Online Appendix for State Differences in Permit-to-Purchase Responses: Homicides, Purchasing, and Spillovers

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A. Synthetic Weights

Table A.1: Connecticut's Synthetic Control Weight By Match and Outcome

Outcome	Donor State	Every Year	Every Other Year
Firearm Homicides	Delaware	0.170	0.000
	Florida	0.001	0.065
	Massachusetts	0.037	0.092
	Nevada	0.119	0.062
	New Jersey	0.019	0.274
	New York	0.099	0.000
	Pennsylvania	0.108	0.326
	Rhode Island	0.395	0.021
	Washington	0.001	0.123
Firearm Suicides	Massachusetts	0.134	0.146
	New Hampshire	0.097	0.081
	New Jersey	0.481	0.479
	Pennsylvania	0.106	0.114
	Washington	0.176	0.179
Non-homicide Violent Crime	New Hampshire	0.130	0.138
	New Jersey	0.491	0.511
	Rhode Island	0.333	0.334

States must have 5% weight in one of the specifications to be included in the table. Each number is the donor state's proportion of the synthetic control. There are other states not listed that contribute small percentages to the pool but less than 5% of the synthetic control.

Table A.2: Maryland's Synthetic Control Weight By Match and Outcome

Outcome	Donor State	Every Year	Every Other Year
Firearm Homicides	Georgia	0.065	0.114
	Mississippi	0.570	0.559
	Nevada	0.365	0.327
Firearm Suicides	Delaware	0.304	0.698
	Nevada	0.142	0.000
	New Jersey	0.553	0.294
Non-homicide Violent Crime	Delaware	0.808	0.848
	Georgia	0.192	0.152
Background Checks	Delaware	0.701	0.701
	New Jersey	0.299	0.299
Time-to-Crime	Delaware	0.576	0.574
	Georgia	0.128	0.136
	New Jersey	0.296	0.290
Self-Sourced Ratio	Delaware	0.429	0.454
	Nevada	0.453	0.418
	New York	0.118	0.128

States must have 5% weight in one of the specifications to be included in the table. Each number is the donor state's proportion of the synthetic control. There are other states not listed that contribute small percentages to the pool but less than 5% of the synthetic control.

Table A.3: Missouri's Synthetic Control Weight By Match and Outcome

Outcome	Donor State	Every Year	Every Other Year
Firearm Homicides	Michigan	0.394	0.560
	Ohio	0.198	0.034
	South Carolina	0.000	0.100
	Tennessee	0.371	0.211
	Vermont	0.037	0.095
Firearm Suicides	Alaska	0.114	0.149
	Montana	0.089	0.028
	Ohio	0.423	0.478
	South Carolina	0.184	0.212
	Washington	0.164	0.079
Non-homicide Violent Crime	Alaska	0.224	0.119
	Delaware	0.000	0.095
	Georgia	0.068	0.162
	Montana	0.000	0.152
	Nevada	0.000	0.081
	Ohio	0.237	0.004
	Oregon	0.000	0.113
	Tennessee	0.295	0.155
	Vermont	0.052	0.001
	Washington	0.117	0.006
Background Checks	Alaska	0.193	0.179
	Ohio	0.311	0.300
	South Carolina	0.148	0.158
	Tennessee	0.043	0.105
	Washington	0.252	0.247
Time-to-Crime	Michigan	0.795	
	Montana	0.137	
	Tennessee	0.053	
Self-Sourced Ratio	Michigan	0.132	
	Tennessee	0.742	
	Washington	0.126	

