Senior Project

Department of Economics

Carrying Without a Permit: The Crime Implications of Loosening Gun Laws

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Abstract

The debate over gun laws in the United States remains deeply polarizing, with some states doubling down on their restrictions and other states moving towards leaner more relaxed regulations. One of the more contentious legislative changes has come in the form of Permit less Carry Laws, which allow an individual the ability to carry a firearm in public without a permit. This study examines the effect of these laws on violent crime, nonviolent crime and firearm-related deaths. Using a Difference-in-Differences model, it compares states that have recently enacted the laws with those that have not while accounting for income, other gun laws, and fixed differences across states and time. Given the many factors affect crime, fully controlling for all variables is a challenge-a limitation shared by much of the existing literature on gun policy. However, these results still offer valuable insight into the isolated effects of permit less carry. The findings suggest that these laws are associated with increases in certain violent crimes, particularly aggravated assault, while nonviolent crimes such as burglary and larceny show modest declines. This study contributes to the growing research towards understanding how to properly move forward in an everchanging world and offers insight for policymakers to understand the complex world of firearm legislation.

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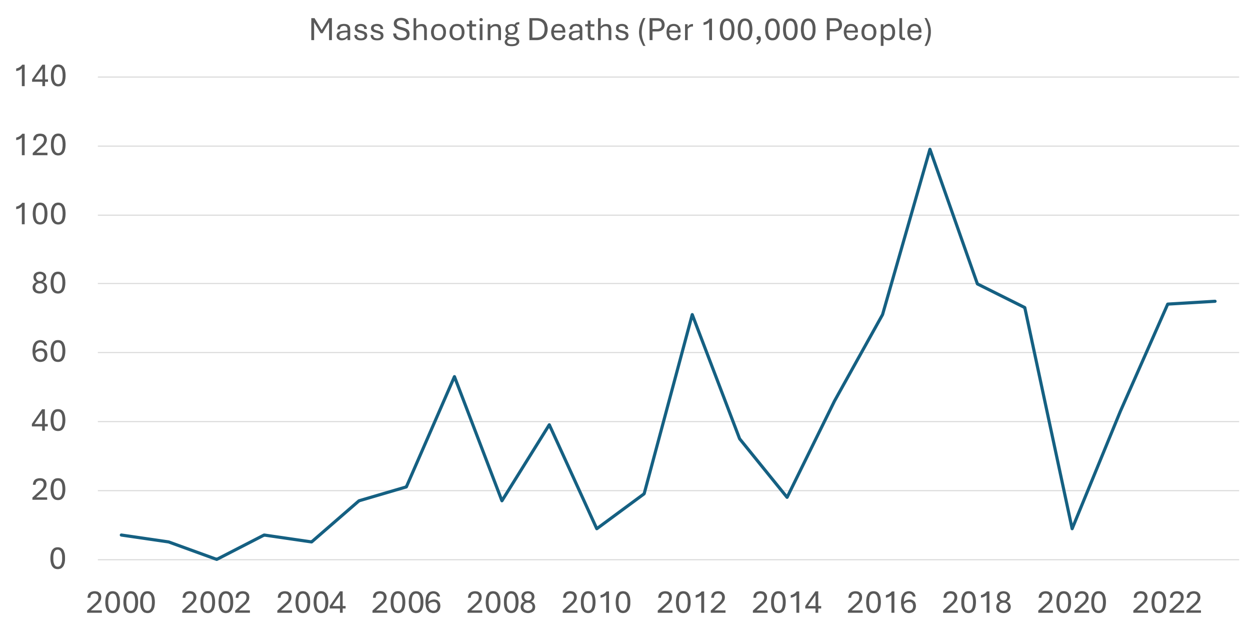
I. Introduction

Firearm legislation remains one of the most polarizing issues in American politics. Especially as the United States has witnessed a concerning increase in the number of mass shootings, school shootings, and public acts of violence. Figure 1 shows the increase of mass shooting deaths per 100,000. Contrary to expectations, many states have begun moving in the opposite direction by enacting more permissive gun laws. Through the adoption of a new type of firearm law. Permit less open carry laws allow individuals who are 21 or older to legally carry a firearm openly without the need of a permit. Seeing as we're only in the infant stages of a party that typically sways more towards looser firearm laws it's more important than ever to understand their implications. Questions are rising regarding the potential consequences of more lax legislation on crime rates and public safety.

Figure 1: Mass Shooting Deaths (Per 100,000 People)



Source: FBI (2024), Own Calculations (2025)

Notes: Mass shooting is defined by the FBI as an incident where four or more individuals are murdered (excluding the shooter).

This paper seeks to answer the question: What is the impact of permitless open carry laws on different forms of crime across states with differing regulations? With ten outcome variables in total, the crimes were put into three main categories: violent, nonviolent crimes and gun incident related deaths. To isolate and address any issues, by examining the effects of PCL (Permit Less) laws on various crime rates while controlling for similar firearm restrictions that enacted during the same period. The focus is on state-level differences, the study aims to offer a comprehensive look at the relationship between PCL laws and public safety, gun deaths, and crime.

Understanding the relationship between laws and crimes is instrumental in evaluating the effectiveness of gun legislation for informing future policymaking decisions. States like Ohio, Texas and Indiana have recently expanded their open carry rights, providing a natural avenue to determine how the changes influence crime patterns. Other states have passed laws that have yet to be implemented statewide and this data could be instrumental into understanding if they made the right choice and others should follow. As policymakers in different regions push for either tighter or expended firearm access, this research can provide empirical evidence to determine whether permitless carry laws have contributed to an increase in violence or as a deterrence. Beyond the economic relevance this topic can help contribute to fields such as criminology, sociology, and law. Helping to shed light on the broader implication of gun laws. These findings may offer valuable insight on whether exercising open carry rights enhances or diminishes your personal and community safety.

Prior studies have examined the relationship between gun laws and crime, but not to the same scale. Most focused on either city-level differences or predated the implementation of the permitless provisions. Some research has looked at the effects of different firearm laws, but little has isolated the permitless component that states have adopted. Much of the existing studies provides some insight into the broad gun policy debate yet limit the scope and only put it at a citywide stance. The arguments amongst the academic community run rampant. Some believe in the deterrence theory while other see more guns as a public health concern. Both ideas have extensive research backing their theories. Given these mixed conclusions, there is limited evidence on how these laws function as many states have only recently adopted them.

This paper hopes to fill the critical gap in the existing literature by providing an up-to-date analysis of permitless open carry laws and their effects on crime. Unlike the prior research, the study will isolate the impact of PCL laws by comparing states that have recently enacted them with those that have not or have never, while controlling for the other firearm policy changes during the time. We'll be employing a difference in differencing approach which has been utilized in prior studies. But, not to the scale that is being used in this research. By utilizing the newly available FBI data, this research will provide a clearer picture of whether these freshly enacted laws contribute to an increase, reduction or no effect on different forms of crime. They'll be helpful for policymakers, law enforcement, researchers, and any gun owner seeking to understand the real-life consequences of expanding open carry rights to be permit less.

Results have been a mixed bag with some crimes having a positive, statistically significant relationship with permit less carry laws while others have the exact opposite. This falls in line with many of the researchers before but there is still a level of uncertainty. The methodology is incredibly sensitive and while it may seem that the relationship is strong, a simple adjustment could change the entire results. The results change when methodology and state/year fixed effects are changed. For the preferred results, states that implemented permit less carry laws saw an increase in violent crime, aggravated assault, and firearm deaths. However, there was also a statistically significant decrease in property crime, larceny and burglary which are all nonviolent crimes. Understandably, crime is a very complex topic and it's difficult to isolate for everything. The effect of things like mental health and sentencing is a real concern that is hard to control for.

This paper will first provide an overview of past research on the relationship between crime and firearm regulation. After that, a description on the data used and how it was obtained. Following that, we will look at the two competing theories of deterrence and public health that most prior research is split on. Next, the empirical methodology and how we used the data to come to the results. Finally, the results which will look at the preferred logarithmic table and the interpretation. The conclusion will apply the results of the study to understanding policy implications. The end of the paper includes a reference section, appendix, and SAS codes.

II. Literature Review

Firearm regulation has a vast and intricate history. Dating back to the second amendment which reads "the right of the people to keep and bear Arms, shall not be infringed." The founding father had plenty of guns and defined the rights surrounding them. In their time firearms were incredibly important in upholding democratic principles. For much of American history that liberty was unregulated and under monitored. It's not abnormal though since it was a time when war and dueling were a normal part of revolutionary life. However, as we entered the early 1900's with industrialization and cityscapes there was a desire for more safe gun ownership. The earliest regulation came from United Staes v. Miller which restricted the sale of sawed-off shotguns (19). Though the progress stopped for some time until the 60's. After the assassination of JFK, MLK, and RFK, President Johnson pushed for the passage of the Gun Control Act of 1968 (18). It required all manufactured or imported guns to have a serial number and prohibited the sale of handguns to minors, felons, and the mentally ill. Until 1986 this was the rule of law until congress passed the Firearm Owners Protection Act which enacted more protections onto gun owners and pushed the states to take more of the responsibility (20). It's continued, with most states having different regulations.

Much of the earliest research followed the passing of the FOPA (Firearm Owners Protection Act). Since many of the bookkeeping agencies we know of today weren't tasked with obtaining crime statistics. Researchers had a hard time doing much of the research we can today. While all these studies share a common interest in investigating this connection, they differ in methodology, geographic focus. Due to these differences, the results often seem inconsistent. Data was difficult to come by early on it was either funded by the government or came riddled with methodological errors, like the use of felon's interviews and citizen surveys, early research concluded that armed citizens are beneficial to reducing criminal behaviors and harsher laws would do the same thing (1,2). Citizens felt safer and used guns in a defensive way against criminals who also agreed it acted as a deterrent. It wasn't the best use of obtaining results but it paved way for one of the key theories in the field. This is known as the deterrence theory: if a citizen is armed, criminals are less likely to commit crimes against them.

Methodology efforts started to improve after this conclusion. While a differencing in differencing approach wasn't popular in the criminology field many researchers took a very close approach. Although still even with newfound data and a way to analyze it the results still came without a shared consensus. In three states with shall issue laws (Removes the states right to deny a permit) it was discovered that homicide rates were higher following the passage of such laws (3). However, a costly U.S county data collection from 1977 to 1992 looking at the policy changes concluded the opposite. Rates of murder and assault were all lower in states that allowed citizens to carry concealed weapons (4). According to their argument, criminals would shift their focus to crimes that do not involve direct contact with the victim. It wasn't long until other research doubted the validity of the data and cited that without Florida, there was no detectable positive or negative on crime rates particularly rape and murder (15). It seems that with very minor adjustments the data can yield a completely different result (17). Among that others would look at additional flaws in their technique.

While a Difference-in-Differences approach was used it failed to account for unobserved factors such as crime trends, sentencing laws, and economic conditions. The efforts made towards constructing and attempting to understand the data was admirable, but its results proved to not hold the test of time. With an additional five years of state data and seven years of county data many of the states initially analyzed came out with disappointing results for the predecessor. It overcame the shortcomings of earlier research and controlled for state and year fixed effects. Many states experienced lower rates of murder but the rates of other crimes like aggravated assault and other violent crimes went up (5,16). This came with the introduction of the contrasting theory in the field which is the public health concern. The public health theory is that while Murder rates may not change but the rates of other crimes increase making a community worse off.

Modern studies all utilize the same methodology and still come to drastically different conclusions. Even those coming after the prior research made. Putting the same criticism forward and concluding that using one additional year of data would have resulted in findings showing a reduction in crime due to the laws (6). Most modern criminologists and sociologists argue that the results are mixed depending on whether state fixed effects are used. The National Research Council even argued that it's difficult to link firearm laws to crime because the results are often very sensitive to model specification (18). When controlling for state trends there is an increase in crimes like robbery and aggravated assault while removing it yields an increase in murder rates (7). This study used a fixed-effects model and isolated the effect of concealed carry laws, becoming one of the first to focus specifically on this issue without considering other types of gun laws. It proposed the theoretical idea that increased gun ownership deters criminals because they fear approaching an armed citizen (8).

As the number of mass shootings has increased more research has been done and continues to be contentious based on geographical location and methodology. West Virginia saw an increase of 29% for firearm mortality following the passage of permitless carry laws. (9) This study relied on CDC data and suggested a clear correlation between the law and the rise in fatalities. Unlike some previous studies, it was easier to establish a causal relationship because fewer factors needed to be controlled for. However, their neighbor just one state away had a less conclusive result. An analysis of all the major Ohio cities found that more permissive gun laws did not result in an increase or decrease in crime. Both studies used the same methodology but differed in city vs state data. Ohio's findings suggest less certainty, leaving room for further investigation (10).

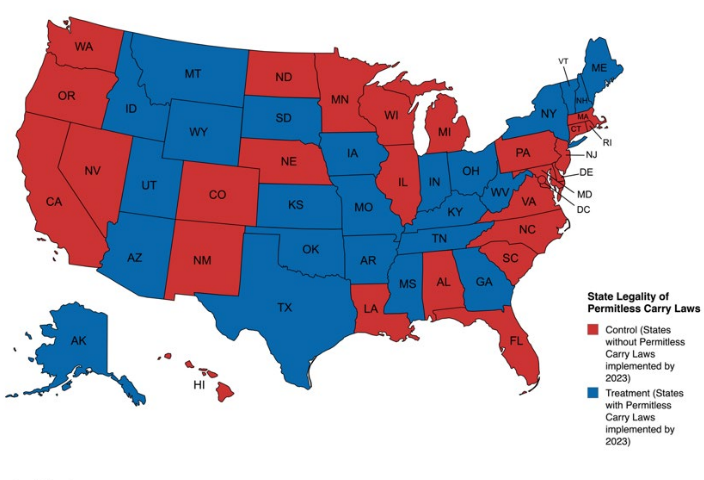
Much of the data analyzed in these papers comes from periods when less permissive gun laws had only recently been implemented. This study closely mirrors what I hope to accomplish, as both use a DID analysis, but I plan to expand it by looking at all 50 states and the District of Columbia. Similarly to prior research I'll be examining the before and aftereffects of permit less carry laws with a much larger data set. Given the availability of updated FBI data and the fact that many states have had these laws in place for over five years, this is something that has yet to be looked at across the entire nation. By combining the best components of prior research such as a large sample size, DID analysis, and a longer time frame. I aim to provide a clearer understanding of the impact of permitless carry laws on violent crime. Therefore, I believe a more focused approach, controlling for other gun laws, will be more effective in isolating the effect of permitless carry laws.

