**Assignment 4: Due Sunday, June 14th 2020**

**Directions**: Please turn in your answers on separate paper, typed, and **beautifully written** with **beautiful tables** and **beautiful figures**.**[[1]](#footnote-1)**

**Github repo and summary (worth 2 points)**

1. Download Hansen\_dwi.dta from github at the following address.

use https://github.com/scunning1975/causal-inference-class/raw/master/hansen\_dwi, clear

Create a new github repo named “RDD”. Inside the RDD directory, put all the subdirectories we’ve discussed in class. Post the link to the repo so I can see it’s done as discussed in your assignment. Save the Hansen\_dwi.dta file into your new /data subdirectory. Note: The outcome variable is “recidivism” or “recid” which is measuring whether the person showed back up in the data within 4 months.

Here is the link to repo for the answer of assignment 4 with all subdirectories discussed in class: <https://github.com/danilo-aristizabal/RDD>

1. In the writing subdirectory, place your assignment. For the first part of this assignment, read Hansen’s paper in the /articles directory of the main class github entitled “Hansen AER”. **Briefly summarize this paper**. What is his research question? What data does he use? What is his research design, or “identification strategy”? What are his conclusions?

**Punishment and Deterrence: Evidence form Drunk Driving (Hansen, 2015)**

There are several factors that complicate testing the effect of punishment severity on crime. In particular, the severity of punishment is normally determined by the severity of the offense. Therefore, comparisons of offenders with harsh and mild punishments would arrive at biased estimates because of omitted variables.

**His research question**: What is the effect of harsher punishments and sanctions on driving under the influence (DUI)?

**Data:** To answer this question he uses administrative data (512,964 DUI stops records) from the state of Washington (WA).

**Identification strategy**: He exploits discrete thresholds that determine both the current as well as potential future punishments for drunk drivers. In WA, Blood alcohol test (BAC) measured above 0.08 is considered an ordinary DUI, with some sanctions depending on the recidivism, while a BAC above 0.15 is considered an aggravated DUI, in other words: harsher punishments, also depends on the recidivism. Since the drivers neither the police can manipulate BAC measures, this gives a quasi-experiment to test whether the harsher punishments and sanctions offenders experience at the BAC thresholds are effective in reducing drunk driving. So, he uses a Regression Discontinuity Design (RDD) to estimate the effect of harsher punishments on drunk driving, using BAC as the running variable.

**Conclusions:** He concludes that harsher punishments and sanctions related with BAC limits reduce future drunk driving. Having a BAC above the DUI threshold reduces recidivism by up to 17%. And having a BAC over the aggravated DUI threshold reduces recidivism by 9% more. The estimates of this paper provide policy valuation for the effect of current BAC thresholds in reducing drunk driving.

**Replication (worth 6 points)**.[[2]](#footnote-2)

1. In the United States, an officer can arrest a driver if after giving them a blood alcohol content (BAC) test they learn the driver had a BAC of 0.08 or higher. We will only focus on the 0.08 BAC cutoff. We will be ignoring the 0.15 cutoff for all this analysis. Create a dummy equaling 1 if **bac1**>= 0.08 and 0 otherwise in your do file or R file. Done!
2. The first thing to do in any RDD is look at the raw data and see if there’s any evidence for manipulation (“sorting on the running variable”). If people were capable of manipulating their blood alcohol content (bac1), describe the test we would use to check for this. Now evaluate whether you see this in these data? Either recreate Figure 1 using the bac1 variable as your measure of blood alcohol content or use your own density test from software. Do you find evidence for sorting on the running variable?

**McCrary density test**: Under the null the density should be continuous at the cutoff point. Under the alternative hypothesis, the density should increase at the kink.

* Partition the assignment variable into bins and calculate frequencies in each bin.
* Treat those frequency counts as dependent variable in a local linear regression.

This is oftentimes visualized with confidence intervals illustrating the effect of the discontinuity on density. If we reject the null hypothesis then there is manipulation of the running variable. If we do not reject the null, then there has not been manipulation of it.

We after doing the test, we find rejecting the null hypothesis



1. The second thing we need to do is check for covariate balance. Recreate Table 2 Panel A but only white male, age and accident (acc) as dependent variables. Use your equation 1) for this. Are the covariates balanced at the cutoff? It’s okay if they are not exactly the same as Hansen’s.

Working on this

1. Recreate Figure 2 panel A-D. You can use the -cmogram- command in Stata to do this. Fit both linear and quadratic with confidence intervals. Discuss what you find and compare it with Hansen’s paper.

Discuss it!

1. Estimate equation (1) with recidivism (recid) as the outcome. This corresponds to Table 3 column 1, but since I am missing some of his variables, your sample size will be the entire dataset of 214,558. Nevertheless, replicate Table 3, column 1, Panels A and B. Note that these are local linear regressions and Panel A uses as its bandwidth 0.03 to 0.13. But Panel B has a narrower bandwidth of 0.055 to 0.105. Your table should have three columns and two A and B panels associated with the different bandwidths.:
   1. Column 1: control for the bac1 linearly
   2. Column 2: interact bac1 with cutoff linearly
   3. Column 3: interact bac1 with cutoff linearly and as a quadratic
   4. For all analysis, use heteroskedastic robust standard errors.
2. Recreate the top panel of Figure 3 according to the following rule:
   1. Fit linear fit using only observations with less than 0.15 bac on the bac1
   2. Fit quadratic fit using only observations with less than 0.15 bac on the bac1

1. Again, my preference is that you attempt to create automated tables and automated figures as much as you can. I’ve placed a simple estout program called ols.do in the estout subdirectory. You just need to edit. [↑](#footnote-ref-1)
2. Much of this advice applies to Stata commands, but you can check the R files for lmb.r to see ways of doing the same in R. [↑](#footnote-ref-2)