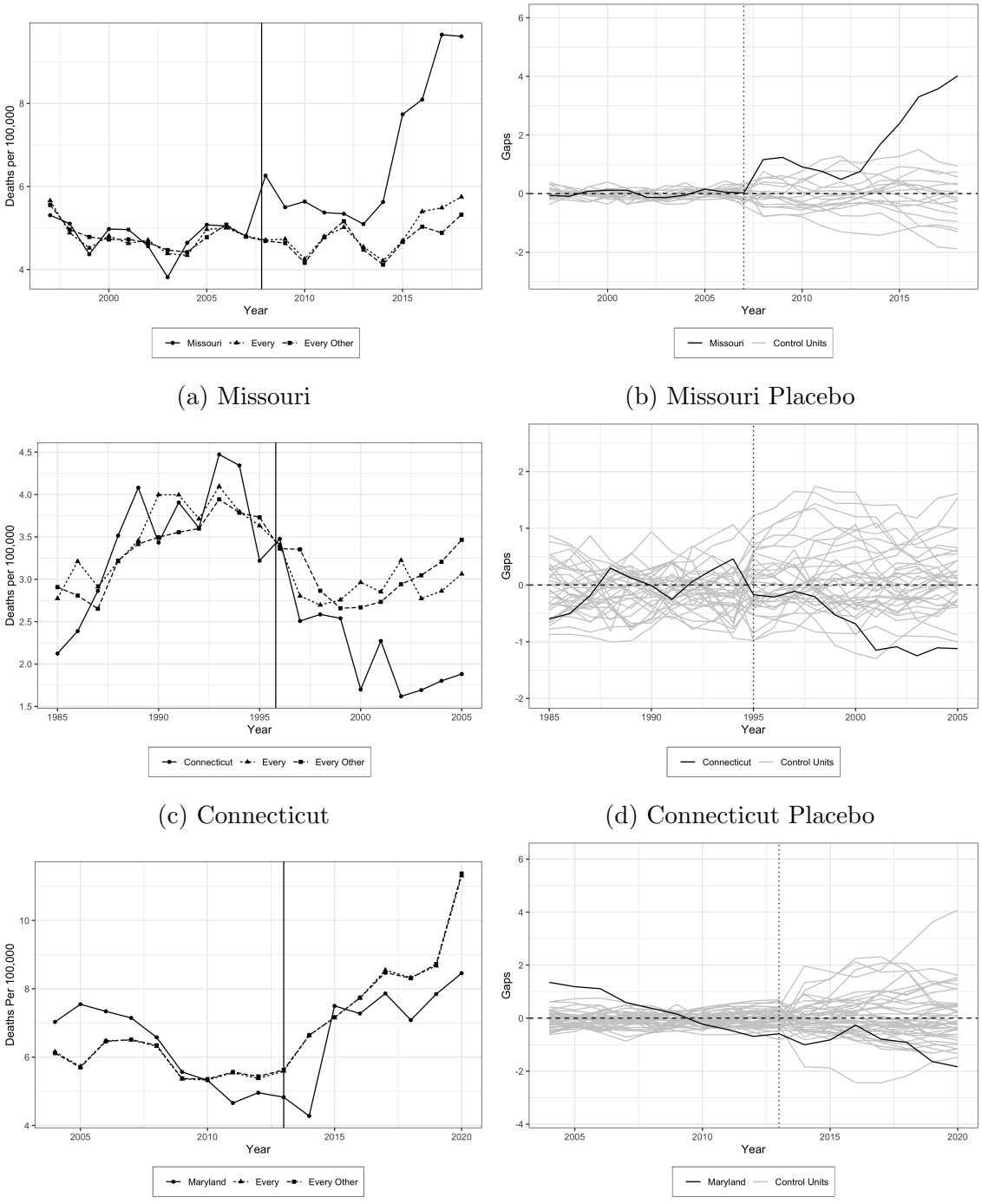
States must have 5% weight in one of the specifications to be included in the table. Each number is the donor state's proportion of the synthetic control. There are other states not listed that contribute small percentages to the pool but less than 5% of the synthetic control.

Table A.4: All Border County Weights

Outcome	Donor State	Every Year	Every Other Year
Missouri Border County State			
Firearm Homicides	Maine	0.210	0.001
	North Carolina	0.439	0.346
	Pennsylvania	0.011	0.346
	South Dakota	0.007	0.179
	Virginia	0.140	0.039
Firearm Suicides	Alabama	0.092	0.127
	Delaware	0.088	0.072
	North Carolina	0.272	0.226
	Pennsylvania	0.370	0.374
	Virginia	0.081	0.076
Connecticut Border County State			
Firearm Homicides	Montana	0.064	0.059
	New Jersey	0.374	0.438
	Oregon	0.103	0.000
	West Virginia	0.331	0.312
	Wyoming	0.006	0.162
Firearm Suicides	Montana	0.063	0.061
	New Jersey	0.359	0.387
	Oregon	0.102	0.118
	West Virginia	0.307	0.325
Maryland Border County State			
Firearm Homicides	Colorado	0.005	0.152
	Montana	0.125	0.060
	Nevada	0.572	0.581
	New Jersey	0.298	0.206
Firearm Suicides	Colorado	0.217	0.388
	Georgia	0.153	0.000
	New Jersey	0.589	0.612

States must have 5% weight in one of the specifications to be included in the table. Each number is the donor state's proportion of the synthetic control. There are other states not listed that contribute small percentages to the pool but less than 5% of the synthetic control.

B. Homicide and Suicide Whole State Replication



(a) Missouri

(b) Missouri Placebo

(c) Connecticut

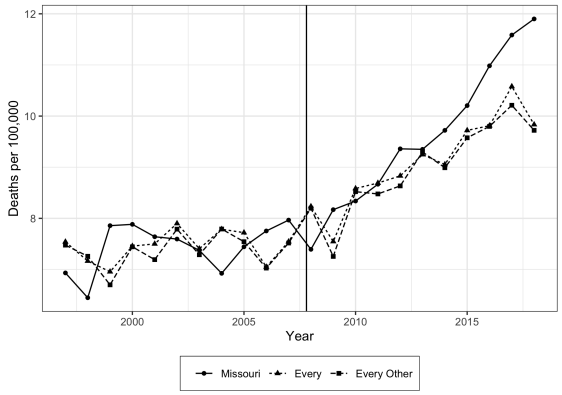
(d) Connecticut Placebo

(e) Maryland

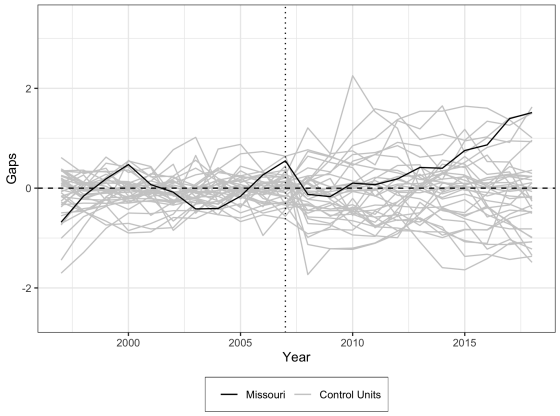
(f) Maryland Placebo

Figure B.1: Firearm Homicides Synthetic Control and Placebos

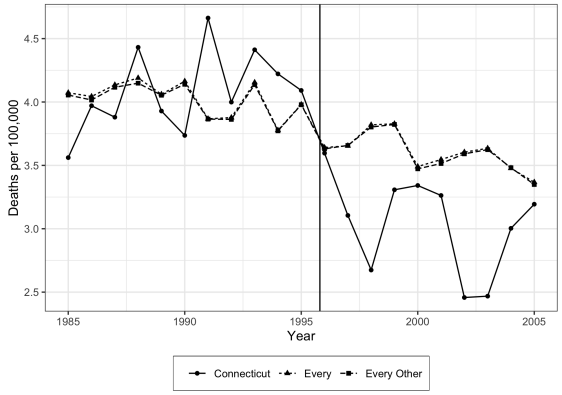
The synthetic control results for firearm homicides for each state using the Restricted-Use Vital Statistics from the CDC. The x-axis is the 10 years before and 10 years after the policy intervention, except in Maryland which only has 7 years after. The vertical lines represent the policy intervention date. Panels (a), (c), and (e) are a comparison of the two synthetic control procedures to the treatment state and the y-axis is deaths per 100,000 people (outcome variable is not rolling average). Panels (b), (d), and (f) are the graphical representations of the placebo testing that determines the p-values in table Table **??**-**??** and the y-axis is the gap between the synthetic control and treatment state for the every year match (outcome variable is rolling average). In all graphs, the treatment state is the solid black line. The synthetic controls are dashed and the placebo states are grey.



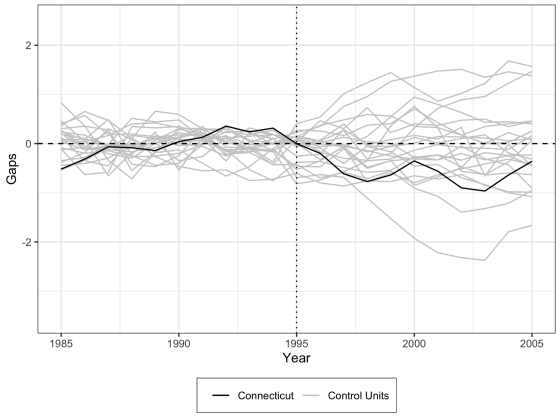
(a) Missouri



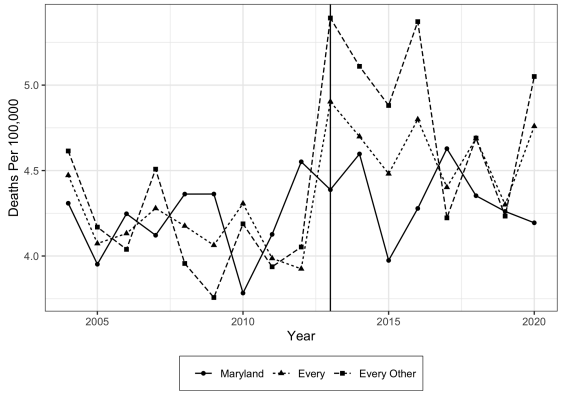
(b) Missouri Placebo



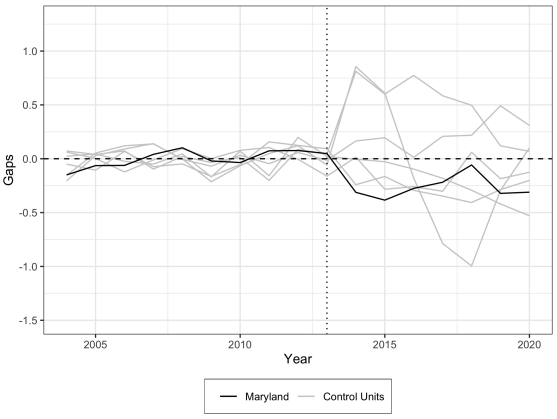
(c) Connecticut



(d) Connecticut Placebo



(e) Maryland

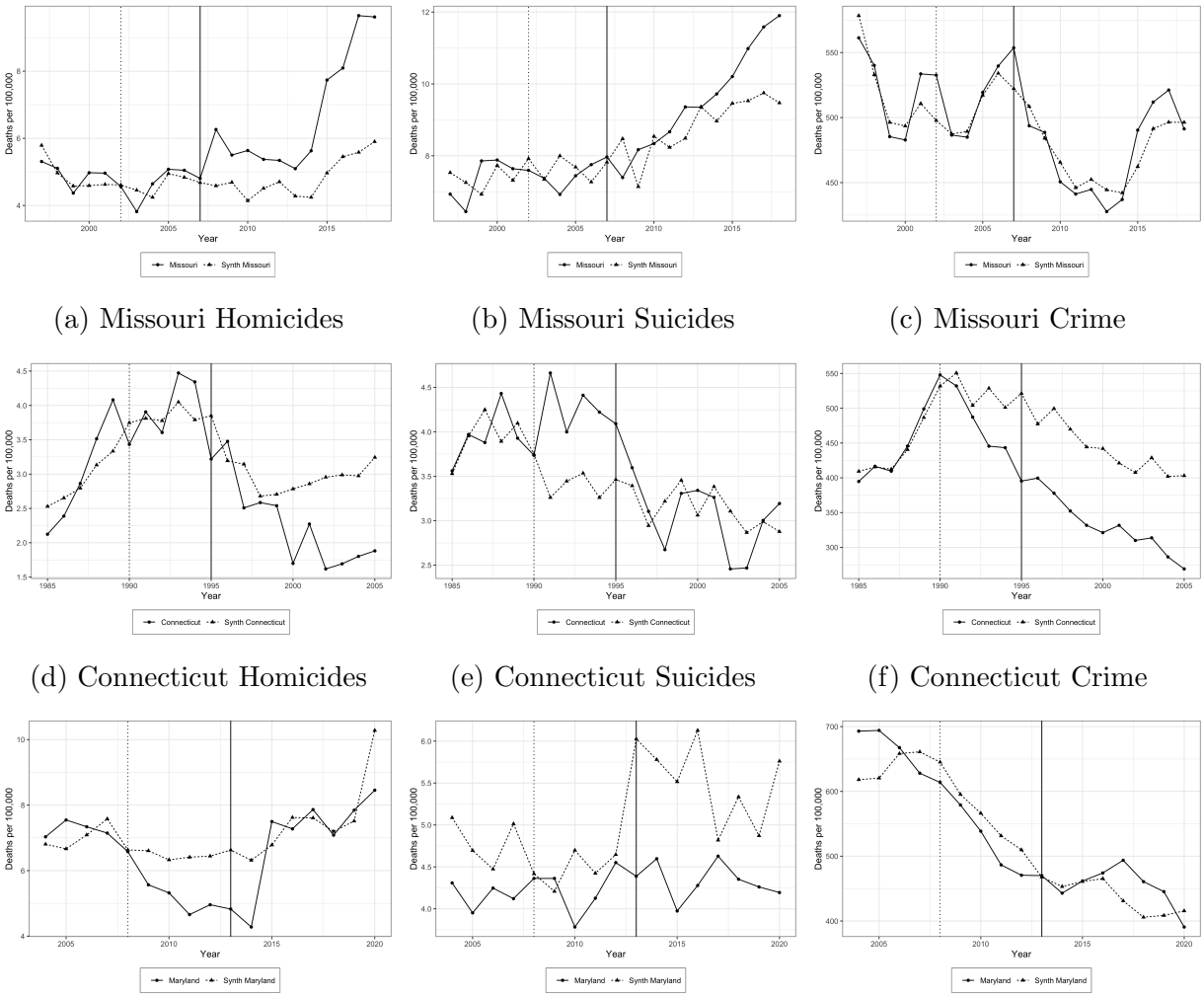


(f) Maryland Placebo

Figure B.2: Firearm Suicides Synthetic Control and Placebos

The synthetic control results for firearm suicide for each state using the Restricted-Use Vital Statistics from the CDC. The x-axis is the 10 years before and 10 years after the policy intervention, except in Maryland which only has 7 years after. The vertical lines represent the policy intervention date. Panels (a), (c), and (e) are a comparison of the two synthetic control procedures to the treatment state and the y-axis is deaths per 100,000 people (outcome variable is not rolling average). Panels (b), (d), and (f) are the graphical representations of the placebo testing that determines the p-values in table Table **??-??** and the y-axis is the gap between the synthetic control and treatment state for the every year match (outcome variable is rolling average). In all graphs, the treatment state is the solid black line. The synthetic controls are dashed and the placebo states are grey.

C. Robustness Test: Half Pre-Intervention Matching



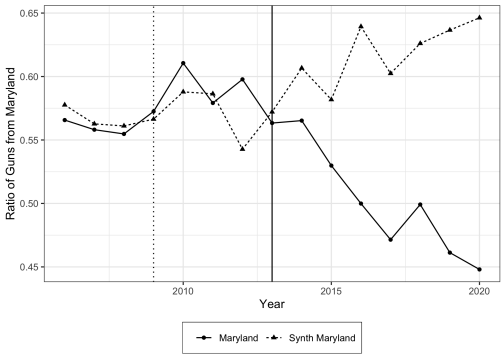
(a) Missouri Homicides (b) Missouri Suicides (c) Missouri Crime

(d) Connecticut Homicides (e) Connecticut Suicides (f) Connecticut Crime

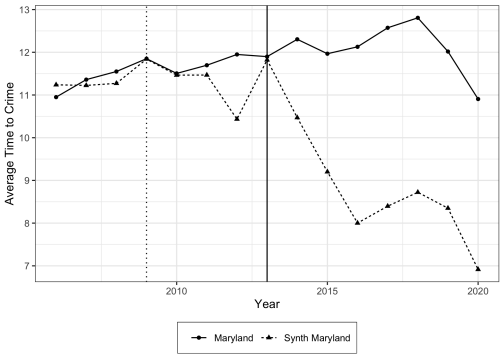
(g) Maryland Homicides (h) Maryland Suicides (i) Maryland Crime

Figure C.3: Half Pre-Intervention Match Placebo Robustness Check

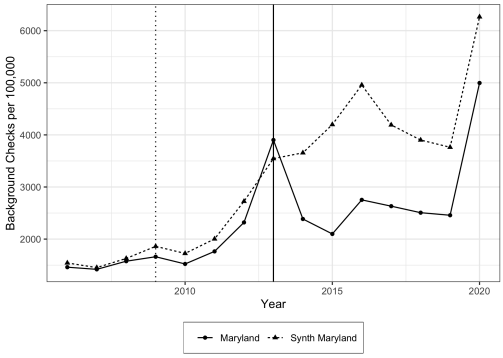
Each figure shows the robustness check and evidence for the identifying assumption by matching in the first 5 years of the pre-intervention period only. The y-axis is the outcome (deaths or crime) in number per 100,000. The x-axis is the 10 years before and after the policy intervention. The dashed vertical line is where the matching procedure ends and the solid vertical line is the policy intervention date. The sources are the same as the main results for each of the figures. Early deviation does not support the identifying assumption. While not a test, tracking well through the entire pre-intervention period does support the identifying assumption.



