Punishment and Deterrence:

Evidence from Drunk Driving

*By* Benjamin Hansen\*

1. **Summary**

In this paper the author wants to test the effect of harsher punishments and sanctions on driving under the influence (DUI) to answer the question of whether punishments and sanctions are effective in reducing drunk driving. Hansen tries to provide quasi-experimental evidence taking advantage that in this scenario, the punishments are determined by strict rules on blood alcohol content (BAC) and prior offenses, so he exploited discrete thresholds that determine the current and potential future punishments for drunk drivers.

He used data from administrative records on 512,964 DUI BAC test in the state of Washington (WA) from 1995 to 2011. Because after January 1, 1999, WA applied a

0.08 threshold for determining a DUI, and a 0.15 threshold for an aggravated DUI, he used data from 1999–2007 to analyze the causal effect on recidivism within four years of the original BAC test. To find the causal effect Hansen exploited a local-linear regression discontinuity design with a rectangular kernel. The main assumption is that some drunk drivers are randomly lucky, having a BAC barely below the threshold, while other drunk drivers are randomly unlucky and have a BAC barely above the threshold as his identification strategy.

The author found no evidence of manipulation (using the McCrary test) or non-random heaping. The results suggest that having a BAC above the DUI threshold reduces recidivism by up to 2 percentage points (17 percent). Likewise having a BAC over the aggravated DUI threshold reduces recidivism by an additional percentage point (9 percent). The results suggest that the additional sanctions experienced by drunk drivers at BAC thresholds are effective in reducing repeat drunk driving. The sensitivity of the results was tested using local linear models with other kernels or higher order polynomials finding little to no major differences.

He also tried some mechanisms including deterrence, incapacitation, and rehabilitation. The evidence suggests the main channels operate through deterrence, although he cannot completely rule out some effects operating through incapacitation and rehabilitation. The author can conclude that harsher punishments and sanctions associated with BAC limits reduce future drunk driving.

1. **Testing manipulation**

To test manipulation, we should use the formal test proposed by McCrary. The idea is that the density of the running variable X should be continuous around the threshold. To carry out the test we should divide the assignment variable into bins and calculate frequencies each bin. Then treat those frequency counts as dependent variable in a local linear regression, if the density is not continuous at the cutoff point (increasing or decreasing), then we reject the null hypothesis and conclude that there is evidence of manipulation. We can also use the calonics test.

In this data under the Calonico test using de “rddensity” package there is no evidence of manipulation as Hansen mentions in his work, the p\_value is 0.59. However, applying the formal McCrary test, evidence of manipulation is found as shown in Figure 1. But there is no evidence of discontinuity on the histogram (Figure 2), so if there is, it is barely noticeable.

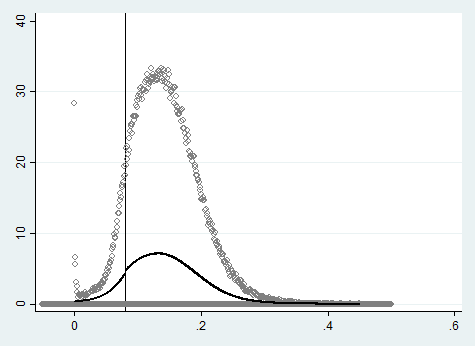


Figure 1. McCrary test graph on BAC

Imagen que contiene mapa, texto

Descripción generada automáticamente

Figure 2. BAC Distribution

1. **Covariate balance**

Table 1—Regression Discontinuity Estimates for the Effect

of Exceeding BAC Thresholds on Predetermined Characteristics

|  |  |  |  |
| --- | --- | --- | --- |
|  | Male | White | Age |
| Characteristics | (1) | (2) | (3) |
| *Panel A. DUI threshold* |  |  |  |
| DUI | 0.0307\*\*\* | 0.00271 | -7.787\*\*\* |
|  | (0.00750) | (0.00653) | (0.215) |
| Mean | 0.773 | 0.835 | 38.57 |
|  |
| Controls | No | No | No |
| Observations | 214,558 | 214,558 | 214,558 |
| R-squared | 0.000 | 0.001 | 0.013 |

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

As shown in Table 3, the covariance balance shows that not all predetermined characteristics are balanced at the cutoff point. Contrary to the findings of the author Age and Male are unbalanced, which would generate suspicions of violations of the smoothing assumption. If the assumption is violated, there would be no way to know if we are finding a real causal effect, most likely the estimates would be biased.