III. Data

Multiple different datasets were utilized to obtain the important data. All of which will lead to a better understanding of the relationship between permit less carry laws and violent, nonviolent, and gun related deaths. Primarily, the FBI Uniform Crime Reporting Program or UCR for most of the yearly crime reports (11). Here I was able to obtain the non-violent and violent crime rates for each state going back to 2000. This includes a statistic created by the FBI which is a collection of all violent crimes. Also used are violent crime types which is the Homicide, Aggravated Assault and Robbery. These three including the violent crime statistic are grouped together and known as violent crimes. There are also nonviolent crimes which have four main outcome variables. These being Property Crime, Larceny, Motor Vehicle Theft and Burglary. The Center for Disease Control or CDC collects more specific death data which helped to find gun related death rates for suicide and general firearm mortality (12). From the CDC we obtained two statistics known as Firearm death Rate and Suicide Deaths. The CDC and FBI data is per 100,000 people. The raw data from the UCR is per population but with a simple adjustment it was changed to PC (per capita) For the permit less carry state laws as well as the control variables of assault rifle bans and implementation of universal background checks I'll use each individual state level policy databases to determine which laws are in place as well as when they were implemented.

The UCR provides comprehensive crime statistics of the following variables: robbery, violent crime, aggravated assault, property crime, and motor vehicle theft. Unlike prior research the analysis has been limited to years deemed relevant to understand the bigger issue. Since the earliest PCL law was put into place in 2003 it was not necessary to include very many years prior to that. Therefore, the data utilized is from 2000-2023. The goal was to use data going up to 2024, but the FBI and CDC have yet to publish it. Unlike prior researcher this is a larger dataset with more states included. There are more states available since permitless carry laws have grown in popularity and more variables to test. The research for PCL laws is almost nonexistent. Much of it is just looks at generally looser firearm laws. With the data the results should yield some insight into the public health outcomes theory and the deterrence theory.

Figure 2: States with Permit less Carry Laws in Place by 2023



Source: Everytown Research & Policy

Notes: States that have passed laws implementing Permit less Carry laws after 2022 are included in the control group due to data restrictions.

I'll be primarily looking at the crime statistics before and after the implementation of the constitutional carry laws. Currently there are 29 states with permitless carry laws in place (13). However, some of these states have not fully implemented them or they've been implemented for less than a year. Such states would be Louisiana which only put such laws into place in July of 2024. So, there are four states excluded from the treatment group because the data isn't recent enough for them to have relevance. Above is figure 2 which notates the state-by-state legality of permitless carry laws. It is discerned by two different colors: Blue, Red. Red indicated states where permitless carry laws have never been in place before or states that have passed the law in 2023 or later. Blue is places where permit less carry laws have been implemented before 2023.

IV. Theoretical Discussion

My research is rooted in the sociological theory that while there may not be a cohesive causal relationship between death rates and permissive gun laws there is an adverse effect on the different crimes such as robbery, aggravated assault and other violent crimes. My expectations are that in states that have implemented permitless carry laws there will be higher rates violent and nonviolent crimes after their implementation dates. However, due to the difficulty of controlling for every factor and much of the consensus around methodological difference, I expect some crimes will be affected in negative and positive ways.

There are two contrasting theories within the research of firearm regulation. That is the public health concern and the Permitless concealed carry laws may not worsen the number of homicides but generally they make a community less safe. By increasing the amount of other crime committed. In contrast to that, the other theory that surrounds the gun regulation debate is the deterrence theory. This posits that more permissive gun laws reduce crime because criminals are less likely to engage in violent acts when they know the potential victim may be armed. In the context of permitless open carry laws this theory believes that if individuals can openly carry firearms without a permit, potential offenders may view them as more dangerous or an increased risk. Therefore, deterring them from committing a violent crime. In much of the existing research these two-theory yield completely different results. Deterrence studies often point to lower crime rates because of the more permissive gun laws while the public health approach points toward higher crime rates. I'll be bridging the gap by testing both theories and using more states.

The increased presence of firearms may lead to more confrontations, accidental discharges or impulsive acts of violence. Contextually when looking at interactions with the police often a gun does not make the situation any safer. A normally safe encounter can turn into a lethal situation very quickly. The increase in gun availability will lead to more armed conflicts. Criminals will arm themselves and because there are no regulatory systems in place to determine if someone is carrying legally or illegally it's likely that you just won't know. Law enforcement will be unable to differentiate between those carrying legally or not and it'll likely lead to more conflicts ending violently. While much of the existing research argues the importance of methodology both theories have their own validity to them. The analysis that'll be done in this study will combine the methodology used by other researchers for both theories. My idea is to test the validity of both theories using more data and more states. I'm going to look at whether there is some truth to the deterrence theory while also testing the hypothesis set out regarding the public health concerns. Due to the competing theories my research is necessary. If we see a decrease in the number of violent crimes following the implementation of permitless carry laws in states, then it means there is some truth to the deterrence theory. However, if we see an increase in the number of violent crimes then the public health theory will prove to be correct. Although there is a third option that I expect the research will likely yield results in support of. That is that while some crimes increase, other types of crimes will see a decrease. Two types of models being used which is a linear and logarithmic model. The expectation based off previous findings is that results will drastically differ depending on the type of model used. This wasn't an uncommon conclusion made by prior research.

V. Empirical Methodology

Research methodologies has certainly evolved over the last few decades which has made establishing causal relationships easier. Much of the earliest research uses simple regression models and surveys which only attempted to establish a relationship between permitless carry laws and crimes. However, many learned from the mistakes of the previous researchers and began using a more complex methodology in Difference-in-Differences approach. To assess the impact of permitless carry laws on crime I will be employing simple regression to establish a baseline understanding of the averages for the crimes in the control and treatment groups. See tables 1,2 and 3 for summary statistics results. But the simple regression model isn't enough and isn't enough to base the full research on. A simpler regression model will likely suffer from the omitted variable bias which is why I'm only using it to establish an idea of what crimes look like. For violent and nonviolent crimes, the control group (Which is where permit less carry is not place) has a higher mean for all outcome crimes. Although they are close to one another. It could be because the control group has more observations present. It does tell us some things about the data though. From the baseline, states without permit less carry have higher rates of crime in general. However, the average mean of gun related crimes is higher in states with permit less carry in place. This doesn't tell us much about the effect of Permitless carry laws, but it does give us some sort of idea of how to think about the crime rates.

Then I'll employ a Difference-in-Difference approach to determine if violent and nonviolent crimes have a statistically significant difference after the implementation of permitless carry laws. This approach will allow me to compare the treatment and control group while controlling for time/state-invariant factors, other gun laws implemented around the same time and avoid income bias. The control group is what it is like if a state never implemented permitless carry laws or prior to implementation and the treatment group is after implementation was put into place.

$$\boldsymbol{Equation\ 1}: \log(\mathcal{Y})_{st} = \beta_0 + \beta_1 PermitlessCarry_{st} + Year_t + State_s + \mathcal{X}_{st} + \varepsilon_{st}$$

$$\textbf{Equation 2}: \mathcal{Y}_{st} = \beta_0 + \beta_1 PermitlessCarry_{st} + Year_t + State_s + \mathcal{X}_{st} + \varepsilon_{st}$$

Two main models were used in the research. The difference in model types is notated above in equations 1 and 2. Since a linear model would only yield results with larger coefficients that are more difficult to interpret my preferred model is the logarithmic which can be interpreted in a percent change form. Generally, this makes more sense rather than having to say that a crime increased by crimes per 100,000. The two equations are generally the same excluding the outcome variables form. The outcome variable $\mathcal{Y}_{st}$ in equation 2 represents the crime rate in states at time t. Similarly, $\log(\mathcal{Y})_{st}$ is the outcome variables in log form. The crimes we will be analyzing that are included in the model are violent and nonviolent crimes. These include homicide, firearm death rate, robbery, aggravated assault, property crime, burglary, larceny and motor vehicle theft, firearm suicide. All violent nonviolent crime will be categorized together as well as any violent crimes being put together in the same table. The same applies for gun related deaths. $\beta_1 PermitlessCarry_{st}$ is an indicator variable equal to 1 if a state has expanded its permit less carry laws. States without permit less carry laws in place or those that have implemented it after 2023 are given zero in the model. $\mathcal{X}_{st}$ reflects all control variables. There are three main control variables being used in the model: The wo types of gun laws included are Assault Rifle Bans and Universal Background checks as well as the state household income. Time fixed effect was added by year and notated in the equation as $Year_t$. The state fixed effect was added as a control variable and is notated as $State_s$. The $\boldsymbol{\varepsilon_{st}}$ is the error and white noise term.

All of the outcome variables passed the parallel trends test. Since implementation dates were staggered across many years, for the sake of the parallel trends test I used a reference year or RT. The reference year is 2010 because all the states excluding Alaska didn't have permit less carry laws in place yet. Based on the results from figures 3-12 you can see that prior to the reference year all the outcome variables were parallel for the treatment and control groups. Understanding these results gave the go ahead to move forward with the research. The DID methodology relies on the parallel trend's assumption, which states that in the absence of permitless carry laws, the crime trends in the treatment and control states/years would follow similar trajectories. With the control variables present there were positive results. Indicating that before any legalization the violent crime trends were consistent.

VI. Results

For the sake of interpretability and cohesive results I opted to look at the logarithmic model. These will tell us how much a rate of crime increased following the implementation of permit less carry laws. Understanding them from a percentage POV rather than seeing larger more random coefficients.

Table 4: Violent Crimes Results (Log)

Regressors	Violent Crime	Homicide	Robbery	Aggravated Assault
Permit less Carry	0.10*** (0.02)	0.01 (0.03)	-0.001 (0.03)	0.08*** (0.02)
Intercept	5.92*** (0.10)	1.92*** (0.13)	4.25*** (0.12)	5.55*** (0.12)
Controls for Income and Other Gun Laws?	Yes	Yes	Yes	Yes
State and Year Fixed Effect?	Yes	Yes	Yes	Yes
Number of Observations	1,225	1,225	1,225	1,225
Adjusted R-Squared	0.8900	0.8921	0.9347	0.8786
Overall Significance	308.49***	169.57***	361.96***	366.19***

Source: FBI (2024), Own Calculations (2025), CDC (2024), FRED (2024)
Notes: Robust Standard errors are in parentheses. Significance: *,**,*** for 10%, 5%, and 1% levels.

Table 4 above shows the results that permit less carry laws have on violent crimes. As notated both the linear and logarithmic model control for state/year fixed effect as well as the income and gun laws implemented around the same time. The coefficient for Violent Crime (Which is an aggregated crime statistic provided by the FBI) indicates that following the PCL passage there was a 10% increase in that particular outcome variable. Similarly, the rate of Aggravated Assault increased by 8%. Both are statistically significant in relation to the model. The adjusted r-squared for violent crime indicates that the model explains 89% of variation in crime rate outcomes and that the model fits well. The overall significance for all of the results is statistically relevant which means that the results for all of the violent crime statistics are not simply by chance. For aggravated assault, the adjusted r squared explains 87% of variation. The outcome variables Homicide and Robbery didn't yield statistically significant coefficients in the permit less carry section which indicates that they didn't see a negative or positive change from the PCL laws being put into place.

Table 5: Non-Violent Crimes Results (Log)

Regressors	Property Crime	Burglary	Larceny	Motor Vehicle Theft
Permit less Carry	-0.05*** (0.02)	-0.04* (0.02)	-0.05*** (0.02)	0.01 (0.03)
Intercept	8.20*** (0.06)	6.89*** (0.09)	7.81*** (0.06)	5.75*** (0.13)
Controls for Income and Other Gun Laws	Yes	Yes	Yes	Yes
State and Year Fixed Effect?	Yes	Yes	Yes	Yes
Number of Observations	1,225	1,225	1,225	1,225
Adjusted R Squared	0.9027	0.9096	0.8972	0.8520
Overall Significance	185.82***	223.47***	158.94***	134.29***

Source: FBI (2024), Own Calculations (2025), CDC (2024), FRED (2024)
Notes: Robust Standard errors are in parentheses. Significance: *,**,*** for 10%, 5%, and 1% levels.

Table 5 above shows the results of the nonviolent outcome variables. As shown in the above three out of the four permit less carry coefficients have statistical significance with some being lower than others. Property crime and Larceny both saw a 5% decrease following the implementation of PCL laws. This is with statistical significance at the 1% level, meaning that the results are relevant and not simply by chance. Burglary saw a 4% decrease following implementation, however it is with the caveat that it is only at the 10% significance level. This indicates that it is likely more by chance than the property crime and larceny variables. Motor vehicle theft, much like homicide and robbery, shows an increase in the rate of crime but isn't statistically significant. Meaning that it is likely not a relevant coefficient. The adjusted r-squared is above 85% for all the nonviolent outcome variables indicating that the model accounts for most of the crime changes. The overall significance is statically significant showing that the results yielded were not simply by chance but explain the variation in crime rates. These also controlled for state/year fixed effect as well as the income level and gun legislation.

Table 6: Gun Related Crimes Results (Log)

Regressors	**Firearm Death Rate**	**Suicide Deaths**
Permit less Carry	0.04*** (0.01)	0.02 (0.05)
Intercept	3.03*** (0.08)	2.93*** (0.23)
Controls for Income and Other Gun Laws	Yes	Yes
State and Year Fixed Effect?	Yes	Yes
Number of Observations	1,225	1,081
Adjusted R	0.9309	0.8542
Overall Significance	322.26***	297.92***

Source: FBI (2024), Own Calculations (2025), CDC (2024), FRED (2024)
Notes: Robust Standard errors are in parentheses. Significance: *,**,*** for 10%, 5%, and 1% levels.

