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All-Offender Ignition Interlock Laws & DUI Arrest Rates

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All-Offender Ignition Interlock Laws & DUI Arrest Rates

by

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ABSTRACT

Ignition interlock devices are installed in motor vehicles after a DUI conviction to prevent the vehicle from starting if the driver is intoxicated. States vary widely in their criteria for the installation of these devices, and the laws mandating installation for all DUI convictions regardless of whether or not it is a first, second, or third offense (etc.) are known as 'all-offender' laws. Previous studies have shown that ignition interlock devices are highly effective in preventing re-offense while installed on the vehicle and that their expanded use has led to a reduction in alcohol-related traffic fatalities. This research examines whether the ability of an ignition interlock device to decrease the number of drunk drivers on the road at any given time is evident in declining DUI arrest rates. This is achieved by comparing states that have implemented all-offender laws to those that have not. I use a difference-in-differences regression model with fixed effects for entity (state or county) and time to evaluate arrest trends over a 16-year period. Data are derived from the FBI's Uniform Crime Report (UCR) and publications made available by Mothers Against Drunk Driving. My results provide no conclusive evidence that all-offender laws promote lower rates of DUI arrest, but data limitations posed by the UCR restrain the scope of conclusions that can be drawn from this study.

ACKNOWLEDGEMENTS

I would like to thank the Economics Faculty at Hunter for providing me with the education needed to complete this degree and this thesis. I would also like to thank my primary advisor and thesis sponsor, Dr. Michael Levere, as well as my secondary reader, Dr. Monica Deza. My graduation from this program would not have been achieved without the support of a wonderful group of classmates and friends, as well as the strong support and encouragement of my husband Matt.

TABLE OF CONTENTS

1 INTRODUCTION

Although alcohol-related traffic fatalities have trended downward over the last two decades (Johnson, 2019), alcohol continues to play a significant role in traffic accidents across the United States. The National Highway Traffic Safety Administration cites alcohol as a factor in nearly 1/3 of traffic-related deaths resulting in over 10,000 annual fatalities (NHTSA, n.d.). Ignition interlock devices with a breathalyzer component were developed in the 1980's, but they did not contain the technical sophistication needed for widespread use until the 1990's (Marques & Voas, 2010). Now one of many tools in the continuing government effort to reduce drunk driving, criminal courts rely heavily on ignition interlock devices to prevent offenders from reengaging in the high-risk behavior that prompted the initial arrest.

All 50 states have an option that allows for the installation of an ignition interlock device after an arrest but not all states require it (IgnitionInterlockInfo, 2019). 'All-offender' states require these devices to be installed on the vehicles of all convicted DUI offenders regardless of whether this is a first-time arrest or a repeat offense (Mothers Against Drunk Driving, 2018). Numerous studies have shown widespread use of ignition interlock devices successfully reduces the number of fatalities associated with drunk driving. Many states have adopted all-offender laws as a result of this research and the advocacy around it (Carter, Flannagan, Bingham, Cunningham, & Rupp, 2015; Ullman, 2016; McGinty, Tung, Shulman-Laniel, Hardy, Rutkow, Frattaroli, & Vernick, 2017).

The U.S. government has directed considerable resources toward the goal of reducing the occurrence of drunk driving, but there are few ways to definitively prevent an intoxicated driver from getting behind the wheel of a vehicle. Ignition interlock devices have partially achieved this goal (Marques & Voas, 2010). If ignition interlock devices successfully reduce the number of intoxicated drivers on our roadways, one possible way to gauge their impact is by examining DUI arrest rates in states where these laws are strict. If arrest rates decrease, this provides strong supporting evidence that ignition interlock devices are exceptionally effective at reducing the overall number of drunk drivers on the road. If arrest rates remain the same or increase, this raises important research questions around why they remain the same despite measurable decreases in alcohol-related traffic fatalities.

In this research, I examine whether or not implementation of an all-offender ignition interlock law translates to a verifiable impact on DUI arrest rates. My study exploits the heterogeneity of ignition interlock laws across the United States over a 2005-2016 period of staggered implementation. This strategy is similar to the approach taken by some of the papers mentioned above, as well as a 2016 study that used a nationwide assessment of all-offender laws to determine their role in decreasing alcohol-related traffic fatalities (Kaufman & Wiebe, 2016). My data are sourced from the FBI's Uniform Crime Report (UCR) and Mothers Against Drunk Driving (MADD).

A difference-in-differences regression comparing outcomes by state is used for a nationwide analysis of the impact of these laws. State and time fixed effects are included. A county-level analysis that utilizes the data of a focused geographic area with strong variability in all-offender implementation is also conducted to compare against the national results. Ultimately I find no conclusive evidence that all-offender laws produce considerable reductions in DUI arrest rates. The analysis is complicated by the staggered adoption rate of all-offender laws across the United States as well as inconsistencies in the UCR data.

