Punishment and Recidivism in Drunk Driving
Preliminary Draft

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Abstract

Traditional economic models of criminal behavior have straightforward predictions: raising the expected cost of crime via apprehension probabilities or punishments decreases crime. I test the effect of harsher punishments on deterring driving under the influence (DUI). In this setting, punishments are determined by strict rules on Blood Alcohol Content (BAC) and previous offenses. Regression discontinuity derived estimates suggest that having a BAC above the DUI threshold reduces recidivism by up to 2 percentage points (17 percent). As receipt f previous DUI violations increases future penalties for drunk driving, this is consistent with Beckerian models of criminal activity. However, enhanced penalties for aggravated DUI also reduce recidivism by an additional percentage point (9 percent), despite the fact that the enhanced punishments only affect the current penalties. This is consistent with models of bounded rationality for offenders, wherein expectations of future punishments are based upon previous punishments experienced.

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1 Introduction

In his seminal work that modeled criminal behavior, Becker (1968) suggests that criminals may commit crimes rationally if the expected benefits of the crime outweigh the expected costs. Along those lines, recent evidence suggests criminals, ranging from violent and property crime offenders (Levitt, 1997; McCrary, 2005; Evans and Owens, 2007; and Chalfin and McCrary, 2011) to drivers exceeding the speed limit (DeAngelo and Hansen, 2011), respond to increased enforcement by committing fewer crimes. However, several factors complicate testing the effect of punishment severity on crime. First and foremost, the severity of punishment is normally determined, at least in part, by the severity of the offense. Thus naive comparisons of offenders with harsh and mild punishments would arrive at biased estimates due to omitted variables.

This paper offers quasi-experimental evidence concerning the effects that punishment severity has on the commission of future crimes. Taking advantage of administrative records on 512,964 DUI stops from the state of Washington (WA), I exploit discrete thresholds that determine both the current as well potential future punishments for first-time and repeat offenders. Specifically, in WA a blood alcohol content (BAC) measured above 0.08 is considered a DUI while a BAC above 0.15 is considered an aggravated DUI, or a DUI that results in higher fines, increased jail time, and a longer license suspension period. Importantly, the future penalties increase for each subsequent DUI received, regardless of whether the previous offense was an ordinary DUI or aggravated DUI.

Drunk driving has contributed to roughly 18,000 traffic fatalities annually for most of the last decade.[1] Many of these deaths can be attributed to drunk drivers with previous drunk driving convictions.[2] To that end many states have passed statutes punishing drunk driving with increasing severity of punishments for repeat offenders in hopes reducing traffic fatalities and injuries. The extent to which these punishments may be effective in saving lives by deterring drunk driving depends in large part on the rationality and foresight of potential drunk drivers.

The estimated effects suggest that having BAC above the DUI threshold reduces recidivism for both first-time and repeat offenders, consistent with a rational economic model of criminal behavior due to the increase in the expected cost of future punishments. However, receipt of an aggravated DUI offense also reduces recidivism. This is in contrast to the predictions of a fully rational model of criminal behavior, as a fully informed criminal would realize the enhanced current penalties had no bearing on the expected cost of punishment for future crimes. Rather, this is consistent with models of bounded rationality, wherein criminals update their beliefs about the cost of future expected penalties based on the last punishment they received.

Small deviations from rationality can have large effects on market outcomes (Akerlof and Yellen, 1985). Prior research has found that the presence of bounded rationality in agents may affect business cycles (Sargent, 1993), aversion to tax reform based on the framing of losses (Tversky and Kahneman, 1986), income targeting (Camerer et al., 1997) and many other behaviors with important implications for economic policy in a wide variety of contexts. Similar to Polinsky and Shavell's (1979) conclusion that risk aversion affects the construction

[1] There was a receipt dip both in traffic deaths and deaths related to drunk driving with the onset of the most recent recession beginning in 2008 coinciding with a dramatic decrease in vehicle miles traveled.

[2] Some states use other phrases such as "driving while intoxicated" (DWI), "operating while impaired" (OWI), or "operating a vehicle under the influence" (OVI).

of optimal punishments, the empirical findings of this paper also suggest that learning can also play a large role in determining the short-term substitutability between enforcement and punishment. Indeed for researchers seeking to study the effect of changes in fines or punishments, traditional difference-in-difference models may understate the true effects of the policy change due to learning. Likewise, policy makers may find that increasing punishments may have muted effects in the short-run, which has broad implications for many government agencies currently coping with temporarily reduced funding for police.

The paper proceeds as follows. Section II provides a background on drunk driving and recidivism. Section III reviews the econometric methods and data sources used in the estimation. Section IV presents the main estimates while Section V concludes.

2 Background

2.1 Drunk Driving

Shortly after the introduction of automobiles, drunk driving emerged as a serious public health issue. In efforts to combat drunk driving, states introduced laws criminalizing driving under the influence (DUI). Identifying the impairment of drivers was initially difficult, as police officers relied mainly on field sobriety tests and their own personal experience to identify the impairment of drunk drivers. In 1956, the first breathalyzers were created, establishing an objective and reasonably accurate method of measuring BAC in relatively noninvasive manner. Their relatively low cost and objective nature took the burden off of police in proving a driver was under the influence of alcohol, and instead placed the burden on the accused to establish their innocence.

Because of the relative ease of measuring BAC through breathalyzers, many states adopted laws stipulating strict thresholds for DUI. Initially the thresholds were generous by today's standards, with a 0.15 BAC level needed to established impairment. Gradually states tightened the standards, with 0.10 becoming a focal point for DUI during the 1980's, until 0.08 became the quasi-uniform standard in the late 1990's and early 2000's. At the same time, more severe restrictions were placed on underage drinkers, with many states adopting "Zero-Tolerance" laws that automatically stripped the license of any underage driver with BAC exceeding low thresholds normally ranging from 0.00 to 0.02.[3] Given the different threshold relevant for young drivers, this paper restricts attention to those older than the legal drinking age.

"Aggravated DUI's" have become common additional charges applied to individuals with BAC at extremely dangerous levels. As of today, 42 of the 50 states maintain enhanced or aggravated DUI penalties for BAC above thresholds ranging from 0.15 to 0.20.[4] In addition, most states maintain "Implied Consent" laws which stipulate that the refusal to take a BAC test is the equivalent of admitting guilt. These motivate the majority of drivers to admit to BAC tests when asked.[5]

Washington's laws are similar to those enacted in the rest of the United States. As of January 1, 1999 for individuals above the legal drinking age, a BAC over 0.08 was considered

[3] See Carpenter (2003) for a thorough review of zero-tolerance laws and their effects on youth risky behavior.

[4] Some states also enforce enhanced or aggravated penalties if children are present in the car.

[5] In WA, 16.7 percent of drivers initially refused to take a BAC test. Given there is no measurement of BAC, these refusals are not part of the estimation sample, but I do allow being pulled and refusing to take a test to be included in recidivism.

a DUI while a BAC above a 0.15 became an aggravated DUI.[6] The current penalties based on previous offenses and BAC are laid out in Table 1. As noted earlier, offenders face more severe punishments if convicted again in the future. However, the punishments for repeat offenses are identical for offenders who initially had a regular or aggravated DUI. This distinction is what allows me to test the bounded rationality of the offenders. Criminologists have referred to these separate effects as deterrence (committing less crimes because of punishment for future crimes), and specific deterrence (committing less crimes because a previous punishment). In an economic model of criminal behavior, the question boils down to the extent which criminals are forward and/or backward looking.

2.2 Criminal Activity and Punishment Severity

Many criminals return to committing crimes again within a few years of being released from incarceration for their original crime. For this reason, criminologists and economists alike have long studied the determinants of recidivism. Some studies have found results consistent with traditional Beckerian models of crime, such as Helland and Tabarrok (2007) who find lower recidivism rates among convicts facing life in prison if convicted of a third strike in California. However, in some situations criminals seem undeterred by higher punishments, with Lee and McCrary (2009) finding that youth in general respond little to the large change in penalties which occurs upon reaching 18 years of age. Lastly, greater punishments in the form of harsher imprisonment conditions lead to increases in recidivism rather than decreasing it (Chen and Shapiro, 2007; Drago et. al, 2011).

