

Regression Discontinuity Design

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Review: DiffinDiff

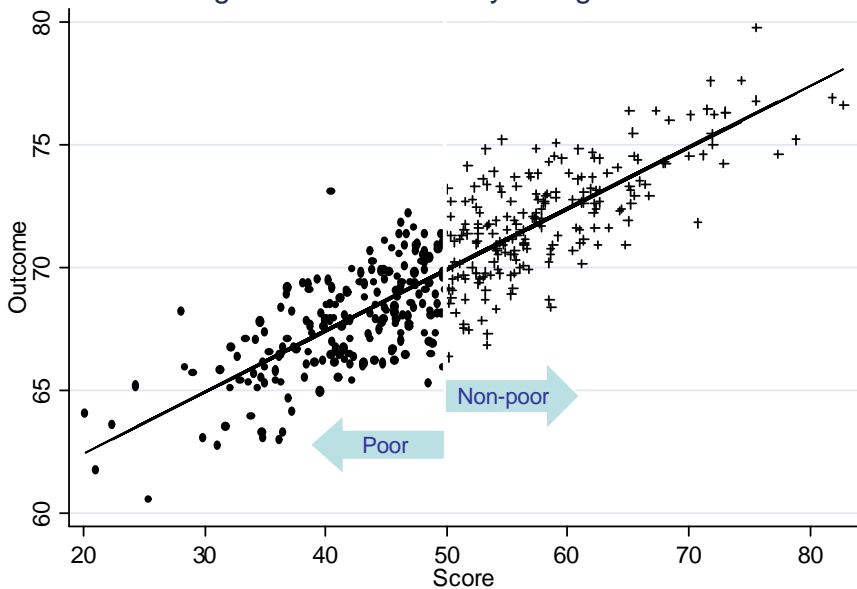
- In the Difference in Differences approach, people are split into two groups: treatment and control
- Recall, basic idea is that people are either impacted or not, use people who are not impacted as a control
- However, what if these groups are very different?
- Many programs use income as a criteria for eligibility
 - If you have less than some amount of income (say 10000 Naira/month), you are eligible
 - Diff-in-Diff approach: treat people with income below the threshold as eligible
 - this means everyone with more than 10000 Naira a month income are compared to everyone with less than 10000

- In particular, this means that someone with 100000 Naira a month income is being compared to someone with 2000 Naira a month
- Do these two seem likely to be similar?
- What if income has an effect on child health?
- Then, people with really low incomes in the treatment group are really negatively effecting program results, while people with really high incomes in control are also hurting it.
- What you'd really like to do is compare people who are just barely eligible with those who are almost eligible.
- Basic idea: people with 9500 Naira a month income are a lot like people with 10500 eligible in everything except for their eligibility for this program
- So, if their program has an effect, and it's implemented carefully, there should be a discontinuous jump at 10000 Naira/month

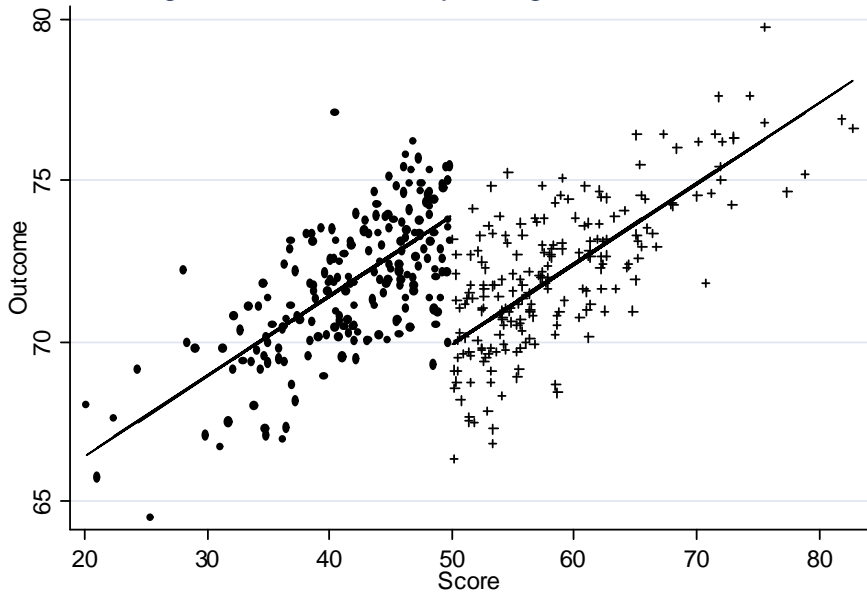
Many programs have cutoffs in eligibility criteria

- Anti-poverty programs targetted to households with less than a given income
- Scholarships targetted to students with test scores above a certain level
- Pensions targetted to adults above a certain age
 - We'll talk about one of these
- Critical assumption, which we'll return to: only difference which changes sharply at the cutoff is program eligible. This means:
 - Eligibility is enforced, so that this changes sharply at cutoff
 - Nothing else changes with eligibility