2 LITERATURE REVIEW

There is an extensive body of research related to the problems caused by drunk driving in the United States and the efforts undertaken by federal, state, and local governments to decrease the rate at which it occurs. In the realm of economics, recent research around drunk driving often focuses on behavioral assessment or risk assessment. Steven Levitt and Jack Porter published a paper in 2001 that calculated the high level of public risk drunk drivers pose compared to sober drivers, as they are 7 – 13 times more likely to cause a fatal motor vehicle crash (Levitt & Porter, 2001). Building on their model of risk analysis to provide an updated assessment of the negative social externalities caused by drunk driving, the authors also evaluated the effectiveness of DUI laws as a means of transferring these risks back to drivers. They found that punishments for first-time offenders may not always be commensurate with the potential damage they can cause, however the harsher penalties imposed on repeat offenders provide an adequate balance.

Economic and public health research around drinking and driving also provides some guidance on whether or not we can expect the total number of DUI arrests to be influenced by changes to DUI laws. A 2014 study that investigated whether or not individuals who drink and drive differ from other drinkers in cognitive ability, knowledge of DUI laws, or other potential risk factors found that individuals who report a high number of episodes of drinking and driving (5 or more) were more likely to be informed about DUI laws than other survey participants (Sloan, Eldred, & Xu, 2014). Taken in context with prior research that shows the majority of drunk drivers are likely to be "chronic offenders" who have driven drunk many times (DeMichele & Lowe, 2011), this more informed population represents a potentially significant portion of DUI arrests. It is possible that highly publicized changes to state DUI laws, like the implementation of an all-offender ignition interlock component, could have a minimizing effect on the number of DUI infractions committed through publicity alone. Knowledge of harsher penalties may act as a deterrent in itself. This research, however, undermines that conclusion in the context of DUI offenders.

Knowledge of the law may not act as a deterrent, but there is much direct evidence that ignition interlock devices are effective in preventing recidivism while installed on the vehicle. In Washington state, researchers examined multiple changes to DUI law over an almost 10-year period that included passage of an all-offender ignition interlock law, an option to install an interlock device to avoid a driver's license suspension, and a compliance-based stipulation that required drivers actually prove an interlock device was installed on their vehicle before their license could be reinstated (McCartt, Leaf, & Farmer, 2018). In this study, increased use of ignition interlock devices coincided with lower recidivism rates for first-time DUI offenders, but not necessarily repeat offenders. Other studies have had different results. A Maryland experiment using random assignment of ignition interlock devices over a 2-year period evaluated whether or not ignition interlocks could serve as a cost-effective deterrent for repeat offenders specifically (Beck, Rauch, Baker, & Williams, 1999). Researchers found that while the device was installed on the vehicle, there was a substantial, measurable drop in the arrest rates of repeat offenders versus the control group, but that effect dissipated once the device was removed. If ignition interlock devices are only an effective deterrent for the limited time they are installed on the vehicle, and only with a specific population of offenders, it is possible we may not see substantive changes to DUI arrest rates in areas where these laws are adopted. The impact of an all-offender law would depend on a number of varying factors, including the amount of time the device was required to be installed on the vehicle as well as the percentage of total DUI arrests attributable to the population most responsive to law.

Identifying strategies that work with repeat offenders is an important policy objective in criminal justice. Additional research shows that response to incentives may not be uniform across different offender groups. Some evidence points to ignition interlock devices as a much-needed temporary deterrent where other long-term punitive measures, like incarceration, have failed. A recent study surrounding harsher sentencing guidelines in Michigan showed that repeat OWI (Operating While Intoxicated) offenders (3rd offence or greater) responded differently to longer periods of incarceration than those convicted of retail fraud (Estelle & Phillips, 2018). A 23% increase in the length of incarceration lowered the rate of recidivism for retail fraud offenders by 22%, but those convicted of a repeated drunk driving offense did not respond the same way. Instead OWI offenders saw such negligible decreases in recidivism that the authors concluded few meaningful policy implications could be drawn from the results.

Unfortunately, despite the pivotal role recidivism plays in DUI offenses, there is not a strong body of highly tested research that can guide policy discussions. A 2015 review of the available literature found that many studies lack the statistical rigor required to draw causal conclusions (Miller, Curtis, Sonderland, Day & Droste, 2015). The authors did conclude that the information currently available shows "…

multi-component programs are more effective than those which target only one aspect of the issue".

3 DATA

Data for this research is compiled from 3 different sources. To determine which states qualify as 'all-offender' and at what point in time their laws changed, I use information provided in a 2018 report produced by Mothers Against Drunk Driving for their Campaign to Eliminate Drunk Driving. I also utilize an accompanying presentation / report published to the MADD website that gives more specific information on the exact date an all-offender law went into effect.

