Concealed Carry Laws and Fatal Police Encounters

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Abstract

This paper explores the effect of concealed carry laws on violence during police encounters. I study the staggered rollout of: (1) right-to-carry (RTC) laws allowing qualified citizens to carry concealed weapons, and (2) permitless carry (PC) laws, which requires no permits. Under both RTC and PC, non-fatal assaults of officers increase. Yet, only under PC laws do fatal shootings of suspects rise–disproportionately affecting minorities–and fewer police are killed in action. Gun laws affect the risk that police face and importantly affect the ultimate outcomes of police encounters.

Keywords: police shootings, concealed carry laws, police behavior, police violence, right-to-carry, permitless carry.

JEL Codes: K14, K40, K42.

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1 Introduction

Recently highly-publicized fatal police shootings, mostly of unarmed minorities, have sparked heated discussions over police behavior and reform(Ray and Neily, 2021; Subramanian and Arzy, 2021; Thompson, 2021). Implementing meaningful reforms requires understanding the factors that trigger violent police behavior and how to mitigate them. One potentially decisive factor is how much danger police believe they are in during an encounter (Nieuwenhuys et al., 2012a,b, 2015). That level of danger may be influenced by the police's perception of whether suspects are armed, legally or not. Indeed, in 57% of police shooting, according to the Washington Post, the victim had a firearm.[1] Concealed carry laws, which regulate who can carry concealed weapons, could affect the likelihood of police encountering a suspect who is armed, as well as what to believe about an armed suspect. Therefore, these laws could affect the uncertainty and risk that police face, and ultimately the frequency of violent police interactions.

In this paper, I examine how concealed carry laws influence police interactions with the public in three parts. I begin by estimating how these laws affect how often police encounters result in a fatal police shooting or in the police themselves being killed or assaulted.[2] Second, I examine potential mechanisms through which these laws could impact police violence. Finally, I conclude by considering how the impact of concealed carry laws on fatal police shootings varies by suspects' race.

I do so by leveraging variation of concealed carry laws at the state level, and I evaluate the effects of two different types of laws: Right-to-carry (RTC) and Permitless carry (PC). RTC laws allow any citizen who satisfies the state's requirements to obtain a concealed carry permit and therefore carry a concealed weapon. Under PC, a permit to carry a concealed weapon is not needed. Up to 2021, RTC is ubiquitous. All but eight states have enacted RTC laws which are either still in effect today or have been succeeded by more lenient laws. The latest trend in concealed carry laws is the Permitless carry. Though little is known

[1] According to the Washington Post data, from the people fatally shot by police from 2015 to 2019 more than 93% were armed.

[2] Mustard (2001) studied whether RTC laws affect felonious deaths of police officers and found that the number of officers' felonious deaths decreases. Crifasi et al. (2016) studied the effect of RTC laws on deaths and non-fatal assaults of officers and found no association with fatal or non-fatal assaults.

about the effects of these laws, as they have been adopted by states in more recent years, there is a growing number of states implementing them. In 2014 there were four states that had enacted PC laws and by 2021 seventeen more, for a total of 21 states.

The impact of concealed carry laws are ambiguous because they have the potential to affect violent police incidents in several ways. More lenient concealed carry laws could increase the likelihood of police interacting with armed citizens as more people are allowed to carry guns. They also introduce uncertainty both as to who is armed since the weapon will be carried in a concealed manner, and on the composition of armed people that police might run into, particularly as to whether they are armed law-abiding citizens or criminals.[3,4,5] Therefore concealed carry laws could increase officers' exposure to risk, resulting in a more aggressive police force and an increase in violent police incidents. On the other hand, knowing that more armed individuals could now be law-abiding citizens, officers may become more cautious and less hasty in their reactions to, and interactions with, potential criminals. In which case the incidence of police violence may decrease or remain unchanged. The effects of concealed carry laws, however, are even more nuanced, as they may affect intermediate outcomes which in turn are likely to affect police violent incidents as crime, for example.

To study the effects of concealed carry laws on fatal police shootings I use data for the 50 states and the District of Columbia, that come from two different sources: the Fatal Encounters database that spans the years 2000 to 2021, and the Washington Post database that covers the years 2015 to 2021.[6] To explore the effects of concealed carry laws on killed and assaulted law enforcement officers I use data from the FBI Law Enforcement Officers Killed and Assaulted (LEOKA) Program that spans the years 2000 to 2019. As previously mentioned, this paper studies two transitions: the switch from restricted and may-issue laws

[3]The uncertainty as to who is armed can be illustrated by an incident in Arizona where officers confronted an unarmed but intoxicated man they incorrectly believed had a gun. During the encounter, officers killed him with five bullets while he was on the floor, because he moved his hand to pull up his slipping pants.

[4]The composition of armed people depends on the context in which a person could carry a concealed weapon and so it differs from RTC to PC.

[5]The confusion on the intentions of armed people can be illustrated by two examples. First, at an Alabama mall, police responding to the scene shot and killed Emantic Fitzgerald Bradford Jr.. Police had mistook him for the shooter as he was assisting civilians while holding his legal gun (McLaughlin and Holcombe, 2018). Another example in Minnesota is Philando Castile who was shot seven times by an officer, during a traffic stop. Castile had informed the officers that he had a concealed carry permit, and when he tried to reach for his license and registration the officer believed that he was reaching for the gun.

[6]However the analysis will be from 2000 to 2019.

(where none or few citizens are allowed to carry concealed weapons) to RTC, and the move from RTC to PC.[7] To estimate the causal effects of the difference-in-differences setup with staggered treatment adoption, I use Callaway and SantAnna (2021)'s new estimator (CS). Additionally, in the appendix I contrast the CS results with the ones from the classical two-way fixed effects (TWFE) model.

I find that when a state moves from restricted or may-issue to RTC, assaults of officers rise but there is no detectable increase in fatal police shootings or officers killed. However, when a state switches from RTC to PC the environment becomes more uncertain and volatile. An increase in assaults against the police is now met with a large (13%) increase in fatal police shootings, coupled with a decrease in police officers' deaths. Overall, under both RTC and PC assaults of officers increase but it's only under PC when officers are fearful about the weapons and the weapon carriers that this is resulting in additional violence.

To further disentangle the findings, I examine the composition of armed people, shaped by the different criteria for carrying a concealed gun under each concealed carry law, and four intermediate outcomes that may affect violent police incidents: crime rates; number of police officers; prevalence of guns, using the percentage of suicides committed by gun as a proxy; and the number of police interactions with the public, estimated by the rate of arrests.[8]

The results suggest that under PC, the increase in fatal police shootings can be attributed to the fact that citizens who under RTC were unqualified to acquire a concealed carry permit, can now carry a concealed weapon, increasing the risk that police officers face. Unqualified citizens based on the requirements to obtain a concealed carry permit under RTC, can be classified into two categories:[9] 1) those who are unfit to own a gun and 2) those who do not have the necessary training to carry a gun. The former category refers to people with a violent history or alcohol-related problems or are mentally unstable and could obtain guns by exploiting legal loopholes that exist in the majority of states. In principal, the concealed

[7]As show in Figure 1, concealed carry laws have only ever loosened or stagnated; that is, there are no instances of transitioning from PC to RTC or from RTC to restricted or may-issue.

[8]In regards to the four intermediate outcomes, I find that under both RTC and PC violent crime rates, prevalence of guns, and number of police officers increase, while arrest rates decrease but not in a statistically significant way.

[9]Under RTC applicants applying for a concealed carry permit must meet certain state requirements, such as background checks, firearm safety class certifications, and demonstrations of handgun proficiency.

carry permit, imposed under RTC, prevents these individuals from carrying a concealed gun in public. The second category includes people who carry concealed guns but have not taken any firearm safety classes or any basic firearms proficiency exams, actions, and certificates that would have been required under RTC laws.[10] Therefore, when switching from RTC to PC, the pool of law-abiding citizens who can carry a concealed gun increases but so does the potential risk that they pose.

The existence of unqualified citizens and the uncertainty they create for officers raise more than just theoretical arguments. Police officers themselves have expressed their concerns regarding arming unqualified citizens, and various police chiefs and unions have opposed PC for those reasons. (Gorman, 2017; Shepperson, 2017; Goudeau, 2017; Robertson and Williams, 2016; Yablon, 2016).

Breaking down the concealed carry effect by race I find that under RTC, consistent with the overall effect, there is no indication of a change in fatal police shootings regarding the race of the suspect. However, under PC the positive effect on fatal police shootings is driven by the minorities.[11] The circumstances of fatal police shootings vary also by race, under PC. There is a larger increase in dangerous incidents from the officer's perspective, involving black suspects compared to white. Incidents where the suspect attacks the officer(s), is not fleeing the scene, and is armed increase more under PC for black suspects that white. However, the increase of armed black suspects that are fatally shot is driven by suspects not armed with a firearm.

The findings of the paper are important for policy because we cannot speak about police shootings without considering all perspectives. In this case PC allows unqualified citizens to carry concealed guns increasing the risk and uncertainty that officers face. That escalates violence which then progresses with officers defending themselves, possibly resulting in more shootings. If we are to address police shootings we must also address what conditions police

[10] Rowhani-Rahbar et al. (2018) conduct a nationally representative survey in 2015 and find that concealed carry permit holders are the most-trained gun owners, 83% of them having taken some formal training.

[11] In Fatal Encounters data 22% of race is being imputed, and in 3% of the data, the deceased's race is missing. As shown in Figure A9 in the Appendix, at the beginning of the sample period the percentage of unspecified race is almost 60%, dropping down to less than 20% in the last 9 years. States adopted RTC mostly in the middle of the sample period in contrast to PC which was adopted by most of the states in the last 5 years. Therefore RTC estimates by race should be interpreted with caution. The results are also consistent when using the sample with the not imputed race, as shown in Appendix G.

officers face and what they are doing in response.[12]

Moreover, this paper contributes to three different literatures: First, it contributes to the concealed carry literature. With much attention being paid to the effect of concealed carry laws on crime, the consequences that these laws can have on police officers work has been largely overlooked.[13] To my knowledge this is the first paper to study the effect of concealed carry laws on fatal police shootings. In addition, it explores the effect of Permitless carry laws, which so far have been understudied as they have been adopted by states in more recent years. Overall, the findings of the paper contributes to the debate on how concealed carry laws affect social welfare.