[6] In addition, the presence of a minor in the car increases the offense to aggravated DUI even if the BAC is betwen 0.08 and 0.15. The zero-tolerance policy in Washington considers a BAC of 0.02 to be sufficient for DUI for individuals under the legal drinking age. Commercial drivers also face stricter standards, with a BAC of 0.04 being sufficient to indicate impairment.

The variety of estimates linking punishment severity and criminal activity, ranging from negative to null to positive, could arise for several reasons. For instance, more severe conditions or time in prison may have criminogenic effects either through peer effects or the depreciation rate of human capital. Furthermore, for most crimes increased punishments translates into longer prison sentences which mechanically changes the age of an individual at the time of release. As such, the age of an individual may directly affect the trade-offs an individual faces when choosing between crime and traditional labor supply. These complications prevent the separation of specific deterrent and demographic effects in nearly all criminal justice settings.[7]

Punishments for drunk driving lack many of the challenges normally present in testing the deterrent effect of punishments. First and foremost, being stopped for drunk driving is a purely reactive process, wherein a police officer notices suspicious behavior (weaving, slow or exceptionally fast driving, driving with the lights off, etc.) and stops the potential offender. In other circumstances, police often choose who to investigate based on previous offenses or convictions. In addition, by using DUI traffic stops to measure recidivism, other issues or biases concerning the point at which to measure recidivism (arrest, charge, or conviction) are avoided. Lastly, the punishments for DUI are largely monetary, which means that one can identify the deterrent effects of more severe punishments without all of the demographic complications which normally would accompany a longer or more severe punishment in other crimes.

As outlined in Table 1, the punishments for DUI are based primarily on two factors:

[7] Even if a study were to randomly assignment sentance length to offenders, this will by definition cause criminals to be older at the time of punishment. In order to identify the specific deterrent effect of a punishment, the punishment would have to leave age, among other factors, unchanged.

BAC and prior offenses. For each subsequent DUI, expected punishment for future crimes increase. In addition, sufficiently high BAC result in enhanced punishments for the current offense, however the high BAC offenses have identical punishment schemes for future crimes if individuals choose to recidivate. These discrete changes in punishments which arise based on BAC can be used to test the deterrent effects of more severe punishments.

3 Data and Methods

In this study, we take advantage of administrative records on 512,964 DUI traffic stops in the state of Washington from 1995 to 2011. After January 1, 1999, Washington applied a .08 threshold for determining a DUI, and a .15 threshold for an aggravated DUI. In order to allow for a period for recidivism to occur the years from 2008 to 2011 are utilized only in the construction of recidivism indicators.[8] Likewise, the stops prior to 1999 are utilized to identify previous offenders. This provides a period of analysis which ranges from 1999-2007. As noted earlier, this paper restricts attention to those above the legal drinking age given that different cutoffs apply to those under 21. The specific cutoffs for DUI and Aggravated DUI allow the usage of a regression discontinuity design (Thistlethwaite and Campbell, 1960; Hahn, Todd, and Van der Klaauw, 2002) to test the effect of punishment severity on recidivism.

In order for a regression discontinuity approach to deliver consistent estimates, several assumptions must be met. Sufficient conditions include the continuity of the underlying

[8]The results increase in statistical precision with the inclusion of these later years, although the lack of a full follow-up period implies the treatment effect becomes a weighted averate treatment effect of years with full follow-up periods and those with partial follow-up periods.

conditional regression and distribution functions (Imbens and Lemieux, 2008). In short,these assumptions imply that both the unobservables and observables are expected to remain unchanged across the threshold, with only treatment status (the probability of treatment) changing.

Of principal concern to our approach, is the ability of drunk drivers to accurately discern their level of impairment prior to being pulled over, lest manipulation be a fundamental problem (McCrary, 2008).[9] Indeed both the decision of how much to drink and the subsequent decision on whether or not to drive drunk are endogenous. To establish identification when using BAC to study the punishment of drunk drivers, it must be assumed that locally it is random if a driver has a BAC either just below or just above the BAC thresholds.

There are a number of reasons why that assumption is likely reasonable. The first is the level accuracy to which the BAC is recorded in WA state, which is 3 digits of accuracy on a scale from 0 to 1. Second, many factors such as the speed of alcohol consumption, food intake, hydration, activity, and metabolism are difficult to measure, making any BAC calculation based on consumption and physical characteristics a rough approximation. Third, even though the breathalyzers measure BAC with a degree of precision, randomness does occur in the measurement of BAC through a breathalyzer, with each stop requiring two measures of BAC be taken independently of one another. The correlation between the two measures is .99, and on average the difference is 0.0008, with the inter-quartile range of differences ranging from -.003 to .004.[10] I utilize the minimum of the two variables as the running variable in the analysis, as the minimum is what determines guilt regarding DUI or

[9]Indeed, websites such as http://bloodalcoholcalculator.org/ attempt to help potential drunk drivers estimate their level of impairment based upon their gender, height, weight, alcohol consumed, and time spent drinking.

[10]The histogram of distribution of difference between the two variables is presented in Appendix Figure 1.

aggravated DUI.

Figure 1 contains a histogram displaying the number of observations in each measured BAC level from 1999-2008. While McCrary (2008) suggests several methods to determine the optimal bin width for analysis (which would be necessary if BAC was reported in a truly continuous manner), in this scenario I instead rely on the original binning choice implied by the implicit rounding from the breathalyzer. Indeed, the distribution of BAC shows little evidence of endogenous sorting to one side of either of the thresholds studied. Likewise, the histogram also shows little evidence of non-random heaping, which can also create bias in regression discontinuity designs (Barreca et. al, 2011).

Further evidence of the legitimacy and need of the regression discontinuity design are outlined in Table 2. The columns of Table 2 contain summary statistics for various segments of the BAC distribution. Those with higher BAC levels are more likely to recidivate, face higher chances of being involved in accident at the time of the BAC exam, and are more likely to have prior DUI's. However, when comparing individuals within relatively small distances to the thresholds for DUI and aggravated DUI, any such differences fade. This initial evidence based on summary statistics supports the legitimacy of the RD design, which is analyzed more formally in the results section.

For the initial models, I specify a local linear regression discontinuity design to estimate the effect of DUI or aggravated DUI receipt on recidivism, with the slopes allowed to change at the discontinuities, as shown in Equation 1. The main results are based on a local-linear regression discontinuity design, while the sensitivity of the results are tested (finding little to no major differences) using local linear models with other kernels or higher order polynomials.[11] An indicator for either a DUI or aggravated DUI indicates respectively whether the BAC falls above the .08 or .15 thresholds. In the models, the BAC variable is rescaled around the relevant threshold, either .08 or .15.

$$recid_i = X_i'\gamma + \alpha_1 DUI_i + \alpha_2 BAC_i + \alpha_3 BAC_i * DUI_i + u_i$$

In the regression discontinuity models, all observations are clustered at the finest bin at which BAC is measured, .001. This captures potential autocorrelation between individuals which have similar BAC levels. The standard errors also implicitly adjust for heteroskedasticity, important because the regression models estimated are linear probability models due to the discrete nature of recidivism, and therefore by construction suffer from heteroskedasticity.[12]

4 Results

Initially, I estimate the effect of DUI or aggravated DUI receipt on recidivism within four years of the initial traffic stop, capturing the medium run effect of punishment on the like-

[11] The higher order polynomials offer little improvement in model fit, and there is relatively little empirical value to expanding to largely bandwidths due to primarly two issues. First, larger bandwidth eventually would result in the joint modeling of both punishment regimes overlapping in the regressions. Second, the majority of the observations fall in the BAC range of .03 to .20, and expanding the bandwidth to include observations from greater BAC ranges does relatively little to increase the sample size.

