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Causal Inference and Research Design
Assignment 4: Sunday, June 14th, 2020

1. **GitHub repository link**

   https://github.com/SergioGarcia211/RDD.git

2. **Summary Hansen's paper**

In this paper Hansen wants to test whether the harsher punishments and sanctions offenders experience at the BAC thresholds are effective in reducing drunk driving. The main idea is to find the causal effect of having a BAC above either 0.08 or 0.15 threshold on recidivism within four years of the original test. To carry out his work he uses the administrative records on 512,964 DUI stops in the state of Washington from 1995 to 2001, given that the BAC thresholds are constant since January 1, 1999, he encloses the data from 1999 to 2007. And taking advantages of the specific cutoffs for DUI and aggravated DUI, it allows the usage of a regression discontinuity design as the identification strategy.

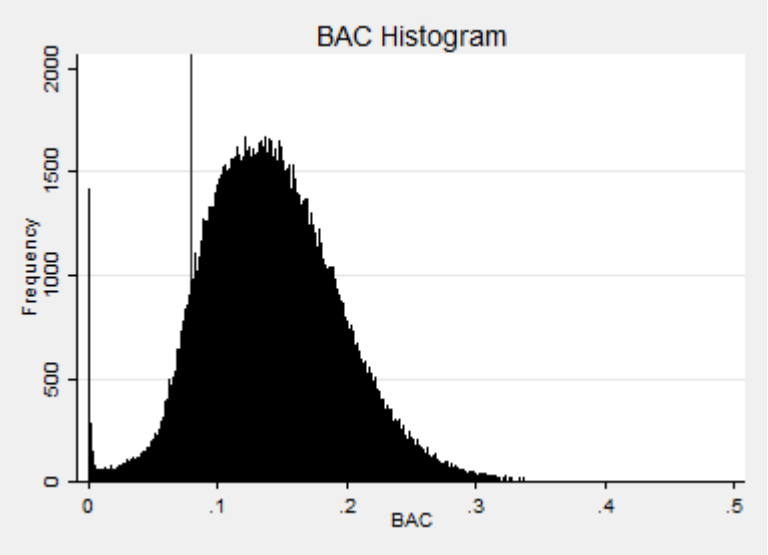
The results suggest that harsher punishments and sanctions associated with BAC limits reduce future drunk driving. Finding evidence that having a BAC above either the 0.08 DUI threshold or the 0.15 aggravated DUI is associated with reduced repeat drunk driving both in the short and long term. In terms of elasticity: he found evidence that 10 percent increase in sanctions and punishments is associated with a 2.3 percent decline in drunk driving. Having a BAC above the DUI threshold decreases the probability of repeating the crime.

3. **Dummy creation:** Do-file

4. **Manipulation**

The histogram of **Figure 1** (recreated here) shows us the distribution of the blood alcohol content (BAC) tests. We can see little evidence of non-random heaping which means no evidence of manipulation of the running variable. But for going further we can use a test to check for this, it's the McCrary Density test under the null hypothesis the density should be continuous at the cutoff point versus the alternative where the density should increase at the

kink. Hansen has done it and has found a p-value of 0.59 for the 0.08 threshold, it is not possible rejecting, so he concludes there is no evidence of manipulations.



5. Covariate balance

Equation (1) $y_i = X_i' \gamma + \alpha_1 DUI_i + \alpha_2 BAC_i + \alpha_3 BAC_i \times DUI_i + u_i$

Using this equation we can test whether is evidence supporting smoothness or not, it is desired to have exogeneous cutoffs. For satisfying this, the covariates of gender, race, age, and accident should be unaffected by BAC thresholds. We fail to reject the null that the predetermined characteristics are unrelated to the BAC cutoffs for DUI only for *white,* the others are statistically significant, which give us information to say that the cutoff is endogenous and it has a relationship with the covariates. Therefore, smoothness is being violated.