DUI arrest data are sourced from the FBI Uniform Crime Report, specifically from a project undertaken by Jacob Kaplan at the University of Pennsylvania and made available through the Inter-university Consortium for Political and Social Research (ICPSR). The dataset Kaplan provides is a streamlined and centralized version of the FBI data relating to their 'Arrests by Age, Sex, and Race' report covering 1974 to 2016. I limit my analysis to the years 2001 – 2016 (New Mexico did not introduce the first statewide all-offender ignition interlock law until 2005). Some states have since adopted all-offender laws beyond the time period looked at in this research. This expanded group includes a 2019 pilot program in California, as well as new statewide laws in Nevada (2018), Iowa (2018), New Jersey (2019), and Kentucky (2020).

Data for the national analysis are aggregated from agency-level DUI arrest and population totals. I collapse the agency-level data by state and year. In an effort to assess data accuracy, I also collapse the mean data for the 'Number of Months Reported' variable that Kaplan includes in each dataset. This variable reflects how many months each agency reported a crime – any crime – in their data. When collapsed to state and year averages, 73% of these collapsed observations have averages of 6 months or more. As this applies to all crimes (and not DUI arrests specifically) it cannot be taken as an indisputable indicator of the accuracy of DUI arrest numbers, but it provides a foundation from which to start.

Data for the county-level analysis are from a file of aggregated agency-level data that Kaplan has already cleaned and merged with the Law Enforcement Agency Identifiers Crosswalk file (ICPSR, n.d.). His imputation procedure for missing data is detailed in the project descriptions available with the files at the ICPSR.

As emphasized by Kaplan in the notes provided for this dataset, there are established problems with the Uniform Crime Report that can have important implications for policy research and analysis. Data submission to the UCR is entirely voluntary, and although the FBI has made substantial efforts to improve the data collection process over recent years this poses notable quality and consistency issues (Federal Bureau of Investigation, 2018). Issues with the UCR are particularly important to consider when using county- or agency-level data. Kaplan directs readers to a 2002 paper by Maltz and Targonski that enumerates some of these risks, many due to the flaws in the imputation process for missing data, inaccurate population counts, and the challenges posed by 'zero-population' agencies like the state police (Maltz & Targonski, 2002). Due to problems with the imputation of the county-level data, Maltz and Targonski state that county-level data should *not* be used in policy studies until data collection methods have improved. My use of county-level data in this paper is secondary to my examination of the nationally aggregated data and only intended to provide supporting evidence for the national results. I consider my use of the county-level data to be a robustness check rather than a strong data-driven indicator of a statistically significant relationship.[1]

Implementation of all-offender laws occurred across different years and dates for each state. To capture the effects of the law in the treatment group, I used the following methodology to determine year of implementation: if the law went into effect from January to June (ex. April 2014), I set the year of implementation as that current year (2014). If the law went into effect from July to December (ex. Nov

[1] The addition of a new variable by Kaplan to this dataset – a 'coverage indicator' – helps with these accuracy concerns by revealing how much of each county's data has been actively reported by an agency versus imputed. A coverage indicator of 100 means all the data has been reported, while a coverage indicator of 0 means it has all been imputed. In an effort to assess whether or not the county-level analysis was worthwhile, I collapsed each county's 2001-2016 coverage indicator value into an average at the state level. All of the states I am looking at for my county-level analysis hovered around 65 or above, with the exclusion of Kentucky. Please refer to Table 1 for the calculated values.

2014), I set the year of implementation as the following year (2015). About 40% of the laws were implemented in the first half of the year and 60% were implemented in the second half of the year. Figure 1 is a map that illustrates how each state is designated in the analysis. Dark purple states implemented an all-offender law during the time period looked at in this study and are included in the treatment group. Light purple states are part of the control group because they implemented (or plan to implement) an all-offender law after the time period looked at in this study. Gray states, which have never implemented an all-offender law, are also part of the control group.

In addition to the all-offender laws themselves, it is important to note that the laws governing a drunk driving offense differ by state. Some states specify the crime as driving under the influence (DUI) or driving while impaired (DWI) while others may specify the crime of driving while intoxicated (also shortened to DWI), operating while intoxicated (OWI), or something similar. These are broad terms that can also include being under the influence of additional drugs or narcotics. I use the terminology "driving under the influence" throughout this paper to be consistent with the UCR. Although the UCR totals may include arrests made for being under the influence of a variety of drugs, alcohol continues to be the motivating factor behind the vast majority of DUI infractions (Lipari, Hughes, & Bose, 2016).

4 METHODOLOGY

To evaluate the impact of an all-offender ignition interlock law on DUI arrest rates I utilize a difference-in-differences regression model with fixed effects for entity (either state or county depending on the analysis) and time. Standard errors are clustered at the state or county level.

The difference-in-differences model with fixed effects for state (or county) and time is defined as:

$$LN\_dui\_tot\_arrests\_PC_{st} = \beta_0 + + \beta_1 * treat\_post_{st} + \theta_s + \delta_t + \mu_{st}$$

All observations are indexed across entity (s, for state or county) and time (t). My dependent variable is a log transformation of DUI arrests per capita (LN_dui_tot_arrests_PC). 'Per capita' in this case means total annual DUI arrests divided by the aggregated state or county population. In the county-level analysis, due to a number of 0 totals, I added one to every arrest observation prior to the log transformation (LN_dui_tot_arrests_PC = ln(dui_tot_arrests_PC + 1)). Below are the definitions of the remaining variables in the model:

- treat_post: This is a dummy variable that equals 1 for any states that implemented all-offender laws but *only* in the years in which the laws were active. The same logic applies for the county-level regressions. The coefficient on this variable provides the relevant difference-in-differences estimate.