[12] Currently, the results address the reduced form effect of having a BAC above the threshold necessary for a DUI or aggravated DUI. About 10 percent of DUI cases are dismissed (often due to procedural issues regarding the collection of the BAC sample), while about 40 percent plead to a lesser offense such as reckless driving. Importantly, pleading to a lesser offense has no bearing on expected future penalties, with identical increased penalties reinstated if individuals recidivate. Future work will confirm the stability of conviction rates across the aggravated DUI threshold. Importantly, the reduced form effect of facing a DUI punishment and aggravated DUI punishment is likely the place at which initial information on punishments is conferred, and hence is the most suitable group to analyze in order to test for bounded rationality, rather than restricting to the set of drivers eventually convicted.

lihood of recidivism. This initial window is later varied to examine recidivism rates within windows ranging from 10 days to 2,500 days in order to verify if punishment leads to long run changes in behavior or incapacitation – potentially because of license suspension or revocation (Owens, 2009). Recidivism is an indicator which takes on the value of 0 if they are not pulled over under suspicion of drunk driving, and takes on a 1 if they are pulled over by a police officer within 4 years of the original offense. This allows the years 1999-2007 to be used as a baseline period of analysis, while the more recent stops from 2008-2011 are utilized to measure recidivism.

In Figure 2, a scatterplot of recidivism rates for all offenders highlights the stark changes in recidivism which occur at the .08 and .15 thresholds. The black lines represent fitted regression in the interval .03 to .079, .08 to .15 and .15 to .20. Figure 3 presents similar scatterplots and fitted regression lines for predetermined characteristics which should remain unchanged across the punishment thresholds. Factors that are highly predictive of recidivism such as the presence of an accident at the current offense, or prior DUI stops are unchanged at the thresholds. Demographic factors such as age, race (defined by white vs. non-white) or gender, are also relatively stable across the DUI punishment thresholds. The stability of predetermined characteristics gives additional credibility to ability of the regression discontinuity to deliver unbiased estimates in this scenario.

4.1 Punishment and Recidivism

The institutional details offer the ability to test how two distinctly different punishment regimes affect recidivism. For both first-time and repeat offenders, expected future fines are higher if individuals are found committing a subsequent DUI (see Table 1). The fines increase by roughly 30 percent for an additional offense, and the jail sentence length increases by an additional 29 to 60 days. Aggravated DUI's are associated with a 35 percent increase in fines and 25 to 100 percent increase in sentence length. Importantly, the aggravated DUI's result in more severe current punishments, but have no bearing on expected punishments associated with future crimes. For example, individuals with a BAC content of .149 vs. .151 currently face very different penalties for their current offense but identical penalties if they reoffend down the road.

Table 3 outlines the estimated effects of having BAC over the DUI threshold for all offenders, repeat offenders, and first time offenders. The estimates are presented both with and without controls, which consist of indicators for gender, race, age, prior offenses, county fixed effects, and year fixed effects. Panel A includes estimates with a bandwidth of .05, while Panel B presents estimates derived with a smaller bandwidth of .025, both using a rectangular kernel for weighting.[13] For all offenders, the estimates suggest that receiving a DUI decreases recidivism by 2 percentage points during a four year follow-up window, statistically significant at the 1 percent level. This effect is consistent across both bandwidths and the presence or omission of controls. First time offenders are also less likely recidivate when receiving a DUI, as are repeat offenders. Importantly, repeat offenders are estimated to reduce their recidivism by a larger margin when having BAC above the DUI threshold. This could be because the expected penalties are much higher if they are caught drunk driving again, or because their baseline recidivism rates are higher. If the two sets of estimates from

[13] Institutional constraints prevent the examination of a larger bandwith as it would include the aggravated DUI cutoff.

Panel A and Panel B are averaged and divided by the average recidivism rate, all offenders, first-time and repeat offenders have recidivism rates which fall by respectively by 17.0, 15.5, 25.2 percent.[14]

Table 4 presents the estimates effects of receiving having a BAC above the aggravated DUI threshold on recidivism within 4 years of the initial stop. Once again, estimates are presented with and without the same controls used in the regressions presented in Table 3. Likewise, Panel A utilizes a bandwidth of .05 while Panel B uses a bandwidth of .025, with all regressions using a rectangular kernel for weighting. Having a BAC above the aggravated DUI threshold reduces recidivism for all offenders by 1.1 percentage points, for first-time offenders by 0.9 percentage points, and repeat offenders by 1.9 percentage points. Given the baseline recidivism rates, the percentage point decreases respectively translate into 8.9, 8.2, 10.6 percentage decreases in recidivism. Once again, the estimates are robust to the inclusion or exclusion of controls, and the choice of bandwidth has little effect on the magnitude of the estimates. Smaller bandwidths decrease precision slightly, which is be expected given the decrease in the sample size.

The issue of bandwidth choice is explored more fully in Figure 4. For every possible bandwidth from .005 to .068, the estimated effect having a BAC above the DUI or aggravated DUI threshold is presented along with the 95% confidence interval, for entire sample of offenders. Controls are utilized in this analysis and a rectangular kernel is used for weighting. The point estimates are relatively stable across nearly all bandwidths. Except for particularly small bandwidths, generally those less .02, the estimates are also statistically significant (at at least the 95% level). The stability of the estimates across various bandwidths suggests

[14] This assumes equal weighting of the estimates.

that the linear specification is reasonable choice for modeling the effect of BAC on recidivism.

4.2 Heterogeneity of Recidivism

In the previous estimates, recidivism is defined rather simply as whether a driver originally pulled over for DUI is pulled over again subsequently. The rich nature of the administrative records on the DUI stops allow a more detailed analysis of the behavioral changes. More severe punishments can have unintended consequences such as increasing the severity of offenses committed for particular subgroups, as illustrated by three strikes laws (Iyengar, 2007). To address these concerns, the previous indicator for whether or not a driver is pulled over again under suspension of DUI is split into four mutually exclusive categories: if the BAC falls in [0,.079], the BAC is in [.080,.15], the BAC is [.151,1], or if the driver refuses the BAC test. These separate indicators offer one approach to measure the severity of the offense. An alternative fifth indicator that also represents the severity of the offense, indicates whether or not a subsequent accident occurred (which also involved a suspicion of DUI).

Table 5 presents the effects of having BAC above the DUI threshold on the more disaggregated definitions of recidivism. Panels A, B, and C present results respectively for all offenders, 1st time offenders, and repeat offenders. All regression are weighted using a rectangular kernel and have a bandwidth of .05. For all drivers, a DUI results in a decreased likelihood of being stopped and having a BAC in all of the categories. The probability effects are largest for the BAC range from .08 to .15. Notice that is also the range with the largest probability mass (see Figure 1). In addition, receiving a DUI reduces the likelihood of being involved in accident in the future (at which the driver is also investigated for DUI). The results suggest DUI receipt results in either less drunk driving or more attentive drunk drivers to the point they are not getting accidents or exhibiting the normal signs of impairment.

In Panels B and C, subtle differences emerge in the estimates for first time and repeat offenders. First and foremost, the repeat offenders have a large and significant reduction in the probability of being in a subsequent accident involving alcohol. This speaks to the large public health benefits offered by increased punishments, given that repeat offenders account for one third of all alcohol related fatalities. Both groups consistently show reductions in recidivating at all BAC levels, although a few of the estimates are not statistically significant. Also, the point estimates suggest that first time offenders receiving with BAC above the DUI threshold are more likely to refuse taking a breath test upon being pulled over again, while repeat offenders are less likely be pulled over and refuse a breath test, although these estimates are borderline insignificant. This could be because first-time offenders have little experience and don't realize that refusing a BAC is the equivalent of admitting guilt (punishable at the same level as an aggravated DUI), while more experienced offenders are aware of the higher punishments associated with refusing a BAC test.

Table 6 presents estimates for the effect of BAC above the aggravated DUI thresholds on the probability of specific recidivism outcomes, similar to Table 5. Once again the regressions are weighting using a rectangular kernel and bandwidth of .05. The estimates suggest that receiving enhanced penalties though an aggravated DUI decreases the likelihood of recidivating in all of the BAC content categories. This again suggests either individuals are driving drunk less, or driving more carefully while drunk. When comparing the effects of have a BAC above the aggravated DUI threshold for first-time and repeat offenders, the main difference in the effects lies with refusals. Repeat offenders are less likely to be pulled over again and refuse to take a BAC test, while first-time offenders experience no change in their probability of refusing a test. This again could be due to differences in the experience of offenders, with repeat offenders having better information about the higher punishments associated with refusing a BAC test.