Imagen que contiene mapa, foto, diferente, grupo

Descripción generada automáticamenteImagen que contiene mapa, texto

Descripción generada automáticamente

Imagen que contiene mapa, texto, foto, luz

Descripción generada automáticamenteImagen que contiene mapa, foto, colgando, luz

Descripción generada automáticamente

Figure 3 BAC and Characteristics

As shown in Panel B and C and as estimated with the balance tests, there are discontinuities in the Age and Male variables on the cutoff point while the other variables seem to be balanced at this point. The results are similar to those found graphically in the paper; however, the conclusions are different.

1. **Results**

Table 2-Regression Discontinuity Estimates for The Effect of Exceeding The 0.08 BAC Threshold On Recidivism

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
|  | control | interact | quad | control2 | interact2 | quad2 |
| VARIABLES | recidivism | recidivism | recidivism | recidivism | recidivism | recidivism |
| *Panel A.* |  |  |  |  |  |  |
| 1.DUI |  | -0.0544\*\*\* | 0.116 |  | -0.0611\* | 0.369 |
|  |  | (0.0152) | (0.0843) |  | (0.0350) | (0.422) |
| bac1 | 0.328\*\*\* | 0.0116 | 3.011\* | 0.200 | -0.155 | 6.035 |
|  | (0.0748) | (0.187) | (1.639) | (0.201) | (0.382) | (8.120) |
| bac\_s |  |  | -25.18\* |  |  | -44.81 |
|  |  |  | (13.75) |  |  | (58.75) |
| 1.DUI#c.bac1 |  | 0.381\* | -4.255\*\* |  | 0.508 | -10.39 |
|  |  | (0.204) | (2.113) |  | (0.449) | (10.61) |
| 1.DUI#c.bac\_s |  |  | 32.88\*\* |  |  | 70.02 |
|  |  |  | (15.12) |  |  | (69.21) |
| white | 0.0146\*\*\* | 0.0146\*\*\* | 0.0146\*\*\* | 0.0161\*\*\* | 0.0161\*\*\* | 0.0161\*\*\* |
|  | (0.00280) | (0.00280) | (0.00280) | (0.00380) | (0.00380) | (0.00380) |
| male | 0.0328\*\*\* | 0.0328\*\*\* | 0.0329\*\*\* | 0.0353\*\*\* | 0.0353\*\*\* | 0.0353\*\*\* |
|  | (0.00233) | (0.00233) | (0.00233) | (0.00316) | (0.00316) | (0.00316) |
| DUI | -0.0268\*\*\* |  |  |  |  |  |
|  | (0.00404) |  |  |  |  |  |
| \_IDUI\_1 |  |  |  | -0.0217\*\*\* |  |  |
|  |  |  |  | (0.00558) |  |  |
| Constant | 0.0573\*\*\* | 0.0781\*\*\* | -0.00668 | 0.0611\*\*\* | 0.0862\*\*\* | -0.125 |
|  | (0.00612) | (0.0127) | (0.0473) | (0.0149) | (0.0274) | (0.278) |
|  |  |  |  |  |  |  |
| Observations | 89,967 | 89,967 | 89,967 | 46,957 | 46,957 | 46,957 |
| R-squared | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Imagen que contiene texto, foto, mapa, colgando

Descripción generada automáticamente

Figure 4. BAC and Recidivism

Link for repository <https://github.com/karol1799p/RDD>