- θ_s: State fixed effects.
- δ_t: Dummy variables for the years 2002 – 2016 (with 2001 omitted for comparison) representing the time fixed effects.
- μ_{it}: An error term.

For the causal relationships established in these regressions to be valid, the following assumptions must be made. First, I must assume that it is reasonable to compare states to each other in this context. Using state variability in law implementation for the basis of this type of statistical analysis is common due to the fact that it gives the researcher access to a large sample population with many shared characteristics and a certain level of uniformity imposed at the federal level. The second important assumption is that there are no other sweeping revisions or changes to DUI law at the time these all-offender laws were implemented that would prevent me from measuring the true impact of these results due to confounding effects. Having a large sample size helps in this regard as it is unlikely every state made equivalent changes to their DUI laws during the same year these new laws were implemented. There are likely state-specific factors that impact DUI arrest rates, but state-fixed effects are also included in these regressions to help control for those influences. As it is not likely that decreases in DUI arrest rates would cause increased implementation of all-offender laws, reverse causation is not a significant concern.

Another underlying assumption in any difference-in-differences analysis is the existence of parallel trends in the dependent variable before implementation of the treatment effect. To test the validity of this in respect to my research, I ran a regression limiting arrest data to the years 2001-2005. This covers the immediate period before the first law was implemented in New Mexico. I then created an interaction term between the year variable and a broader treatment variable (treat_all) that equaled 1 in any state that ever introduced an all-offender law. This would allow me to see if there were any statistically significant differences between the treatment group and the control group prior to the appearance of the first law. No statistically significant differences were identified for any of the years prior to implementation, though one year (2004) was omitted due to collinearity. Parallel trends can be assumed.[2] See Table 2 for the results of this regression.

Due to variability in data reporting among the agencies included in the UCR, I decided to structure my regressions for the national analysis around the state averages calculated for the 'Number of Months Reported' variable. Again the 'Number of Months Reported' variable indicates the number of months out of the

[2] Although this method of assessing parallel trends is inexact, as adoption of the new law was staggered across states over many years, it does help establish a basis for valid causal analysis.

year that an agency actually reported their crime data to the UCR. These specifications are intended to ascertain whether or not deficiencies in data collection are exerting an outsize influence on the results. If the direction or magnitude of the coefficient differs dramatically from one grouping to another, this may signal a problem. The national regressions utilize a large set of selected state data with no initial restrictions on the average number of months reported that is then limited to states with an average of 6 or more months of data reported or states with an average of 9 or more months of data reported.[3] South Carolina, Ohio, and North Dakota are excluded from the final analysis due to conspicuously large increases in DUI arrest rates during the relevant period of time (Figure 2).[4]

The county-level approach focuses on a small number of neighboring states that have seen great variability in their implementation of an all-offender ignition interlock law. The methodology behind this approach is to minimize any state-specific differences between the treatment and control groups in the national analysis that may unintentionally produce evidence of a causal relationship. Using

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[3] Washington D.C. is included. Florida is excluded due to the fact that the state cited 0 statewide DUI arrests across all relevant years in addition to having low reporting averages.

[4] If included, South Carolina, Ohio, and North Dakota produce a statistically significant relationship between the variables of interest in one of the main regressions. There is a strong possibility that these trends are due to data consistency issues, however, rather than being indicative of genuine increases in the rate of arrest. As a result, removing them from the analysis seemed necessary to draw sound causal conclusions.

a narrow geographic area and county-level data will account for more of those differences and strengthen any statistically significant results. When considering how to conduct the county-level analysis, I identified two states of interest: Illinois and West Virginia. Both states adopted all-offender laws several years before their neighbors, with some of those neighbors never adopting the laws at all or only adopting them after the time period looked at in this work. Unfortunately the inaccuracy of the DUI data reported for Illinois prevented a county-level analysis. Illinois has one of the lowest average coverage indicators I calculated, and after contacting the Illinois State Archives to get a more complete source of DUI arrest data I determined that the Illinois numbers were too incomplete to use. West Virginia, on the other hand, had an average coverage indicator above 50 and implemented an all-offender law 4 years before any neighboring state (Virginia). Figures 3 and 4 depict the total DUI arrest trends across the relevant time period for West Virginia and the states surrounding it.

