Econometrics -2 PS6

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Discussed with Miriam and Giacomo.

Regression Discontinuity Design and Differences-in-Differences

7.1 Application: Low birth weight and infant health

This application is predominantly a replication of Douglas Almond, Joseph J. Doyle, Amanda E. Kowalski, and Heidi Williams (2010): "Estimating Marginal Returns to Medical Care: Evidence from At-risk Newborns", Quarterly Journal of Economics, 125(2): 591-634.

Alan I. Barreca, Melanie Guldi, Jason M. Lindo, and Glen R. Waddell (2011): "Saving Babies? Revisiting the effect of very low birth weight classi
cation", Quarterly Journal of Economics, 126(4): 2117-2123.

The original study was motivated by the argument that low birth weight classifi
cation triggers additional treatment that might promote infant health. The data set is based on Vital Statistics Linked Birth and Infant Death data (runandjump sample1500g.dta) and is available on OLAT. Each observation corresponds to a birth. Because the births have been matched to death data, we observe whether a given child does or does not survive one hour (agedth1), 24 hours (agedth2), one week (agedth3), 28 days (agedth4), and one year (agedth5). This data is available for the years 1983-1992 and 1994-2002 and contains children with birth weights between 1350 and 1650 grams (N=376,408). The running (assignment) variable is: birth weight in grams (bweight).

a. To ease interpretation of results, create a birth weight variable (bwtcent) for which 1500g corresponds to zero.

Done.

b. Show the distribution of birth weights around the 1500-gram cutoff in three ways. Plot the frequencies using 1-gram bins, 10-gram bins, and 25-gram bins with bins radiating out from the 1500-gram cutoff. Is the distribution of birth weights smooth?

Hint: Be careful not to pool together observations across the threshold. Therefore, you need to create variables that tell you what bin an observation is in. For example, for the 1-gram bins, use the following command: bin1=bwtcent+0.5. This ensures that the x-variable (bin1) is centered on the middle of the bin. To construct the other bins, make sure that observations on the upper edge are included in the upper bin. To get the frequencies, I recommend using the commands preserve and collapse.

See figures 1, 2, and 3.