Finally, Table 6 shows the results for the CDC crime data which are specifically gun related crimes. It indicates that the permit less carry laws being put into place led to a 4% increase in the firearm death rate. This is likely due to the notion that more firearms in circulation lead to more firearm related deaths. However, the suicide death rate didn't see a statistically significant change. The firearm death rate has an adjusted r squared of 0.9309 which determines that about 93% of variation is controlled for in my research. Suicide deaths adjusted r squared appears to indicate that it might not be the best outcome variable to connect to PCL implementation. However, both have very high statistically significant coefficients for the overall significance.

VII. Conclusion

The findings of this study suggest that permit less carry laws change different rates of crime in different ways. Unfortunately, in this case there isn't a one size fits all solution. Some violent crimes saw a dramatic increase while others resulted in no increase at all. Although with simple adjustments of the methodology results differ. When referring to tables 16-18 below, when even changing from a logarithmic to linear model the outcome variables change in their level of significance. For instance, in the linear model the results found that violent crime, robbery, and aggravated assault all increased while homicide decreased. Even with just the slightest adjustment robbery became statistically significant in the eyes of the linear model. For nonviolent crimes the linear model only saw a decrease in the rate of Larceny. For the logarithmic model it appears that rates of violent crime, aggravated assault and firearm deaths all increase following the implementation of permit less carry laws. While other nonviolent crimes saw a decrease such as property crime, larceny and burglary. Some of the outcome variables yielded results like the recent Ohio study which found that there were no changes in the crime rate after states put PCL laws into place. It's difficult to say how many conclusions can be made. Much like prior studies, the results are all over the place depending on what type of model is used and additions made to the methodology. Once again, controlling for every single component that goes into the crime rate is a difficult task. Doing so requires understanding more than just the crime rates themselves but also the small factors that can make a big difference. Things like mental health, sentencing laws, existing trends, and a broader look at socioeconomic status. You cannot conclusively say that one of the two theories presented is true because the problem is more complex than that. There were parts of the deterrence theory that appear to be true in the sense that nonviolent crimes decrease. However, the public health question still proves to be very important. Considering that the rates of violent crimes increase dramatically. The national bureau of economic research conclusion was very accurate in the sense that it’s difficult to isolate specific gun laws and connect their results to crime rates (17).

Moving forward policymakers should carefully consider the implications of passing such laws as they may have worse adverse effects on communities. This study provides a more comprehensive, state level analysis of Permitless Carry’s compared to prior research. Something to before now has not been done to this scale. My hope is that this can push other researchers to use more complex models that control for additional variables in the future. In the future, policymakers and other researchers should employ a similar methodology with as many states and years as possible. Although it’d be best to control for additional variables since that ended up being the shortcoming of my research and others before me. Specifically, focusing and isolating the effect of one law while controlling for other put in place during the same time. Although this isn’t with some shortcomings. While it would have been good to control for every factor, that just isn’t something that even high-level researchers have mastered in relation to crime Better understanding crime can help to combat certain crimes which can have adverse effects on the economy, number of homicides and how to decrease the number of shootings. With gun legislation always changing and the current political climate future researchers should look to examine the long-term impacts of more permissive firearm laws.

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VIII. Appendix

Table 1: Summary Statistics Table for Violent Crimes

Control or Treatment	Observations	Outcome Variable	Mean	Std Dev	Minimum	Maximum
Control (Permit less not in place)	673	violent crime	437.48	227.07	78.24	1637.86
Control (Permit less not in place)	673	homicide	5.9	5.43	0.62	46.38
Control (Permit less not in place)	673	robbery	120.24	103.99	6.76	748.52
Control (Permit less not in place)	673	aggravated assault	274.92	137.62	42.59	871.87
Treatment (Permit less in place)	552	violent crime	355.56	157.41	102.46	891.67
Treatment (Permit less in place)	552	homicide	4.55	2.35	0.83	11.75
Treatment (Permit less in place)	552	robbery	65.96	45.62	8.26	184.52
Treatment (Permit less in place)	552	aggravated assault	243.08	120.39	53.71	598.53

Source: FBI (2024), Own Calculations (2025), CDC (2024), FRED (2024)
Notes: Robust Standard errors are in parentheses. Significance: *,**,*** for 10%, 5%, and 1% levels.

Table 2: Summary Statistics for Nonviolent Crimes

Control or Treatment	Observations	Outcome Variable	Mean	Std Dev	Minimum	Maximum
Control (Permit less not in place)	673	property crime	2866.99	963.18	1000.3	6408.95
Control (Permit less not in place)	673	burglary	550.36	262.43	118.34	1241.62
Control (Permit less not in place)	673	larceny	1995.5	623.76	765.6	4076.47
Control (Permit less not in place)	673	motor vehicle theft	321.12	208.01	67.05	1776.48
Treatment (Permit less in place)	552	property crime	2744.81	869.53	809.48	5849.82
Treatment (Permit less in place)	552	burglary	562.32	253.39	55.56	1202.75
Treatment (Permit less in place)	552	larceny	1947.96	562.25	592.19	3704.03
Treatment (Permit less in place)	552	motor vehicle theft	234.54	137.04	29.52	1059.85

Source: FBI (2024), Own Calculations (2025), CDC (2024), FRED (2024)
Notes: Robust Standard errors are in parentheses. Significance: *,**,*** for 10%, 5%, and 1% levels.

Table 3: Summary Statistics for Gun Related Crimes

Control or Treatment	Observations	Outcome Variable	Mean	Std Dev	Minimum	Maximum
Control (Permit less not in place)	673	Firearm Death Rate	10.92	5.29	2.1	31
Control (Permit less not in place)	673	Suicide deaths	140.31	185.6	10	928
Treatment (Permit less in place)	552	Firearm Death Rate	14.07	4.36	5	33.9
Treatment (Permit less in place)	552	Suicide deaths	85.08	72.02	10	394

Source: FBI (2024), Own Calculations (2025), CDC (2024), FRED (2024)
Notes: Robust Standard errors are in parentheses. Significance: *,**,*** for 10%, 5%, and 1% levels.

Table 4: Violent Crimes Results (Log)

Regressors	Violent Crime	Homicide	Robbery	Aggravated Assault
Permit less Carry	0.10*** (0.02)	0.01 (0.03)	-0.001 (0.03)	0.08*** (0.02)
Intercept	5.92*** (0.10)	1.92*** (0.13)	4.25*** (0.12)	5.55*** (0.12)
Controls for Income and Other Gun Laws?	Yes	Yes	Yes	Yes
State and Year Fixed Effect?	Yes	Yes	Yes	Yes
Number of Observations	1,225	1,225	1,225	1,225
Adjusted R-Squared	0.8900	0.8921	0.9347	0.8786
Overall Significance	308.49***	169.57***	361.96***	366.19***

Source: FBI (2024), Own Calculations (2025), CDC (2024), FRED (2024)
Notes: Robust Standard errors are in parentheses. Significance: *,**,*** for 10%, 5%, and 1% levels.

Table 5: Non Violent Crimes Results (Log)

Regressors	Property Crime	Burglary	Larceny	Motor Vehicle Theft

Permit less Carry	-0.05*** (0.02)	-0.04* (0.02)	-0.05*** (0.02)	0.01 (0.03)
Intercept	8.20*** (0.06)	6.89*** (0.09)	7.81*** (0.06)	5.75*** (0.13)
Controls for Income and Other Gun Laws	Yes	Yes	Yes	Yes
State and Year Fixed Effect?	Yes	Yes	Yes	Yes
Number of Observations	1,225	1,225	1,225	1,225
Adjusted R	0.9027	0.9096	0.8972	0.8520
Overall Significance	185.82***	223.47***	158.94***	134.29***

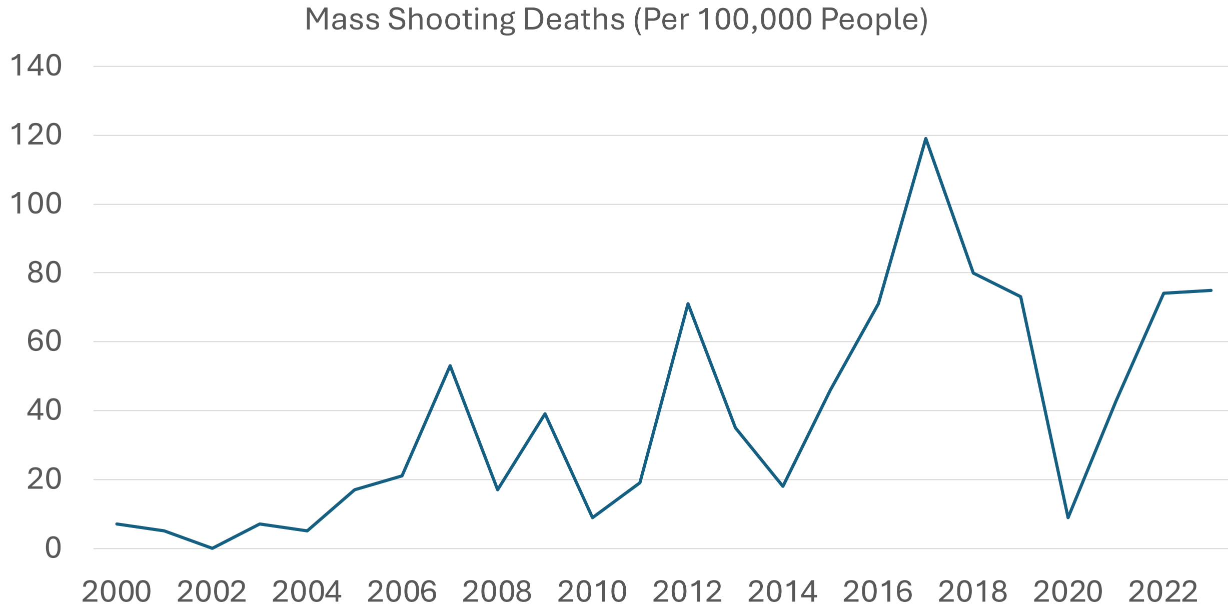
Source: FBI (2024), Own Calculations (2025), CDC (2024), FRED (2024)
Notes: Robust Standard errors are in parentheses. Significance: *,**,*** for 10%, 5%, and 1% levels.

Table 6: Gun Related Crimes Results (Log)

Regressors	**Firearm Death Rate**	**Suicide Deaths**
Permit less Carry	0.04*** (0.01)	0.02 (0.05)
Intercept	3.03*** (0.08)	2.93*** (0.23)
Controls for Income and Other Gun Laws	Yes	Yes
State and Year Fixed Effect?	Yes	Yes
Number of Observations	1,225	1,081
Adjusted R	0.9309	0.8542
Overall Significance	322.26***	297.92***

Source: FBI (2024), Own Calculations (2025), CDC (2024), FRED (2024)
Notes: Robust Standard errors are in parentheses. Significance: *,**,*** for 10%, 5%, and 1% levels.

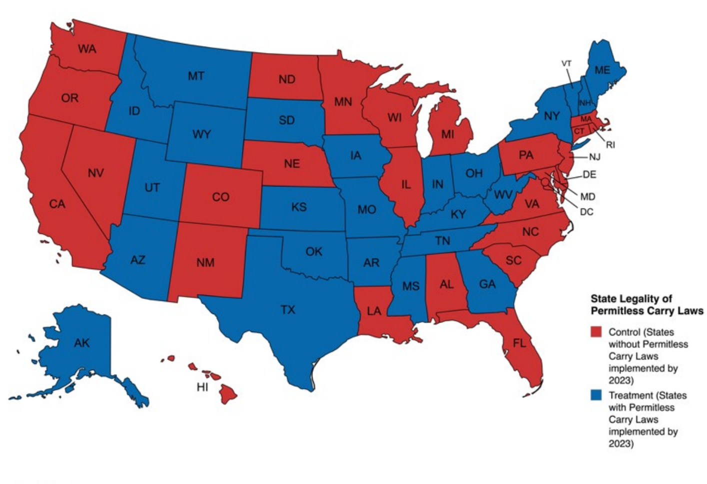
Figure 1: Mass Shooting Deaths (Per 100,000 People)



Source: FBI (2024), Own Calculations (2025)

Notes: Mass shooting is defined by the FBI as an incident where four or more individuals are murdered (excluding the shooter).

Figure 2: States with Permit less Carry Laws in Place by 2023



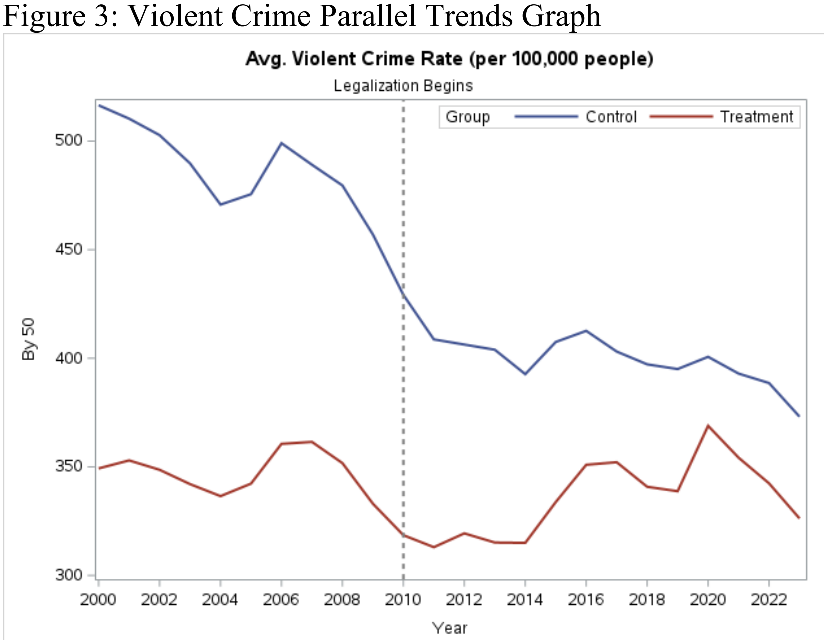
Source: Everytown Research & Policy

Notes: States that have passed laws implementing Permit less Carry laws after 2022 are included in the control group due to data restrictions.