The first county-level regression includes West Virginia and all 5 of its bordering states – Kentucky, Maryland, Ohio, Pennsylvania, and Virginia. As the trend graphs illustrate, both Kentucky and Ohio experienced dramatic spikes in total DUI arrests in 2005 and 2008 respectively. Based on the average coverage indicators, the spike in Kentucky appears to be due to a sudden increase in agencies reporting data that falls back down from 2006 – 2008, and then permanently returns to the much-improved reporting level in 2009. The mystery behind the spike in Ohio, however, I have been unable to solve as the average coverage indicators remained steady and I could not find an alternate source confirming or explaining the increase. As a result, the second regression removes Kentucky and Ohio from the analysis. The third regression compares West Virginia to Ohio and Pennsylvania exclusively, as those are the only two states in the group that never implemented an all-offender law close to the relevant time period (Maryland enacted a law in October 2016, which makes the effective date of implementation for this research 2017 so I decided not to include it here). The fourth and final regression compares West Virginia to Maryland only. The logic here is that, based on the graph of total DUI arrests, West Virginia and Maryland come closest to demonstrating the parallel trends necessary for a reliable difference-in-differences analysis.

5 RESULTS

[5.1] National Regressions (Table 3)

Table 3 displays the results of the national regression models. In the first regression, there are no restrictions on the average number of months of data reported. This model produces a negative coefficient that represents an almost 6% decrease in DUI arrests in states that implemented an all-offender ignition interlock law. The second regression focuses on states with an average of 6 or more months of data reported. The coefficient in this regression is strikingly similar to the result produced by the regression with no restrictions, even though the number of observations drops by almost 200. The third regression has the most severe limitations; only states with an average of 9 or more months of data reported are included. This regression also produces a negative coefficient, though the magnitude decreases from 6% to approximately 4%. Although all three regressions produce negative coefficients that are similar in magnitude, they all lack statistical significance. As statistical significance cannot be established, these results provide no strong scientific evidence that a decrease in DUI arrest rates can be attributed to implementation of an all-offender law.[5]

[5.2] County-Level Regressions (Table 4)

The results of the county-level analysis can be found in Table 4. Statistically significant results are produced in 3 out of the 4 models tested, but the magnitude of each of the coefficients in these models is far too small to consider them evidence of any meaningful effect. The first model, which includes the full set of data for West Virginia and all surrounding states, produces a positive coefficient. This is likely attributable to the fact that this model includes Kentucky and Ohio, both states that are deliberately excluded from several of the other specifications due to previously discussed problems with their data. The following two models - both of which exclude Kentucky - produce negative coefficients that are statistically

[5] Refer to footnote 4 for a short description of how the removal of South Carolina, Ohio, and North Dakota affects the statistical significance of the treatment variable.

significant at a 1% level. The strictest specification, which includes only Maryland and West Virginia, produces an extremely small positive coefficient with no statistical significance. Problems with the county-level data make it difficult to draw any meaningful conclusions, but these regression results provide no evidence that the county-level data strongly supports or contradicts the findings of the national analysis.

6 CONCLUSION

The role of ignition interlock devices in decreasing DUI-related fatalities is well documented and expanding their use is an important policy objective for that reason alone. The majority of U.S. states have now implemented an all-offender law with additional legislation pending in Massachusetts and Michigan (CapeCodToday, 2019; WLUC-TV, 2019). My results are consistent in showing all-offender ignition interlock laws may reduce the overall rate of DUI arrest, but the statistical significance needed to prove a considerable causal impact cannot be strongly established.

Previous research shows drunk drivers commit the offense an average of 80 times before experiencing their first arrest (Mothers Against Drunk Driving, 2019). DUI arrest rates may remain the same while DUI-related fatalities decrease as ignition interlock devices effectively redirect law enforcement resources, allowing officers to stop more high-risk drivers than they were able to stop before. If that is the case, additional strategies will be needed to achieve meaningful reductions in DUI arrest rates. This conclusion echoes expert recommendations to pursue a variety of different approaches aimed at reducing the incidence of drunk driving. Other programs that have demonstrated success toward this goal include sobriety checks, license suspensions, assessments for alcohol addiction, media awareness campaigns, and youth education programs (Centers for Disease Control and Prevention, 2016).