Table 1: Table 2 - Panel A

	(1) male	(2) white	(3) aged	(4) acc
1.DUI	0.0307***	0.00271	-7.787***	-0.219***
	(0.00729)	(0.00617)	(0.204)	(0.00627)
N	214558	214558	214558	214558

Standard errors in parentheses

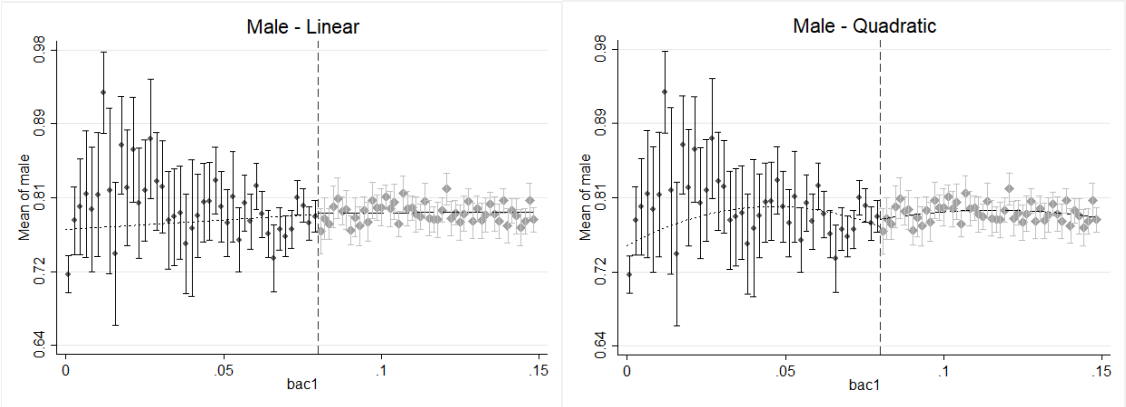
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6. Figure 2 - BAC and Characteristics (Panel A-D)

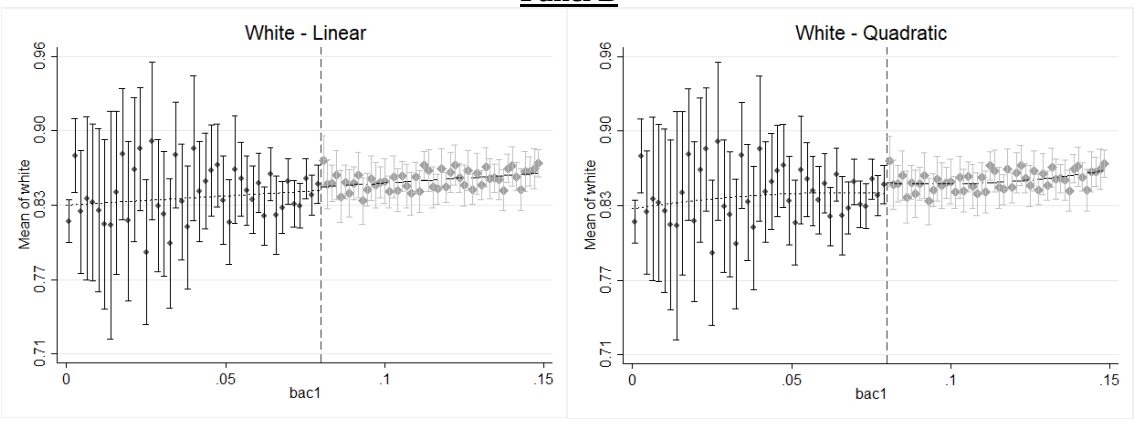
This figure shows us some bins characteristics and corresponding fitted regression lines based on equation (1). We can see that in demographic factors such gender, age, and race they remain unchanged across the punishment threshold of 0.08, that gives us information to believe that neither offenders nor the police officer is able to manipulate the running variable (BAC test). Also, it is possible to conclude the same in the case of the presence of an accident at the scene. The results here are pretty similar to those found by Hansen in his paper.