Table 7: Violent Crime Parallel Trends Test

Effect	F Value	Pr > F
Model	6.79	<.0001
Intercept	24.32	<.0001
treatment	1.04	0.3082
treatment*Rt	0.00	0.9918
Rt	0.19	0.6640
Rt*Rt	0.16	0.6876
treatment*Rt*Rt	0.00	0.9889
treatment*Rt*Rt*Rt	0.00	0.9897
Rt*Rt*Rt	0.18	0.6741

Figure 3: Violent Crime Parallel Trends Graph



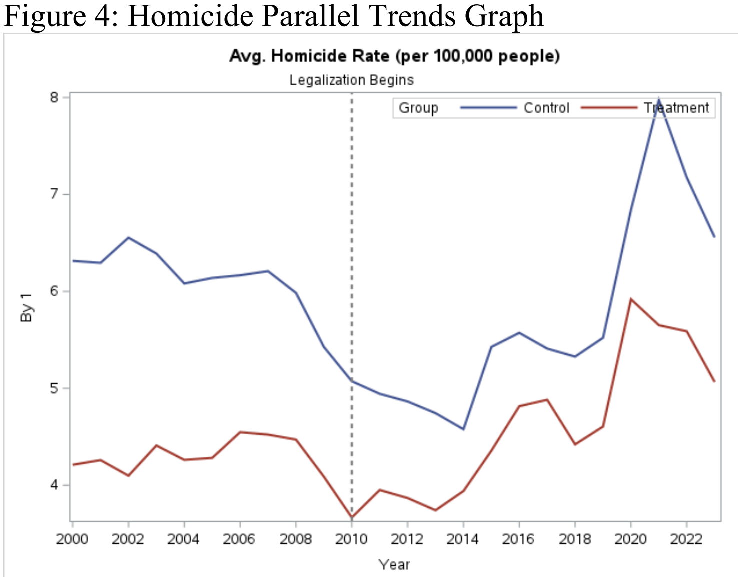
Sources: FBI (2024), Own Calculations (2025)
Notes: This figure shows the average violent crime rate over time, comparing states that implemented permit less carry laws (“treatment”) to those that did not (“control”). Permit less

Carry Laws in the treatment group were implemented in 2010 or later. Alaska was excluded from the analysis, as its permit less carry law was implemented in 2003.

Table 8 : Homicide Parallel Trends Test

Effect	F Value	Pr > F
Model	3.00	0.0043
Intercept	7.46	0.0065
treatment	0.50	0.4790
treatment*Rt	0.00	0.9715
Rt	0.09	0.7656
Rt*Rt	0.03	0.8574
treatment*Rt*Rt	0.01	0.9211
treatment*Rt*Rt*Rt	0.01	0.9156
Rt*Rt*Rt	0.02	0.8

Figure 4: Homicide Parallel Trends Graph

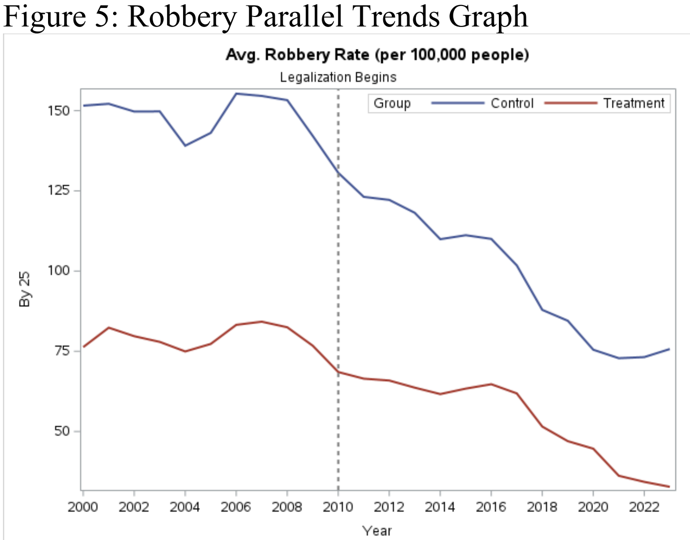


Sources: FBI (2024), Own Calculations (2025)
Notes: This figure shows the average violent crime rate over time, comparing states that implemented permit less carry laws ("treatment") to those that did not ("control"). Permit less Carry Laws in the treatment group were implemented in 2010 or later. Alaska was excluded from the analysis, as its permit less carry law was implemented in 2003.

Table 9 :Robbery Parallel Trends Test

Effect	F Value	Pr > F
Model	11.67	<.0001
Intercept	9.40	0.0023
treatment	1.54	0.2145
treatment*Rt	0.03	0.8655
Rt	0.11	0.7366
Rt*Rt	0.14	0.7115
treatment*Rt*Rt	0.03	0.8559
treatment*Rt*Rt*Rt	0.04	0.8426
Rt*Rt*Rt	0.15	0.6955

Figure 5: Robbery Parallel Trends Graph

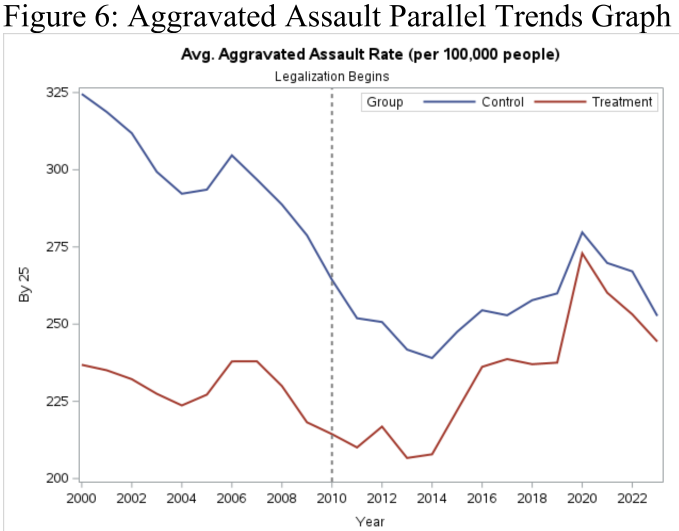


Sources: FBI (2024), Own Calculations (2025)
Notes: This figure shows the average violent crime rate over time, comparing states that implemented permit less carry laws ("treatment") to those that did not ("control"). Permit less Carry Laws in the treatment group were implemented in 2010 or later. Alaska was excluded from the analysis, as its permit less carry law was implemented in 2003.

Table 10: Aggravated Assault Parallel Trends Test

Effect	F Value	Pr > F
Model	3.59	0.0009
Intercept	27.19	<.0001
treatment	0.57	0.4507
treatment*Rt	0.01	0.9417
Rt	0.20	0.6557
Rt*Rt	0.15	0.6956
treatment*Rt*Rt	0.01	0.9200
treatment*Rt*Rt*Rt	0.00	0.9462
Rt*Rt*Rt	0.17	0.6768

Figure 6: Aggravated Assault Parallel Trends Graph

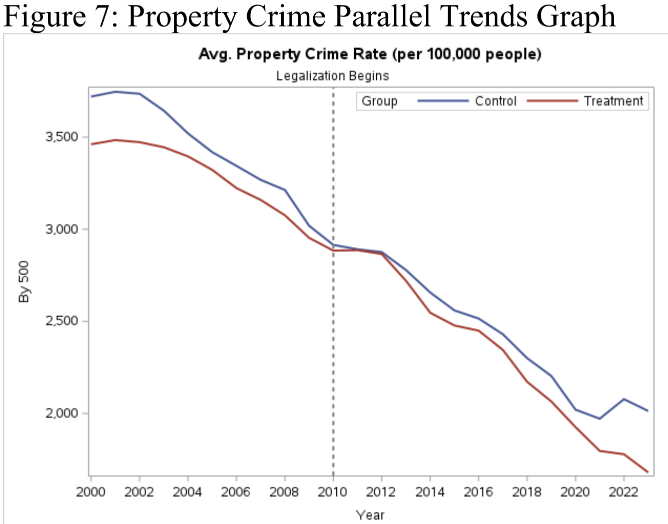


Sources: FBI (2024), Own Calculations (2025)
Notes: This figure shows the average violent crime rate over time, comparing states that implemented permit less carry laws (“treatment”) to those that did not (“control”). Permit less Carry Laws in the treatment group were implemented in 2010 or later. Alaska was excluded from the analysis, as its permit less carry law was implemented in 2003.

Table 11: Property Crime Parallel Trends Test

Effect	F Value	Pr > F
Model	6.00	<.0001
Intercept	116.37	<.0001
treatment	0.11	0.7418
treatment*Rt	0.01	0.9065
Rt	0.09	0.7641
Rt*Rt	0.05	0.8242
treatment*Rt*Rt	0.02	0.8910
treatment*Rt*Rt*Rt	0.01	0.9201
Rt*Rt*Rt	0.11	0.7429

Figure 7: Property Crime Parallel Trends Graph

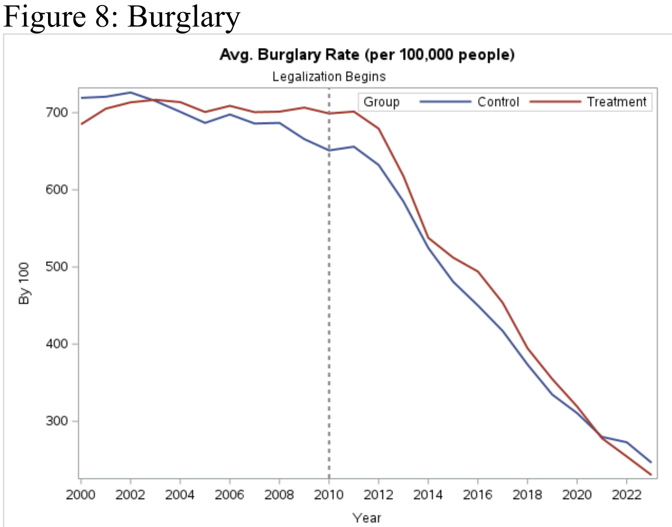


Sources: FBI (2024), Own Calculations (2025)
Notes: This figure shows the average violent crime rate over time, comparing states that implemented permit less carry laws ("treatment") to those that did not ("control"). Permit less Carry Laws in the treatment group were implemented in 2010 or later. Alaska was excluded from the analysis, as its permit less carry law was implemented in 2003.

Table 12: Burglary

Effect	F Value	Pr > F
Model	0.26	0.9698
Intercept	57.42	<.0001
treatment	0.10	0.7487
treatment*Rt	0.04	0.8383
Rt	0.00	0.9513
Rt*Rt	0.00	0.9511
treatment*Rt*Rt	0.04	0.8515
treatment*Rt*Rt*Rt	0.05	0.8292
Rt*Rt*Rt	0.01	0.9331

Figure 8: Burglary



Sources: FBI (2024), Own Calculations (2025)

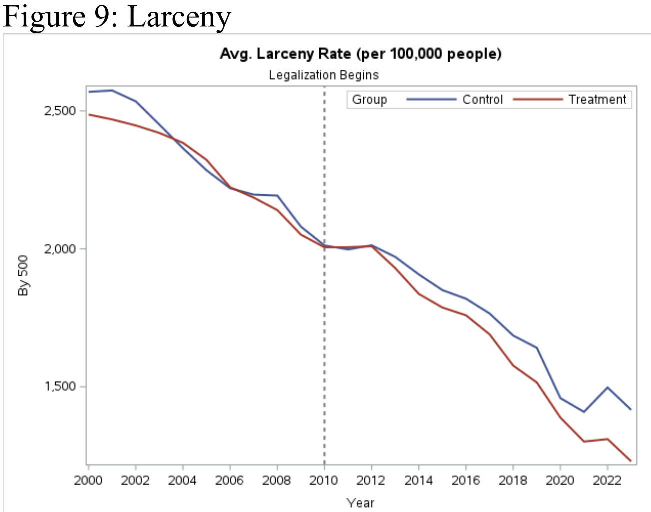
Notes: This figure shows the average violent crime rate over time, comparing states that implemented permit less carry laws ("treatment") to those that did not ("control"). Permit less

Carry Laws in the treatment group were implemented in 2010 or later. Alaska was excluded from the analysis, as its permit less carry law was implemented in 2003.

Table 13 : Larceny

Effect	F Value	Pr > F
Model	7.57	<.0001
Intercept	154.75	<.0001
treatment	0.24	0.6264
treatment*Rt	0.16	0.6914
Rt	0.01	0.9037
Rt*Rt	0.29	0.5934
treatment*Rt*Rt	0.09	0.7653
treatment*Rt*Rt*Rt	0.04	0.8465
Rt*Rt*Rt	0.26	0.6089

Figure 9: Larceny



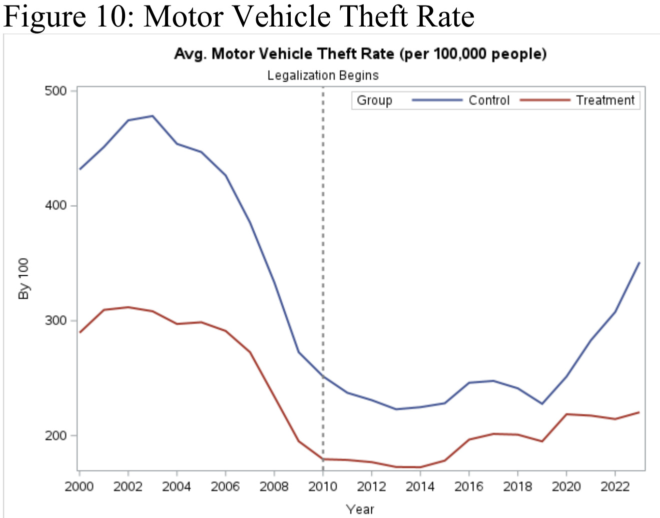
Sources: FBI (2024), Own Calculations (2025)
Notes: This figure shows the average violent crime rate over time, comparing states that implemented permit less carry laws ("treatment") to those that did not ("control"). Permit less

Carry Laws in the treatment group were implemented in 2010 or later. Alaska was excluded from the analysis, as its permit less carry law was implemented in 2003.