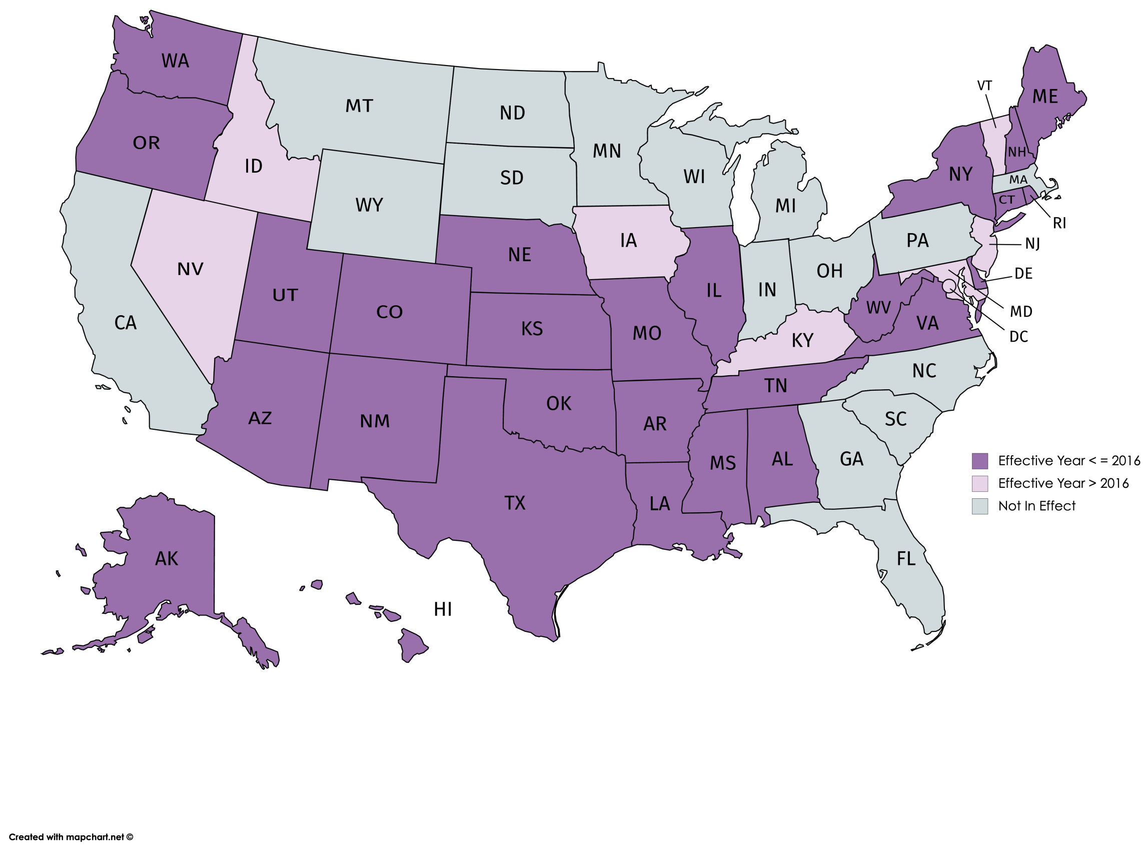
Given the variability of implementation of these programs across states or counties, incorporating these controls into expanded regressions would significantly enhance the explanatory power of the models. Controls that represent other factors influencing DUI arrest rates, or arrest rates in general, also present a natural next step for further analysis. Ignition interlock requirements themselves can have great variability across jurisdictions. Some states have a compliance-based requirement for an ignition interlock device where the device must register no breathalyzer failures while it is installed on the vehicle (Mothers Against Drunk Driving, 2018). The amount of time the device is required to be on the vehicle after an arrest also varies by state; perhaps states with longer required interlock periods see more substantive reductions in DUI arrests.

Alternate state and county sources of DUI data may provide yet another opportunity to strengthen the explanatory power of the models in this paper. These alternate data sources can be tested on their own or used to quantify measurement error in the UCR. States continue to implement all-offender laws beyond the 2016 period examined here. This means that the pool of data open to researchers to further evaluate and build on these conclusions continues to grow in scope and quality.

7 FIGURES AND TABLES

Figure 1

All-Offender Law – Assignation of Effective Year



Dark purple states serve as the treatment group.
Light purple and gray states serve as the control group.

Source Data for Figure 1: Original Data Derived From Harris, F., & Mothers Against Drunk Driving. (2018, June 18). *Ignition Interlock Laws in the United States of America: Campaign to Eliminate Drunk Driving*. Retrieved December 31, 2019, from https://www.madd.org/wp-content/uploads/2018/06/State-IID-overview.6-18-18.pdf; Year Assignations Based On Methodology Detailed On Pages 13-14; Image Created Using mapchart.net

