Master's Thesis MSc Economics

Effect of Firearm Purchase Delay Laws on Handgun-Related Suicides

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Introduction

- Most common firearm-related death is self-inflicted!
  - In 2020, there were 24,292 firearm-related suicides compared to 19,384 firearm-related homicides.
- Evidence suggests that large percentage of suicides are impulsive.
- Firearm purchase delay laws provide delayed access to firearms for individuals looking to make a purchase.
- Focus on waiting periods and licensing and permitting requirements.
  - Specifically, legislation related to handguns.
- However, evidence on the effect of delay laws on handgun-related suicides is still inconclusive.

Introduction

- This paper aims to provide further evidence on the causal effect of delay laws on handgun-related suicides through the analysis of two research questions:
  1. What is the effect of repealing firearm purchase delay laws on handgun-related suicide rates in the United States?
  2. What was the impact of firearm purchase delay laws on handgun-related suicide rates during the 2008 economic recession?

Empirical Strategy - Research Question 1

- States repealed delay laws in different calendar years, hence, staggered DiD setup.
- TWFE can be problematic in such setups.
  - Solution: two different estimation methods (TWFE and CS).
- Main specification:

$$ln(HandgunSuicides_{st}) = \alpha + \beta_1 NoDelay_{st} + \gamma_t X_s + \lambda_t + \mu_s + \varepsilon_{st} \quad (1)$$

- Event-study specification:

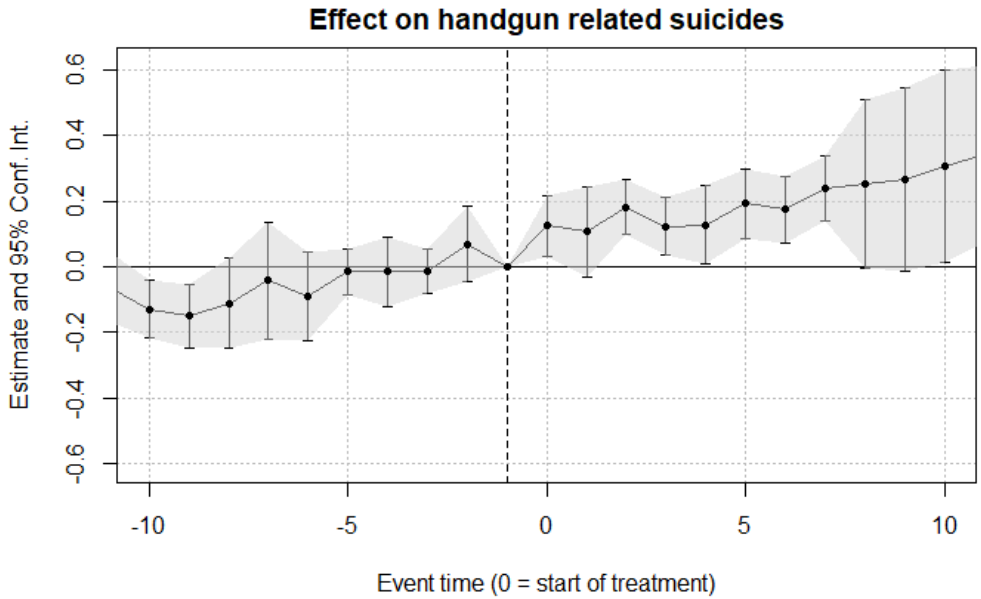
$$ln(HandgunSuicides_{st}) = \alpha + \sum_{\tau=-10}^{-2} \beta_\tau NoDelay_{s\tau} + \sum_{\tau=0}^{10} \beta_\tau NoDelay_{s\tau} + \gamma_t X_s + \lambda_t + \mu_s + \varepsilon_{st} \quad (2)$$