Table 14: Motor Vehicle Theft

Effect	F Value	Pr > F
Model	16.06	<.0001
Intercept	8.36	0.0040
treatment	0.43	0.5128
treatment*Rt	0.07	0.7934
Rt	1.73	0.1888
Rt*Rt	0.21	0.6441
treatment*Rt*Rt	0.00	0.9741
treatment*Rt*Rt*Rt	0.03	0.8638
Rt*Rt*Rt	0.00	0.9562

Figure 10: Motor Vehicle Theft Rate



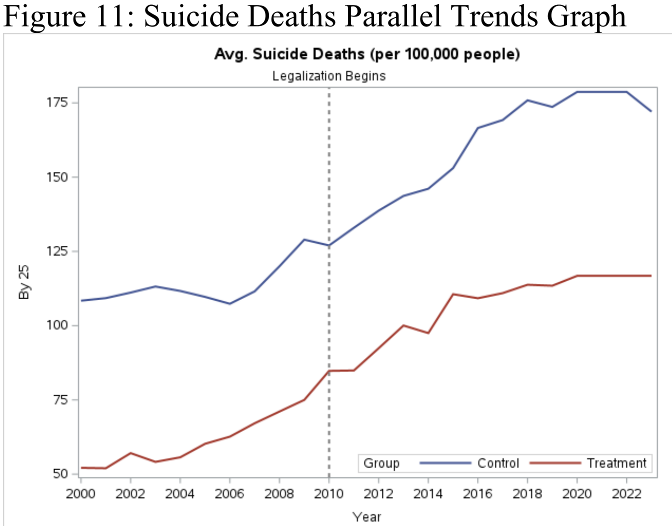
Sources: FBI (2024), Own Calculations (2025)

Notes: This figure shows the average violent crime rate over time, comparing states that implemented permit less carry laws ("treatment") to those that did not ("control"). Permit less Carry Laws in the treatment group were implemented in 2010 or later. Alaska was excluded from the analysis, as its permit less carry law was implemented in 2003.

Table 15: Suicide Deaths Parallel Trends Test

Effect	F Value	Pr > F
Model	3.81	0.0005
Intercept	4.12	0.0430
treatment	0.77	0.3806
treatment*Rt	0.06	0.7999
Rt	0.14	0.7096
Rt*Rt	0.09	0.7583
treatment*Rt*Rt	0.07	0.7925
treatment*Rt*Rt*Rt	0.06	0.8040
Rt*Rt*Rt	0.07	0.7869

Figure 11: Suicide Deaths Parallel Trends Graph

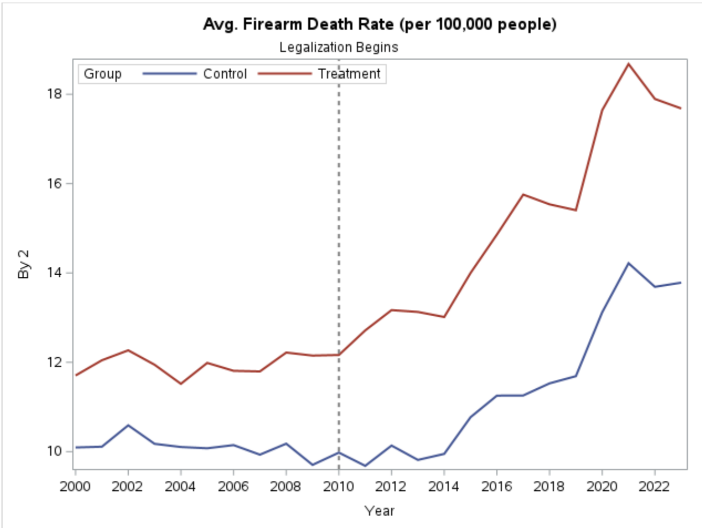


Sources: FBI (2024), Own Calculations (2025)
Notes: This figure shows the average violent crime rate over time, comparing states that implemented permit less carry laws ("treatment") to those that did not ("control"). Permit less Carry Laws in the treatment group were implemented in 2010 or later. Alaska was excluded from the analysis, as its permit less carry law was implemented in 2003.

Table 15: Firearm Death Rate Parallel Trends Test

Effect	F Value	Pr > F
Model	4.95	<.0001
Intercept	36.23	<.0001
treatment	2.20	0.1383
treatment*Rt	0.11	0.7445
Rt	0.00	0.9656
Rt*Rt	0.00	0.9662
treatment*Rt*Rt	0.06	0.8147
treatment*Rt*Rt*Rt	0.04	0.8511
Rt*Rt*Rt	0.01	0.9347

Figure 12: Firearm Death Rate Parallel Trends Graph



Sources: FBI (2024), Own Calculations (2025)
Notes: This figure shows the average violent crime rate over time, comparing states that implemented permit less carry laws ("treatment") to those that did not ("control"). Permit less Carry Laws in the treatment group were implemented in 2010 or later. Alaska was excluded from the analysis, as its permit less carry law was implemented in 2003.

Table 16: Violent Crimes (Linear)

Regressors	Violent Crime	Homicide	Robbery	Aggravated Assault
Permitless Carry	50.25*** (8.03)	-0.05 (0.17)	19.87*** (2.96)	27.18*** (5.76)
Intercept	543.29*** (49.37)	11.17*** (1.72)	150.65*** (23.19)	359.43*** (33.24)
Controls for Income and Other Gun Laws?	Yes	Yes	Yes	Yes
State and Year Fixed Effect?	Yes	Yes	Yes	Yes
Number of Observations	1,225	1,225	1,225	1,225
Adjusted R-Squared	0.9007	0.8653	0.9192	0.8797
Overall Significance	221.29***	116.22***	130.17***	227.57***

Sources: FBI (2024), Own Calculations (2025), CDC (2024), FRED (2024)
Notes: Robust Standard errors are in parentheses. Significance: *,**,*** for 10%, 5%, and 1% levels.

Table 17: Non Violent Crimes (Linear)

Regressors	Property Crime	Burglary	Larceny	Motor Vehicle Theft

Permit less Carry	-58.30 (41.24)	-3.77 (11.97)	-61.47** (25.82)	6.94 (11.66)
Intercept	3,888.22*** (165.12)	840.25*** (47.70)	2,584.30*** (131.39)	463.66*** (76.31)
Controls for Income and Other Gun Laws	Yes	Yes	Yes	Yes
State and Year Fixed Effect?	Yes	Yes	Yes	Yes
Number of Observations	1,225	1,225	1,225	1,225
Adjusted R	0.8976	0.8921	0.8885	0.7457
Overall Significance	199.68***	199.14***	166.13***	60.08***

Sources: FBI (2024), Own Calculations (2025), CDC (2024), FRED (2024)
Notes: Robust Standard errors are in parentheses. Significance: *,**,*** for 10%, 5%, and 1% levels.

Table 18: Gun Related Crimes (Linear)

Regressors	**Firearm Death Rate**	**Suicide Deaths**
Permit less Carry	1.04*** (0.24)	-10.42** (4.86)
Intercept	21.82*** (1.35)	-5.20 (19.80)
Controls for Income and Other Gun Laws	Yes	Yes
State and Year Fixed Effect?	Yes	Yes
Number of Observations	1,225	1,081
Adjusted R	0.8862	0.9291
Overall Significance	185.76***	225.41***

Sources: FBI (2024), Own Calculations (2025), CDC (2024), FRED (2024)
Notes: Robust Standard errors are in parentheses. Significance: *,**,*** for 10%, 5%, and 1% levels.