Second, this paper is related to the literature of police behavior, police violence, and racial bias in policing .[14,15] Specifically it explores the decision making of police officers under uncertainty and how laws can change the environment in which officers operate. Furthermore, even though the paper does not speak directly on racial disparities in fatal police shootings caused by concealed carry laws it contributes in detecting heterogeneous treatment effects and exploring how the circumstances in fatal police shootings differ by race.

Lastly, the paper utilizes the CS estimator, a new approach that has emerged from the growing literature on difference-in-differences for dealing with staggered treatment adoption.

[12]This paper does not make any claims on whether police shootings are justified or unjustified. It simply states that concealed carry laws, specifically PC, can increase the risk that officers face and thus may affect the way they behave.

[13]Advocates of lenient concealed carry laws, particularly RTC argue that permitting citizens to carry concealed weapons can discourage criminals from committing violent crimes (Lott, 2010; Lott and Mustard, 1997; Moody and Marvell, 2008; Moody et al., 2014). In contrast, those opposed to RTC laws argue that more guns in the streets will promote a culture of violence, hence increasing violent crimes (McDowall et al., 1996; Zimmerman, 2014; Siegel et al., 2017). Some consider different effects in terms of types of crime, degree of gun prevalence, region, level of urbanization, and the time period (Manski and Pepper, 2018; Durlauf et al., 2016); while others, reanalyzing and testing the Lott and Mustard (1997) results showed that their estimates are highly "fragile" and "sensitive"(Duggan, 2001; Black and Nagin, 1998; Donohue and Ayres, 2003; Aneja et al., 2011; Durlauf et al., 2016). Although it remains unclear whether RTC causes more crime (National Research Council, 2005), modern findings present strong evidence that ten years after enacting an RTC law a state's rate of violent crime increases by up to 15% (Donohue et al., 2019).

[14]The literature explores how various factors can affect police behavior and police violence, such as, but not limited to, the characteristics of the officer (Friedrich, 1980; Eugene A. Paoline and Terrill, 2007; Ridgeway, 2016; Rozema and Schanzenbach, 2019), the characteristics of the suspect and the encounter (Friedrich, 1980; Edwards et al., 2019), the militarization of the police force (Bove and Gavrilova, 2017; Harris et al., 2017) and the liability of officers, for example the use of body worn cameras (Ariel et al., 2016, 2017) and the existence of collective bargaining rights (Dharmapala et al., 2020; Cunningham et al., 2021).

[15]Recent research that has focused on racial bias of police officers are Donohue and Levitt (2001); Anwar and Fang (2006); Fryer (2019); Hoekstra and Sloan (2020).

It compares the traditional TWFE approach with the CS and demonstrates the severity of TWFE's bias by finding results with opposite sign of the RTC effect.[16]

The remainder of this paper proceeds as follows: Section 2 provides background information regarding concealed carry laws. Section 3 discusses the conceptual framework, and section 4 describes the data and presents the empirical strategy. In sections 5 and 6 I estimate the concealed carry effects of police violent incidents, and how they vary by race, respectively. Section 7 concludes.

2 Concealed Carry Laws Background

Concealed carry laws vary by state in many ways. They differ in terms of the types of background checks required, length of waiting periods, and minimum requirements, among many other aspects. States can be classified in four broad categories based on how easy the process to legally carry a concealed weapon in public is for a private citizen.

The most regulated category is restricted or no-issue; states in this category prohibit any concealed carry of guns in public. Next is may-issue, where a citizen may obtain a permit if he/she both meets the state requirements and demonstrates "good cause" and/or "good character". Therefore, under these laws local authorities have considerable discretion in granting or denying a concealed carry permit, and it is not guaranteed that the applicant will be issued one even if she meets the general requirements.

Then there is the shall-issue category, also known as right-to-carry (RTC); in states falling under this category, the applicant can get a concealed carry permit as long as he/she meets the state requirements, which many times include background checks, firearm safety class certifications, and demonstrations of handgun proficiency. Last are the unrestricted states, where people are not required to have a permit to carry a concealed weapon in public; this is also known as Permitless carry (PC), Constitutional carry, and Vermont carry. Figure 1 shows changes of the concealed carry laws from 2000 to 2019 for the 50 states and the District of Columbia.[17]

[16]For the TWFE results of the effects of concealed carry laws on fatal police shootings as well as on law enforcement officers killed and assaulted see Appendix C and Appendix D, respectively.

[17]In the state of Arkansas, even though the PC law passed on August 16, 2013, there was a general

Up to the mid 1990s, the majority of states were either no-issue or may-issue states, and over time, they started to adopt RTC policies. In 2014 Illinois was the last state under restricted laws. Over the last few years there has been a growing trend of states switching from RTC to PC. As shown in Figure 1, in 2014 only 5 states had PC, and within the next five years, nine more switched, for a total of 14 PC states in 2019.

So far, the literature investigating the effect of these laws on crime rates is focusing on the transition from no-issue or may-issue to RTC. This paper studies both the transition from more strict states (no- and may- issue) to RTC and the newer trend, the transition from RTC to PC since data from more recent years has been made available.

3 Conceptual Framework

In this section I discuss two mechanical changes and four intermediate outcomes that can influence the effect of concealed carry laws on police violent incidents.

3.1 Mechanical changes

All else constant, the changes we would observe by relaxing the requirements for carrying a concealed gun would be: first, more people will be allowed to be armed, and second, there will be a change in the composition of armed people.

Likelihood of Carrying a Gun.

In both transitions, from restricted laws to RTC, and from RTC to PC, the probability of running into an armed person increases. This, in principle, should translate into an increase in the risk police face and in turn into more aggressive behavior and higher incidence of police violent encounters. However, in practice, this may not necessarily be the case. The way police react to the increase in the number of armed individuals will depend also on the characteristics of those recently armed as a result of the law change. For instance, the knowledge that any given individual carrying a gun is not necessarily breaking the law may lead police officers to be less impulsive in their interactions with armed citizens. Therefore,

confusion among civilians and officials regarding the interpretation of the law. The confusion was cleared in October 17, 2018 after the Arkansas Court of Appeals issued a ruling confirming that permitless carry is legal. (https://www.usacarry.com/arkansas-permitless-carry/)

in order to understand how this increase in the likelihood of running into an armed person will affect police shootings, we must determine the characteristics of those who will be newly armed in each case.

Composition of Armed Citizens.

Even though under RTC laws, unlike in may-issue states, applicants for a concealed carry permit do not have to demonstrate "good cause" and/or "good character", they still have to meet the state requirements. In addition to minimum age and residency, many times states with RTC laws require background checks, rearm safety class certificates, and demonstration of handgun proficiency. In fact, it has been found that concealed carry permit holders are the most-trained gun owners, with 83% of having taken some formal training (Rowhani-Rahbar et al., 2018). Therefore, when a state adopts RTC it, in principle, gives only to citizens who are law abiding, trained, and mentally sound the opportunity to carry a concealed weapon. In theory, these newly armed individuals should not cause any risk to police officers.

On the other hand, under PC, none of the requirements mentioned above are mandatory, and citizens who were once considered unqualified under RTC can now carry concealed weapons. Based on the RTC requirements that do not apply under PC we could classify unqualified citizens into two broad categories. First, are those who would have failed the background check for being deemed unfit to own a gun, and second are those who are untrained and lack the necessary knowledge to carry a gun. People in the former category would have been denied the concealed carry permit for reasons such as violent history, alcohol-related problems, and mental issues.

Concealed carry laws are not the only laws that regulate access and use of guns, and PC itself does not solely explain the acquisition of guns by unfit citizens, other laws (particularly, background checks) are in place to regulate that. However, even though background checks on all buyers that purchase a firearm from a licensed dealer are required by federal law, they are not required for private sales of firearms (for example, at gun shows). In these situations, enforcement of background checks is up to state laws or the discretion of the seller.[18] All

[18]Currently, there are 18 states that expanded background check to all firearm purchases, while in 33 states the private sales loopholes through which unfit people can buy a gun legally without being detected by the system remains open. In addition, all but 6 states and the District of Columbia do not require any type of gun registration.

13 states that adopted PC do not have laws that address the private sales loopholes and do not require gun registration. Therefore, in these PC states, the concealed carry permit would have worked as a second screening for unqualified citizens, and in theory it should have prevented them from carrying a concealed gun in public.

The second category of unqualified citizens includes people who would have been denied the concealed carry permit under RTC laws for not taking any firearm safety classes or any basic firearms proficiency exams. Since obtaining a concealed carry permit is not compulsory under PC laws, gun owners who would have chosen to take safety classes and training only if the law required it, now choose not to, and will carry a concealed gun without a permit.

Therefore, when switching from RTC to PC, the increase in the probability of running into an armed person is accompanied by an increase in the threat that armed people pose because it is more likely they are unfit to handle the ownership of a gun. At the same time, unqualified armed civilians could create uncertainty in regards to the quality of the larger armed population. This creates general confusion for the police officers as to which armed law-abiding citizen may be a threat, which in turn, causes negative spillovers to police interactions with qualified armed citizens.

Finally, changes in the composition of armed individuals under PC would only cause a change in the behavior of police officers if they themselves were concerned about the qualifications of the newly armed citizens. This is evident by the fact that various police chiefs and unions have vocalized their worries and opposition when it comes to PC and who can carry a concealed gun under these laws (Gorman, 2017; Shepperson, 2017; Goudeau, 2017; Robertson and Williams, 2016; Yablon, 2016). The following statement from the Charleston Police Chief Greg Mullen, when South Carolina was considering passing PC in 2017, summarizes the aforementioned arguments: "...this [PC] bill creates-the ability for anyone who can legally purchase a rearm, many who have not completed a background check or received any type of training, to walk our streets and neighborhoods with a handgun on their hip, in a bag or under their jacket without any review or training"(Gorman, 2017).

3.2 Intermediate outcomes

Crime Rate.

The most obvious factor that affects police behavior is crime. When crime increases, violent police encounters are also likely to increase as a reaction. The concealed carry literature on how RTC laws affect crime, however, is divided. Following the most recent findings by Donohue et al. (2019), a state's rate of violent crime can increase by up to 15%, ten years after enacting an RTC.

Number of Law Enforcement Officers.

Another factor that can affect the number of violent police outcomes is the number of law enforcement officers. A higher number of police officers may lead to an increase in violence, as the frequency of encounters between police officers and civilians would also increase. However, at the same time, a bigger police force might decrease crime which in return would decrease the number of violent incidents. Donohue et al. (2019) finds that states that adopt RTC laws increase the size of their police force by about 7-8%.

Prevalence of Guns.

More lenient gun laws can make the idea of owning a gun more appealing and, consequently, increase the number of gun owners and guns carried in public. This would eventually increasing the likelihood of police officers running into an armed person.[19]

The nonexistence of administrative data on firearm ownership (Cook and Ludwig, 2006) has forced researchers to look for substitutes. The most widely used proxy for gun prevalence is the percentage of suicides committed with guns (PSG) (Kleck, 2004; Azrael et al., 2004; Moody and Marvell, 2005; Cook and Ludwig, 2006; Siegel et al., 2013; Nagin, 2020; Fridel, 2021), and it is the one being used in this paper.

Number of Police Interactions with the Public.

More/fewer interactions between police and the public might lead to more/less violent encounters, and in turn can affect the number of police shootings.

Donohue et al. (2019) argues that RTC impairs police officers and discuss three possible causes. First, the allocation of police time among different tasks could change. Police officers instead of going after violent criminals, would have to deal with more bureaucratic tasks (such as issuing and checking RTC permits in every interaction that involves a gun),

[19] Nagin (2020) finds that statewide prevalence of gun ownership is positively correlated to fatal police shootings and Sheppard et al. (2021) find that more fatal police shootings occur in counties with high levels of household gun ownership.

tracking stolen guns, and gun accidents. Second, police officers may be discouraged by concealed weapons and prefer to initiate interactions with individuals who are most likely to be armed, only if they believe that it is absolutely necessary. The number of police interactions under RTC could decrease for these two reasons. Lastly, armed law-abiding citizens may hinder police work either unintentionally, by making it harder to identify the actual criminal or intentionally through vigilante efforts to catch criminals.[20] This may not directly affect police interactions but can impact the number of arrests, which is the proxy for police interactions that I use in the paper.

Taking into consideration Donohue et al. (2019)'s arguments, the effects of PC on police interactions are ambiguous. Unlike RTC, under PC, law enforcement might not have to issue as many concealed carry permits and deal with the bureaucratic aspect of the law. On the other hand, more non-violent incidents involving guns might occur, demanding even more time, or as the risks they face increase officers may shy away more.

As I mentioned earlier, I will proxy police interaction with the rate of arrests. A valid concern when using arrests as a proxy for police interactions is that, in a given encounter, being armed or unarmed may affect the likelihood of being arrested and, therefore, we may see a change in arrests even if the number of interactions remains the same. However, as I am comparing the RTC and the PC regimes, as long as these laws affect the probability of arrest only through the likelihood of the person subject to the interaction having a gun, and as long as the direction and the magnitude of that relationship doesnt change across RTC and PC, arrests are a valid proxy for police interactions. If being armed increases/decreases the probability of being arrested in the same way regardless of the type of concealed carry law, then arrests underline the same number of interactions under both RTC and PC.

[20] As illustrated in Donohue et al. (2019), in November 2017 in Denver law-abiding citizens had unintentionally hindered police work, and "delayed the investigation" when they pulled out their handguns during a shooting at a Walmart (Simpson, 2017). An example of an intentional intervention on police work by a good guy with a gun is the incident that took place in Illinois on 2014. While a police officer was chasing an armed robber, a concealed carry permit holder fired towards the criminal."Since the officer did not know where the shots were fired from, he was forced to terminate his foot pursuit and take cover for his own safety" (Glanton and Sadovi, 2014).

4 Data and Empirical Strategy

4.1 Data

Fatal police shootings.

Data on the number of fatal shootings by law enforcement officers is obtained at the state level from two different sources: the Fatal Encounters.org database, and the Washington Post database.[21,22]

The Fatal Encounters project is run by journalist D. Brian Burghart, and is a first step in creating a "*national database of people killed during interactions with law enforcement*". The data set includes all types of incidents where a person died in front of a police officer, either on- or off-duty. In order to eliminate noise from self-inflicted gunshot wounds, suicides, accidents, and criminal activity, I define fatal police shootings as an event where a person that is neither a relative nor an acquaintance of the officer is fatally shot by a firearm fired by a police officer, either on-duty or operating under the capacity of law enforcement.[23] Data collection starts from 2000 and goes up to date. Fatal Encounters provides information on the race, age, and gender of the individual fatally shot by police officers, however, it does have two main limitations. First, in more than a third of the incidents, mostly prior to 2013, the race of the deceased is not specified.[24] Second, Fatal Encounters data do not consistently provide enough information about the incidents, such as if the deceased was armed/unarmed, their mental state, or why the officer(s) became involved, which therefore limits the possibility of more detailed analysis.

The Washington Post dataset improves on the limitations of the Fatal Encounters dataset by providing more detail on the incident level. In addition to the race, age, and gender of the individuals fatally shot by police officers, it provides information on whether the victim was armed, what they were armed with, whether he/she was fleeing the scene, and if he/she

[21] http://www.fatalencounters.org

[22] https://github.com/washingtonpost/data-police-shootings

[23] Excluding cases where the police officer is in civilian clothing, on- or off-duty, being the victim of casual criminal activity, and uses the gun in self-defense.

[24] To address this, Fatal Encounters imputed the missing race using the Bayesian Improved Surname Geocoding (BISG)(Elliott et al., 2008). Figure A9 in the Appendix shows the percentage and number of victims with unspecified race by year before and after the imputation.

had signs of mental illness. The only drawback of the Washington Post data is that it is only available for the years 2015 onward. For this reason it is used only to study the PC effects.

Summary statistics of the two data sources for fatal police shootings are shown in Table 1. When comparing columns (2) and (3), which report averages for the same time period, 2015 to 2019, we observe that Fatal Encounters and the Washington Post are consistent in both the characteristics of the victim and the average number of people shot and killed by police officers. For the years 2015 to 2019 the average age of the deceased is 36 to 37 years old, more than 95% are male, half are white, and around a quarter are black. Moreover, the average number of deaths by gun per state-year is between 19 and 20 and the average rate per million people ranges from 3.5 to 3.7. Appendix A provides a more detailed comparison of the two data sources.

Law Enforcement Officers Killed or Assaulted .

To estimate the effect of concealed carry laws on killed and assaulted officers I use data from the FBI Law Enforcement Officers Killed and Assaulted (LEOKA) Program that spans the years 2000 to 2019.

Data on police officers feloniously killed in the line of duty is at the state level and is obtained directly from the FBI website.[25] As shown in Panel A of Table 2 the average number of officers killed by firearm per state-year is 0.89 and the average rate per 100,000 police officers is 5.6. Fewer officers are being killed by other means with the average number per state-year being 0.15 and the average rate per 100,000 police officers 0.655.

Regarding the data on officers assaulted while performing their duties I utilize the concentrated files compiled by Jacob Kaplan using data from the FBI's LEOKA series (Kaplan, 2021). The data is at the agency level and for the main analysis I include agencies that have been reporting to the FBI for at least 15 years, out of the sample's 20.[26] Panel B of Table 2 shows that, in contrast with police officers killed, the number of police officers assaulted by firearm is more than 26 times smaller that the number of officers assaulted by other means. The average number of law enforcement officers assaulted by firearm per agency-year is 0.71 and 18.91 by other means. The average rate per 10,000 police officers is 34.69 and 976.53,

[25] https://www.fbi.gov/services/cjis/ucr/leoka

[26] For more information about the cleaning data process see Appendix D.

respectively.

4.2 Empirical Strategy

To estimate the causal effect of concealed carry laws on violent police encounters I use a difference-in-differences quasi-experimental design with the identifying assumption of parallel trends.[27]

Until recently, the most common way of estimating causal effects in a difference-in-differences setup with staggered treatment adoption was the TWFE linear regression. However, an array of methodological papers that have come out in recent years point out possible biases that can arise from TWFE, specifically in the presence of treatment effect heterogeneity and dynamic effects (de Chaisemartin and D'Haultfuille, 2020; Goodman-Bacon, 2021; Sun and Abraham, 2021).To deal with the drawbacks of TWFE the literature has proposed a variety of new methods (Callaway and SantAnna, 2021; de Chaisemartin and D'Haultfuille, 2020; Sun and Abraham, 2021).

In this paper, I estimate the effect of concealed carry laws of violent police encounters using both the traditional TWFE estimator, as well as the new estimator proposed by Callaway and SantAnna (2021). Even though I elaborate on both methods below, results from the TWFE analysis are reported in the appendix.[28]

4.2.1 TWFE

The TWFE linear regression models for estimating the RTC and PC effects, respectively, are:

$$Log(Y_{s,t}) = \alpha + \beta_1 \mathbf{RTC}_{s,t} + \gamma_s + \delta_t + \epsilon_{s,t} \tag{1}$$

$$Log(Y_{s,t}) = \alpha + \beta_2 \mathbf{PC}_{s,t} + \gamma_s + \delta_t + \epsilon_{s,t} \tag{2}$$

The variables $\mathbf{RTC}_{s,t}$ and $\mathbf{PC}_{s,t}$ are dummy variables, indicating when a state has RTC or PC, respectively. These dummy variables turn on the first year that the law has been in effect

[27]For evidence regarding the parallel trends assumption see Appendix B.

[28]For the TWFE results of fatal police shootings and of law enforcement officers killed and assaulted see Appendices C and D, respectively.

for at least half a year, and remain turned on for all future years following.[29] In equation 1 the control group (baseline) are the states under no or may-issue, and the coefficient of interest is β_1 which estimates the RTC effects. In equation 2, the omitted category is the RTC states, and β_2 reflects the PC effects. Figures A3 and A4 in the appendix present the states that belong to the control and treatment groups for the RTC and the PC TWFE analysis, respectively. The outcome $Y_{s,t}$ for the main part of the analysis is defined as the number of individuals fatally shot by law enforcement per million people, in state (s) and year (t). The model includes also state (γ_s) and time (δ_t) fixed effects.

4.2.2 Callaway & Sant'Anna estimator (CS)

This paper, to overcome the possible biases of the TWFE approach and to estimate easy to interpret casual parameters will use the new estimation method (CS) proposed by Callaway and SantAnna (2021).

CS is a two-step approach estimation strategy. In the first step CS estimates the causal parameter *group-time average treatment effect*, which is the average treatment effect for group g in time t, where a group is defined by when states are first treated. The *group-time average treatment effect* allows for treatment effect heterogeneity across groups and time. In the second step, the *group-time average treatment effect* are combined to create aggregated causal parameters.

For this paper I use two summary measures of the casual effects: First, I estimate the overall average effect of participating in the treatment across all states that ever participated in the treatment. I do so by aggregating the *group-time average treatment effect* by group and then averaging these *group average treatment effects* together. This overall ATT summary measure is interpreted similarly to the ATT of the difference-in-differences setup with two periods and two groups. Finally, I aggregate the *group-time average treatment effect* by relative time to explore the dynamic effects of concealed carry laws, similar to an event study approach.

To estimate the *group-time average treatment effect*, CS uses the doubly robust estimator,

[29] Table A1 shows the dates that RTC and PC laws took effect, along with the fraction of the year that the laws are in effect the first year.

developed by SantAnna and Zhao (2020), and adapted by Callaway and SantAnna (2021) for the staggered treatment adoption setting.[30] Standard errors are calculated using a bootstrap procedure and are clustered at the state-level. For the analysis I will use both unbalanced and balanced in calendar time panels. The states that are excluded from the balanced panel are the ones that at some point had a concealed carry law irrelevant for the analysis of the concealed carry law of interest. For example if I study the effect of RTC I exclude from the analysis the state-year observations where the PC is in effect, as it is a more lenient law and not needed for estimating the RTC effect; in that case the states that are not being observed through-out the 20 years of the analysis and therefore are not balanced are the ones that eventually adopt PC.[31]

A main feature of the CS which differs from TWFE, is that it does not use the already treated states in the control group, avoiding in this way the undesirable comparison of already treated with newly treated states. The parameters are easier to interpret and any biases that rise from the presence of dynamic effects are eliminated. Figures A5 and A6 in the appendix present the states that belong to the control and treatment groups for the RTC and PC analysis of the CS approach, respectively, for both unbalanced and balanced samples. Comparing the above figures with the analogous figures of TWFE (Figures A3 and A4) show that the sample panels used in CS and TWFE can be significantly different depending on the number of states in the already treated group. Specifically, when studying the RTC effect the CS approach excludes 30 states that had already adopted RTC before the beginning of the sample, while when studying the PC effect the only state that is excluded in the CS approach compare to TWFE is Vermont which had always PC.

[30]The other methods available for estimating the CS estimator besides the doubly-robust is the inverse probability weighting method, and the outcome regression. The doubly-robust estimator is the least biased as relies on less stringent modeling conditions than the other two. For more information on doubly-robust, inverse probability weighting approach, and outcome regression see SantAnna and Zhao (2020) and Callaway and SantAnna (2021).

[31]Similarly for the PC analysis the states that are not included in the balanced panel are the ones that at some point had restricted or may-issue concealed carry laws.

5 Concealed carry laws and fatal police encounters.

5.1 Right-to-Carry Effect on Fatal Police Encounters

Fatal Police Shootings.

To estimate the RTC effect on fatal police shootings I use the Fatal Encounters data set which spans the years 2000 to 2019. Using the CS estimator, the results in Panel A of Table 3 show that when a state with restricted or may-issue laws adopts RTC, the rate of people fatally shot by police officers increases by about 4% and 7.5%, which translates to around 0.6 and 1.2 more people fatally shot by police officers every year in a given state, for the unbalanced and balanced sample, respectively.[32,33,34] However, both effects are statistically insignificant.

Figure 2 shows the effect of RTC laws on fatal police shootings using the event study approach.[35] Since different states enacted RTC laws in different years the panel is not balanced in relative time, meaning I do not observe the same number of states in each relative-time period. Sub-figure 2.a shows the unbalanced event study from periods t-5 to t+6 and sub-figures 2.b, 2.c, and 2.d present balanced event studies that differ in the relative time periods covered and therefore the number of treated states included. The results of the event-studies are consistent with the overall statistically insignificant effect of 4%.[36]

Law Enforcement Killed by firearm.

Panel B of Table 3 reports the CS estimator results on how RTC affects the number of law enforcement officers feloniously killed by firearm per 100,000 officers.[37] The analysis is at the state-year level. I find no evidence that officers are killed in action as a result of RTC

[32]For the unbalanced (balanced) sample, by multiplying the baseline mean rate of treated states, 2.6 (2.65), with the percentage increase, 4% (7.5%), I get the increase in number of people that are fatally shot by police officers per million persons every year in a given state under RTC. From Table 1 I can infer that the average population in each state is 6,000,000 people.

[33]The two states that are being dropped from the unbalanced to the balanced sample are Kansas and Missouri. For a full list of the states included in each sample see figure A5 in the appendix.

[34]The preferred transformation of the outcome is the logarithm of the rate. Figure A2 in the appendix shows the distributions of the different outcome transformations. Only 5% of the observations (state-year) report zero fatal police shootings.

[35]The event study is estimated by aggregating the CS group-time average treatment effects by relative time.

[36]Appendix C shows the RTC effect using the inverse hyperbolic sine transformation of the outcome variable, the TWFE model, and the Sun and Abraham (2021)'s event study approach.

[37]The average number of police officers per state is 18,994.

laws. The results are compatible with Crifasi et al. (2016), though are not consistent with those found by Mustard (2001), who concluded that RTC laws decrease the likelihood of a felonious death.[38]

Law Enforcement Assaulted by firearm

Panel C of Table 3 reports the CS estimator results on how RTC affects the number of law enforcement officers assaulted by firearm per 10,000 officers.[39] This time the analysis is at the agency-year level. In columns (1) and (2) using the logarithm there is some indication of an increase in assaults. Though the effects are not statistically significant, they are large in magnitude.

Looking at the rates in columns (3) and (4) the rate of assaults increases by almost 13 and 12 assaults by agency-year per 10,000 officers, both effects are statistically significant.[40] The results are not consistent with the ones that Crifasi et al. (2016) found as they conclude that RTC laws are not associated with increased risk of officers' assault.

Overall under RTC I find no indication of an increase in fatal shootings between officers and civilians. The increase in officers's assaults can be attributed to an increase in crime, as seen in the analysis that follows, but overall those interactions do not seem to escalate to the point in which an officer is fatally shooting the suspect.

5.2 Permitless Carry Effect on Fatal Police Encounters

Next, I estimate the move from RTC to PC, in which citizens who previously needed to acquire a permit to carry a concealed gun, no longer need to.

Fatal police shootings

To estimate the effects of PC on fatal police shootings I use both the Fatal Encounters and the Washington Post data. Panel A of table 4 presents the PC effects using the Fatal Encounters data for the years 2000 to 2019, and the analysis is at the yearly level. Using the CS estimator, the results show that when a state from RTC laws adopts PC, the rate of

[38]For estimates using a TWFE model for both linear and Poisson regressions, as well as using the inverse hyperbolic sine transformation of the outcome variable see Appendix D.

[39]The average number of police officers per agency in the sample is 150.

[40]Due to a large amount of zero assaults reported (above 85%), the preferred outcome transformation is the rate. For estimates using a TWFE model for both linear and Poisson regressions, as well as using the inverse hyperbolic sine transformation of the outcome variable see Appendix D.

people fatally shot by police officers increases by around 13% and 11%, for the unbalanced and balanced panel, respectively. That translates to around 1.8 and 1.7 more people fatally shot by police officers per year in a given state.[41,42,43] This effect is statistically significant at the 5% level.

Panel B of table 4 presents the PC effects using the Washington Post data. The analysis is at the quarterly level and covers the years 2015 to 2019. Consistent with the findings from the Fatal Encounters data, the CS estimator shows that when a state from RTC laws adopts PC, the rate of people fatally shot by police officers increases by around 19%, for both the unbalanced and balanced panel. That translates to around 1.16 more people fatally shot by police officers per quarter in a given state.[44]

Similar to Figure 2 , Figure 3 shows the effect of PC laws on fatal police shootings using the event study approach and the Fatal encounters data. Sub-figure 3.a shows the unbalanced event study from periods t-5 to t+5 and sub-figures 3.b, 3.c, and 3.d present balanced event studies that differ in the relative time periods covered and therefore the number of treated states included. The results of the event-studies are consistent with the overall statistically significant effect of 13%.[45]

Law Enforcement Killed by firearm.

Panel C of Table 4 report the CS estimator results on how PC affects the number of law enforcement officers feloniously killed by firearm per 100,000 officers. The analysis is at the state-year level. Using the logarithm of the rate of officers killed in columns (1) and (2), under permitless carry there is a large in magnitude decrease. The effect remains strongly negative and becomes statistically significant when using the rate of officers killed in columns

[41]For the unbalanced (balanced) sample, by multiplying the baseline mean rate of treated states, 2.4 (2.34), with the percentage increase, 12.7% (11.9%), I get the increase in number of people that are fatally shot by police officers per million persons every year in a given state under RTC. From Table 1 I can infer that the average population in each state is 6,000,000 people.

[42]For a full list of the states included in the unbalanced and balanced sample see figure A6 in the appendix.

[43]As mentioned earlier, the preferred transformation of the outcome is the logarithm of the rate. Figure A2 in the appendix shows the distributions of the different outcome transformations, and also only 5% of the observations (state-year) report zero fatal police shootings.

[44]For a direct comparison of the PC effect of Fatal Encounters and Washington Post data, using the same time frame and level of analysis see Appendix A.

[45]Appendix C shows the PC effect using the inverse hyperbolic sine transformation of the outcome variable, the TWFE model, and the Sun and Abraham (2021) event study approach using the Fatal Encounters data.

(3) and (4).[46]

Law Enforcement Assaulted by firearm.

Panel D of Table 4 report the CS estimator results on how PC affects the number of law enforcement officers assaulted by firearm per 10,000 officers.The analysis of the officers assaulted is at the agency-year level. The findings show a statistically significant increase in the rate of officers assaulted using both the rate and the logarithmic transformation.[47]

Overall under PC the rate of fatal police shootings where the potential suspect is killed increases and that is robust across both data sets used. This exertion of additional force by the police officers when encounter defendants is met with a reduction in their own killings and coupled with an increase in their assaults, as encounters become more volatile.

5.3 Mechanisms

The main analysis shows that states who switch from restricted or may-issue laws to RTC experience, on average, an increase of about 4% in the rate of people fatally shot by law enforcement, though the effect is statistically insignificant. Whereas RTC states that adopt PC, which is a more lenient law, experience a 13% increase in the rate of people fatally shot by law enforcement.

In this section I disentangle these results by investigating five possible mechanisms: the composition of armed people, crime rates, prevalence of guns, number of law enforcement officers, and number of police interactions with the public.[48]

The following analysis suggests that the increase of fatal police shootings under PC is due to the newly armed people that under RTC would not have been qualified for a concealed carry permit, but now are able to carry a concealed weapon. This change is the composition of armed people increases the risk that police officers face.

[46]The preferred transformation of the outcome is the rate since around 55% of the observations (state-year) have zero police fatalities. Figure A8 in the appendix shows the distributions of the different outcome transformations. For estimates using a TWFE model for both linear and Poisson regressions, as well as using the inverse hyperbolic sine transformation of the outcome variable see Appendix D.

[47]Similar to the RTC analysis, due to a large amount of zero assaults reported (above 85%) the preferred outcome transformation is the rate. In Appendix D I report estimates of the TWFE model using both linear and Poisson regressions, as well as the inverse hyperbolic sine transformation of the outcome variable.

[48]Data for crime rates, number of full-time law enforcement employees, and percentage of suicides committed by gun was obtained from the FBI's uniform crime reports, the FBI's police employee data, and NCHS, respectively. Data is at the state-year level.

5.3.1 Composition of Armed Citizens.

Concealed carry laws, as discussed in earlier sections, could change, first the likelihood of running into an armed person and second, the composition of armed people. The likelihood of carrying a gun alone cannot fully capture the effects of concealed carry laws. In both transitions, from restricted laws to RTC and from RTC to PC, the probability of running into an armed person increases, but the rate of people fatally shot by law enforcement doesn't change accordingly.

Regarding the composition of armed people, when a state adopts RTC laws, it allows law-abiding citizens that can show proof of handgun proficiency and pass a background check to carry a concealed weapon. In contrast, under PC a permit is not needed and unfit and untrained people who would have been denied the concealed carry permit under RTC could carry a concealed gun.[49]

To explore the composition of people fatally shot under PC I use the Washington Post data that provide information on the circumstances of the shooting. Table 5 explores the PC effect on various characteristics of the deceased and their actions.[50]. First, Panel A shows that both unarmed and armed victims increase by 3.6% and 17%, respectively. Breaking down the types of weapons that the deceased were armed with reveals that the increase in armed victims is driven by ones armed with guns. This increase of armed victims can be attributed either to an increase in the likelihood of running into armed people or to a higher perceived risk by the officers, or both. The former argument is deduced from the idea that even if the number of armed people that police officers interact with doesn't increase, the fact that officers fatally shoot more armed people than before shows that they feel threatened by armed people more often.

The increase of unarmed victims emphasizes the uncertainty that police officers face as to who is armed as well as the negative spillovers of unqualified armed people on all police interactions.

Second, Panel B explores the mental state of the suspects, providing some empirical evidence on the existence of unfit gun carriers. The findings show that when a state adopts

[49]For more details see section 3.1.

[50]For results using the rate of the outcome variable see Appendix E

PC the rate of individuals fatally shot by law enforcement officers that exhibit signs of mental illness increases by almost 9%. Furthermore, the rate of people fatally shot that were mentally ill and armed with a gun increases by 6%.

Finally, regarding the circumstances of the incident, Panel C and D show that the suspects' behavior with respect to fleeing did not change. However there was an 18% increase to the fatal police incidents where the suspect attacked the officer.

Overall, based on the Washington Post data, when a state with RTC laws adopts PC the incidents in which law enforcement officers fatally shoot potential suspects are more dangerous than before, as the suspect is either more likely to be armed with a gun, attack the officer or be mentally ill.

As suggestive evidence for the existence of untrained people, Table 6 show that the rate of accidental shootings increased by about 10%.[51] However, as mentioned earlier, this is only suggestive evidence. This phenomenon could be attributed both to an increase of concealed gun carriers and/or to the lack of training of these newly armed citizen.

Furthermore, evidence that unqualified citizens affect police officers' work and behavior in practice is the fact that law enforcement chiefs and unions have raised their concerns about the qualifications of the newly armed people. For that reason have expressed their opposition of PC(Gorman, 2017; Shepperson, 2017; Goudeau, 2017; Robertson and Williams, 2016; Yablon, 2016).

To summarize, when switching from RTC to PC, the increase in the likelihood of running into an armed person is accompanied with an increase in the threat that armed people can pose. That should, in theory lead to an increase in fatal police shootings, which is supported by the main findings.

5.3.2 Intermediate Outcomes

Table 7 shows the effect of RTC (Panel A) and PC (Panel B) laws on crime rates, number of law enforcement officers, and the percentage of suicides committed with guns. The latter

[51] Data for the accidental shootings were obtained from the Gun Violence Archive, from 2014-2017. Due to the period that the data cover it is not possible to study the RTC effect. Accidental shootings exclude cases where the ID of a person was mistaken i.e. thought it is was an intruder/threat but it turned out to be a friend/family, and cases of stray bullets.

of which is used as a proxy for gun prevalence .

Crime Rate.

Columns (1) and (2) of Tables 7 show that violent crime increase under both RTC and PC laws by 12% and 5%, respectively, with both effect being statistically significant at the 1% level. On the other hand, property crime decreases under RTC by 3% and increases under PC laws by almost 2%, though both effects are statistically insignificant. The findings for the RTC laws are consistent with Donohue et al. (2019), even though they cover a longer time period and use a TWFE analysis.

Prevalence of Guns.

Using the percentage of suicides committed with guns as a proxy for gun prevalence, column (3) of Table 7 shows that when a state adopts RTC and PC laws the percentage of suicides committed with guns increases by 1.2% and almost 1% respectively. Both effects are statistically significant at the 1% level. Overall, RTC and PC seem to have small positive effects on gun prevalence.These results are not consistent with Duggan (2001), who uses sales of the magazine *Guns & Ammo* as a proxy and finds no evidence that concealed carry laws increase the rate of gun ownership.

Number of Law Enforcement Officers.

Regarding the number of police officers employed, column (4) of Table 7 shows that when a state adopts RTC laws the rate of police officers increases by 5.4% and it is statistically significant at the 10% level. When a state from RTC adopts PC laws the rate of police officers increases only by 1.6% and it is statistically insignificant. The findings are overall consistent with Donohue et al. (2019) that find that states that adopt RTC laws increase the size of their police force by about 7-8%.

Number of Police Interactions with the Public.

As mentioned in section 3.2, to estimate the number of police interactions, I use the rate of arrests. Specifically, I use the rate of arrests for both victimless crimes, such as drug offenses, gambling, and prostitution, where it is up to the police officers to intervene and enforce the law, as well as for index crimes, such as violent and property crimes. Moreover, to further understand whether the concealed carry effects on the rate of arrests are driven by a change in crime, I also estimate the concealed carry effects on arrests per crime. This

outcome is only available for index crimes (violent and property crimes) as the actual number of crimes committed is unknown for the rest of the crime categories. The data are obtained from the FBI's Uniform crime reports *Offenses Known and Clearances by Arrest* and *Arrests by Age, Sex, and Race* series. These data are at the agency level, and span the years 2000 to 2016.

Panel A of Table 8 shows that when a state adopts RTC the rate of arrests for agencies serving at least 25,000 people decreases by 6.4%, though the effect is statistically insignificant. Breaking down the arrests by the types of crime, it appears that the negative effect is mainly driven by arrests for victimless crimes. The rate of arrest for victimless crimes decreases by 22%, but-as the overall-effect it is statistically insignificant. That finding supports Donohue et al. (2019)'s argument, discussed in section 3.2, that officers have more limited time and therefore prioritize crimes reported by victims over offenses that need to be sought out by police. The results also support the argument that police may shy away from dangerous situations, intervening only when it is truly necessary, something that is less likely with victimless crimes. The only statistically significant change in arrests under RTC is an 8% increase in the arrests of property crimes. That effect is not entirely driven by an increase in property crimes as column (9) shows that arrests per crime in the case of property crimes increases too by 0.7% and it is statistically significant at the 10% level.

The findings for the PC effect on Panel B of Table 8 should be interpreted with caution as until 2016, the most recent year that arrests data is available, 8 states out of a total of 14 transition to PC. The results show a 0.3% increase in the total rate of arrests for agencies serving at least 25,000 people when a states adopts PC, and the effect is statistically insignificant. Breaking down the results by types of crimes, the direction of the effects are the same as under RTC but now the 8.6% decrease of victimless crimes and the 9.3% increase of arrests for vandalism are statistically significant at the 10% level; while the increase of arrests for drugs and violent crimes by 16% and 6.6% respectively are statistically significant at the 1% level. The increase in arrests of violent crimes is mostly driven by an increase in violent crimes as column (8) shows that arrests per crime for violent crimes increases only by 0.3% and it is statistically insignificant.

To summarize, under both RTC and PC violent crime rates, prevalence of guns, and num-

ber of police officers increase, while arrest rates decrease but not in a statistically significant way. Even though the direction of the effect is the same for RTC and PC, the magnitudes of the effects are always larger under RTC. Just taking into account the concealed carry laws effect on intermediate outcomes, one could have expected fatal police shootings to increase more under RTC than under PC. However, as argued earlier, under PC the composition of armed people seems to increase the risk that officers face. That factor is significant enough to observe a higher increase in fatal police shootings under PC.

6 Concealed carry laws and fatal police encounters by race

In this section I examine how the impact of RTC and PC laws on fatal police shootings varies by the race of the suspect.

6.1 Right-to-Carry Effect on Fatal Police Encounters by race

Table 9 shows the RTC effect for different race groups, using the CS estimator. Black people is the only racial group that experiences a decline in fatal police shootings while Hispanics face the biggest increase. The effects of all racial groups are statistically insignificant. However, the RTC effect by race should be interpreted with caution because around 22% of race is being imputed and in 3% of the data the race of the deceased is missing.[52]

6.2 Permitless Carry Effect on Fatal Police Encounters by race

The PC effects by race group in Table 10 show that when using the unbalanced sample (column(1)), Hispanics and Black people experience the largest increase in fatal police shooting of 36% and 35% respectively, both estimates are statistically significant at the 1% level. At the same time, white people face a 10% increase, statistically significant at the 10% level. Yet, as mentioned earlier, around 22% of race is being imputed, and in 3% of the data race

[52]For more information on the imputed and missing race in the Fatal Encounters data, and for the RTC effects using only the non-imputed race data, the inverse hyperbolic sine transformation and the rate of the outcome variable see Appendix G.

of the deceased is missing. This race uncertainty occurs, mostly, prior to 2013, and for the period of 2013 to 2019 the percentage of cases with imputed and missing race drops to 4% and 1%, respectively.[53]

The PC effect on fatal police shootings by race follows a similar pattern, with the exception of Hispanic people, when using the Washington Post data for the years 2015 to 2019. Fatal police shootings increase for black people by 24% and for white people 13%, both effects statistically significant at the 1% level. Hispanic people experience a 14% increase though this time it is statistically insignificant.

6.3 Permitless Carry Effect on the Circumstances of Fatal Police Encounters by race

To explore why minorities, especially black people, experience the largest increase in fatal police shootings under PC, I use the Washington Post data to examine whether the circumstances of the shootings vary by race.

First, Table 11 reports the summary statistics of different circumstances of fatal police shootings by race. In almost 10% of the shootings involving black people the suspect was unarmed, with that percentage dropping to 6% and 7.6% for white and hispanic people respectively. Moreover, in almost 60% of shootings that involve black people the suspect was armed with a gun, that percentage is similar for white people (59%), while for hispanic people the likelihood of the suspect being armed with a gun is 51%.

The mental health of the suspect is the characteristic that varies the most between white people and minorities. Almost 31% of white suspects show signs of mental illness and more than half of those are armed with a gun. For black people the likelihood that the suspect is mentally ill is around 16%, almost half of the likelihood of white people, while less than half of those are armed with a gun.

Next, I see how the circumstances of fatal police shootings change under PC by race. Columns (1) to (4) of Table 12 show that unarmed and armed suspects increase for both white

[53]For more information on the imputed and missing race in the Fatal Encounters data, and for the PC effects using only the non-imputed race data, the inverse hyperbolic sine transformation and the rate of the outcome variable see Appendix G.

and black people. For white people the magnitude of the effect on armed suspects (11%) was around 3 times bigger than on the unarmed suspects (3.3%). While for black people the magnitude of the effect on armed suspects (31.6%) was almost 5 times bigger than on the unarmed suspects (6.4%). Though there was a larger increase of armed suspects, in both absolute and relative terms for black people compare to white people, that effect of PC on armed black people is mainly driven by an increase of armed suspects though not with a gun. That is in contrast to the white suspects.

Columns (5) to (8) of Table 12 show that fatal shootings where the suspect is not fleeing the scene and is attacking the officer(s) increase for both white and black people. However for white people the increase in the incidents where the suspect is attacking the officers (9.7%) is relatively similar to the increase of incidents where the suspect is not attacking the officers (8.2%). In contrast, for black people the increase in the incidents where the suspect attacks the officer(s) (28.9%) is more than 4 times larger than the increase of suspects that do not attack the officer (6.7%).

Regarding the mental health of the suspects, Table 13 shows that under PC there is a statistically significant increase for minorities in the incidents where the suspect shows signs of mental illness. For black people there is also a statistically significant increase in the cases where the suspect is mentally ill and both armed with a gun (6.4%), or unarmed (1.9%).

7 Conclusion

This paper estimates the effects of concealed carry laws on violent police interactions, and more specifically on fatal police shootings and law enforcement officers killed and assaulted. I leverage state-level staggered roll-out of concealed carry laws and use the estimation method proposed by Callaway and SantAnna (2021). I find that when states with stricter concealed carry laws adopt RTC, and allow qualified citizens to carry concealed guns after acquiring a permit to do so, assaults of officers increase though there is no detectable increase in fatal police shootings or officers killed. States that subsequently switch to PC, and a permit for carrying a concealed gun is not needed, experience an increase in the number of people fatally shot by police officers, driven by minorities. From the police side, under PC assaults of officers

by firearms increase, while there is a reduction of officers' killed in action. Furthermore, I find suggestive evidence that the increase of fatal police shooting under PC can be attributed to the change in composition of armed individuals. In particular, citizens who under RTC would have been considered unqualified can carry a concealed weapon under PC, which increases the risk that police officers face.

The gravity and importance of the effects of concealed carry laws on fatal police shootings can be illustrated in two points. First, being killed by law enforcement is the most extreme outcome that can occur from a police interaction. Therefore, the effects detected in this study on such a rare event indicate that concealed carry laws could potentially have a much larger impact on more common violent incidents, such as non-lethal police shootings. Finally, even if fatal police shooting are relatively rare, when they do happen, their consequences can be devastating to communities.

Understanding how civil laws, in this case concealed carry laws, can influence law enforcement's jobs and consequently their actions, has direct implications for future policy considerations. The questions studied in this paper are directly related to two ongoing issues - the debate surrounding concealed carry laws and the discussion over police reform. Therefore, the findings of this study provide insights that are important to consider in determining the effects of more lenient concealed carry laws on social welfare, and in evaluating reforms to mitigate police violence.

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8 Tables and Figures

Table 1: Summary Statistics: Fatal shootings by law enforcement

	Fatal Encounters		Washington Post
	(1)	(2)	(3)
Years covered	2000-2019	2015-2019	2015-2019
Average state population	6,016,665	6,369,024	
Per state-year			
Average number of deaths by gun	15.85	20.82	19.25
Average rate of deaths per million people by gun	2.7	0.37	3.5
Victims characteristics			
Average age	35.50	36.95	36.64
% Male	95.66	95.12	95.62
% Race[1]: White	47.09	50.18	48.22
Black	28.31	25.37	24.28
Hispanic	18.46	18.35	17.35
Race unspecified	2.53	1.70	5.94
Race unspecified before imputation	20.13	8.06	
Incident characteristics			
%Unarmed			6.90
% Armed			93.10
% Armed with gun			57.22
% Armed without gun			35.88
% sigh of mental illness			24.05
% mentally ill & armed with gun			12.00
% mentally ill & armed without gun			10.70
% mentally ill & unarmed			1.35
% Not fleeing			29.02
%Attack officers			64.58

[1] race in the Fatal Encounter's data is after imputation.

Table 2: Summary Statistics: Law Enforcement Officers Killed and Assaulted

Panel A: Law Enforcement Officers Killed, State-level		
Years covered	2000-2019	
Average state population	6,016,665	
Average number of police officers per state	18,994.91	
Law Enforcement officers feloniously killed per state-year:	by firearm	not by firearm
Average number	0.887	0.152
Average number per 100,000 police officers	5.60	0.66
Panel B: Law Enforcement Officers Assaulted, Agency-level		
Years covered	2000-2019	
Number of agencies	856	
Average number of officers by agency	150.47	
Law Enforcement officers assaulted per agency-year:	by firearm	not by firearm
Average number	0.714	18.912
Average number per 10,000 police officers	34.69	976.53

Table 3: Right-to-carry effect on violent police incidents, 2000-2019

	Logarithm of rate		Rate	
	(1)	(2)	(3)	(4)
Panel A: Fatal shootings Fatal Encounters data, state-year level				
Right-to-carry	0.039	0.074	0.205	0.311**
	(0.048)	(0.073)	(0.142)	(0.159)
Baseline mean rate of treated	2.592	2.653	2.592	2.653
Number of states	20	18	20	18
Panel B: Police officers feloniously killed by firearm, state-year level				
Right-to-carry	–0.050	–0.157	0.489	0.386
	(0.176)	(0.416)	(0.693)	(1.519)
Baseline mean rate of treated	3.473	3.077	3.473	3.077
Number of states	20	18	20	18
Balanced panel	No	Yes	No	Yes
Panel C: Police officers assaulted by firearm, agency-year level				
Right-to-carry	0.238	0.248	12.750***	11.916***
	(0.629)	(0.623)	(4.055)	(4.259)
Baseline mean rate of treated	9.854	8.304	9.854	8.304
Number of agencies	856	601	856	601
Minimum years agency reports	15	17	15	17

Notes. The dependent variable in Panel A is the number of people fatally shot by law enforcement per million persons. The dependent variable in Panel B is the number of police officers feloniously killed per 100,000 police officers, and in Panel C is the number of police officers non-fatally assaulted per 10,000 police officers. All results are estimated using Callaway and SantAnna (2021)'s estimator. In Panel A and B the analysis is at the state-year level and uses state population weights and weights based on the number of officers per state, respectively. In Panel C the analysis is at the agency-year level and uses weights based on the number of officers per agency. Standard errors are clustered at the state level, in parentheses. *10%, **5%, and ***1% significance level.

Table 4: Permitless carry effect on violent police incidents, 2000-2019

	Logarithm of rate		Rate	
	(1)	(2)	(3)	(4)
Panel A: Fatal shootings, Fatal Encounters data, state-year level				
Permitless carry	0.127**	0.119**	0.792***	0.815***
	(0.052)	(0.058)	(0.208)	(0.241)
Baseline mean rate of treated	2.401	2.343	2.401	2.343
Number of states	42	30	42	30
Panel B: Washington Post data, state-quarterly level, 2015-2019				
Permitless carry	0.188**	0.189**	0.256**	0.257**
	(0.078)	(0.076)	(0.108)	(0.108)
Baseline mean rate of treated	1.029	1.029	1.029	1.029
Number of states	39	38	39	38
Panel C: Police officers feloniously killed by firearm, state-year level				
Permitless carry	–0.450	–0.919	–4.869***	–10.079
	(0.288)	(0.968)	(1.800)	(9.054)
Baseline mean rate of treated	7.003	7.174	7.003	7.174
Number of states	42	28	42	28
Balanced panel	No	Yes	No	Yes
Panel D: Police officers assaulted by firearm, agency-year level				
Permitless carry	0.104	0.367**	12.559**	21.273***
	(0.161)	(0.181)	(5.540)	(6.485)
Baseline mean rate of treated	14.861	12.856	14.861	12.856
Number of agencies	2025	1489	2025	1489
Minimum years agency reports	15	17	15	17

Notes. The dependent variable in Panel A and B is the number of people fatally shot by law enforcement per million persons. The dependent variable in Panel C is the number of police officers feloniously killed per 100,000 police officers, and in Panel D is the number of police officers non-fatally assaulted per 10,000 police officers. All results are estimated using Callaway and SantAnna (2021)'s estimator. In Panel A the analysis is at the state-year level and in Panel B at the state-quarterly level (covering only the years 2015 to 2019). Both Panels A and B use state population weights. I Panel C the analysis is at the state-year level and uses weights based on the number of officers per state, respectively. In Panel D the analysis is at the agency-year level and uses weights based on the number of officers per agency. Standard errors are clustered at the state level, in parentheses. *10%, **5%, and ***1% significance level.

Table 5: Permitless carry effect on the characteristics of people fatally shot by police, using Washington Post data, state-quarterly level, 2015-2019

	(1)	(2)	(3)	(4)	(5)
Panel A: (Log of rate)	unarmed	armed	armed with gun	armed w/o gun	Vehicle
Permitless carry	0.036***	0.169**	0.164***	0.042	0.040**
	(0.008)	(0.082)	(0.027)	(0.119)	(0.016)
Baseline mean rate of treated	0.069	0.959	0.617	0.342	0.029
			mentally ill		
Panel B: (Log of rate)	not mentally ill	mentally ill	with gun	w/o a gun	and unarmed
Permitless carry	0.130	0.088***	0.060***	0.029***	0.008***
	(0.082)	(0.028)	(0.021)	(0.010)	(0.003)
Baseline mean rate of treated	0.817	0.212	0.143	0.065	0.004
Panel C: (Log of rate)	fleeing	not fleeing			
Permitless carry	-0.018	0.175			
	(0.039)	(0.116)			
Baseline mean rate of treated	0.285	0.676			
Panel D: (Log of rate)	attack	not attack			
Permitless carry	0.181***	0.056			
	(0.025)	(0.067)			
Baseline mean rate of treated	0.718	0.311			
Number of units	39	39	39	39	39

Notes. All results are estimated using Callaway and SantAnna (2021)'s estimator. The dependent variable is the logarithm of people fatally shot by law enforcement per million persons. Data are at the state-quarterly level. The panel is unbalanced. All regressions use state population weights. Standard errors are clustered at the state level, in parentheses. *10%, **5%, and ***1% significance level.

Table 6: Permitless carry effect on accidental shootings, 2014-2017

	Logarithm of rate
	(1)
Permitless carry	0.095***
	(0.027)
Baseline mean rate of treated	0.790
Number of states	38

Notes. The dependent variable is the logarithm of the number of accidental shootings per 100,000 persons. Data for the accidental shootings is obtained from the Gun Violence Archive, from 2014-2017. All results are estimated using Callaway and SantAnna (2021)'s estimator. The unbalanced and balanced panel are the same for estimating the Permitless carry effect for the years 2014 to 2017. All regressions use state population weights. Standard errors are clustered at the state level, in parentheses. *10%, **5%, and ***1% significance level.

Table 7: Intermediate outcomes: how Right-to-carry and Permitless carry affect crime rates, PSG*, and number of police officers, 2000-2019

Log of rate:	Violent crime	Property crime	PSG	# of Police
	(1)	(2)	(3)	(4)
Panel A: Right-to-carry effect				
Right-to-carry	0.120***	-0.029	0.012***	0.054*
	(0.016)	(0.030)	(0.004)	(0.028)
Baseline mean rate of treated	354.577	3322.521	0.494	313.712
Number of states	20	20	20	20
Panel B: Permitless carry effect				
Permitless carry	0.049***	0.018	0.009***	0.016
	(0.017)	(0.015)	(0.003)	(0.012)
Baseline mean rate of treated	263.118	2894.824	0.601	282.002
Number of states	41	41	41	41

Notes. All results are estimated using Callaway and SantAnna (2021)'s estimator. The dependent variable for columns (1), (2), (3), and (4) is the logarithm of violent crime rate, property crime rate, percentage of suicides committed by gun, and number of police officers per 100,000 people. The panel is unbalanced. All regressions use state population weights. Standard errors are clustered at the state level, in parentheses. *10%, **5%, and ***1% significance level.
*PSG: Percentage of suicides committed by gun.

Table 8: Intermediate outcomes: how Right-to-carry and Permitless carry affect arrest rates, agency-level, 2000-2016

	Logarithm of rate of arrests							Arrests per Crime	
	Total Arrests	Victimless Crimes	Vandalism	Weapon Violation	Drugs	Violent	Property	Violent	Property
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Right-to-carry effect									
Right-to-carry	-0.064	-0.223	0.073	-0.119	0.028	0.012	0.081**	-0.020	0.007*
	(0.079)	(0.167)	(0.127)	(0.180)	(0.145)	(0.030)	(0.034)	(0.023)	(0.004)
Baseline mean rate of treated	29001.980	12011.845	1298.929	450.594	3960.298	5377.566	5902.750	0.318	0.108
Number of agencies	941	941	941	941	941	941	941	941	941
Panel B: Permitless carry effect									
Permitless carry	-0.003	-0.086*	0.093*	-0.018	0.160***	0.066***	0.038	0.003	-0.007***
	(0.022)	(0.044)	(0.048)	(0.121)	(0.057)	(0.020)	(0.040)	(0.003)	(0.002)
Baseline mean rate of treated	26531.334	9746.427	1120.497	347.364	4179.056	5747.527	5390.462	0.247	0.084
Number of agencies	1276	1276	1276	1276	1276	1276	1276	1276	1276

Notes. All results are estimated using Callaway and SantAnna (2021)'s estimator. The dependent variable in columns (1) to (7) is the logarithm of the number of arrests per million people for the type of crime mentioned above each column, and for columns (8) and (9) it is the logarithm of the number of arrests per crime. Violent crimes: murders, manslaughter, forcible rape, robberies, and assaults. Property crimes: burglaries, larceny, and motor theft. Victimless crimes: prostitution and commercialized vice, gambling, DUI, liquor laws, drunkenness, vagrancy, suspicion, curfew, and loitering violations. Data are at the agency-year level, where agencies serves at least 25,000 people. All regressions include year, state, and agency fixed effects, estimated using agency population weights. Standard errors are clustered at the state level, in parentheses. *10%, **5%, and ***1% significance level.

Table 9: RTC effects on fatal police shootings by race, using Fatal Encounters data, 2000-2019

	Logarithm of Rate	
	(1)	(2)
Panel A: White		
Right-to-carry	0.039	0.086
	(0.369)	(0.361)
Baseline mean rate of treated	1.173	1.107
Panel B: Black		
Right-to-carry	-0.038	-0.067
	(0.951)	(1.134)
Baseline mean rate of treated	7.346	7.403
Panel C: Hispanic		
Right-to-carry	0.165	0.287
	(0.151)	(0.306)
Baseline mean rate of treated	2.856	2.747
Number of states	20	18
Balanced panel	No	Yes

Notes. All results are estimated using Callaway and SantAnna (2021)'s estimator. The dependent variable is the logarithm of people fatally shot by law enforcement per million persons. The regressions are weighted using population weights of the race of interest. Standard errors are clustered at the state level, in parentheses. 22% of race is imputed, and 3% of race is missing. RTC effects by race should be interpreted with caution. *10%, **5%, and ***1% significance level.

Table 10: PC effect of fatal police shootings by race, using Fatal Encounters and Washington Post data

	Fatal Encounters yearly-level 2000-2019		Washington Post quarterly-level 2015-2019	
Logarithm of rate	(1)	(2)	(3)	(4)
Panel A: White people				
Permitless carry	0.101*	0.079	0.131***	0.131***
	(0.056)	(0.079)	(0.028)	(0.028)
Baseline mean rate of treated	2.023	2.016	0.905	0.905
Panel B: Black people				
Permitless carry	0.353***	0.493***	0.236***	0.238***
	(0.090)	(0.119)	(0.073)	(0.077)
Baseline mean rate of treated	4.530	3.672	1.724	1.724
Panel C: Hispanics				
Permitless carry	0.364***	0.349**	0.138	0.142
	(0.108)	(0.136)	(0.105)	(0.111)
Baseline mean rate of treated	1.254	1.240	0.478	0.478
Number of states	42	30	39	38
Balanced panel	No	Yes	No	Yes

Notes. All results are estimated using Callaway and SantAnna (2021)'s estimator. The dependent variable is the logarithm of people fatally shot by law enforcement per million persons. The regressions are weighted using population weights of the race of interest. Standard errors are clustered at the state level, in parentheses. In Fatal Encounters data 22% of race is imputed, and 3% of race is missing. *10%, **5%, and ***1% significance level.

Table 11: Summary Statistics: Washington Post

Years covered	2000-2019		
Average state population	6,016,665		
Incident characteristics	White	Black	Hispanics
% Unarmed	6.10	9.58	7.63
% Armed	93.90	90.42	92.37
% Armed with gun	58.69	59.70	51.29
% Armed without gun	35.21	30.72	41.08
% sigh of mental illness	30.67	15.57	18.66
% mental illness & armed with gun	17.00	6.00	7.51
% mental illness & armed without gun	12.33	7.66	10.21
% mental illness & unarmed	1.34	1.91	0.94
% not fleeing	68.25	57.29	60.21
% attack officers	66.48	67.36	57.39

Table 12: Characteristics of people fatally shot by law enforcement under PC by race:
PC effects using Washington Post data, quarterly, 2015-2019

		Armed			Fleeing		Attack	
Logarithm of rate	unarmed (1)	total (2)	with gun (3)	w/o gun (4)	true (5)	false (6)	true (7)	false (8)
Panel A: White people								
Permitless carry	0.033***	0.110***	0.103***	0.016	-0.026	0.102**	0.097***	0.082***
	(0.008)	(0.028)	(0.037)	(0.021)	(0.052)	(0.041)	(0.033)	(0.027)
Baseline mean rate of treated	0.066	0.839	0.571	0.269	0.239	0.627	0.638	0.267
Panel B: Black people								
Permitless carry	0.064***	0.316***	0.122*	0.307***	0.010	0.354***	0.289***	0.067*
	(0.023)	(0.071)	(0.062)	(0.060)	(0.051)	(0.049)	(0.080)	(0.040)
Baseline mean rate of treated	0.120	1.604	1.181	0.423	0.812	0.756	1.249	0.474
Panel C: Hispanics								
Permitless carry	0.005	0.203	0.362	-0.168***	-0.175***	0.368	0.357	-0.149
	(0.011)	(0.334)	(0.338)	(0.022)	(0.060)	(0.446)	(0.438)	(0.124)
Baseline mean rate of treated	0.046	0.432	0.293	0.139	0.138	0.264	0.328	0.149
Number of states	39	39	39	39	39	39	39	39

Notes. All results are estimated using Callaway and SantAnna (2021)'s estimator. The dependent variable is the logarithm of people fatally shot by law enforcement per million persons. Data are at the state-quarterly level. The regressions are weighted using population weights of the race of interest. Standard errors are clustered at the state level, in parentheses. *10%, **5%, and ***1% significance level.