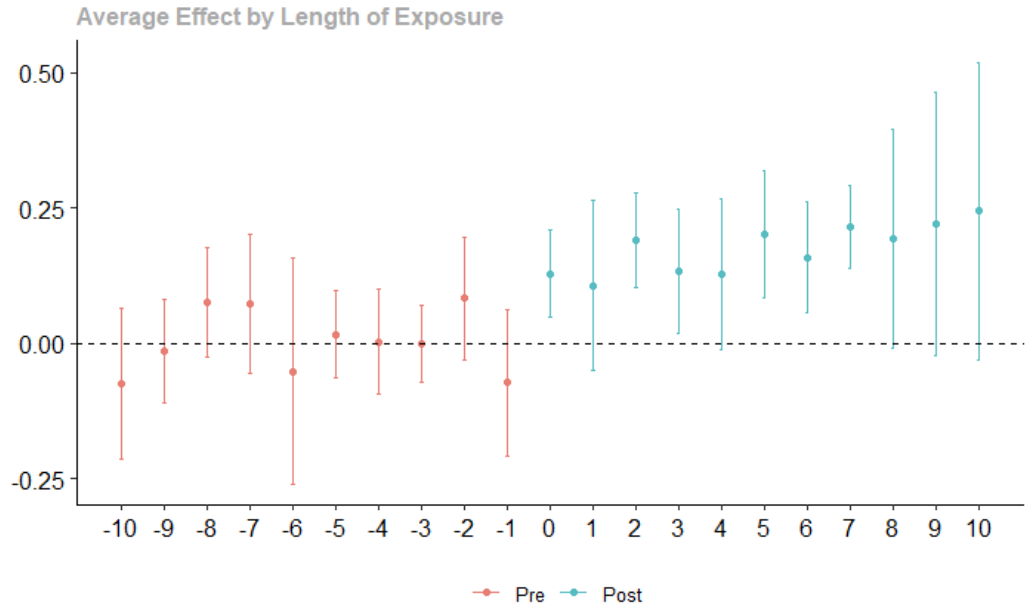
Empirical Strategy - Research Question 2

- Again DiD setup. However, in this sample there is no variation in treatment timing.
- Therefore, only TWFE estimator is used.
- Heterogeneous treatment effects are not analyzed given the contradictory findings which will be mentioned later.
- Main specification:

$$ln(HandgunSuicides_{st}) = \alpha + \beta_1(NoDelay_s \times Post_t) + \gamma_t X_s + \lambda_t + \mu_s + \varepsilon_{st} \quad (3)$$

Results - Research Question 1





Results - Research Question 1

	Outcome variable: Log of ...-related suicides per 100,000 people				
	Handgun			All	Non-handgun
	(1)	(2)	(3)	(4)	(5)
NoDelay	0.228**	0.133*	0.134**	0.036	−0.067**
	[0.015, 0.475]	[−0.012, 0.328]	[0.010, 0.295]	[−0.046, 0.116]	[−0.156, −0.011]
	p = 0.032	p = 0.066	p = 0.041	p = 0.251	p = 0.017
Inference	WCSE	WCSE	WCSE	WCSE	WCSE
Num.Obs.	374	374	374	374	374
States	17	17	17	17	17
Std.Errors	by: State	by: State	by: State	by: State	by: State
FE: State	✓	✓	✓	✓	✓
FE: Year	✓	✓	✓	✓	✓
Controls	×	✓	✓	×	×

Notes: Confidence intervals are presented in square brackets. Additionally, p-values are presented for each estimate. The sample period is from 1999 until 2020. In Column (2) included control variables are % rural and % only HS degree. In Column (3) included control variables are % rural, % only HS degree, % white population, and median income. All control variables are as of 2000 and interacted with Year FE. All regressions are weighted by state population. Levels of stat. significance: * $p < 0.1$, ** $p < 0.05$.

Table: Baseline results (TWFE,RQ1)

