MEMORANDUM

The College of William and Mary
Econ 308 Econometrics

Date: Apr 15, 2022
From: Yichuan(Jacky) Zhang
To: Professor Pereira
Subject: An analysis on effects of concealed weapons laws on violent crimes

Guns control has always been a focal point in U.S. society. Some people believe that allowing citizens to carry concealed weapons will decrease crime while many others disagree. This memo addresses this issue by analyzing the effects of concealed weapons laws on violent crimes from a panel data analysis approach.

First, we perform a logarithmic transformation for the violent crime rate variable to better interpret the results. We run a simple regression of our logarithmic crime rate on the shall variable. Then we run a regression of the logarithmic crime rate on a series of variables. According to this model, if a state has a shall-carry law, the crime rate is expected to decrease by 36.8%. With a p-value of 0.000, this coefficient is statistically significant. This is the sign that I expected since knowing other people might have weapons is likely to deter some crimes. However, this estimate seems to be too large in a "real-world" sense to me. By adding control variables in our second regression, the coefficient changes from -0.44 to -0.368 and both shall variables in the regressions are statistically significant. However, both two outcomes don't seem realistic in a "real-world" scenario. Besides, the marriage rate might be a variable that is different across states but also has effects on the crime rate. If the marriage rate in one state is consistently high, it is possible that this state will have a smaller crime rate. Since different states and times may have an impact on our results, we consider adding fixed effects of state and time to our regression models. The F-test statistic for the state fixed effects is 181.42, together with a p-value of 0.0000, suggesting that different state does have an effect on the crime rate. For the time fixed effects, the F-test statistic is 17.07 and the p-value is 0.0000. Therefore, crime rate is also different from time to time. Since both state fixed effects and time fixed effects are significant, it is reasonable to conclude that the joint effect of the state and year effects is also significant. The F-test testing the joint significance provides a test statistic of 135.65 and a 0.0000 p-value, which verifies this conclusion. After testing for the joint significance, we use a Hausman test to determine whether a fixed or random effects specification is preferred for our data. According to the Hausman test's result (0.0001 p-value), we reject the null hypothesis that the two sets of regression results are the same. Therefore, we need to use the fixed effects model out of concerns about bias.

In our analysis, there may still be some problems that threaten the validity. For example, potential omitted variables that have effects on the crime rate. Also, we should also consider some accidental use of weapons. In conclusion, I think concealed-weapon laws do have an effect on the crime rate – by allowing people to carry concealed weapons, the crime rate is likely to decrease for some amount. However, that effect is not significantly large and in many cases is different from people's expectations. Besides, different states and time periods should also be considered when making this kind of law.

Table I: Regression Estimates for the Determinants of Crime Rate

	(1)	(2)
	Crime Rate	Crime Rate
shall	-0.443***	-0.368***
	(0.0420)	(0.0326)
incarceration rate		0.00161***
		(0.000107)
density		0.0267*
		(0.0132)
real per capita personal income		0.00121
		(0.00778)
population		0.0427***
		(0.00256)
percent of state population that is black, ages 10 to 64		0.0809***
		(0.0167)
percent of state population that is white, ages 10 to 64		0.0312***
		(0.00838)
percent of state population that is male, ages 10 to 29		0.00887
		(0.0108)
_cons	6.135***	2.982***
	(0.0207)	(0.543)
N	1173	1173

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table II: Regression Estimates for the Determinants of Crime Rate with Fixed and Random Effects

	(1)	(2)
	Crime Rate (fe)	Crime Rate (re)
shall	-0.0461*	-0.0696***
	(0.0189)	(0.0191)
incarceration rate	-0.0000710	0.000189**
	(0.0000936)	(0.0000687)
density	-0.172*	0.0662
	(0.0850)	(0.0374)
real per capita personal income	-0.00920	-0.0105
	(0.00591)	(0.00587)
population	0.0115	0.0226***
	(0.00872)	(0.00635)
percent of state population that is black, ages 10 to 64	0.104***	0.107***
	(0.0178)	(0.0133)
percent of state population that is white, ages 10 to 64	0.0409***	0.0401***
	(0.00507)	(0.00510)
percent of state population that is male, ages 10 to 29	-0.0503***	-0.0375***
	(0.00640)	(0.00605)
_cons	3.866***	3.525***
	(0.385)	(0.387)
r2	0.218	
N	1173	1173
df_r	1114	

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$