Figure 2

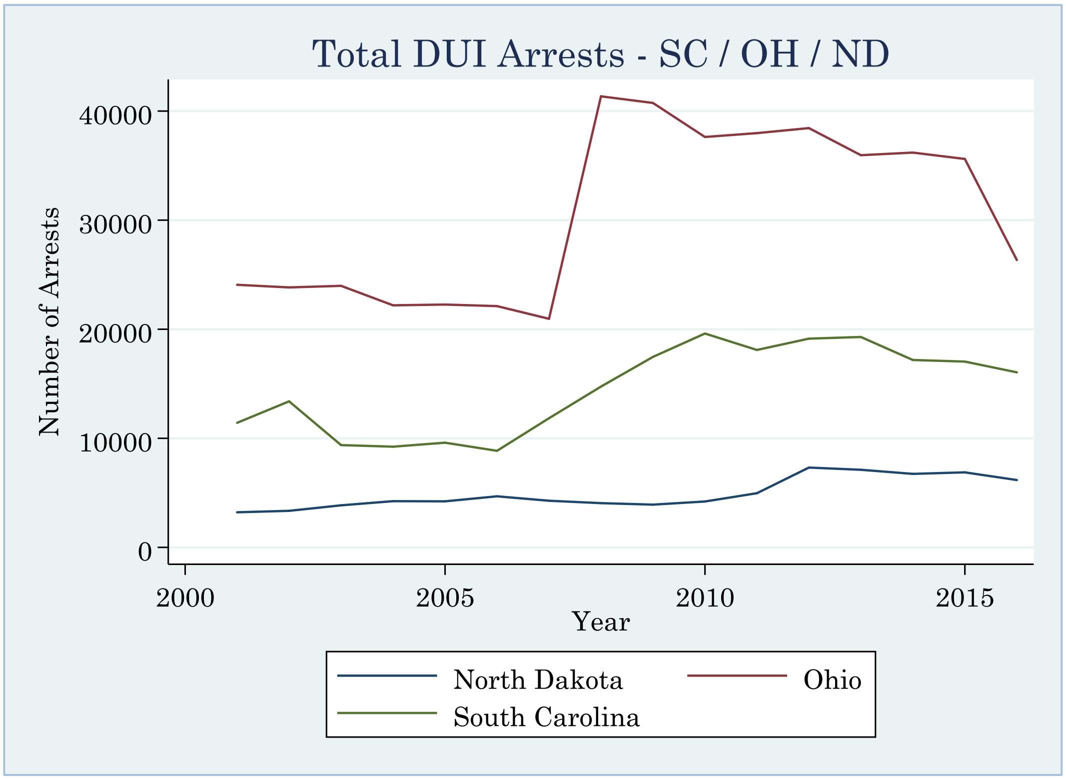


Figure 3

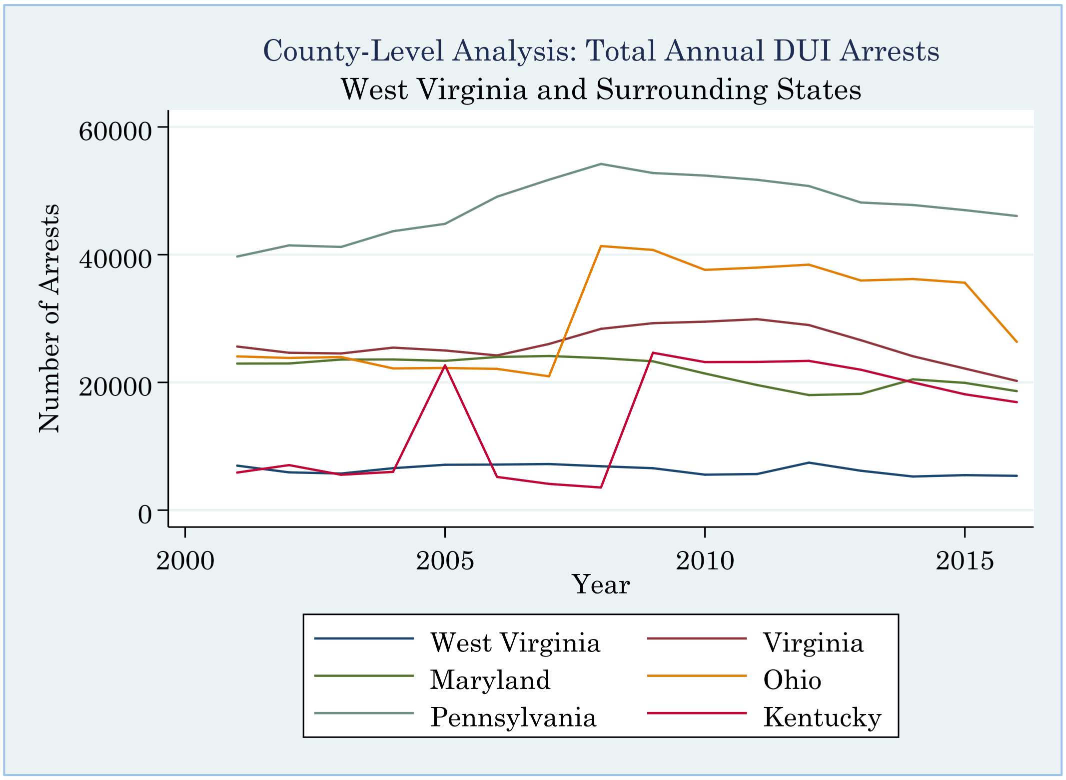
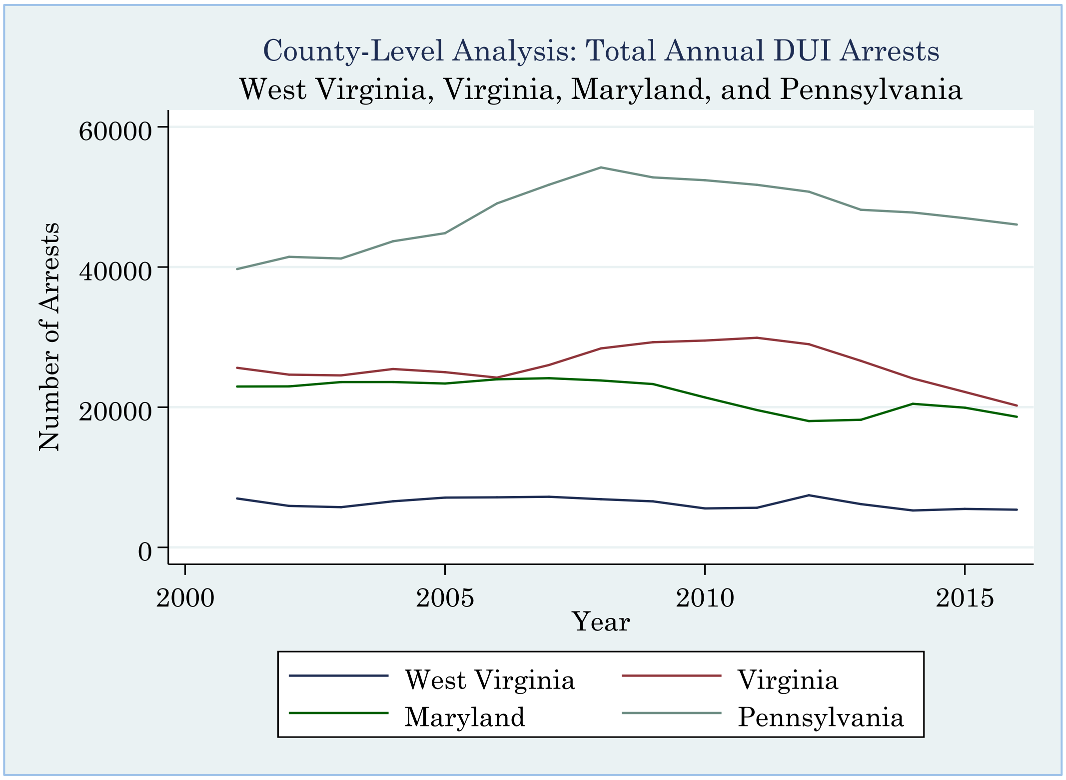