IX. SAS Codes

```
/*Importing and Sorting data*/
Proc import datafile="/home/u63734064/MySAS/Crime Statsready.xls"
		out=legalization dbms=xls replace;
	sheet="Sheet1";
	getnames=yes;
run;

proc sort Data=legalization;
	by state_name;
run;

Proc import datafile="/home/u63734064/MySAS/Crime Statsready.xls" out=FBIstats
		dbms=xls replace;
	sheet="Sheet2";
	getnames=yes;
run;

proc sort Data=FBIstats;
	by state_name;
run;

Proc import datafile="/home/u63734064/MySAS/Crime Statsready.xls"
		out=firearmdeaths dbms=xls replace;
	sheet="Sheet3";
	getnames=yes;
run;

proc sort Data=Firearmdeaths;
	by state_name;
run;

Proc import datafile="/home/u63734064/MySAS/Crime Statsready.xls" out=suicides
		dbms=xls replace;
	sheet="Sheet4";
	getnames=yes;
run;

proc sort Data=suicides;
	by state_name;
run;

Proc import datafile="/home/u63734064/MySAS/Crime Statsready.xls"
		out=officerdeaths dbms=xls replace;
```

```
	sheet="Sheet5";
	getnames=yes;
run;

Proc import datafile="/home/u63734064/MySAS/Crime Statsready.xls"
		out=massshooting dbms=xls replace;
	sheet="Sheet6";
	getnames=yes;
run;

Proc import datafile="/home/u63734064/MySAS/Crime Statsready.xls"
		out=medianincome dbms=xls replace;
	sheet="Sheet7";
	getnames=yes;
run;

proc sort Data=medianincome;
	by state_name;
run;

data combined;
	merge legalization FBIstats firearmdeaths suicides medianincome;
	by state_name;

	if year>= Year_of_Implemetation then
		did=1;
	else
		did=0;

	if Year_of_Implemetation>2022 then treatment=0;
	else treatment=1;

	if year> universal_background_checks then
		UBC_in_effect=1;
	else
		UBC_in_effect=0;

	if year> assault_weapon_ban then
		AWB_in_effect=1;
	else
		AWB_in_effect=0;

	/*creating per capita variables:*/
	violentcrimePC=(violentcrime/population)*100000;
	homicidePC=(homicide/population)*100000;
	robberyPC=(robbery/population)*100000;
```

```
	aggravatedassaultPC=(aggravatedassault/population)*100000;
	propertycrimePC=(propertycrime/population)*100000;
	burglaryPC=(burglary/population)*100000;
	larcenyPC=(larceny/population)*100000;
	motorvehicletheftPC=(motorvehicletheft/population)*100000;
	Rt=year-2010;

	keep treatment state_name year violentcrimePC homicidePC robberyPC
aggravatedassaultPC
		propertycrimePC burglaryPC larcenyPC motorvehicletheftPC FirearmDeathRate
		suicidedeaths RT did median_income officer_deaths mass_shootings
mass_shooting_deaths UBC_in_effect AWB_in_effect Year_of_Implemetation;
run;

/*Summary Statistics*/
proc means data=combined mean std min max n maxdec=2;
   class treatment;
   var violentcrimePC homicidePC robberyPC aggravatedassaultPC
      propertycrimePC burglaryPC larcenyPC motorvehicletheftPC
      FirearmDeathRate suicidedeaths;
run;



proc export data=combined
	outfile="/home/u63734064/MySAS/Summarystatsforfinal"
	dbms=xlsx
	replace;
run;



/*Parallel Trends Test*/
/*Violent Crime*/

ods output ParameterEstimates=ParallelTrendsResults;
Proc SurveyReg Data=Combined plots=none;
	*Class state_name /Ref=first;
	where year < 2010;
	Model violentcrimePC=treatment treatment*RT RT RT*RT treatment*RT*RT
treatment*RT*RT*RT RT*RT*Rt/*state_name*/ /Solution Adjrsq;
run;

quit;
```

```
data combined_graph;
	set combined;
	if Year_of_Implemetation < 2010 then delete;
run;

proc means data=combined_graph noprint;
	class year treatment;
	var violentcrimePC;
	output out=avg_violentcrime_all mean=avg_violentcrime;
run;



data avg_violentcrime_all_labeled;
   set avg_violentcrime_all;
   length group_label $9;
   if treatment = 1 then group_label = "Treatment";
   else if treatment = 0 then group_label = "Control";
run;


proc sgplot data=avg_violentcrime_all_labeled;
	where _TYPE_ = 3;
	series x=year y=avg_violentcrime / group=group_label lineattrs=(thickness=2);
	refline 2010 / axis=x lineattrs=(pattern=shortdash thickness=2 color=gray)
label="Legalization Begins";

	xaxis label="Year" values=(2000 to 2023 by 1); /* Show all years on X-axis */
	yaxis label="By 50"
	      valuesformat=comma6.; /* Adds commas like 25,000 instead of 25000 */

	keylegend / title="Group" location=inside position=topright;
	title "Avg. Violent Crime Rate (per 100,000 people)";
	/*footnote "Permitless Carry Laws in the treatment group were implemented in 2010 or
later. Alaska was excluded from the analysis, as its permitless carry law was implemented in
2003. ";*/
	/*footnote"This figure shows the average violent crime rate over time, comparing states
that implemented permitless carry laws ("treatment") to those that did not ("control"). While
legalization dates are staggered, the treatment group includes states that enacted permitless carry
laws in 2010 or later; the control group includes states without such laws during the study period.
Alaska was excluded from the analysis, as its permitless carry law was implemented in 2003.
Crime data were sourced from the FBI's Uniform Crime Reporting (UCR) Program and the
CDC. For the complete map of treatment and control states, please refer to Map 1 above.";*/
run;
```

```
/*Homicide*/

ods output ParameterEstimates=ParallelTrendsResults;
Proc SurveyReg Data=Combined plots=none;
	*Class state_name /Ref=first;
	where year < 2010;
	Model homicidePC=treatment treatment*RT RT RT*RT treatment*RT*RT
treatment*RT*RT*RT RT*RT*Rt/*state_name*/ /Solution Adjrsq;
run;

quit;

data combined_graph_homicide;
	set combined;
	if Year_of_Implemetation < 2010 then delete;
run;


proc means data=combined_graph_homicide noprint;
	class year treatment;
	var homicidePC;
	output out=avg_homicide mean=avg_val;
run;


data avg_homicide_labeled;
	set avg_homicide;
	length group_label $9;
	if treatment = 1 then group_label = "Treatment";
	else if treatment = 0 then group_label = "Control";
run;


proc sgplot data=avg_homicide_labeled;
	where _TYPE_ = 3;
	series x=year y=avg_val / group=group_label lineattrs=(thickness=2);
	refline 2010 / axis=x lineattrs=(pattern=shortdash thickness=2 color=gray)
label="Legalization Begins";

	xaxis label="Year" values=(2000 to 2023 by 1);
	yaxis label="By 1" valuesformat=comma6.;
```

```
	keylegend / title="Group" location=inside position=topright;
		title "Avg. Homicide Rate (per 100,000 people)";
	/*footnote"This figure shows the average homicide rate over time, comparing states that
implemented permitless carry laws (“treatment”) with those that did not (“control”). While
legalization dates are staggered, the treatment group includes states that enacted permitless carry
laws in 2010 or later; the control group includes states without such laws during the study period.
Alaska was excluded from the analysis, as its permitless carry law was implemented in 2003.
Crime data were sourced from the FBI’s Uniform Crime Reporting (UCR) Program and the
CDC. For the complete map of treatment and control states, please refer to Map 1 above.";*/

run;

/*ROBBERY */

ods output ParameterEstimates=ParallelTrendsResults;
Proc SurveyReg Data=Combined plots=none;
	*Class state_name /Ref=first;
	where year < 2010;
	Model robberyPC=treatment treatment*RT RT RT*RT treatment*RT*RT
treatment*RT*RT*RT RT*RT*Rt/*state_name*/ /Solution Adjrsq;
run;

quit;



data combined_graph_robbery;
	set combined;
	if Year_of_Implemetation < 2010 then delete;
run;


proc means data=combined_graph_robbery noprint;
	class year treatment;
	var robberyPC;
	output out=avg_robbery mean=avg_val;
run;


data avg_robbery_labeled;
	set avg_robbery;
	length group_label $9;
	if treatment = 1 then group_label = "Treatment";
	else if treatment = 0 then group_label = "Control";
run;
```

```
proc sgplot data=avg_robbery_labeled;
	where _TYPE_ = 3;
	series x=year y=avg_val / group=group_label lineattrs=(thickness=2);
	refline 2010 / axis=x lineattrs=(pattern=shortdash thickness=2 color=gray)
label="Legalization Begins";

	xaxis label="Year" values=(2000 to 2023 by 1);
	yaxis label="By 25" valuesformat=comma6.;

	keylegend / title="Group" location=inside position=topright;
			title "Avg. Robbery Rate (per 100,000 people)";
	/*footnote"This figure shows the average robbery rate over time, comparing states that
implemented permitless carry laws (“treatment”) with those that did not (“control”). While
legalization dates are staggered, the treatment group includes states that enacted permitless carry
laws in 2010 or later; the control group includes states without such laws during the study period.
Alaska was excluded from the analysis, as its permitless carry law was implemented in 2003.
Crime data were sourced from the FBI’s Uniform Crime Reporting (UCR) Program and the
CDC. For the complete map of treatment and control states, please refer to Map 1 above.";*/

run;


ods output ParameterEstimates=ParallelTrendsResults;
Proc SurveyReg Data=Combined plots=none;
	*Class state_name /Ref=first;
	where year < 2010;
	Model aggravatedassaultPC=treatment treatment*RT RT RT*RT treatment*RT*RT
treatment*RT*RT*RT RT*RT*Rt/*state_name*/ /Solution Adjrsq;
run;

quit;



data combined_graph_aggravatedassault;
   set combined;
   if Year_of_Implemetation < 2010 then delete;
run;

proc means data=combined_graph_aggravatedassault noprint;
   class year treatment;
   var aggravatedassaultPC;
   output out=avg_aggravatedassault mean=avg_val;
run;
```

```
data avg_aggravatedassault_labeled;
   set avg_aggravatedassault;
   length group_label $9;
   if treatment = 1 then group_label = "Treatment";
   else if treatment = 0 then group_label = "Control";
run;

proc sgplot data=avg_aggravatedassault_labeled;
   where _TYPE_ = 3;
   series x=year y=avg_val / group=group_label lineattrs=(thickness=2);
   refline 2010 / axis=x lineattrs=(pattern=shortdash thickness=2 color=gray)
label="Legalization Begins";
   xaxis label="Year" values=(2000 to 2023 by 1);
   yaxis label="By 25" valuesformat=comma6.;
   keylegend / title="Group" location=inside position=topright;
                              title "Avg. Aggravated Assault Rate (per 100,000 people)";
         /*footnote"This figure shows the average aggravated assault rate over time, comparing
states that implemented permitless carry laws (“treatment”) with those that did not (“control”).
While legalization dates are staggered, the treatment group includes states that enacted
permitless carry laws in 2010 or later; the control group includes states without such laws during
the study period. Alaska was excluded from the analysis, as its permitless carry law was
implemented in 2003. Crime data were sourced from the FBI’s Uniform Crime Reporting (UCR)
Program and the CDC. For the complete map of treatment and control states, please refer to Map
1 above.";       */

run;


/*PROPERTY CRIME*/
ods output ParameterEstimates=ParallelTrendsResults;
Proc SurveyReg Data=Combined plots=none;
         *Class state_name /Ref=first;
         where year < 2010;
         Model propertycrimePC=treatment treatment*RT RT RT*RT treatment*RT*RT
treatment*RT*RT*RT RT*RT*Rt/*state_name*/ /Solution Adjrsq;
run;

quit;


data combined_graph_propertycrime;
   set combined;
   if Year_of_Implemetation < 2010 then delete;
run;

proc means data=combined_graph_propertycrime noprint;
```

```
    class year treatment;
    var propertycrimePC;
    output out=avg_propertycrime mean=avg_val;
run;

data avg_propertycrime_labeled;
    set avg_propertycrime;
    length group_label $9;
    if treatment = 1 then group_label = "Treatment";
    else if treatment = 0 then group_label = "Control";
run;

proc sgplot data=avg_propertycrime_labeled;
    where _TYPE_ = 3;
    series x=year y=avg_val / group=group_label lineattrs=(thickness=2);
    refline 2010 / axis=x lineattrs=(pattern=shortdash thickness=2 color=gray)
label="Legalization Begins";
    xaxis label="Year" values=(2000 to 2023 by 1);
    yaxis label="By 500" valuesformat=comma6.;
    keylegend / title="Group" location=inside position=topright;
                                title "Avg. Property Crime Rate (per 100,000 people)";
            /*footnote"This figure shows the average property crime rate over time, comparing states
that implemented permitless carry laws (“treatment”) with those that did not (“control”). While
legalization dates are staggered, the treatment group includes states that enacted permitless carry
laws in 2010 or later; the control group includes states without such laws during the study period.
Alaska was excluded from the analysis, as its permitless carry law was implemented in 2003.
Crime data were sourced from the FBI’s Uniform Crime Reporting (UCR) Program and the
CDC. For the complete map of treatment and control states, please refer to Map 1 above.";
            */

run;


/*BURGLARY*/
ods output ParameterEstimates=ParallelTrendsResults;
Proc SurveyReg Data=Combined plots=none;
            *Class state_name /Ref=first;
            where year < 2010;
            Model burglaryPC=treatment treatment*RT RT RT*RT treatment*RT*RT
treatment*RT*RT*RT RT*RT*Rt/*state_name*/ /Solution Adjrsq;
run;

quit;


data combined_graph_burglary;
```

```
   set combined;
   if Year_of_Implemetation < 2010 then delete;
run;

proc means data=combined_graph_burglary noprint;
   class year treatment;
   var burglaryPC;
   output out=avg_burglary mean=avg_val;
run;

data avg_burglary_labeled;
   set avg_burglary;
   length group_label $9;
   if treatment = 1 then group_label = "Treatment";
   else if treatment = 0 then group_label = "Control";
run;

proc sgplot data=avg_burglary_labeled;
   where _TYPE_ = 3; /
   series x=year y=avg_val / group=group_label lineattrs=(thickness=2);
   refline 2010 / axis=x lineattrs=(pattern=shortdash thickness=2 color=gray)
label="Legalization Begins";
   xaxis label="Year" values=(2000 to 2023 by 1);
   yaxis label="By 100" valuesformat=comma6.;
   keylegend / title="Group" location=inside position=topright;
                                    title "Avg. Burglary Rate (per 100,000 people)";
         /*footnote"This figure shows the average property crime rate over time, comparing states
that implemented permitless carry laws (“treatment”) with those that did not (“control”). While
legalization dates are staggered, the treatment group includes states that enacted permitless carry
laws in 2010 or later; the control group includes states without such laws during the study period.
Alaska was excluded from the analysis, as its permitless carry law was implemented in 2003.
Crime data were sourced from the FBI’s Uniform Crime Reporting (UCR) Program and the
CDC. For the complete map of treatment and control states, please refer to Map 1 above.";
         */

run;

/*LARCENY*/
ods output ParameterEstimates=ParallelTrendsResults;
Proc SurveyReg Data=Combined plots=none;
         *Class state_name /Ref=first;
         where year < 2010;
         Model larcenyPC=treatment treatment*RT RT RT*RT treatment*RT*RT
treatment*RT*RT*RT RT*RT*Rt/*state_name*/ /Solution Adjrsq;
run;
```

```
quit;

data combined_graph_larceny;
   set combined;
   if Year_of_Implemetation < 2010 then delete;
run;

proc means data=combined_graph_larceny noprint;
   class year treatment;
   var larcenyPC;
   output out=avg_larceny mean=avg_val;
run;

data avg_larceny_labeled;
   set avg_larceny;
   length group_label $9;
   if treatment = 1 then group_label = "Treatment";
   else if treatment = 0 then group_label = "Control";
run;

proc sgplot data=avg_larceny_labeled;
   where _TYPE_ = 3;
   series x=year y=avg_val / group=group_label lineattrs=(thickness=2);
   refline 2010 / axis=x lineattrs=(pattern=shortdash thickness=2 color=gray)
label="Legalization Begins";
   xaxis label="Year" values=(2000 to 2023 by 1);
   yaxis label="By 500" valuesformat=comma6.;
   keylegend / title="Group" location=inside position=topright;
                                    title "Avg. Larceny Rate (per 100,000 people)";
         /*footnote"This figure shows the average larceny rate over time, comparing states that
implemented permitless carry laws ("treatment") with those that did not ("control"). While
legalization dates are staggered, the treatment group includes states that enacted permitless carry
laws in 2010 or later; the control group includes states without such laws during the study period.
Alaska was excluded from the analysis, as its permitless carry law was implemented in 2003.
Crime data were sourced from the FBI's Uniform Crime Reporting (UCR) Program and the
CDC. For the complete map of treatment and control states, please refer to Map 1 above.";*/

run;


/*MOTOR VEHICLE THEFT*/
ods output ParameterEstimates=ParallelTrendsResults;
Proc SurveyReg Data=Combined plots=none;
         *Class state_name /Ref=first;
         where year < 2010;
```

```
	Model motorvehicletheftPC=treatment treatment*RT RT RT*RT treatment*RT*RT treatment*RT*RT*RT RT*RT*Rt/*state_name*/ /Solution Adjrsq;
run;

quit;


data combined_graph_motorvehicletheft;
   set combined;
   if Year_of_Implemetation < 2010 then delete;
run;

proc means data=combined_graph_motorvehicletheft noprint;
   class year treatment;
   var motorvehicletheftPC;
   output out=avg_motorvehicletheft mean=avg_val;
run;

data avg_motorvehicletheft_labeled;
   set avg_motorvehicletheft;
   length group_label $9;
   if treatment = 1 then group_label = "Treatment";
   else if treatment = 0 then group_label = "Control";
run;

proc sgplot data=avg_motorvehicletheft_labeled;
   where _TYPE_ = 3;
   series x=year y=avg_val / group=group_label lineattrs=(thickness=2);
   refline 2010 / axis=x lineattrs=(pattern=shortdash thickness=2 color=gray)
label="Legalization Begins";
   xaxis label="Year" values=(2000 to 2023 by 1);
   yaxis label="By 100" valuesformat=comma6.;
   keylegend / title="Group" location=inside position=topright;
                                   title "Avg. Motor Vehicle Theft Rate (per 100,000 people)";
	/*footnote"This figure shows the average motor vehicle theft rate over time, comparing states that implemented permitless carry laws (“treatment”) with those that did not (“control”). While legalization dates are staggered, the treatment group includes states that enacted permitless carry laws in 2010 or later; the control group includes states without such laws during the study period. Alaska was excluded from the analysis, as its permitless carry law was implemented in 2003. Crime data were sourced from the FBI’s Uniform Crime Reporting (UCR) Program and the CDC. For the complete map of treatment and control states, please refer to Map 1 above.";*/

run;
```

```
/*SUICIDE DEATHS*/
ods output ParameterEstimates=ParallelTrendsResults;
Proc SurveyReg Data=Combined plots=none;
	*Class state_name /Ref=first;
	where year < 2010;
	Model suicidedeaths=treatment treatment*RT RT RT*RT treatment*RT*RT
treatment*RT*RT*RT RT*RT*Rt/*state_name*/ /Solution Adjrsq;
run;

quit;


data combined_graph_suicidedeaths;
   set combined;
   if Year_of_Implemetation < 2010 then delete;
run;

proc means data=combined_graph_suicidedeaths noprint;
   class year treatment;
   var suicidedeaths;
   output out=avg_suicidedeaths mean=avg_val;
run;

data avg_suicidedeaths_labeled;
   set avg_suicidedeaths;
   length group_label $9;
   if treatment = 1 then group_label = "Treatment";
   else if treatment = 0 then group_label = "Control";
run;

proc sgplot data=avg_suicidedeaths_labeled;
   where _TYPE_ = 3;
   series x=year y=avg_val / group=group_label lineattrs=(thickness=2);
   refline 2010 / axis=x lineattrs=(pattern=shortdash thickness=2 color=gray)
label="Legalization Begins";
   xaxis label="Year" values=(2000 to 2023 by 1);
   yaxis label="By 25" valuesformat=comma6.;
   keylegend / title="Group" location=inside position=bottomright;
					title "Avg. Suicide Deaths (per 100,000 people)";
	/*footnote"This figure shows the average suicide death rate over time, comparing states
that implemented permitless carry laws (“treatment”) with those that did not (“control”). While
legalization dates are staggered, the treatment group includes states that enacted permitless carry
laws in 2010 or later; the control group includes states without such laws during the study period.
Alaska was excluded from the analysis, as its permitless carry law was implemented in 2003.
```