Figure 2

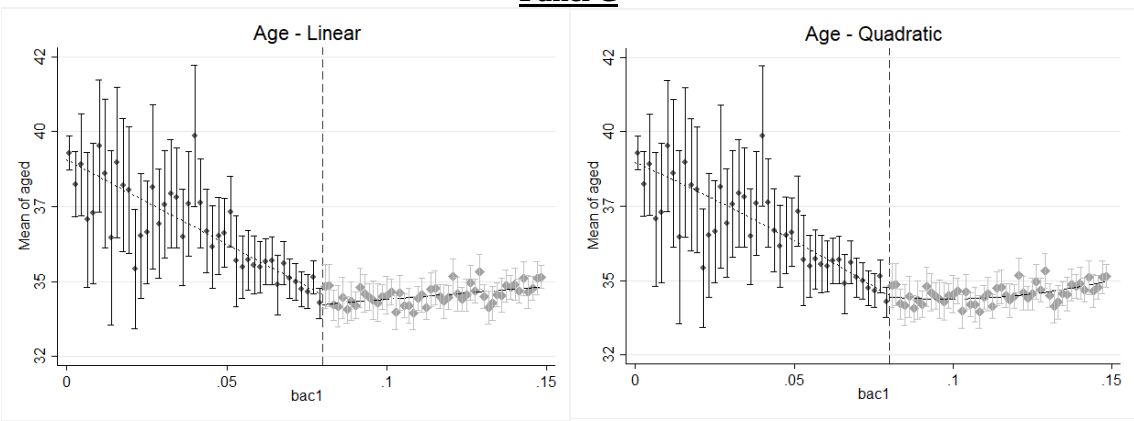
Panel A



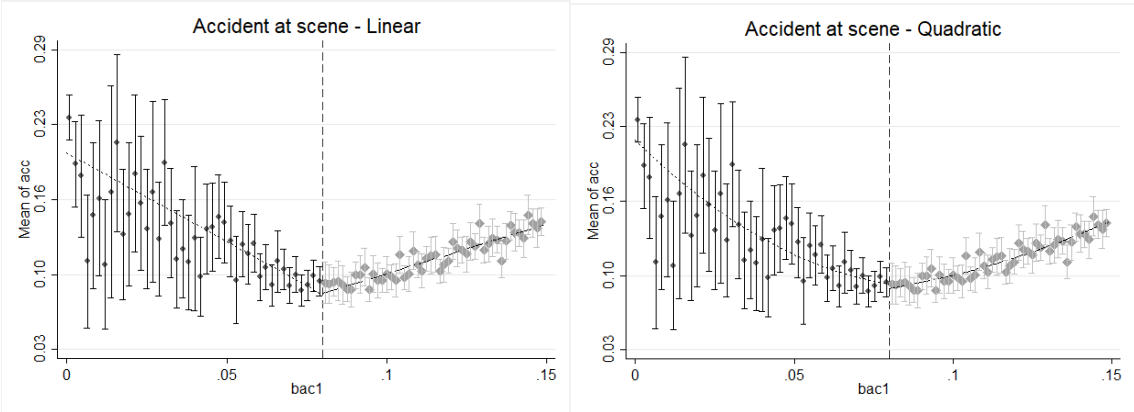
Panel B



Panel C



Panel D



7. **Panel A uses as its bandwidth 0.03 to 0.13. Panel B has a narrower bandwidth of 0.055 to 0.105.**
    a. **Column 1: control for the bac1 linearly**
    b. **Column 2: interact bac1 with cutoff linearly**
    c. **Column 3: interact bac1 with cutoff linearly and as a quadratic**

Table 1: Table 3 - Panel A

	(1) recidivism	(2) recidivism	(3) recidivism
1.DUI	-0.0266***	-0.0549***	0.108
	(0.00404)	(0.0152)	(0.0844)
N	89967	89967	89967

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2: Table 3 - Panel B

	(1) recidivism	(2) recidivism	(3) recidivism
1.DUI	-0.0218***	-0.0623	0.337
	(0.00559)	(0.0351)	(0.423)
N	46957	46957	46957

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

8. **BAC and recidivism**