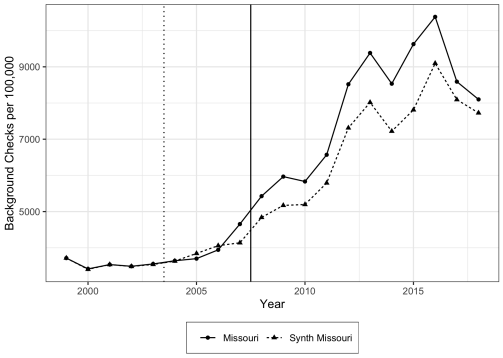
(a) Maryland Self-Sourced Ratio



(b) Maryland Time-to-Crime



(c) Maryland Background Check

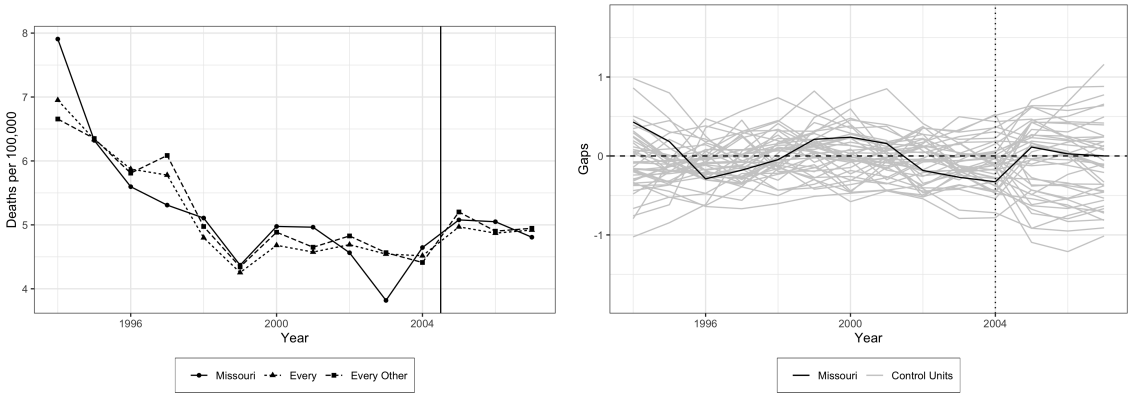


(d) Missouri Background Check

Figure C.4: Trace and Background Check Robustness Check: Match First Half of Pre-Intervention Period

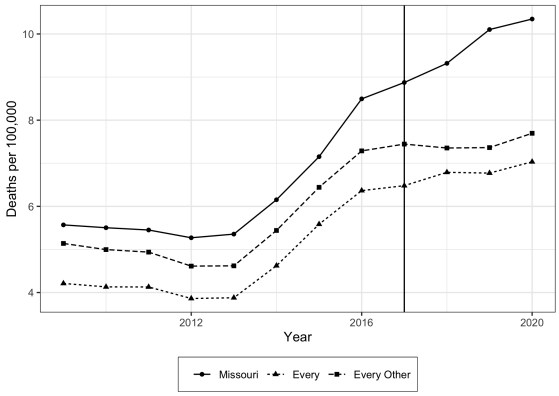
Each figure shows the robustness check and evidence for the identifying assumption by matching in the first half of the pre-intervention period only. In panel (a) the y-axis is the ratio of guns purchased in Maryland. In panel (b), the y-axis is the average time-to-crime in years. In panels (c) and (d), the y-axis is the background checks per 100,000. The x-axis for Maryland results is the 10 years before and 7 years after the policy intervention. For Missouri, the x-axis is the 8 years before and 10 years after the police intervention. The dashed vertical line is where the matching procedure ends and the solid vertical line is the policy intervention date. The sources are the same as the main results for each of the outcomes. Early deviation does not support the identifying assumption. While not a test, tracking well through the entire pre-intervention period does support the identifying assumption.