In summary, the results suggest that drunk drivers either respond to punishments by either driving drunk less, or driving drunk more carefully. Punishments associated with DUI also decrease future accidents, particularly among repeat offenders. Likewise, enhanced penalties resulting from aggravated DUI's are estimated to reduce recidivism all the BAC categories. This suggests that the unintended consequences that can arise if punishments are too severe (see Iyengar, 2007), are not present for DUI or aggravated DUI punishments. In addition, the reduction in recidivism for those receiving a DUI is consistent with a Beckerian model of rational criminality, as a DUI increases the punishments for subsequent drunk driving. However, the decreases in recidivism for aggravated DUI offenders diverge from the predictions of a model of fully rational criminals, as the enhanced penalties for aggravated DUI's do not change future fines for reoffending. The results are consistent with a model of criminality with bounded rationality where criminals have limited information regarding punishments which they update based upon the last punishment they received.

4.3 Recidivism Windows

The preceding analyses relied on a fixed window of four years for recidivism following the initial offense. This section expands on the previous estimates by utilizing varying windows of length for recidivism, a more nuanced approach that has a number of additional advantages. First, it allows a more detailed inspection of the effect of punishments on the change in the hazard functions. Second, it provides evidence on whether the previous estimates concerning the effectiveness of punishment are driven by long run changes in behavior, or short-run changes due to incapacitation (see Donohue and Levitt, 2001 and Owens, 2009). Third, it provides additional sensitivity analyses regarding the magnitude and statistical significance of the effects estimated in the previous section. All regressions are estimated using local linear regressions with a bandwidth of .05 and rectangular kernel weighting.

Note that incapacitation effects are somewhat different in the context of drunk driving. Normally incapacitation is driven by the inability to commit crime because individuals are in prison. Drunk drivers receive relatively short incarceration sentences, with sentences ranging from 24 hours to a few months depending on BAC and previous offenses. However, licenses are either suspended or revoked for a period of time following the offense (the difference between suspension and revocation lying in whether the individual needs to pass a license exam to have their license reinstated). Whether this constitutes incapacitation is debatable. Individuals may be issued restricted licenses for work purposes, despite having their license revoked for DUI. In that sense, suspended or restricted licenses are more similar to restrictions criminals face in acquiring handguns or other weapons post release. Along those lines, recidivism is still possible even if licenses are suspended or revoked. Importantly and regardless, this analysis will allow the detection of any abrupt changes that result because of changes in license privileges.

Figure 5 presents the estimated probability effects (with confidence intervals) and semi-elasticities for every potential time windows from 10 days to 2500 days which are factors of

10, both for first-time and repeat offenders. As shown, even for relatively short windows, having a BAC above the DUI threshold leads to a significant reduction in the probability of recidivism both for first-time and repeat offenders. Consistently, the effect of having a BAC above the DUI threshold grows in absolute magnitude as the window increases in size for both types of offenders. Scaling by the baseline probability of recidivism, yields a semi-elasticity (Appendix Figure 2 presents the baseline probability across windows for first-time and repeat offenders). This suggest that over the first two years, having a BAC above the DUI threshold decreases recidivism by 30 percent both for first-time and repeat offenders. As the recidivism window expands to 2500 days (almost 7 years), the long-run effects of a DUI receipt decreases in absolute magnitude to a 10 percent decrease for first time offenders 20 percent for repeat offenders. This more intricate analysis of recidivism suggests that the punishment associated with DUI's creates both short-term and long-term effects on recidivism.

The effects of having BAC above the aggravated DUI threshold across recidivism windows from 10 to 2500 days are explored in Figure 6. Similar regressions are employed, once again using rectangular kernels for weighting. For aggravated DUI's, once again the point estimates are initially around zero before growing consistently negative as the recidivism window expands. However, it appears after longer windows (those over 1500 days) that the estimates become statistically significant. Initially, the semi-elasticities hover around zero, but in the long term the semi-elasticities for both first-time and repeat offenders converge towards -.1. Enhanced punishments from aggravated DUI's do not appear to offer any additional deterrence in the short run above an ordinary DUI. However, in the long run, having a BAC above the aggravated DUI threshold decreases recidivism by an additional

10 percent. This is again consistent with criminals updating their priors following a harsher punishment, resulting in long-run changes their behavior, rather than being incapacitated.

4.4 Robustness

In addition to the preceding sensitivity analyses, this section discusses other robustness checks performed to confirm the results. First, a detailed regression analysis of covariates examines the statistical significance of the estimated effect of DUI and aggravated DUI on predetermined characteristics, complementing the graphical analysis in Figure 3. Second, offer a placebo test utilizes early data from 1995-1998 when the cut-off for a DUI was .10 and no aggravated DUI was enforced.

Table 7 contains estimates of the potential effect of DUI and aggravated DUI receipt on predetermined characteristics which should be unaffected by BAC thresholds. The regression models estimated are similar to the preferred models in the earlier analyses, employing a bandwidth of .05 and a rectangular kernel for weighting. For each characteristic examined, race (white vs. non-white), gender, age, and whether there was an accident at the scene), I fail to reject the null that the predetermined characteristics are unrelated to the BAC cutoffs for DUI and aggravated DUI. This supports the graphical scatterplots in Figure 3 suggesting no relationship between the punishment thresholds and the predetermined characteristics.

In Table 8, a placebo test of the post-Jan 1, 1999 laws examines the effect of have a BAC above the DUI and aggravated DUI threshold during the 1995-1998 time window when the threshold for a DUI was .10 and no aggravated DUI laws existed. One caveat is that 1995 contains an incomplete registry of the state-wide DUI stops, as the new record keeping system and software were still in the process of rolling out. The results are not sensitive to the inclusion or exclusion of that first year of the administrative records. Independent of the inclusion or exclusion of other control variables, recidivism rates from earlier time periods are unrelated to the future laws.[15]

5 Conclusion

Alcohol abuse continues to be a major problem for public health in the United States (Carpenter and Dobkin, 2010). The externality associated with each incident of drunk driving may be as high as $8,000 (Levitt and Porter, 2011). This paper offers evidence concerning the effectiveness of punishment severity as a deterrent to recidivism among drunk drivers, finding evidence that more severe punishments reduce recidivism rates both in the short and long term. Given the penalties for an aggravated DUI are on average 30 to 50 percent higher than those of a standard DUI, this would suggest an deterrence elasticity ranging from -0.4, to -.7. Importantly, the identification strategy does not estimate the full deterring effect of the laws, as the presence of more severe punishments may also deter who would have otherwise been drunk drivers from first-time.

More broadly, the findings of this paper also contribute to understanding the foresight – and hindsight – of criminals. Having BAC above the DUI threshold decreases the likelihood of recidivism, consistent with the predictions of a rational model of criminality as a DUI increases the expected cost of future criminality. However, aggravated DUI receipt also de-

[15] Appendix Tables 1 and 2 contain estimates from other models which explore the sensitivity of the main results to the usage of other kernels for weighting or higher order polynomials to model the forcing variable to address the possibility of specification bias (Lee and Card, 2008). The results are similar in magnitude when utilizing these other specifications.

creases the likelihood of recidivism. If an offender were fully rationally, they would consider the marginal BAC over the aggravated BAC threshold as bad luck and realize that although the penalty was higher on this occasion, that an aggravated DUI would have no bearing on future penalties and should be view as a sunk cost. The significant decrease in recidivism evident in drunk drivers with BAC over the .15 threshold is consistent with a model where criminals update their beliefs about expected punishment for future crimes based on the last punishment they received.[16] Notably, this finding is consistent with other recent research in criminology (Anwar and Loughran, 2011) and business management (Haselhun, Pope and Schweitzer, forthcoming).

As noted earlier, even small departures in rationality can lead to large deviations in behavior (Akerlof and Yeller, 1985). Importantly, one implication of this type of behavior or learning in offenders is that changes in punishments may require long durations in order to reaching their full deterring potential. So while well publicized changes in punishments such as three-strikes laws may deter crime significantly (see Helland and Tabborak, 1997), less well known changes in punishments such as increases in fines or sentence duration may have limited deterring effects in the short-run.

