Replication and Critique of *Punishment and Deterrence: Evidence from Drunk Driving*

PB4A7 Quantitative Applications for Behavioural Science 2022

QUESTION

In the state of Washington, drunk driving (or driving under the influence, DUI) is determined by blood alcohol content (BAC)[1]. A driver with a BAC over 0.08 is considered a case of DUI and will receive criminal punishments. To replicate Hansen (2015), I investigate:

Does receiving punishments at the 0.08 BAC threshold decrease recidivism of drunk driving?

METHODS

- **Data:** Data provided by the instructor
- **Main design:** Regression discontinuity design (RDD)
- **Bandwidths:** 0.05 (from 0.03 to 0.13)
  - Sensitivity analysis: 0.025 (from 0.055 to 0.105)
- **Models:** Local linear regression
  - Sensitivity analysis: Local quadratic regression
- **Controls:** Gender; Race; Age; BAC test being conducted at an accident
- **Kernel functions:** Rectangular kernel
  - Sensitivity analysis: Rectangular + Triangular kernel
- **Robustness check:** Donut hole regression discontinuity design (dropping window: 0.001)

RESULTS

Estimates based on local linear regression models show that receiving punishments at the 0.08 BAC threshold decreases recidivism by up to

2.4 percentage points

Estimates based on local quadratic regression models show a decrease in recidivism by up to **1.6** percentage points.

Table 1 Regression Discontinuity Estimates of the Effect of Receiving Punishments at the 0.08 BAC Threshold on Recidivism

	Rectangular kernel		Triangular kernel	
Bandwidths	Linear	Quadratic	Linear	Quadratic
0.05	−0.024*** (0.004)	−0.014** (0.006)	−0.020*** (0.005)	−0.014** (0.006)
0.025	−0.021*** (0.006)	−0.014* (0.008)	−0.018*** (0.006)	−0.016* (0.009)

Note. **p* < 0.1, ***p* < 0.05, ****p* < 0.01.

CRITIQUE

- The original study has **2 strengths**:
  - The success of the replication shows the validity of the original findings
  - Additional analyses show the robustness or the heterogeneity of the effects
- It can make **5 improvements**:
  - Adopt data-based bandwidth selection[2,3] to ensure objectivity and transparency
  - Use logistic regressions in the RDD design[4]
  - Separate the analysis for heap points to avoid biased estimates due to non-random heaping (if any)[5]
  - Repeat the analyses using data from other regions to ensure external validity
  - Run field experiments to establish the validity of the causal relation

REFERENCES

1 Hansen, B. (2015). Punishment and deterrence: Evidence from drunk driving. *American Economic Review, 105*(4), 1581–1617.
2 Cattaneo, M. D., & Vazquez-Bare, G. (2017). The choice of neighborhood in regression discontinuity designs. *Observational Studies, 3*(2), 134–146.
3 Calonico, S., Cattaneo, M. D., & Farrell, M. H. (2022). Coverage error optimal confidence intervals for local polynomial regression. *Bernoulli, 28*(4).
4 Xu, K. L. (2017). Regression discontinuity with categorical outcomes. *Journal of Econometrics, 201*(1), 1–18.
5 Barreca, A. I., Lindo, J. M., & Waddell, G. R. (2016). Heaping-induced bias in regression-discontinuity designs. *Economic Inquiry, 54*(1), 268–293.

LSE THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE