

for the four different models, showing that the DAW and BC models indicate that RTC laws have increased violent and property crime, while the LM and MM models provide evidence that RTC laws have increased murder. We argue that the DAW set of explanatory variables are the most plausible and show that modest and advisable corrections to the LM and MM specifications also generate estimates that RTC laws increase violent crime.

The remainder of the paper shows that the synthetic controls approach under all four sets of explanatory variables uniformly supports the conclusion that RTC laws lead to substantial increases in violent crime. Part III describes the statistical underpinnings of the synthetic controls approach and specific details of our implementation of this technique. Part IV provides our synthetic controls estimates of the impact of RTC laws, and Part V concludes with some thoughts on the mechanisms by which RTC laws increase violent crime.

## Part II

# Panel Data Estimates of the Impact of RTC Laws

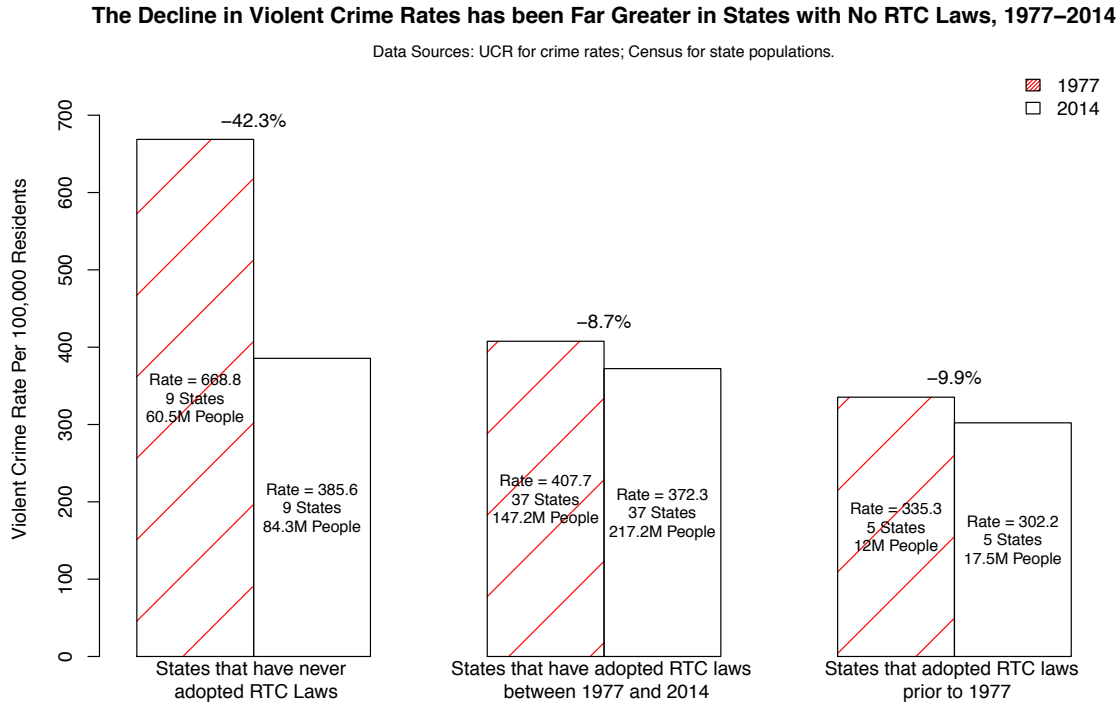
## A. The No-Controls Model

We follow the NRC report by beginning with the basic facts about how crime has unfolded relative to national trends for states adopting RTC laws. Figure 1 depicts percentage changes in the violent crime rate over our entire data period for three groups of states: those that never adopted RTC laws, those that adopted RTC laws sometime between 1977 and 2014, and those that adopted RTC laws prior to 1977. It is noteworthy that the nine states that never adopted RTC laws experienced declines (in percentage terms) in violent crime that are greater than four times the reduction experienced by states that adopted RTC either prior to 1977 or during our period of analysis.<sup>5</sup>

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<sup>5</sup>Over the same 1977-2014 period, the states that avoided adopting RTC laws had substantially lower increases in their rates of incarceration and police employment. The nine never-adopting states increased their incarceration rate by 205 percent, while the incarceration rates in the adopting states rose by 262 and 259 percent, for those adopting RTC laws before and after 1977 respectively. Similarly, the rate of police employment rose by 16 percent in the never-adopting states and by 38 and 55 percent, for those adopting before and after 1977, respectively.

Figure 1



The NRC report presented a “no-controls” estimate, which is just the coefficient estimate on the variable indicating the date of adoption of a RTC law in a crime rate panel data model with state and year fixed effects. According to the NRC report, “Estimating the model using data to 2000 shows that states adopting right-to-carry laws saw 12.9 percent increases in violent crime – and 21.2 percent increases in property crime – relative to national crime patterns.”

We now estimate this same model using 14 additional years of data (through 2014) and 11 additional adopting states (listed at the bottom of Table 8). Row 1 of Table 1 shows the results of this “no-controls” panel data approach using a dummy model, which just estimates how much on average crime changed after RTC laws were passed (relative to national trends). According to this model, the average post-passage increase in violent crime was 20.2 percent, while the comparable increase in property crime was 19.2 percent. Row 1 also reports the impact of RTC laws on the murder rate (Column 1) and the murder count using a negative binomial model (Column 2), which provide statistically insignificant estimates that RTC laws increase murder by 4-5 percent.<sup>6</sup>

<sup>6</sup>The dummy variable model reports the coefficient associated with an RTC variable that is given a value of zero if an RTC law is not in effect in that year, a value of one if an RTC law is in effect that entire year,

The NRC Report also presented a spline model to estimate how RTC adoption might alter the trend in crime for adopting states, which suggested violent crime and property declined relative to trend in the data through 2000, while the trend in murder was unchanged. Row 2 of Table 1 recomputes this “no-controls” spline model on data through 2014, which eliminates the earlier suggestion that RTC laws were associated with any drop (relative to trend) in violent or property crime, and reaffirms the null finding for murder.<sup>7</sup> In other words, more and better data have strengthened the dummy variable model finding that RTC laws increase violent crime, and eliminated the earlier spline model showing of possible declines in violent and property crime.

**Table 1: Panel Data Estimates Showing Greater Increases in Violent and Property Crime Following RTC Adoption: State and Year Fixed Effects, and No Other Regressors, 1977-2014**

|                      | Murder Rate<br>(1) | Murder Count<br>(2) | Violent Crime Rate<br>(3) | Property Crime Rate<br>(4) |
|----------------------|--------------------|---------------------|---------------------------|----------------------------|
| Dummy Variable Model | 3.83 (8.79)        | 1.049 (0.053)       | 20.21*** (6.83)           | 19.18*** (6.06)            |
| Spline Model         | -0.28 (0.61)       | 1.004 (0.004)       | 0.22 (0.79)               | 0.14 (0.50)                |

OLS estimations include year and state fixed effects and are weighted by state population. Robust standard errors (clustered at the state level) are provided next to point estimates in parentheses. Incidence Rate Ratios (IRR) estimated using Negative Binomial Regression, where state population is included as a control variable, are presented in Column 2. The null hypothesis is that the IRR equals 1. The source of all the crime rates is the Uniform Crime Reports (UCR). \* p < .1, \*\* p < .05, \*\*\* p < .01. All figures reported in percentage terms.

While the Table 1 dummy model indicates that RTC states experience a worse post-passage crime pattern, this does not prove that RTC laws increase crime. For example, it might be the case that some states decided to fight crime by allowing citizens to carry concealed handguns while others decided to hire more police and incarcerate a greater number of convicted criminals. If police and prisons were more effective in stopping crime, the “no controls” model might show that the crime experience in RTC states was worse than in other states even if this were not a true causal result of the adoption of RTC laws. As it turns out, though, RTC states not only experienced higher rates of violent crime but they also had larger increases in incarceration and police than other states. While the roughly 7 percent greater increase in the incarceration rate in RTC states is not statistically significant,

and a value equal to the portion of the year an RTC law is in effect otherwise. The date of adoption for each RTC state is shown in Appendix Table A1.

<sup>7</sup>The spline model reports results for a variable which is assigned a value of zero before the RTC law is in effect and a value equal to the portion of the year the RTC law was in effect in the year of adoption. After this year, the value of this variable is incremented by one annually for states that adopted RTC laws between 1977 and 2014. The spline model also includes a second trend variable representing the number of years that have passed since 1977 for the states adopting RTC laws over the sample period.