Crime data were sourced from the FBI's Uniform Crime Reporting (UCR) Program and the CDC. For the complete map of treatment and control states, please refer to Map 1 above.";*/

```
run;


/*FIREARM DEATH RATE*/
ods output ParameterEstimates=ParallelTrendsResults;
Proc SurveyReg Data=Combined plots=none;
        *Class state_name /Ref=first;
        where year < 2010;
        Model firearmdeathrate=treatment treatment*RT RT RT*RT treatment*RT*RT
treatment*RT*RT*RT RT*RT*Rt/*state_name*/ /Solution Adjrsq;
run;

quit;

data combined_graph_firearmdeath;
   set combined;
   if Year_of_Implemetation < 2010 then delete;
run;

proc means data=combined_graph_firearmdeath noprint;
   class year treatment;
   var FirearmDeathRate;
   output out=avg_firearmdeath mean=avg_val;
run;

data avg_firearmdeath_labeled;
   set avg_firearmdeath;
   length group_label $9;
   if treatment = 1 then group_label = "Treatment";
   else if treatment = 0 then group_label = "Control";
run;

proc sgplot data=avg_firearmdeath_labeled;
   where _TYPE_ = 3;
   series x=year y=avg_val / group=group_label lineattrs=(thickness=2);
   refline 2010 / axis=x lineattrs=(pattern=shortdash thickness=2 color=gray)
label="Legalization Begins";
   xaxis label="Year" values=(2000 to 2023 by 1);
   yaxis label="By 2" valuesformat=comma6.;
   keylegend / title="Group" location=inside position=topleft;
                                        title "Avg. Firearm Death Rate (per 100,000 people)";
        /*footnote"This figure shows the average firearm death rate over time, comparing states
that implemented permitless carry laws ("treatment") with those that did not ("control"). While
```

```
legalization dates are staggered, the treatment group includes states that enacted permitless carry
laws in 2010 or later; the control group includes states without such laws during the study period.
Alaska was excluded from the analysis, as its permitless carry law was implemented in 2003.
Crime data were sourced from the FBI's Uniform Crime Reporting (UCR) Program and the
CDC. For the complete map of treatment and control states, please refer to Map 1 above.";*/

run;
/* Linear Models-Table 1 (Impact of Permitless Legalization on Violent Crime*/

ods output ParameterEstimates=PEVC FitStatistics=AdjRsqVC DataSummary=ObsVC
	Effects=OSMVC;

Proc SurveyReg Data=Combined plots=none;
	Class state_name year /Ref=first;
	Model1: Model violentcrimePC=DID state_name year median_income UBC_in_effect
		AWB_in_effect/Solution Adjrsq;
run;

quit;
ods output ParameterEstimates=PEHC FitStatistics=AdjRsqHC DataSummary=ObsHC
	Effects=OSMHC;

Proc SurveyReg Data=Combined plots=none;
	Class state_name year /Ref=first;
	Model2: Model homicidePC=DID state_name year median_income UBC_in_effect
		AWB_in_effect/Solution Adjrsq;
run;

quit;
ods output ParameterEstimates=PERB FitStatistics=AdjRsqRB DataSummary=ObsRB
	Effects=OSMRB;

Proc SurveyReg Data=Combined plots=none;
	Class state_name year /Ref=first;
	Model3: Model robberyPC=DID state_name year median_income UBC_in_effect
		AWB_in_effect /Solution Adjrsq;
run;

quit;
ods output ParameterEstimates=PEAA FitStatistics=AdjRsqAA DataSummary=ObsAA
	Effects=OSMAA;

Proc SurveyReg Data=Combined plots=none;
	Class state_name year /Ref=first;
	Model4: Model aggravatedassaultPC=DID state_name year median_income
		UBC_in_effect AWB_in_effect /Solution Adjrsq;
```

```
run;

quit;


/*Table 2 (Impact of Permitless Carry Legalization on Nonviolent crimes*/

ods output ParameterEstimates=PEPC FitStatistics=AdjRsqPC DataSummary=ObsPC
        Effects=OSMPC;

Proc SurveyReg Data=Combined plots=none;
        Class state_name year /Ref=first;
        Model5: Model propertycrimePC=DID state_name year median_income UBC_in_effect
                AWB_in_effect /Solution Adjrsq;
run;

quit;
ods output ParameterEstimates=PEBU FitStatistics=AdjRsqBU DataSummary=ObsBU
        Effects=OSMBU;

Proc SurveyReg Data=Combined plots=none;
        Class state_name year /Ref=first;
        Model6: Model burglaryPC=DID state_name year median_income UBC_in_effect
                AWB_in_effect /Solution Adjrsq;
run;

quit;
ods output ParameterEstimates=PELA FitStatistics=AdjRsqLA DataSummary=ObsLA
        Effects=OSMLA;

Proc SurveyReg Data=Combined plots=none;
        Class state_name year /Ref=first;
        Model7: Model larcenyPC=DID state_name year median_income UBC_in_effect
                AWB_in_effect /Solution Adjrsq;
run;

quit;
ods output ParameterEstimates=PEMV FitStatistics=AdjRsqMV DataSummary=ObsMV
        Effects=OSMMV;

Proc SurveyReg Data=Combined plots=none;
        Class state_name year /Ref=first;
        Model8: Model motorvehicletheftPC=DID state_name year median_income
                UBC_in_effect AWB_in_effect /Solution Adjrsq;
run;
```

```
quit;


/*Table 3 (Impact of Permitless Carry Legalization on Gun Related Crimes)*/

ods output ParameterEstimates=PEFDR FitStatistics=AdjRsqFDR DataSummary=ObsFDR
        Effects=OSMFDR;

Proc SurveyReg Data=Combined plots=none;
        Class state_name year /Ref=first;
        Model9: Model FirearmDeathRate=DID state_name year median_income
                UBC_in_effect AWB_in_effect /Solution Adjrsq;
run;

quit;
ods output ParameterEstimates=PESD FitStatistics=AdjRsqSD DataSummary=ObsSD
        Effects=OSMSD;

Proc SurveyReg Data=Combined plots=none;
        Class state_name year /Ref=first;
        Model10: Model suicidedeaths=DID state_name year median_income UBC_in_effect
                AWB_in_effect /Solution Adjrsq;
run;

quit;

/*Combining tables*/
data Table_Long;
        length Model $21 Parameter $30;
        set PEVC (in=a) PEHC (in=b) PERB (in=c) PEAA (in=d) PEPC (in=e) PEBU (in=f)
                PELA (in=g) PEMV (in=h) PEFDR (in=i) PESD (in=j);

        if a then Model="Violent Crime";
        else if b then Model="Homicide";
        else if c then Model="Robbery";
        else if d then Model="Aggravated Assault";
        else if e then Model="Property Crime";
        else if f then Model="Burglary";
        else if g then Model="Larceny";
        else if h then Model="Motor Vehicle Theft";
        else if i then Model="Firearm Death Rate";
        else if j then Model="Suicide Deaths";

        length Star $3;
        if Probt <= 0.01 then Star = "***";
        else if Probt <= 0.05 then Star = "**";
```

```
	else if Probt <= 0.1 then Star = "*";
	else Star = "";

	Results = Estimate;
	EditedResults = cats(put(Results, comma16.2), Star);
	output;

	Results = StdErr;
	EditedResults = cats("(", put(Results, comma16.2), ")");
	output;


	if Parameter in ("DID", "Intercept");

	keep Model Parameter EditedResults;
run;



proc sort data=Table_Long out=Table_Long_Sorted;
	by Model Parameter;
run;


data Model_VC(rename=(EditedResults=ViolentCrime))
		Model_HC(rename=(EditedResults=Homicide))
		Model_RB(rename=(EditedResults=Robbery))
		Model_AA(rename=(EditedResults=AggravatedAssault))
		Model_PC(rename=(EditedResults=PropertyCrime))
		Model_BU(rename=(EditedResults=Burglary))
		Model_LA(rename=(EditedResults=Larceny))
		Model_MV(rename=(EditedResults=MotorVehicleTheft))
		Model_FDR(rename=(EditedResults=FirearmDeathRate))
		Model_SD(rename=(EditedResults=SuicideDeaths));
	set Table_Long_Sorted;

	if Model="Violent Crime" then output Model_VC;
	else if Model="Homicide" then output Model_HC;
	else if Model="Robbery" then output Model_RB;
	else if Model="Aggravated Assault" then output Model_AA;
	else if Model="Property Crime" then output Model_PC;
	else if Model="Burglary" then output Model_BU;
	else if Model="Larceny" then output Model_LA;
	else if Model="Motor Vehicle Theft" then output Model_MV;
	else if Model="Firearm Death Rate" then output Model_FDR;
	else if Model="Suicide Deaths" then output Model_SD;
```

```
        drop model;
run;




data Table_Wide;
        merge Model_VC Model_HC Model_RB Model_AA Model_PC Model_BU Model_LA
Model_MV
                Model_FDR Model_SD;
        by Parameter;

        /* Keep only DID and Intercept */
        if Parameter in ("did", "Intercept");

        length Order 6;
        if Parameter = "did" then Order = 1;
        else if Parameter = "Intercept" then Order = 2;

run;


proc sort data=Table_Wide out=Table_Wide_Sorted1;
        by Order;
run;

proc export data=Table_Wide_Sorted1
        outfile="/home/u63734064/MySAS/Tablewide1"
        dbms=xlsx
        replace;
run;




/* Number of Observations */
data NumObs;
        merge ObsVC(rename=(NValue1=ViolentCrime))
ObsHC(rename=(NValue1=Homicide))
                ObsRB(rename=(NValue1=Robbery))
ObsAA(rename=(NValue1=AggravatedAssault))
                ObsPC(rename=(NValue1=PropertyCrime))
ObsBU(rename=(NValue1=Burglary))
```

```
                    ObsLA(rename=(NValue1=Larceny))
ObsMV(rename=(NValue1=MotorVehicleTheft))
                    ObsFDR(rename=(NValue1=FirearmDeathRate))
                    ObsSD(rename=(NValue1=SuicideDeaths));
          by Label1;
          where Label1="Number of Observations";
          keep ViolentCrime Homicide Robbery AggravatedAssault PropertyCrime Burglary
                    Larceny MotorVehicleTheft FirearmDeathRate SuicideDeaths;
run;

/* Adjusted R-Squared */
data AdjRsq;
          merge AdjRsqVC (rename=(CValue1=ViolentCrime) drop=NValue1)
                    AdjRsqHC (rename=(CValue1=Homicide) drop=NValue1)
                    AdjRsqRB (rename=(CValue1=Robbery) drop=NValue1)
                    AdjRsqAA (rename=(CValue1=AggravatedAssault) drop=NValue1)
                    AdjRsqPC (rename=(CValue1=PropertyCrime) drop=NValue1)
                    AdjRsqBU (rename=(CValue1=Burglary) drop=NValue1)
                    AdjRsqLA (rename=(CValue1=Larceny) drop=NValue1)
                    AdjRsqMV (rename=(CValue1=MotorVehicleTheft) drop=NValue1)
                    AdjRsqFDR (rename=(CValue1=FirearmDeathRate) drop=NValue1)
                    AdjRsqSD (rename=(CValue1=SuicideDeaths) drop=NValue1);
          where Label1="Adjusted R-Square";
run;

data OSM_ViolentCrime(rename=(EditedFValue=ViolentCrime))
    OSM_Homicide(rename=(EditedFValue=Homicide))
    OSM_Robbery(rename=(EditedFValue=Robbery))
    OSM_AggravatedAssault(rename=(EditedFValue=AggravatedAssault))
    OSM_PropertyCrime(rename=(EditedFValue=PropertyCrime))
    OSM_Burglary(rename=(EditedFValue=Burglary))
    OSM_Larceny(rename=(EditedFValue=Larceny))
    OSM_MotorVehicleTheft(rename=(EditedFValue=MotorVehicleTheft))
    OSM_FirearmDeathRate(rename=(EditedFValue=FirearmDeathRate))
    OSM_SuicideDeaths(rename=(EditedFValue=SuicideDeaths));

   set OSMVC(in=a) OSMHC(in=b) OSMRB(in=c) OSMAA(in=d)
      OSMPC(in=e) OSMBU(in=f) OSMLA(in=g) OSMMV(in=h)
      OSMFDR(in=i) OSMSD(in=j);

   if Effect = "Model";


   length Star $3;
   if ProbF <= 0.01 then Star = "***";
   else if ProbF <= 0.05 then Star = "**";
```

```
   else if ProbF <= 0.1 then Star = "*";
   else Star = "";


   Label1 = "Overall Significance";
   EditedFValue = cats(put(FValue, comma20.2), Star);


   if a then output OSM_ViolentCrime;
   else if b then output OSM_Homicide;
   else if c then output OSM_Robbery;
   else if d then output OSM_AggravatedAssault;
   else if e then output OSM_PropertyCrime;
   else if f then output OSM_Burglary;
   else if g then output OSM_Larceny;
   else if h then output OSM_MotorVehicleTheft;
   else if i then output OSM_FirearmDeathRate;
   else if j then output OSM_SuicideDeaths;

   keep Label1 EditedFValue;
run;

data OverallSig;
        merge OSM_ViolentCrime OSM_Homicide OSM_Robbery OSM_AggravatedAssault
OSM_PropertyCrime OSM_Burglary OSM_Larceny OSM_MotorVehicleTheft
OSM_FirearmDeathRate OSM_SuicideDeaths;
        by Label1;
run;



/* Export Adjusted R-Squared values */
proc export data=AdjRsq
   outfile="/home/u63734064/MySASAdjusted_RSquaredlin"
   dbms=xlsx
   replace;
run;

/* Export Overall Significance values */
proc export data=OverallSig
   outfile="/home/u63734064/Overall_Significancelin"
   dbms=xlsx
   replace;
run;
```

```
proc export data=NumObs
   outfile="/home/u63734064/Overall_Significance"
   dbms=xlsx
   replace;