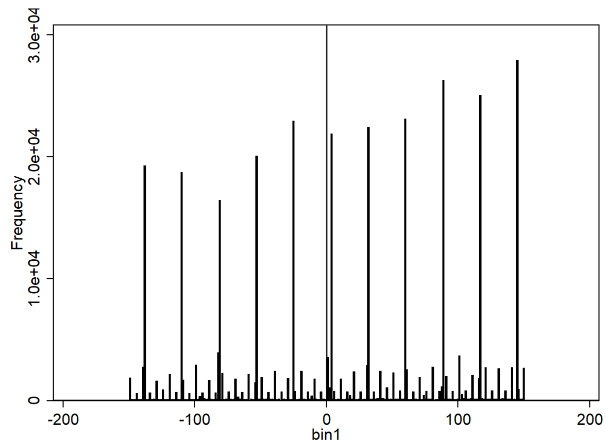

Figure 1: Question 1b: bin=1

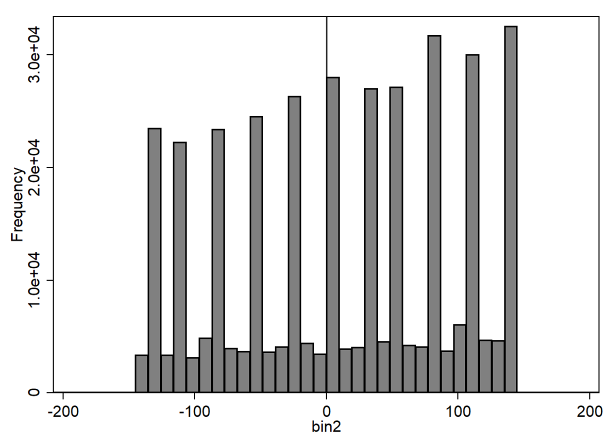

Figure 2: Question 1b: bin=10

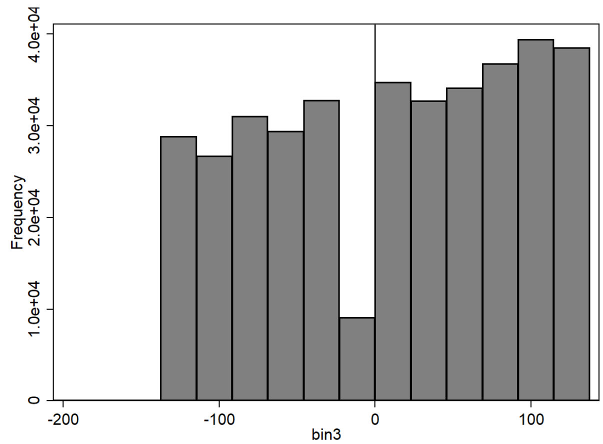

Figure 3: Question 1b:bin=25

c. Explain, why non-random sorting across the treatment-threshold is a concern in RD designs. Make your arguments explicit and apply them to this particular example.

It can be an indication of manipulating of the running variable.
In particular, poor-quality hospitals may be more likely to round the birth weight or to manipulate birth weight to obtain favorable treatment for children.

McCrary (2008) proposes in the article Justin McCrary (2008): Manipulation of the running variable in the regression discontinuity design: A density test", Journal of Econometrics, 142(2), 698-714. to test for non-random sorting by considering whether the distribution of the running variable is discontinuous at the treatment threshold.

d. Using the bins and associated frequencies from part b. as your observations, estimate whether the distribution is discontinuous at the 1500-gram threshold. First, estimate the discontinuity using a regression that is linear in birth weights (LLR), allowing the slope to be different on each side of the cutoff. Second, estimate the discontinuity using a weighted regression (LWR) (hint: use option "lowess" in Stata for each side of the cutoff). Third, assume a 2nd order polynomial for each side of the cutoff (PR). Use bandwidths of 150 grams, 100 grams, and 50 grams. Depict your results graphically. Explain, why you should use robust standard errors. Based on these nine estimates, do you conclude that the running variable is smooth across the threshold? Hint: In addition to the constant, your regression model should have three additional parameters to be estimated. For each bin size, you need to preserve the data, collapse the data, create variables needed to get the RD estimates, conduct the analysis, and then restore the data. Make your sample restrictions (relating to the bandwidth) after the data has been collapsed.

The graphs have not been attached since there are too many of them.

You should use robust standard errors since the errors are likely to be heteroskedastic. The running variable is not smooth across the threshold. In particular, there appears to be a peak at the threshold.

Another way of testing for non-random sorting is to compare the underlying (or pre-existing) characteristics of subjects on each side of the cutoff. We usually expect these characteristics to be smooth through the treatment threshold because they cannot be affected by treatment. If they are not smooth, we usually take this as evidence that agents are manipulating the running variable.

e. Obtain RD estimates for discontinuities in whether the mother is white (constructed from mom race) and whether she has less than a high school education (mom ed1). Show your results in two tables, each table presenting estimates based on the following specifications (clustering standard errors on birth weights):
i. Bandwidth=90, rectangular kernel weights, slope flexible on each side of threshold
ii. Bandwidth=60, rectangular kernel weights, slope flexible on each side of threshold
iii. Bandwidth=30, rectangular kernel weights, slope flexible on each side of threshold
iv-vi. Same as above but using triangular kernel weights. (optional)

Results can be found in Table 1 and 2

Table 1: Paramater estimates from OLS, race

	(1) band = 90 b/se	(2) band = 60 *b/se*	(3) band = 30 *b/se*
bwtcent	-0.000	-0.000	-0.001^{**}
	(0.000)	(0.000)	(0.000)
0.dummy	0.000	0.000	0.000
	(.)	(.)	(.)
1.dummy	0.010	0.018	0.039^{***}
	(0.012)	(0.014)	(0.011)
0.dummy#c.bwtcent	0.000	0.000	0.000
	(.)	(.)	(.)
1.dummy#c.bwtcent	0.000	0.000	-0.001
	(0.000)	(0.000)	(0.001)
$_{c}ons$	0.651^{***}	0.644^{***}	0.633^{***}
	(0.009)	(0.010)	(0.008)
N	233887	163422	72941

f.