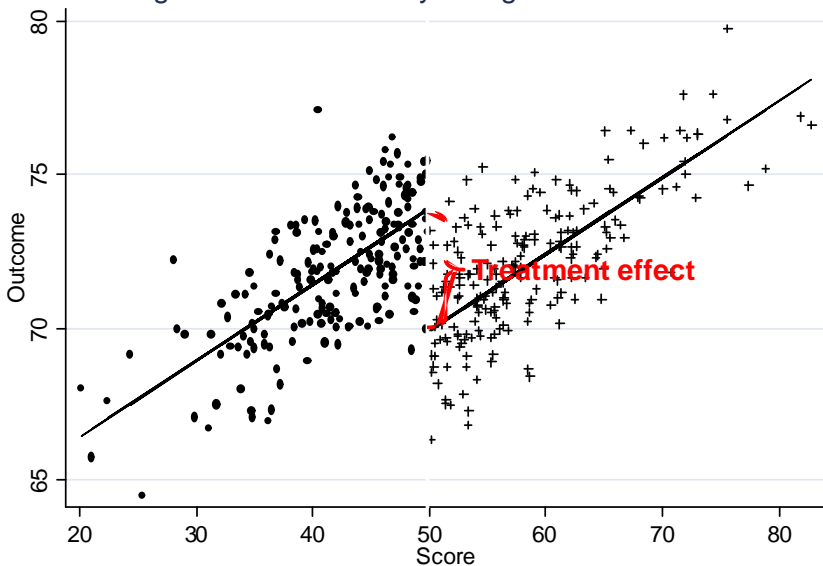
Regression Discontinuity Design - Baseline



Regression Discontinuity Design - Post Intervention



Regression Discontinuity Design - Post Intervention



Case Study: South African OAP: Effects on Child Health

- In South Africa, all women over 60 and men over 65 are eligible for an old age pension, subject only to a means test
- This pension is very large in size ($\cong 2 * \text{med household income}$)
- Nearly all South Africans are below means threshold (especially those of African descent)
- Impact Evaluation: Did this pension impact child health? And does it matter whether the man or the woman received it?

Approach of Analysis

- Could do difference in differences. Don't have baseline data, so can't difference over time, but could compare

$$\bar{Y}_{Elig}^{O60} - \bar{Y}_{Elig}^{U60} - \left(\bar{Y}_{NotElig}^{O60} - \bar{Y}_{NotElig}^{U60} \right)$$

- But, 2 problems
- Not many people are ineligible. Seems like a not very good control group
- Also, children who live with everyone under 60 might be a lot different than those who live with someone over 60.
- When everyone is under 60, probably no grandparents in the house. Children who live with grandparents might be a lot different in terms of income, ethnicity, schooling, family ties, etc.
- Really want to compare similar children. What about comparing children who live with eligible grandmothers who are just over 60 to those who live with grandmothers who are just under 60

Was criteria enforced?

- First, must verify that Pension receipt changes sharply at age 60 for women and 65 for men.
- Otherwise, if we find something that changes at those ages, it's really not obvious what it could be – we know it isn't getting a pension.

Age Group	Women	Men
% receiving pension		
• 55-59	16%	5%
60-64	77%	22%
65+		60%

- So pension eligibility was enforced

RD design with the OAP

- Look at children who live with older adults
- Interested in child health. Look at height/age and weight for age measured in standard deviations from mean
 - noisy measure for children (as discussed yesterday)
- How to implement RD (suppose \bar{w} = mean weight for a given group)?
 - Compare children who live with women who are 60-65 (\bar{w}_W^{60-65}) with those who live with women who are 55-60 (\bar{w}_W^{55-60})
 - and compare children who live with men who are 60-65 (\bar{w}_M^{60-65}) with those who live with men who are 65-70 (\bar{w}_M^{65-70})
- Could also run regression: $w_i = \beta_1 (W > 60)_i + \beta_2 (M > 65)_i + \beta_3 (W > 55)_i + \beta_4 (M > 60)_i + \varepsilon_i$
These do (more or less) the same thing.

Big effects for women on weight

- Girls who live with a woman who is just pension eligible are .6 standard deviations heavier than girls who live with women who are almost pension eligible
- Girls who live with a man who is pension eligible are no different than girls who live with men who are almost pension eligible
- Boys who live with a woman who is just pension eligible are .3 standard deviations heavier than boys who live with women who are almost pens. elig. (though not sig.)
- Boys who live with a man who is just pension eligible are the same weight as boys who live with a man who is almost pension eligible.
- Smaller differences for height (though they exist for very small people).

Limitations of RD

- As we mentioned, RD doesn't work if the eligibility criteria is not enforced
 - Otherwise, the one thing we can be sure of is that the program did not cause the effect we're measuring.
- RD also compares people who are very close to the threshold cutoff. In the pension example, can we say anything about children who do not live with their grandparents?
 - In this case, we were worried that these children were very different from their peers, so we didn't want to consider them in the treatment or control group.
 - But a lot of important effects may only happen to people who are far from the cutoff.
- RD also is in trouble if anything else changes with eligibility
- Is this an issue in pension study? Recall that we are only comparing children who live with grandparents who are just elig. to those who live with gp's that are almost elig?
 - If people move into different households in response to the pension