For researchers, this suggests that interrupted time-series approaches or difference-in-difference models which take advantage of discrete changes in laws may underestimate the long-run impact of increased punishments.[17] From a policy perspective, utilizing increases in

[16] Another type of learning which could explain this finding is if individuals have state-dependent utility, and individuals receiving an aggravated DUI have experienced losing a license for longer time period and hence have better information about how that translates into decreased utility. This is still an example of a bounded rationality, with individuals learning about how outcomes translate into utility, rather than learning about differences in punishments.

[17] This in particular might occur when controlling for state-specific time trends due to correlation between learning and the state-specific trend variable.

punishments or fines to offset reductions in police may work well in theory, but in the short run may fail in practice.

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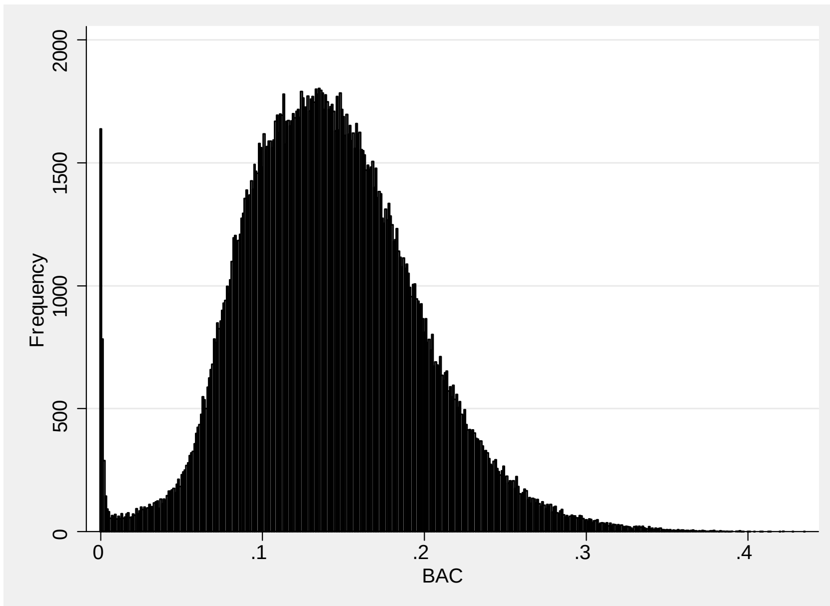
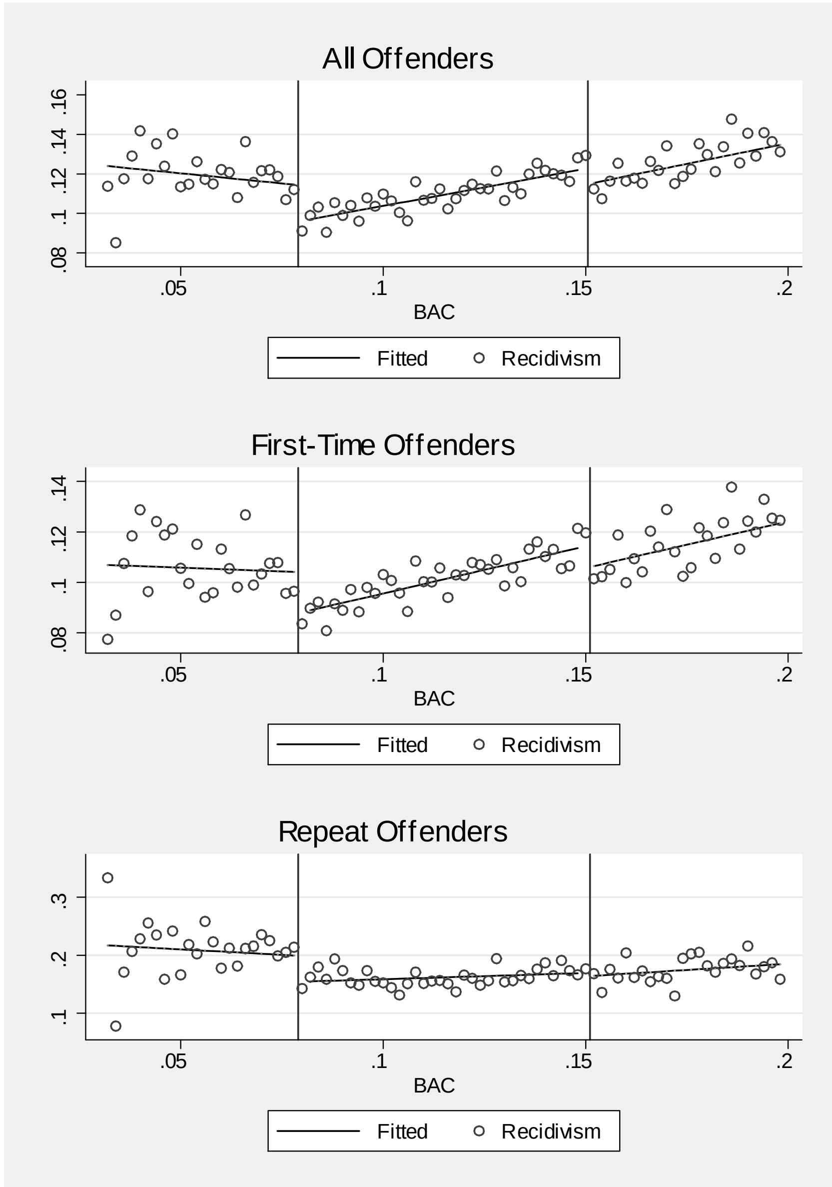
6 Figures and Tables

Figure 1: BAC Distribution



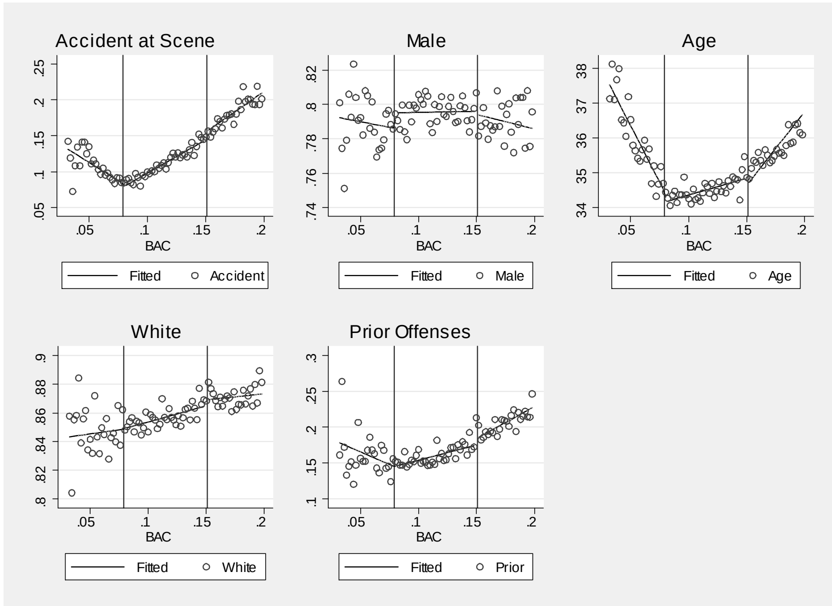
This figure contains a histogram of BAC distribution. Bin width is .001.

Figure 2: BAC and Recidivism



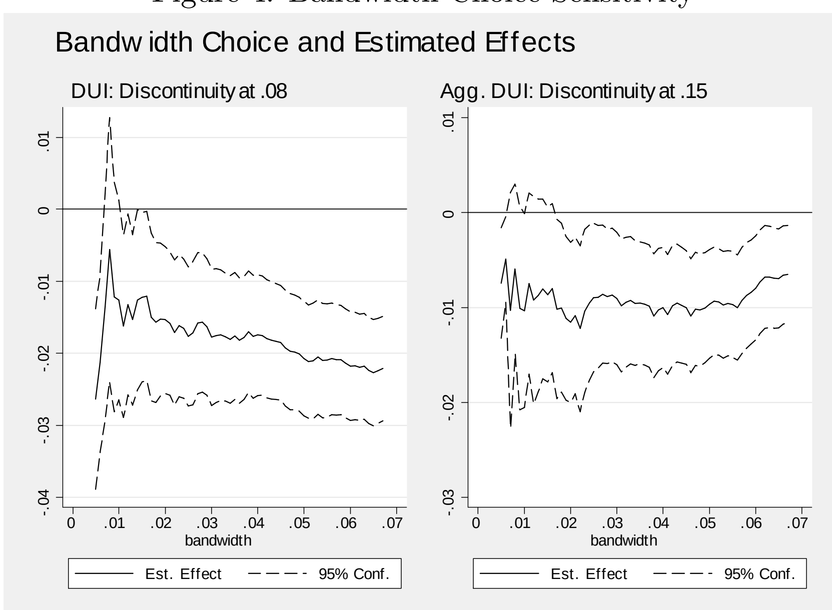
This figure contains a scatterplots of BAC distribution and recidivism. Bin width is .002.