D. Note on Missouri 2004 and 2017 Conceal and Cary Changes

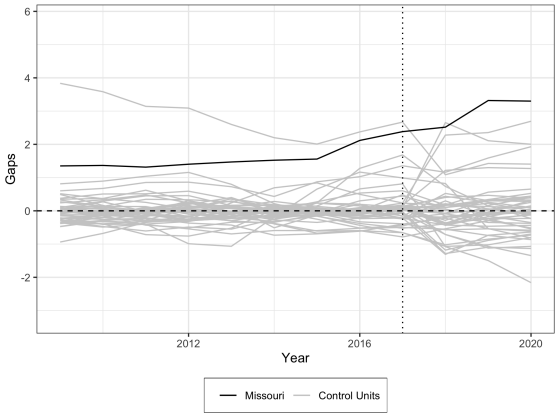


(a) Missouri Firearm Homicides 2004 Law

(b) Missouri Firearm Homicides 2004 Law: Placebo



(c) Missouri Firearm Homicides 2017 Law



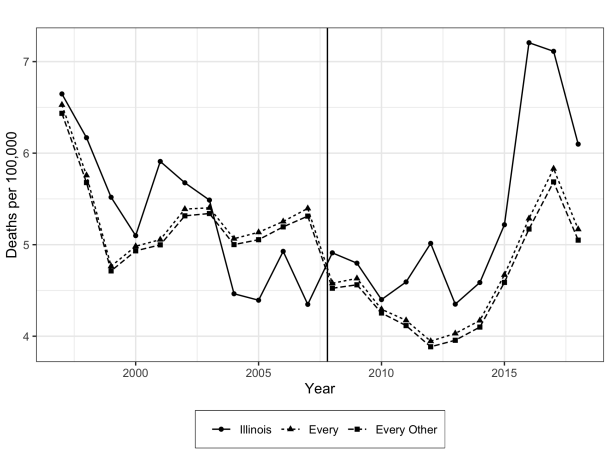
(d) Missouri Firearm Homicides 2017 Law: Placebo

Figure D.5: Firearm Homicides in Missouri Following Conceal and Cary Changes

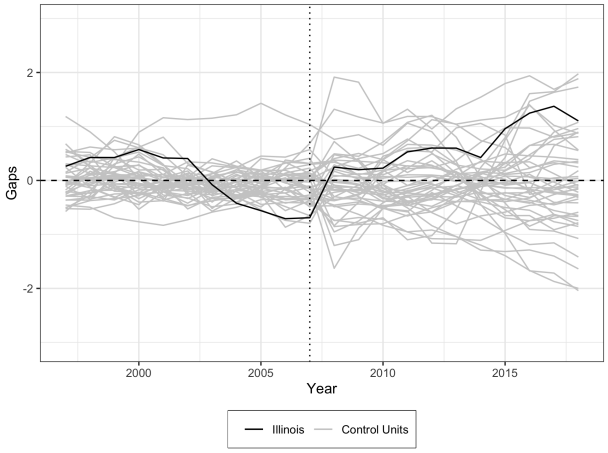
These figures are the visual synthetic control results Missouri for two possible law changes in Missouri in 2004 and 2017. The y-axis for Panel (a) and (c) are deaths per 100,000 and gaps between the synthetic control and Missouri for Panel (b) and (d). The x-axis is years. For Panel (a) and (b), there are 10 years before the policy change and 3 years after the policy change. For Panel (c) and (d) there are 10 years prior to the policy and 3 years after. Firearm suicides are from the Restricted-Use Vital Statistics from the CDC. Panels (a) and (c) are a comparison of the two synthetic control procedures in Missouri. Panel (b) and (d) are the graphical representations of the placebo testing that determines the p-values in table Table **??**. In all graphs, the treatment border-county state is the solid black line. The synthetic controls are dashed and the placebo states are grey.

E. Full State Spillover Analysis

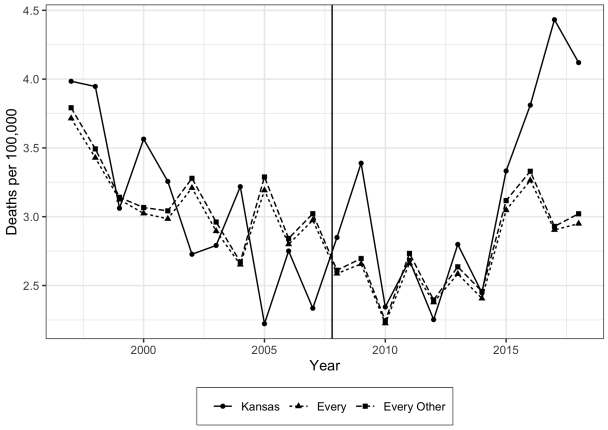
E.1. Spillover Analysis: Synthetic Control Figures