Figure 4



Source Data for Figures 2, 3, and 4: Collapsed State and Year Data Derived from Kaplan, J. (2018-12-29). *Uniform crime reporting (UCR) program data: Arrests by age, sex, and race, 1974-2016: Ucr_arrests_yearly_1974_2016_dta.zip* Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor]. doi:10.3886/E102263V7-10643

Table 1

County-Level Analysis, State Data Characteristics (*Reflecting 2001- 2016*)

State	Av. Coverage Indicator	Av. Number of Mo. Rpt.
Kentucky	51.14	4.85
Maryland	94.78	8.52
Ohio	64.86	6.64
Pennsylvania	87.06	7.2
Virginia	95.83	9.54
West Virginia	79.21	6.4

Table 2

Regression to Assess Parallel Trends Between Treatment and Control Groups Prior to Treatment Implementation

Interaction Term *(treat_all = 1)*	Coefficient
2001 * treat_all	- .0159879 (.040102)
2002 * treat_all	.0133775 (.0253946)
2003 * treat_all	- .0304166 (.0226967)
2004 * treat_all	*(Omitted Due to Collinearity)*
2005 * treat_all	- .0493315*** (.0169866)

Base Year = 2001, treat_all = 0
*P-Value Significance: * = .10, ** = 0.05, *** = 0.01*

Table 3

National Difference-In-Differences Regression Model Results
Dependent Variable: Log Transformation DUI Arrests Per Capita

	No Restrictions on Average No. Months of Data Reported	Only States with Average of 6 or More Months of Data Reported	Only States with Average of 9 or More Months of Data Reported
	(1)	(2)	(3)
treat_post	- .0566568 (.0900497)	- .0547761 (.0365529)	- .0411551 (.0817098)
Data Used	46 States and D.C.	35 States	12 States
R2 Overall	0.0152	0.0436	0.1736
R2 Within	0.1344	0.4097	0.3750
R2 Between	0.0044	0.0122	0.0067
Observations	752	560	192
Clustered Standard Errors	State	State	State

*P-Value Significance: * = .10, ** = 0.05, *** = 0.01*

Table 4

County-Level Difference-In-Differences Regression Model Results
Dependent Variable: Log Transformation DUI Arrests Per Capita

	West Virginia and All Surrounding States (4)	Ohio and Kentucky Excluded (5)	Ohio and Pennsylvania Only (6)	Maryland Only (7)
treat_post	.0008141*** (.0002039)	- .0004613*** (.0001372)	- .0006716*** (.0002245)	.0002987 (.0002411)
Data Used	WV, VA, MD, OH, PA, KY	WV, VA, MD, PA	WV, OH, PA	WV and MD
R2 Overall	0.0408	0.0489	0.0330	0.0942
R2 Within	0.0752	0.1089	0.0575	0.2614
R2 Between	0.0292	0.0329	0.0099	0.1756
Observations	7,808	4,480	3,360	1,264
Clustered Standard Errors	County	County	County	County

*P-Value Significance: * = .10, ** = 0.05, *** = 0.01*

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