Figure 3: BAC and Characteristics



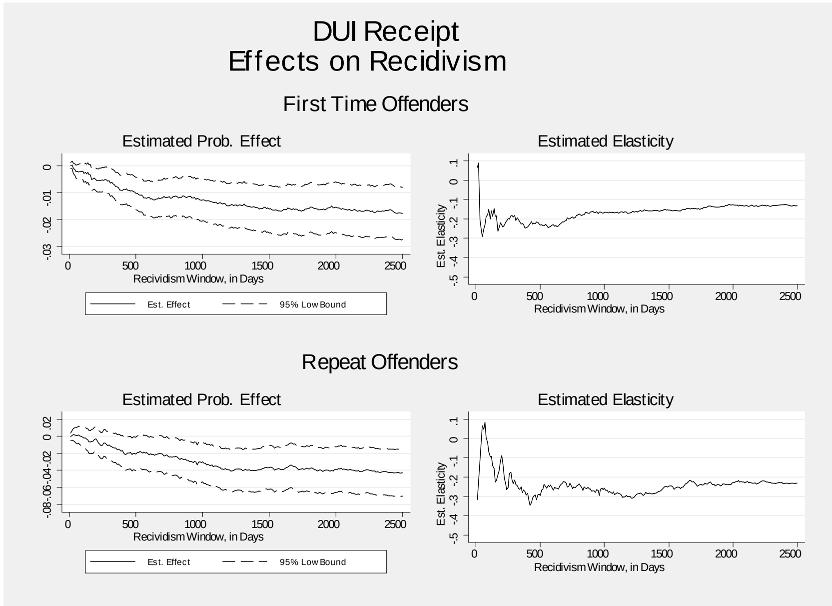
This figure contains scatterplots of BAC and predetermined characteristics. Bin width is .002.

Figure 4: Bandwidth Choice Sensitivity



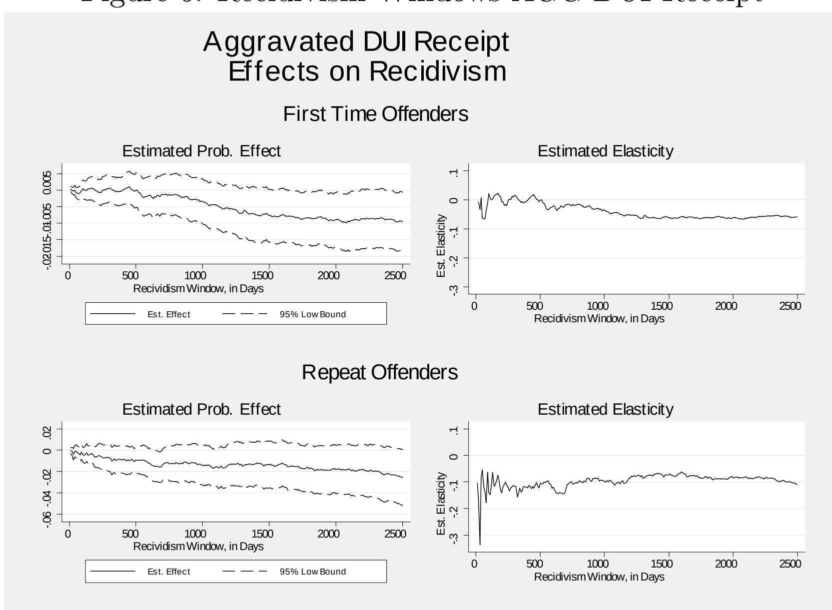
This figures presents the main estimates across various bandwidths.

Figure 5: Recidivism Windows DUI Receipt



This figures presents the main estimates across various time windows.

Figure 6: Recidivism Windows AGG DUI Receipt



This figures presents the main estimates across various time windows.

Table 1: Penalties for DUI Conviction Based on BAC

	1st Offense		2nd Offense		>=3rd Offense	
	DUI	Agg. DUI	DUI	Agg. DUI	DUI	Agg. DUI
BAC	[.08,.15]	(.15,1]	>=0.08	>.15	>=0.08	>.15
Min. Penalty	$865.50	$1,120.50	$1,120.50	$1,545.50	$1,970.50	$2,820.50
Max. Penalty	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
Min. Jail Time	24 Hours	48 Hours	30 Days	45 Days	90 Days	150 Days
Min. Home Release	14 Days*	28 Days*	60 Days**	90 Days**	120 Days**	150 Days
License Susp./Revok. Period	90 Days+	365 Days++	2 Years++	900 Days++	3 Years++	4 Years++
SR-22 Insurance	Yes	Yes	Yes	Yes	Yes	Yes

This table outlines the differences in penalties depending on the BAC measured.
* In lieu of Jail Time. ** Mandatory. +.Suspension. ++ Revocation.

Table 2: Summary Statistics

	I	II	III	IV	V	VI	VII	VIII
BAC Range	[0,1]	[0,.08)	[.08,.15]	(.15,1]	[.074,.079]	[.080,.085]	[.145,.150]	[.151,.156]
BAC	.141	.054	.117	.192	.076	.083	.147	.153
	(.054)	(.025)	(.019)	(.036)	(.001)	(.001)	(.001)	(.001)
# Priors	.190	.188	.161	.223	.139	.148	.170	.193
	(.529)	(.783)	(.441)	(.534)	(.432)	(.423)	(.444)	(.490)
Age	35.5	36.0	34.5	36.4	34.9	34.3	35.3	34.9
	(11.4)	(12.2)	(11.4)	(11.2)	(11.9)	(11.6)	(11.5)	(11.3)
Male	.792	.785	.796	.788	.792	.788	.785	.785
White	.862	.843	.857	.872	.852	.850	.866	.878
Accident	.149	.115	.112	.199	.089	.088	.145	.151
Recidivism	.120	.117	.110	.134	.113	.097	.122	.109
Obs.	229,400	25,515	108,690	95,195	4,572	4,596	6,798	6,431

This table contains summary statistics for various BAC ranges.
Standard errors are not reported for discrete indicators as they are a function of the mean.

Table 3: DUI Receipt and Recidivism

	I	II	III	IV	V	VI
	All Offenders		1st Time Offenders		Repeat Offenders	
Panel A: $BAC \in [-.03, .13]$						
DUI	-.020***	-.021***	-.016***	-.017***	-.053***	-.053***
	[-4.68]	[-5.00]	[-3.92]	[-4.21]	[-3.48]	[-3.50]
BAC	-.134	-.166	-.100	-.149	0.120	.093
	[-.69]	[-0.86]	[-0.56]	[-0.80]	[0.25]	[0.15]
$BAC * DUI$	.531**	.567***	0.543***	.591**	-.180	-.146
	[2.58]	[2.78]	[2.71]	[2.96]	[2.18]	[-0.21]
Controls	No	Yes	No	Yes	No	Yes
Obs.	95,111	95,111	82,626	82,626	12,485	12,485
Panel B: $BAC \in [-.055, .105]$						
DUI	-.019***	-.019***	-.017***	-.018***	-.037**	-.038**
	[-3.83]	[-4.02]	[-3.67]	[3.80]	[2.01]	[2.07]
BAC	-.369	-.431	-0.237	-.302	-.375	-.379
	[-1.32]	[-1.59]	[-0.83]	[-1.06]	[-0.33]	[-.35]
$BAC * DUI$	.933***	.976***	.987***	1.040***	-.475	-.379
	[2.88]	[3.09]	[2.90]	[3.06]	[-0.37]	[-0.40]
Controls	No	Yes	No	Yes	Yes	Yes
Obs.	49,396	49,396	43,070	43,070	6,326	6,326

This table contains regression discontinuity based estimates of the effect of having BAC above the DUI threshold on recidivism for various all offenders, first-time and repeat offenders. Panel A contains estimates with a bandwidth of .05 while Panel B has a bandwidth of .025, with all regressions utilizing a rectangular kernel for weighting. Controls include indicators for county, year, race, gender, and age of the offender.