Results - Research Question 1

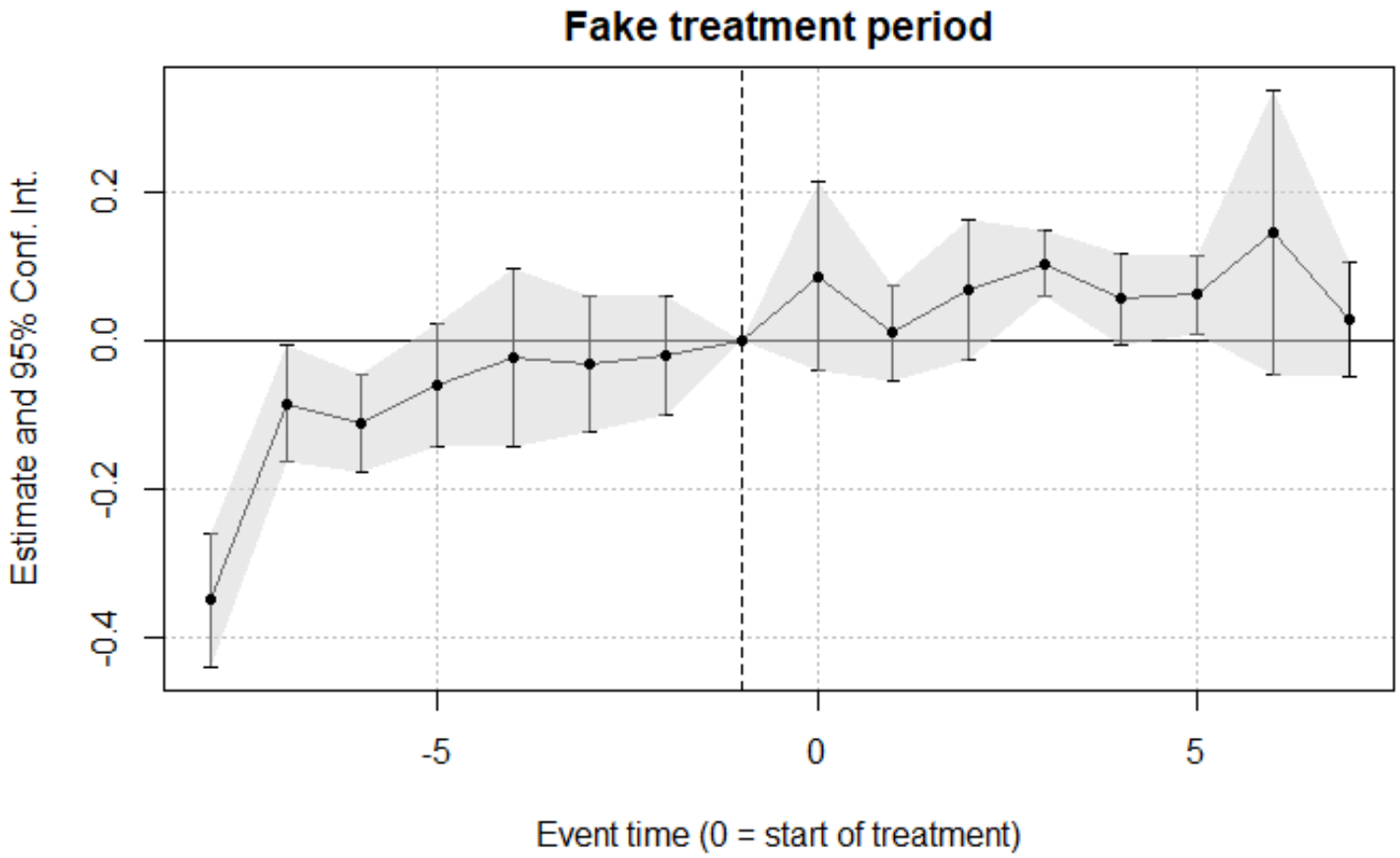
Outcome variable: Log of handgun-related suicides per 100,000 people					
(a) Unconditional parallel trends					
	Partially aggregated				Single parameters
Group-specific effects	Virginia	Missouri	Michigan	Wisconsin	
	0.1245*	0.2311*	0.1671*	0.3266*	0.1998*
	(0.0407)	(0.0317)	(0.0308)	(0.0166)	(0.0246)
Event study	e=0	e=1	e=2	e=3	
	0.1285*	0.1062	0.1906*	0.1338*	0.1742*
	(0.0475)	(0.0611)	(0.0393)	(0.0464)	(0.0481)
(b) Conditional parallel trends					
	Partially aggregated				Single parameters
Group-specific effects	Virginia	Missouri	Michigan	Wisconsin	
	0.1886*	0.1777	0.1014*	0.2779*	0.1725*
	(0.0473)	(0.1011)	(0.0467)	(0.0462)	(0.0461)
Event study	e=0	e=1	e=2	e=3	
	0.1140	0.1228	0.1959*	0.1200*	0.1589*
	(0.0587)	(0.0745)	(0.0476)	(0.0439)	(0.0458)

