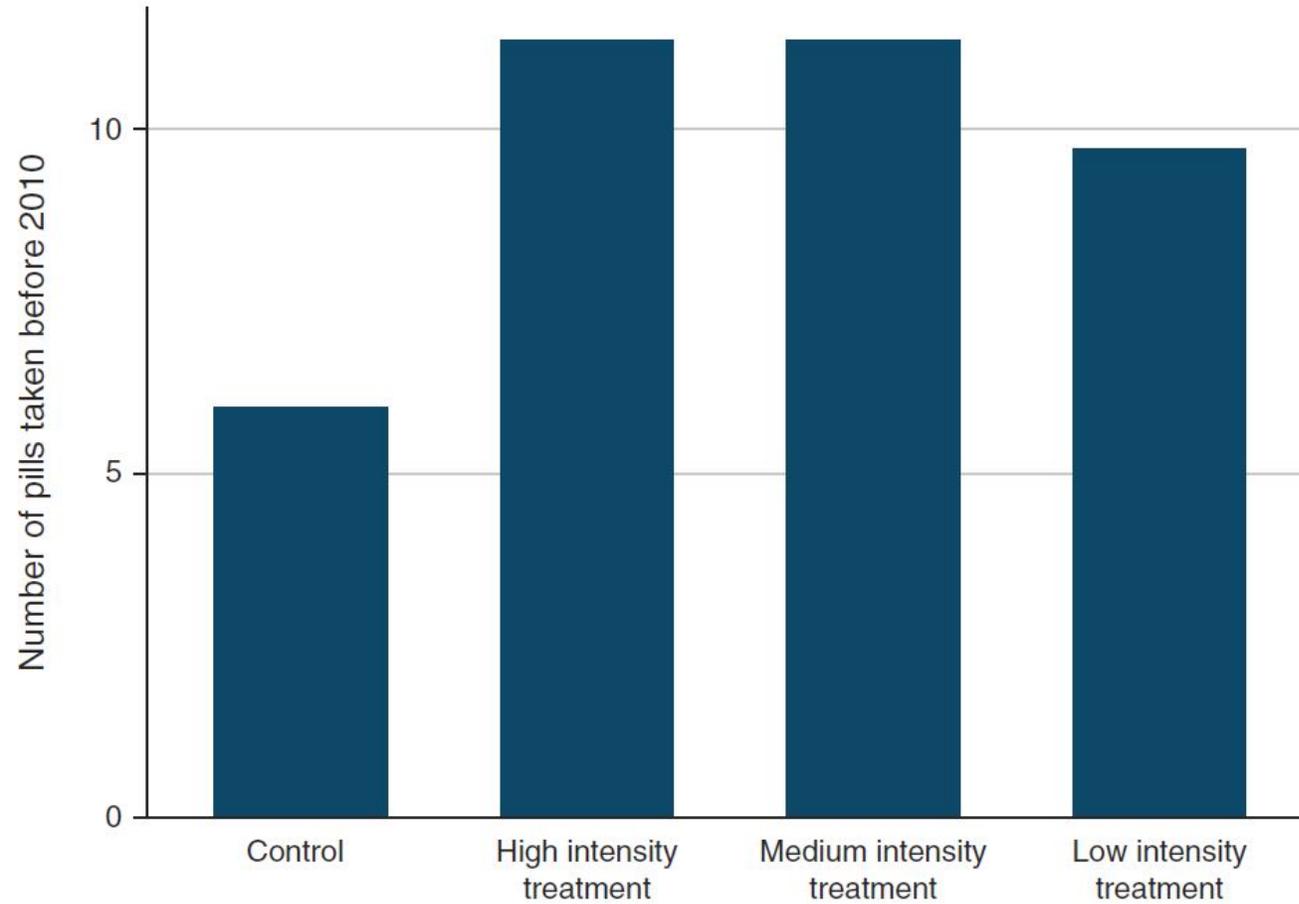
- Made available iron pills at a rural health center in the fall of 2010
- Provide classroom-based media program that encourages adolescents to take iron pills

## Source

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Chong, Cohen, Field, Nakasone and Torero 2016

# Encouragement Design: Pill Take-Up by Treatment



# Encouragement Design: Results among Previously Anemic Students

- Those encouraged are approximately 34 percent less likely to be anemic at follow-up
- Impact of encouragement on school grades is 0.45 standard deviations.
- Impact of taking the pills on school grades is in the range of 0.58 and 0.9 standard deviations

**Thank you!**