*, **, and *** indicate significance at the 10, 5, and 1 % levels, [] contains estimated t-statistics.

Table 4: AGG DUI Receipt and Recidivism

	I	II	III	IV	V	VI
	All Offenders		1st Time Offenders		Repeat Offenders	
Panel A: $BAC \in [-.10, .20]$						
Agg DUI	-.011***	-.010***	-.009**	-.009**	-.021**	-0.022*
	[-3.17]	[-305]	[-2.19]	[-2.10]	[-2.04]	[-2.15]
BAC	.423***	.457***	.333***	.365***	0.740***	0.769***
	[6.80]	[7.42]	[4.37]	[4.85]	[3.27]	[3.44]
$BAC * Agg\ DUI$	.077	.067	0.010	.010	-.144	-.150
	[0.61]	[.54]	[0.73]	[0.79]	[-0.41]	[-0.43]
Controls	No	Yes	No	Yes	No	Yes
Obs.	146,426	146,626	124,192	124,192	22,234	22,234
Panel B: $BAC \in [-.125, .175]$						
Agg DUI	-.011**	-0.011**	-.010*	-.010*	-.017	-.019
	[-2.29]	[-2.25]	[-1.70]	[-1.65]	[-1.17]	[-1.34]
BAC	0.536*	0.583***	.446**	.486**	.830	.946
	[2.84]	[3.09]	[2.30]	[2.49]	[1.13]	[1.31]
$BAC * Agg\ DUI$	-.224	-.248	-.012	-0.022	-.124	-.135
	[-0.75]	[-0.72]	[-0.03]	[-0.05]	[-1.20]	[-1.36]
Controls	No	Yes	No	Yes	Yes	Yes
Obs.	78,622	78,622	66,541	66,541	12,081	12,081

This table contains regression discontinuity based estimates of the effect of having BAC above the Aggravated DUI threshold on recidivism for various all offenders, first-time and repeat offenders. Panel A contains estimates with a bandwidth of .05 while Panel B has a bandwidth of .025, with all regressions utilizing a rectangular kernel for weighting. Controls include indicators for county, year, race, gender, and age of the offender.

*, **, and *** indicate significance at the 10, 5, and 1 % levels, [] contains estimated t-statistics.

Table 5: DUI Receipt
Recidivism Heterogeneity

	Recidivism Outcomes				
Recidivism BAC Range	[.08,.15]	(.15,.1]	[0,.08)	Refusal	Accident
Panel A: All Offenders					
DUI	-.0153**	-.007**	-.004*	.001	-.003**
	[-4.02]	[-2.37]	[-1.69]	[0.18]	[2.04]
BAC	.125	.010	-.250	.157*	-.014
	[0.75]	[0.09]	[2.24]	[1.92]	[-0.21]
$BAC * DUI$	.0180	.333***	-.110	.140	.120*
	[0.10]	[2.58]	[-0.46]	[1.44]	[1.72]
Controls	Yes	Yes	Yes	Yes	Yes
Obs.	95,111	95,111	95,111	95,111	95,111
Panel B: First − Time Offenders					
DUI	-.0148***	-.007**	-.003	.004	-.002
	[-3.90]	[-2.16]	[-1.54]	[1.57]	[-1.15]
BAC	.120	.132	-.239	0.81	-.026
	[0.75]	[1.10]	[2.32]	[0.85]	[-0.40]
$BAC * DUI$	.091	.200	.125	.195*	.117*
	[0.52]	[1.53]	[1.16]	[1.88]	[1.67]
Controls	Yes	Yes	Yes	Yes	Yes
Obs.	82,626	82,626	82,626	82,626	82,626
Panel C: Repeat Offenders					
DUI	-.021*	-.010	-.009	-0.016	-.0128**
	[-1.92]	[-1.28]	[-1.36]	[-1.63]	[2.51]
BAC	.316	-.606	-.243	0.826**	.121
	[0.64]	[-1.62]	[-0.75]	[2.56]	[0.49]
$BAC * DUI$	-.690	.978	-.041	-.488	.072
	[-1.27]	[2.39]	[-0.12]	[-1.27]	[0.26]
Controls	Yes	Yes	Yes	Yes	Yes
Obs.	12,485	12,485	12,485	12,485	12,485

This table contains regression discontinuity based estimates on the effect of having BAC above DUI threshold on various types of recidivism. Panel A contains estimates for all offenders, Panel B contains estimates for first-time offenders, and Panel C contains estimates for repeat offenders. All regressions are estimated with a bandwidth of .05 and use a rectangular kernel for weighting. Controls include indicators for county, year, race, gender, and age of the offender.
*, **, and *** indicate significance at the 10, 5, and 1 % levels, [] contains estimated t-statistics.

Table 6: AGG DUI Receipt
Recidivism Heterogeneity

	Recidivism type				
Recidivism BAC Range	[.08,.15]	(.15,.1]	[0,.08)	Refusal	Accident
Panel A : All Offenders					
AGG DUI	-.005**	-.004*	-.003***	-.001	-.006
	[-2.35]	[-1.80]	[-3.06]	[-0.75]	[-0.52]
BAC	-.136*	.617***	-.087***	.003	.120***
	[-2.54]	[11.57]	[-3.11]	[7.36]	[4.37]
BAC ∗ AGG DUI	-.208***	.119	.050	-0.019	-0.03
	[-2.86]	[1.21]	[1.63]	[-0.23]	[-0.71]
Controls	Yes	Yes	Yes	Yes	Yes
Obs.	146,626	146,626	146,626	146,626	146,626
Panel B : First − Time Offenders					
AGG DUI	-.005**	-.004	-.006	.0005	-.004
	[-2.34]	[-1.63]	[-1.21]	[0.25]	[-0.29]
BAC	-.127**	.595***	-.252	.227***	.096***
	[-2.26]	[10.46]	[0.91]	[5.18]	[3.26]
BAC ∗ AGG DUI	-.179**	.081	-.110	.028	-.016
	[2.26]	[0.79]	[-0.46]	[0.33]	[-0.31]
Controls	Yes	Yes	Yes	Yes	Yes
Obs.	124,912	124,912	124,912	124,912	124,912
Panel C : Repeat Offenders					
AGG DUI	-.004	-.004	-.002	-.014**	-0.002
	[-0.55]	[-0.57]	[-.80]	[-2.06]	[-0.58]
BAC	-.254*	0.668***	-.227**	.605***	.233***
	[-1.35]	[4.44]	[-2.53]	[3.81]	[2.73]
BAC ∗ AGG DUI	-.303	.257	.254*	-.304	-.142
	[-1.28]	[0.99]	[2.30]	[-1.23]	[-1.06]
Controls	Yes	Yes	Yes	Yes	Yes
Obs.	22,234	22,234	22,234	22,234	22,234

This table contains regression discontinuity based estimates on the effect of having BAC above DUI threshold on various types of recidivism. Panel A contains estimates for all offenders, Panel B contains estimates for first-time offenders, and Panel C contains estimates for repeat offenders. All regressions are estimated with a bandwidth of .05 and use a rectangular kernel for weighting. Controls include indicators for county, year, race, gender, and age of the offender.
*, **, and *** indicate significance at the 10, 5, and 1 % levels, [] contains estimated t-statistics.