Table 2: Paramater estimates from OLS, education

	(1) band = 90 b/se	(2) band = 60 *b/se*	(3) band = 30 *b/se*
bwtcent	0.000	0.000	0.001***
	(0.000)	(0.000)	(0.000)
0.dummy	0.000	0.000	0.000
	(.)	(.)	(.)
1.dummy	-0.005	−0.005	−0.026***
	(0.008)	(0.011)	(0.009)
0.dummy#c.bwtcent	0.000	0.000	0.000
	(.)	(.)	(.)
1.dummy#c.bwtcent	-0.000	−0.000	−0.001***
	(0.000)	(0.000)	(0.000)
$_cons$	0.282***	0.284***	0.302***
	(0.008)	(0.010)	(0.008)
N	213055	148776	66370

g.
Estimates can be found in Table 3 and 4. The Estimates do not seem to be sensitive to the bandwidth or the weighting scheme since the effects are similar in magnitude and significance across specifications. The standard errors also appear to be similar regardless of if we cluster them or not indicating that the affect of low birth weight does not cluster within groups of similar birth weight.

Table 3: Paramater estimates from OLS, cluter se

	(1) band = 90 b/se	(2) band = 60 *b/se*	(3) band = 30 *b/se*
bwtcent	-0.000	0.000	0.001
	(0.000)	(0.000)	(0.001)
1.dummy	-0.004	−0.006	−0.018
	(0.007)	(0.010)	(0.014)
1.dummyc.bwtcent	-0.000	−0.000	−0.001**
	(0.000)	(0.000)	(0.001)
N	233887	163422	72941

(sorry I didn't manage to finish the rest)

7.2 Application: Cultural Background and Fertility

Table 4: Paramater estimates from OLS, robust se

	(1)	(2)	(3)
	band = 90	band = 60	band = 30
	b/se	*b/se*	*b/se*
bwtcent	-0.000	0.000**	0.001***
	(0.000)	(0.000)	(0.000)
1.dummy	-0.004*	−0.006**	−0.018***
	(0.002)	(0.003)	(0.004)
1.dummyc.bwtcent	-0.000**	−0.000***	−0.001***
	(0.000)	(0.000)	(0.000)
N	233887	163422	72941

Consider the following working paper: Pettersson-Lidbom, P., and P. Skogman Thoursie (2017): "The Role of Cultural Transmission and Social- ization in Fertility Choices: Evidence from a Policy Experiment", Working Paper. The authors of the paper use a nation-wide reform in Sweden to investigate the effect of cultural background on fertility choices. Speci cally, in 1980 Sweden passed a reform giving women strong
financial incentives to have children closer to each other (reduce birth-spacing). Their data set consists of the universe of all births in Sweden from 1968 to 1988, which contains information about the mother country of origin and immigration status.

a. What is the treatment that is being analyzed by the authors? What else can be considered treatment in this framework? What are the outcomes considered by the authors?
The treatment is the introduction of a policy in Sweden that gave women incentives to space their children wihtin 24 months. The object of interest is the treatment differential between groups of women coming from societies with traditional gender roles and groups coming from modern gender roles.

The main outcome of interest is a dummy variable that takes the value of 1 if a mother gives birth to the second child within 24 months of giving birth to the first child, and 0 otherwise.

b.

Immigrants from societies with traditional gender roles may have different outlooks to fertility. For example, some may consider payment incentives related to fertility as corruption of the underlying motives.

Unmeasured immigrant characteristics is an issue for identification since it prevents from obtaining causal estimates.

c.
Unmeasured immigrant characteristics are differenced out and thus do not influence the treatment effect. We have to assume that the trends between the different group is the same before the treatment.

d.
While in theory, this should not matter as it is possible to control for individual characteristics, it is possible that this affects internal validity. Immigrants from high fertility countries may have a higher birth rate and may respond less to the treatment.
e.

It is possible that the more traditional women also do not work and hence the treatment effect underestimates the treatment differential. We can test this by checking if the proportion of women that work in different groups are the same.

f.
Thanks.