run;


/*Log Model*/
data combined;
	merge legalization FBIstats firearmdeaths suicides medianincome;
	by state_name;

	if Year_of_Implemetation > 2023 then treatment = 0;
	else treatment = 1;

	if year> Year_of_Implemetation then
		did=1;
	else
		did=0;

	if year> universal_background_checks then
		UBC_in_effect=1;
	else
		UBC_in_effect=0;

	if year> assault_weapon_ban then
		AWB_in_effect=1;
	else
		AWB_in_effect=0;

		violentcrimePC=(violentcrime/population)*100000;
	homicidePC=(homicide/population)*100000;
	robberyPC=(robbery/population)*100000;
	aggravatedassaultPC=(aggravatedassault/population)*100000;
	propertycrimePC=(propertycrime/population)*100000;
	burglaryPC=(burglary/population)*100000;
	larcenyPC=(larceny/population)*100000;
	motorvehicletheftPC=(motorvehicletheft/population)*100000;


	log_violentcrime = log(violentcrimePC);
	log_homicide = log(homicidePC);
	log_robbery = log(robberyPC);
	log_aggravatedassault = log(aggravatedassaultPC);
	log_propertycrime = log(propertycrimePC);
	log_burglary = log(burglaryPC);
```

```
	log_larceny = log(larcenyPC);
	log_motorvehicletheft = log(motorvehicletheftPC);
	log_FirearmDeathRate = log(FirearmDeathRate);
	log_suicidedeaths = log(suicidedeaths);

	keep state_name year log_violentcrime log_homicide log_robbery
		log_aggravatedassault log_propertycrime log_burglary log_larceny
		log_motorvehicletheft log_FirearmDeathRate log_suicidedeaths
		did median_income officer_deaths mass_shootings mass_shooting_deaths
		UBC_in_effect AWB_in_effect;
run;




/*Table 1 Log Model*/
ods output ParameterEstimates=PEVC FitStatistics=AdjRsqVClog DataSummary=ObsVClog
	Effects=OSMVClog;

Proc SurveyReg Data=Combined plots=none;
	Class state_name year /Ref=first;
	Model1: Model log_violentcrime = did state_name year median_income
		UBC_in_effect AWB_in_effect /Solution Adjrsq;
run;

quit;
ods output ParameterEstimates=PEHC FitStatistics=AdjRsqHClog DataSummary=ObsHClog
	Effects=OSMHClog;

Proc SurveyReg Data=Combined plots=none;
	Class state_name year /Ref=first;
	Model2: Model log_homicide = did state_name year median_income
		UBC_in_effect AWB_in_effect /Solution Adjrsq;
run;

quit;
ods output ParameterEstimates=PERB FitStatistics=AdjRsqRBlog DataSummary=ObsRBlog
	Effects=OSMRBlog;

Proc SurveyReg Data=Combined plots=none;
	Class state_name year /Ref=first;
	Model3: Model log_robbery = did state_name year median_income
		UBC_in_effect AWB_in_effect /Solution Adjrsq;
run;
```

```
quit;
ods output ParameterEstimates=PEAA FitStatistics=AdjRsqAAlog DataSummary=ObsAAlog
	Effects=OSMAAlog;

Proc SurveyReg Data=Combined plots=none;
	Class state_name year /Ref=first;
	Model4: Model log_aggravatedassault = did state_name year median_income
		UBC_in_effect AWB_in_effect /Solution Adjrsq;
run;

quit;

/*Table 2 Log Model*/
ods output ParameterEstimates=PEPC FitStatistics=AdjRsqPClog DataSummary=ObsPClog
	Effects=OSMPClog;

Proc SurveyReg Data=Combined plots=none;
	Class state_name year /Ref=first;
	Model5: Model log_propertycrime = did state_name year median_income
		UBC_in_effect AWB_in_effect /Solution Adjrsq;
run;

quit;
ods output ParameterEstimates=PEBU FitStatistics=AdjRsqBUlog DataSummary=ObsBUlog
	Effects=OSMBUlog;

Proc SurveyReg Data=Combined plots=none;
	Class state_name year /Ref=first;
	Model6: Model log_burglary = did state_name year median_income
		UBC_in_effect AWB_in_effect /Solution Adjrsq;
run;

quit;
ods output ParameterEstimates=PELA FitStatistics=AdjRsqLAlog DataSummary=ObsLAlog
	Effects=OSMLAlog;

Proc SurveyReg Data=Combined plots=none;
	Class state_name year /Ref=first;
	Model7: Model log_larceny = did state_name year median_income
		UBC_in_effect AWB_in_effect /Solution Adjrsq;
run;

quit;
ods output ParameterEstimates=PEMV FitStatistics=AdjRsqMVlog DataSummary=ObsMVlog
	Effects=OSMMVlog;
```

```
Proc SurveyReg Data=Combined plots=none;
	Class state_name year /Ref=first;
	Model8: Model log_motorvehicletheft = did state_name year median_income
		UBC_in_effect AWB_in_effect /Solution Adjrsq;
run;

quit;

/*Table 3 Log Model*/
ods output ParameterEstimates=PEFDR FitStatistics=AdjRsqFDRlog
DataSummary=ObsFDRlog
	Effects=OSMFDRlog;

Proc SurveyReg Data=Combined plots=none;
	Class state_name year /Ref=first;
	Model9: Model log_FirearmDeathRate = did state_name year median_income
		UBC_in_effect AWB_in_effect /Solution Adjrsq;
run;

quit;
ods output ParameterEstimates=PESD FitStatistics=AdjRsqSDlog DataSummary=ObsSDlog
	Effects=OSMSDlog;

Proc SurveyReg Data=Combined plots=none;
	Class state_name year /Ref=first;
	Model10: Model log_suicidedeaths = did state_name year median_income
		UBC_in_effect AWB_in_effect /Solution Adjrsq;
run;

quit;

/*Combining all the Log Models together*/
data Table_Long;
	length Model $30 Parameter $30 EditedResults $60;
	set PEVC (in=a) PEHC (in=b) PERB (in=c) PEAA (in=d) PEPC (in=e)
	   PEBU (in=f) PELA (in=g) PEMV (in=h) PEFDR (in=i) PESD (in=j);

	/* Assign model labels */
	if a then Model = "Log Violent Crime";
	else if b then Model = "Log Homicide";
	else if c then Model = "Log Robbery";
	else if d then Model = "Log Aggravated Assault";
	else if e then Model = "Log Property Crime";
	else if f then Model = "Log Burglary";
	else if g then Model = "Log Larceny";
```

```
	else if h then Model = "Log Motor Vehicle Theft";
	else if i then Model = "Log Firearm Death Rate";
	else if j then Model = "Log Suicide Deaths";

	/* Add stars based on p-values */
	length Star $3;
	if Probt <= 0.01 then Star = "***";
	else if Probt <= 0.05 then Star = "**";
	else if Probt <= 0.1 then Star = "*";
	else Star = "";

	/* Keep only DID and Intercept, format together */
	if upcase(Parameter) in ("DID", "INTERCEPT") then do;
		EditedResults = cats(put(Estimate, comma16.2), Star, byte(10), "(", put(StdErr,
comma16.2), ")");
		output;
	end;

	keep Model Parameter EditedResults;
run;


proc sort data=Table_Long out=Table_Long_Sorted;
	by Model Parameter;
run;


/* Split by model into separate datasets and rename results */
data
	Model_VC(rename=(EditedResults=LogViolentCrime))
	Model_HC(rename=(EditedResults=LogHomicide))
	Model_RB(rename=(EditedResults=LogRobbery))
	Model_AA(rename=(EditedResults=LogAggravatedAssault))
	Model_PC(rename=(EditedResults=LogPropertyCrime))
	Model_BU(rename=(EditedResults=LogBurglary))
	Model_LA(rename=(EditedResults=LogLarceny))
	Model_MV(rename=(EditedResults=LogMotorVehicleTheft))
	Model_FDR(rename=(EditedResults=LogFirearmDeathRate))
	Model_SD(rename=(EditedResults=LogSuicideDeaths));
	set Table_Long_Sorted;

	if Model = "Log Violent Crime" then output Model_VC;
	else if Model = "Log Homicide" then output Model_HC;
	else if Model = "Log Robbery" then output Model_RB;
	else if Model = "Log Aggravated Assault" then output Model_AA;
	else if Model = "Log Property Crime" then output Model_PC;
```

```
	else if Model = "Log Burglary" then output Model_BU;
	else if Model = "Log Larceny" then output Model_LA;
	else if Model = "Log Motor Vehicle Theft" then output Model_MV;
	else if Model = "Log Firearm Death Rate" then output Model_FDR;
	else if Model = "Log Suicide Deaths" then output Model_SD;

	drop Model;
run;


data Model_VC(rename=(EditedResults=LogViolentCrime))
		Model_HC(rename=(EditedResults=LogHomicide))
		Model_RB(rename=(EditedResults=LogRobbery))
		Model_AA(rename=(EditedResults=LogAggravatedAssault))
		Model_PC(rename=(EditedResults=LogPropertyCrime))
		Model_BU(rename=(EditedResults=LogBurglary))
		Model_LA(rename=(EditedResults=LogLarceny))
		Model_MV(rename=(EditedResults=LogMotorVehicleTheft))
		Model_FDR(rename=(EditedResults=LogFirearmDeathRate))
		Model_SD(rename=(EditedResults=LogSuicideDeaths));
	set Table_Long_Sorted;

if Model =: "Log Violent Crime" then output Model_VC;
else if Model =: "Log Homicide" then output Model_HC;
else if Model =: "Log Robbery" then output Model_RB;
else if Model =: "Log Aggravated Assault" then output Model_AA;
else if Model =: "Log Property Crime" then output Model_PC;
else if Model =: "Log Burglary" then output Model_BU;
else if Model =: "Log Larceny" then output Model_LA;
else if Model =: "Log Motor Vehicle Theft" then output Model_MV;
else if Model =: "Log Firearm Death Rate" then output Model_FDR;
else if Model =: "Log Suicide Deaths" then output Model_SD;

drop model;
run;


data Table_Wide;
	merge Model_VC Model_HC Model_RB Model_AA Model_PC Model_BU Model_LA
Model_MV
		Model_FDR Model_SD;
	by Parameter;

	/* Keep only DID and Intercept */
	if Parameter in ("did", "Intercept");
```

```
	length Order 6;
	if Parameter = "did" then Order = 1;
	else if Parameter = "Intercept" then Order = 2;

run;

proc export data=Table_Wide
	outfile="/home/u63734064/MySAS/Tablewide"
	dbms=xlsx
	replace;
run;




/* Number of Observations */
data NumObs;
	merge ObsVClog(rename=(NValue1=LogViolentCrime))
ObsHClog(rename=(NValue1=LogHomicide))
		ObsRBlog(rename=(NValue1=LogRobbery))
ObsAAlog(rename=(NValue1=LogAggravatedAssault))
		ObsPClog(rename=(NValue1=LogPropertyCrime))
ObsBUlog(rename=(NValue1=LogBurglary))
		ObsLAlog(rename=(NValue1=LogLarceny))
ObsMVlog(rename=(NValue1=LogMotorVehicleTheft))
		ObsFDRlog(rename=(NValue1=LogFirearmDeathRate))
		ObsSDlog(rename=(NValue1=LogSuicideDeaths));
	by Label1;
	where Label1="Number of Observations";
	keep LogViolentCrime LogHomicide LogRobbery LogAggravatedAssault
LogPropertyCrime LogBurglary
		LogLarceny LogMotorVehicleTheft LogFirearmDeathRate LogSuicideDeaths;
run;

/* Adjusted R-Squared */
data AdjRsq;
	merge AdjRsqVClog (rename=(CValue1=LogViolentCrime) drop=NValue1)
		AdjRsqHClog (rename=(CValue1=LogHomicide) drop=NValue1)
		AdjRsqRBlog (rename=(CValue1=LogRobbery) drop=NValue1)
		AdjRsqAAlog (rename=(CValue1=LogAggravatedAssault) drop=NValue1)
		AdjRsqPClog (rename=(CValue1=LogPropertyCrime) drop=NValue1)
		AdjRsqBUlog (rename=(CValue1=LogBurglary) drop=NValue1)
		AdjRsqLAlog (rename=(CValue1=LogLarceny) drop=NValue1)
		AdjRsqMVlog (rename=(CValue1=LogMotorVehicleTheft) drop=NValue1)
		AdjRsqFDRlog (rename=(CValue1=LogFirearmDeathRate) drop=NValue1)
		AdjRsqSDlog (rename=(CValue1=LogSuicideDeaths) drop=NValue1);
```

```
    where Label1="Adjusted R-Square";
run;



/*Overall Significance*/
data OSM_LogVC(rename=(EditedFValue=ViolentCrime))
     OSM_LogHC(rename=(EditedFValue=Homicide))
     OSM_LogRB(rename=(EditedFValue=Robbery))
     OSM_LogAA(rename=(EditedFValue=AggravatedAssault))
     OSM_LogPC(rename=(EditedFValue=PropertyCrime))
     OSM_LogBU(rename=(EditedFValue=Burglary))
     OSM_LogLA(rename=(EditedFValue=Larceny))
     OSM_LogMV(rename=(EditedFValue=MotorVehicleTheft))
     OSM_LogFDR(rename=(EditedFValue=FirearmDeathRate))
     OSM_LogSD(rename=(EditedFValue=SuicideDeaths));

   set OSMVClog(in=a) OSMHClog(in=b) OSMRBlog(in=c) OSMAAlog(in=d)
      OSMPClog(in=e) OSMBUlog(in=f) OSMLAlog(in=g) OSMMVlog(in=h)
      OSMFDRlog(in=i) OSMSDlog(in=j);

   if Effect = "Model";

   length Star $3;
   if ProbF <= 0.01 then Star = "***";
   else if ProbF <= 0.05 then Star = "**";
   else if ProbF <= 0.1 then Star = "*";
   else Star = "";

   Label1 = "Overall Significance";
   EditedFValue = cats(put(FValue, comma20.2), Star);

   if a then output OSM_LogVC;
   else if b then output OSM_LogHC;
   else if c then output OSM_LogRB;
   else if d then output OSM_LogAA;
   else if e then output OSM_LogPC;
   else if f then output OSM_LogBU;
   else if g then output OSM_LogLA;
   else if h then output OSM_LogMV;
   else if i then output OSM_LogFDR;
   else if j then output OSM_LogSD;

   keep Label1 EditedFValue;
run;
```

```
data OverallSig;
	merge OSM_LogVC OSM_LogHC OSM_LogRB OSM_LogAA OSM_LogPC
	    OSM_LogBU OSM_LogLA OSM_LogMV OSM_LogFDR OSM_LogSD;
	by Label1;
run;


/* Export Adjusted R-Squared values */
proc export data=AdjRsq
   outfile="/home/u63734064/MySASAdjusted_RSquared"
   dbms=xlsx
   replace;
run;

/* Export Overall Significance values */
proc export data=OverallSig
   outfile="/home/u63734064/Overall_Significance"
   dbms=xlsx
   replace;
run;


proc export data=NumObs
   outfile="/home/u63734064/Overall_Significance"
   dbms=xlsx
   replace;
run;
```