Table 7
DUI/AGG DUI Receipt and Characteristics

Characteristics	Acc.	Male	White	Prior	Age
Panel A : DUI Receipt					
DUI	-.004	.007	.002	0.039	−.165
	[-1.08]	[1.33]	[0.39]	[0.55]	[-0.99]
BAC	-.955***	-.219	.137	-.700***	-6.51***
	[-5.24]	[1.19]	[0.57]	[2.18]	[-8.72]
$BAC * DUI$	.184***	0.380*	0.001	.980***	7.04***
	[9.44]	[1.80]	[0.00]	[2.88]	[8.97]
Controls	No	No	No	No	No
Obs.	95,111	95,111	95,111	95,111	95,111
Panel B : Agg DUI Receipt					
AGG DUI	.003	-.001	0.003	0.008	.049
	[0.71]	[-1.23]	[0.99]	[1.31]	[0.40]
BAC	1.010***	-0.153	0.226***	0.459***	1.48***
	[11.98]	[-1.50]	[3.16]	[3.61]	[4.91]
$BAC * AGG\ DUI$	.237	0.097	-0.185**	0.266	1.12***
	[1.58]	[0.60]	[1.61]	[1.40]	[2.74]
Controls	No	No	No	No	No
Obs.	146,626	146,626	146,626	146,626	146,626

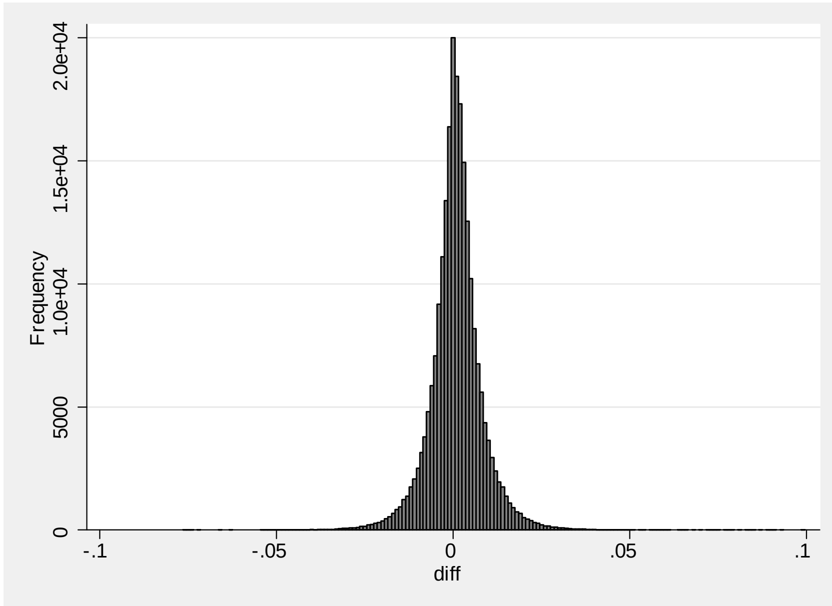
This table contains regression discontinuity based estimates on the effect of having BAC above the DUI threshold on recidivism for various predetermined characteristics. Panel A focuses on effect of BAC above the DUI threshold, while Panel B focuses the Aggravated DUI threshold Controls include indicators for county, year, race, gender, and age of the offender.
All regressions have a bandwidth of .05 and use a rectangular kernel for weighting.
*, **, and *** indicate significance at the 10, 5, and 1 % levels, [] contains estimated t-statistics.

Table 8: Placebo Period, 1995-1998

	I	II	III	IV
	DUI Receipt		AGG DUI Receipt	
DUI [Agg DUI]	-.004	-.003	.002	.002
	[-0.25]	[-0.18]	[.024]	[0.18]
BAC	0.325	0.313	0.598***	0.622***
	[0.61]	[0.59]	[2.61]	[2.72]
$BAC * [Agg\ DUI]$	-.495	-.469	0.063	.591**
	[-0.83]	[-0.79]	[0.19]	[2.96]
Controls	No	Yes	No	Yes
Obs.	17,275	17,275	33,507	33,507

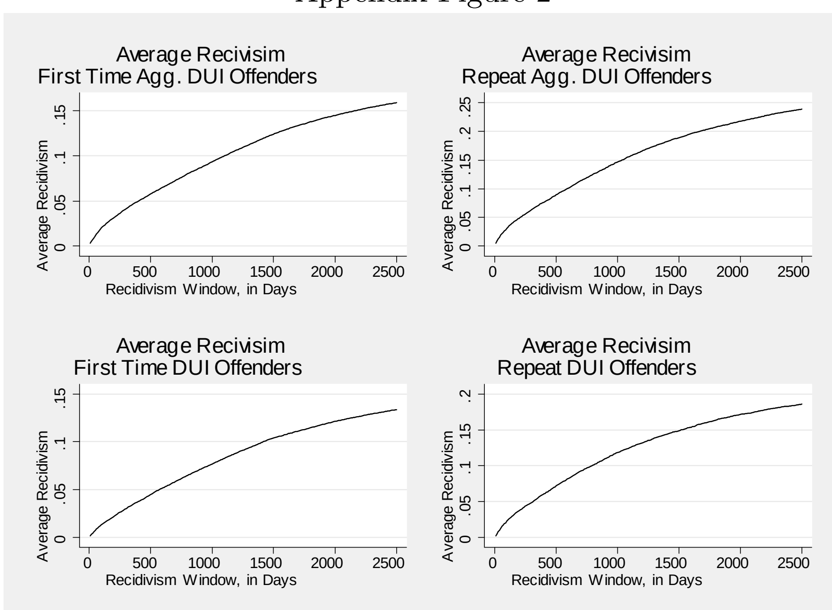
This table contains a regression similar to Table 3 for a period with a different BAC threshold for DUI, and no aggravated DUI. Controls are identical to those in previous regressions. The bandwidth is .05, and rectangular kernel is used for weighting. [] contains estimated t-statistics.
*, **, and *** indicate significance at the 10, 5, and 1 % levels

Appendix Figure 1



This figure illustrates the difference in the two BAC samples taken.

Appendix Figure 2



This figure illustrates the cumulative probability of recidivism for varying time windows.

Appendix Table 1: DUI/AGG DUI Receipt

	DUI			AGG DUI		
Characteristics	I	II	III	IV	V	VI
DUI [AGG DUI]	-.021***	-0.013**	-.020***	-0.010***	-0.012**	-0.010*
	[-5.00]	[-2.57]	[3.00]	[3.05]	[-2.45]	[-1.64]
Polynomial Order	1	2	3	1	2	3
Controls	Yes	Yes	Yes	Yes	Yes	Yes
R^2	.008	.008	.008	.007	.007	.007
Obs.	95,111	95,111	95,111	146,626	146,626	146,626

This table explores the sensitivity of the main estimates to the order of the polynomial in regression.
Controls include indicators for county, year, race, gender, and age of the offender.
*, **, and *** indicate significance at the 10, 5, and 1 % levels, [] contains estimated t-statistics.

Appendix Table 2: DUI/AGG DUI Recidivism

	DUI				AGG DUI			
Characteristics	I	II	III	IV	I	II	III	IV
Panel A : Bandwidth = .05								
DUI [AGG DUI]	-.015***	-.016***	-.017***	-.018***	-0.010***	-0.010***	-.010***	-.010***
	[-3.57]	[-3.73]	[-4.03]	[-4.21]	[-2.78]	[-2.73]	[-2.96]	[-2.90]
Kernel	Triangle	Triangle	Gaussian	Gaussian	Triangle	Triangle	Gaussian	Gaussian
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Obs.	95,111	95,111	95,111	95,111	156,663	156,663	156,663	156,663
Panel B : Bandwidth = .025								
DUI [AGG DUI]	-.014***	-.015***	-.016***	-0.17***	-.010**	-.010**	-.010**	-.009**
	[-2.92]	[-3.05]	[-3.15]	[-3.20]	[-2.15]	[-2.15]	[-2.11]	[-2.10]
Kernel	Triangle	Triangle	Gaussian	Gaussian	Triangle	Triangle	Gaussian	Gaussian
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Obs.	49,396	49,396	49,396	49,396	78,622	78,622	78,622	78,622

This table explores the sensitivity of the main estimates to the type of kernel for weighting. Panel A estimates using a bandwidth of .05, while Panel B has estimates with a bandwidth of .025.
Controls include indicators for county, year, race, gender, and age of the offender.
*, **, and *** indicate significance at the 10, 5, and 1 % levels, [] contains estimated t-statistics.