Notes: The sample period is from 1999 until 2020, with a total of 374 observations from 17 states. Standard errors computed using the multiplier bootstrap. Provided in parenthesis & clustered at the state level. Results of Panel (a) are based on the unconditional parallel trends assumption. Results of Panel (b) are based on the conditional parallel trends assumption. Conditional on the following variables: % rural, % only HS degree, % white population, and median income. All variables are as of 2000. Levels of stat. significance: * $p < 0.05$. All regressions are weighted by state population. Panel (a) and Panel (b) estimates are generated using the outcome regression estimator. Comparison group: Only "Never-Treated" units.

Table: Baseline results (CS, RQ1)

Results - Research Question 1

- Results robust with respect to multiple different robustness checks performed.
- However, following figure provides evidence that pre-treatment trends could be driving some of the observed results.



Results - Research Question 2

	Outcome variable: Log of ...-related suicides per 100,000 people					
	Handgun				All	Non-handgun
	(1)	(2)	(3)	(4)	(5)	(6)
NoDelay x Post	0.038**	0.033	0.050*	0.043**	−0.032**	−0.047**
	[0.003, 0.073]	[−0.009, 0.074]	[−0.003, 0.103]	[0.007, 0.079]	[−0.061, −0.003]	[−0.093, −0.001]
	p = 0.032	p = 0.120	p = 0.062	p = 0.021	p = 0.033	p = 0.046
Inference	Clustered SE	Clustered SE	Clustered SE	Clustered SE	Clustered SE	Clustered SE
Num.Obs.	460	460	460	460	460	460
States	46	46	46	46	46	46
Std.Errors	by: State	by: State	by: State	by: State	by: State	by: State
FE: State	✓	✓	✓	✓	✓	✓
FE: Year	✓	✓	✓	✓	✓	✓
Controls	×	✓	✓	✓	×	×

Notes: Confidence intervals are presented in square brackets. Additionally, p-values are presented for each estimate. The sample period is from 2000 until 2009. In Column (2) included control variables are % rural and % only HS degree. In Column (3) included control variables are % rural, % only HS degree, % white population, and median income. All control variables are as of 2000 and interacted with Year FE. In Column (4), the only included control variable is the time-varying state level unemployment rate which is compiled for the years from 2000 until 2009. All regressions are weighted by state population. Levels of stat. significance: * $p < 0.1$, ** $p < 0.05$.

Table: Baseline results (RQ2)

Results - Research Question 2

- Findings of Research Question 2 are dependent on the regressions being weighted by the state population.
- Estimates remain positive with different samples and control variables, but vary with respect to the levels of statistical significance observed.
- Only marginal changes to the levels of statistical significance when WCSE are used.
- Placebo test suggested a minor positive effect in the fake "Post" period.

Conclusion & Food for Thought

- Main findings (RQ1):
  - 17 to 26 percent increase in the rate of handgun-related suicides.
  - 1 percent increase in handgun sales led to a 0.52 percent increase in handgun-related suicides.
  - This increase most likely attributable to the substitution effect given 6.5 percent decrease in non-handgun-related suicide rates.
  - No evidence was found that the observed increase in handgun-related suicide rates led to an increase in overall suicide rates.
- Main findings (RQ2):
  - Evidence of 4 percent increase in handgun-related suicide rates in states without restrictive delay laws.
  - However, decrease in both non-handgun-related and overall suicide rates is also observed.
  - Problems with interpretation of results, why was there a decrease in overall suicide rates?
    - ★ Is it possible that there was there was a differential reaction to the 2008 recession between the *NoDelay* and *Delay* states?

Conclusion & Food for Thought

- General conclusion: Absence of restrictive delay laws leads to an increase in handgun-related suicide rates.
- Furthermore, in times of crisis, people will turn to more lethal means if they are more readily available.
- However, no increase in overall suicide rates was observed in either of the research questions, limiting policy implications.
- Possible interpretation of the findings could imply that the economic theory of suicide could explain more than previously thought.
- Additional avenues for research:
  - Decomposing substitution effect in more detail
  - Exploring net-effect for each state individually
  - Repeating analysis in cooperation with the CDC (no data limitations)

Thank you for your attention!