Table 13: Characteristics of people fatally shot by law enforcement under PC by race: PC effects using Washington Post data, quarterly, 2015-2019

	Mentally ill		Mentally ill - true		
	false	true	with gun	w/o gun	unarmed
Logarithm of rate	(1)	(2)	(3)	(4)	(5)
Panel A: White people					
Permitless carry	0.091***	0.049	0.031	0.018	0.006*
	(0.019)	(0.030)	(0.024)	(0.015)	(0.003)
Baseline mean rate of treated	0.676	0.229	0.165	0.063	0.000
Panel B: Black people					
Permitless carry	0.289***	0.117***	0.064***	0.035	0.019**
	(0.070)	(0.033)	(0.024)	(0.025)	(0.009)
Baseline mean rate of treated	1.522	0.202	0.130	0.071	0.000
Panel C: Hispanics					
Permitless carry	0.135	0.066***	0.036	0.030*	0.001
	(0.311)	(0.013)	(0.024)	(0.016)	(0.001)
Baseline mean rate of treated	0.457	0.021	0.021	0.000	0.000
Number of states	39	39	39	39	39

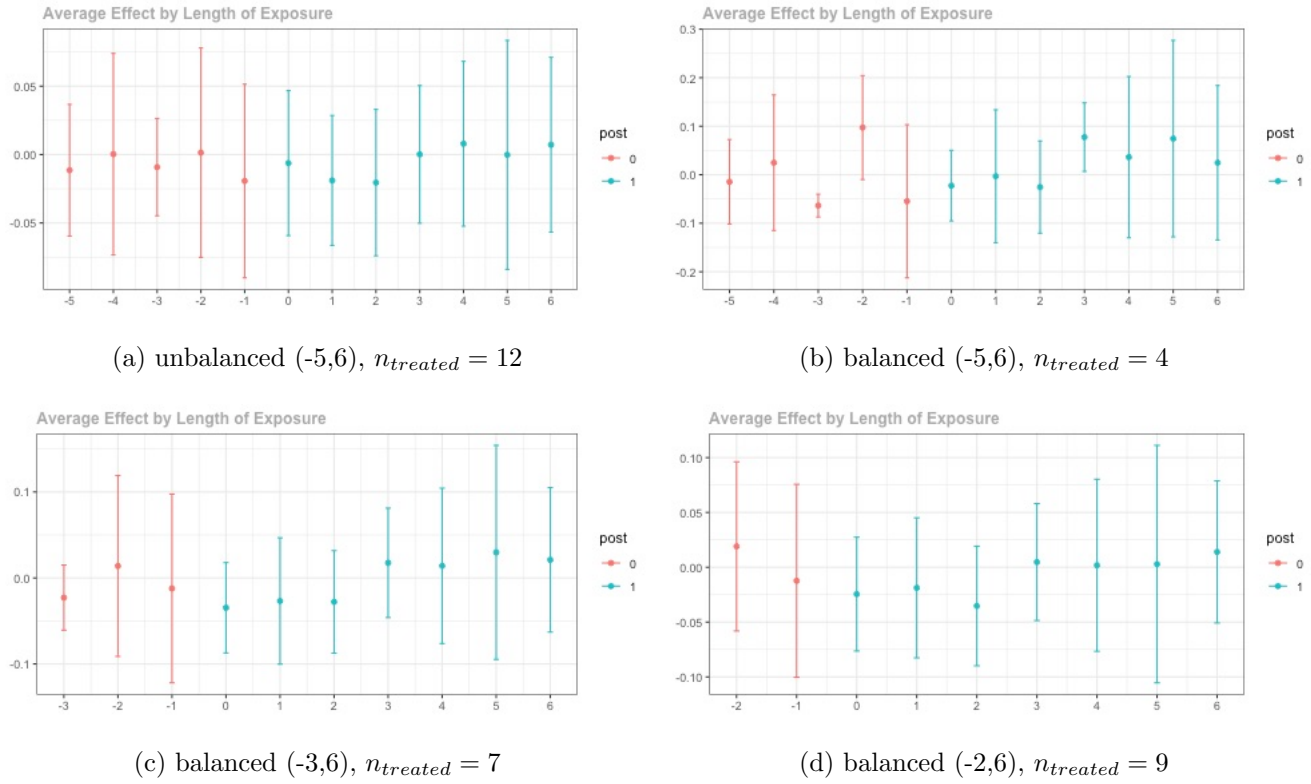
Notes. All results are estimated using Callaway and SantAnna (2021)'s estimator. The dependent variable is the logarithm of people fatally shot by law enforcement per million persons. Data are at the state-quarterly level. The regressions are weighted using population weights of the race of interest. Standard errors are clustered at the state level, in parentheses. *10%, **5%, and ***1% significance level.

Changes of concealed-carry laws by state and year, 2000-2019

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Massachusetts	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM
Rhode Island	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM
Maryland	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM
New Jersey	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM
California	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM
Hawaii	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM
Delaware	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM
New York	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM
District of Columbia	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RTC	RTC
Illinois	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RTC	RTC	RTC	RTC	RTC	RTC
Wisconsin	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Iowa	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Kansas	RM	RM	RM	RM	RM	RM	RM	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	PC	PC	PC	PC	PC
Nebraska	RM	RM	RM	RM	RM	RM	RM	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Missouri	RM	RM	RM	RM	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	PC	PC	PC
Ohio	RM	RM	RM	RM	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
New Mexico	RM	RM	RM	RM	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Colorado	RM	RM	RM	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Minnesota	RM	RM	RM	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Michigan	RM	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Alaska	RTC	RTC	RTC	RTC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC
Arizona	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	PC	PC	PC	PC	PC	PC	PC	PC	PC
Wyoming	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	PC	PC	PC	PC	PC	PC	PC	PC	PC
Mississippi	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	PC	PC	PC	PC
Idaho	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	PC	PC	PC	PC
Maine	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	PC	PC	PC	PC
West Virginia	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	PC	PC	PC	PC
New Hampshire	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	PC	PC	PC
North Dakota	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	PC	PC
Arkansas	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	PC
South Dakota	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	PC
Kentucky	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	PC
Montana	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Georgia	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Tennessee	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Washington	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Texas	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Alabama	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Indiana	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Oregon	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Nevada	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
North Carolina	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Virginia	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Florida	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
South Carolina	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Connecticut	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Louisiana	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Pennsylvania	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Utah	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Oklahoma	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC	RTC
Vermont	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC

RM Restricted or "May issue" RTC Right-to-Carry PC Permitless Carry

Figure 1: Changes of CC laws



(a) unbalanced (-5,6), $n_{treated} = 12$

(b) balanced (-5,6), $n_{treated} = 4$

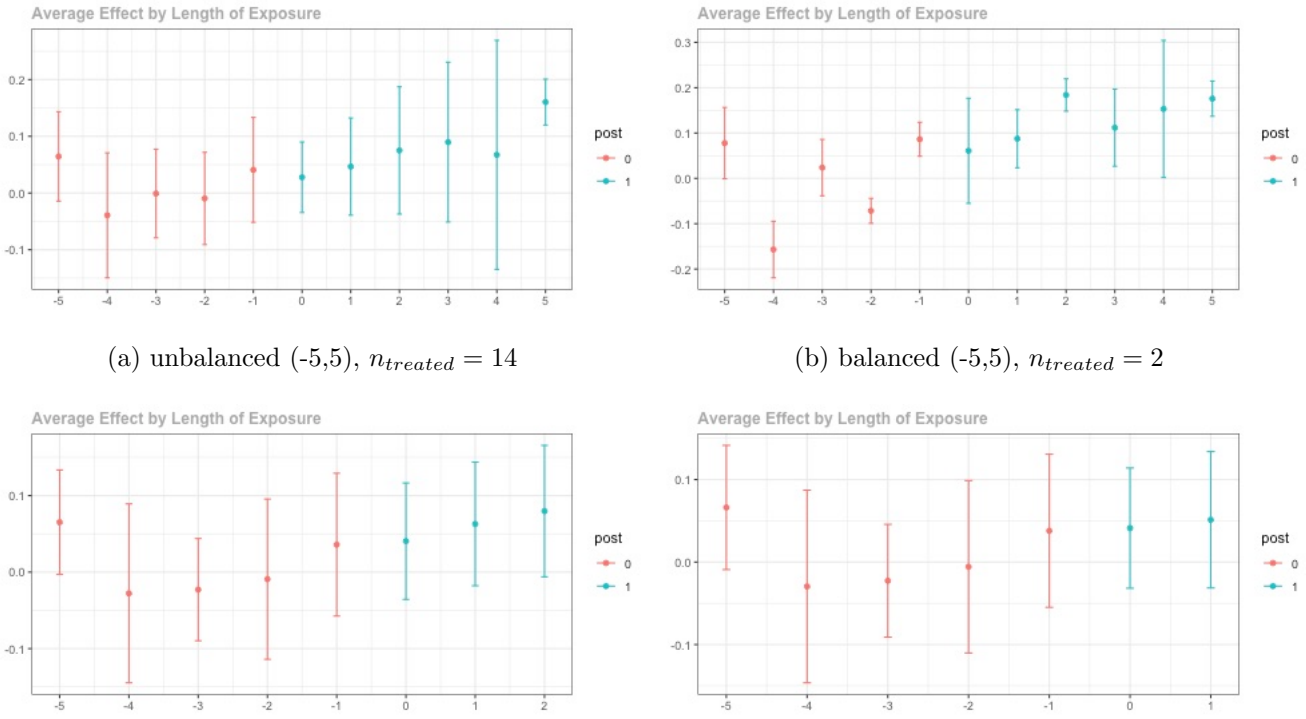
(c) balanced (-3,6), $n_{treated} = 7$

(d) balanced (-2,6), $n_{treated} = 9$

Figure 2

RTC effect on fatal police shootings using Fatal Encounters data, 2000-2019

The figure plots coefficients and 95% confidence intervals of yearly indicators leading up to and following the passage of a RTC law, estimated using Callaway and SantAnna (2021)'s estimator. The dependent variable is the logarithm of the rate of people fatally shot by law enforcement.



(a) unbalanced (-5,5), $n_{treated} = 14$

(b) balanced (-5,5), $n_{treated} = 2$

(c) balanced (-5,2), $n_{treated} = 9$

(d) balanced (-5,1), $n_{treated} = 10$

Figure 3

PC effect on fatal police shootings using Fatal Encounters data, 2000-2019

The figure plots coefficients and 95% confidence intervals of yearly indicators leading up to and following the passage of a PC law, estimated using Callaway and SantAnna (2021)'s estimator. The dependent variable is the logarithm of the rate of people fatally shot by law enforcement.