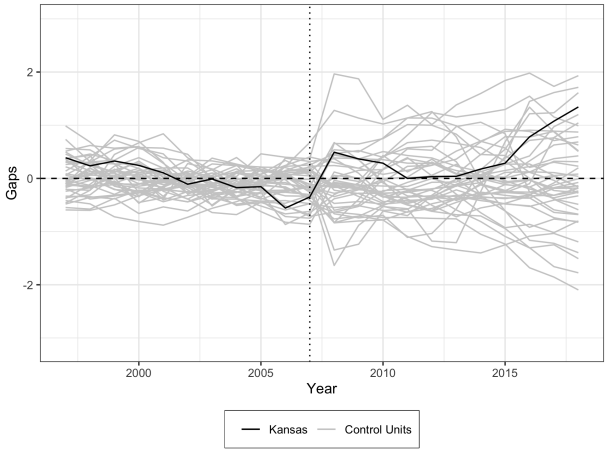
(a) Illinois Firearm Homicides



(b) Illinois Firearm Homicides Placebo



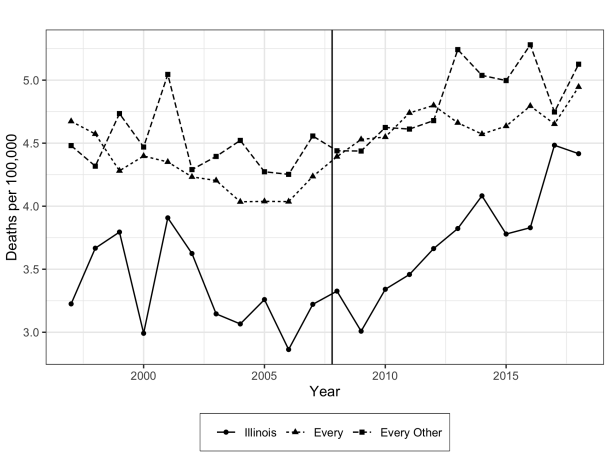
(c) Kansas Firearm Homicides



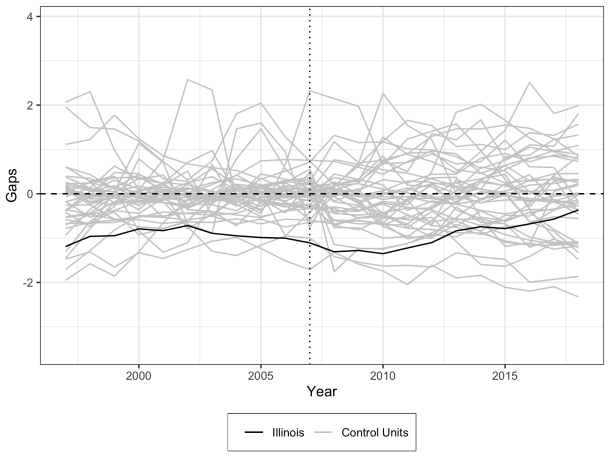
(d) Kansas Firearm Homicides Placebo

Figure E.6: Kansas and Illinois Synthetic Control: Firearm Homicides

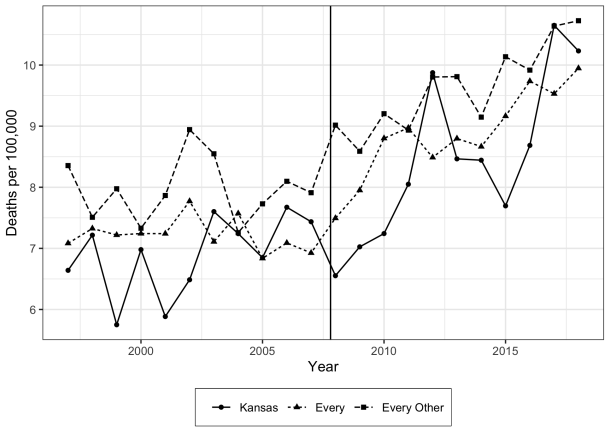
Looking at the spillover states to check if there was an increase in homicides around the same time as Missouri's policy change.



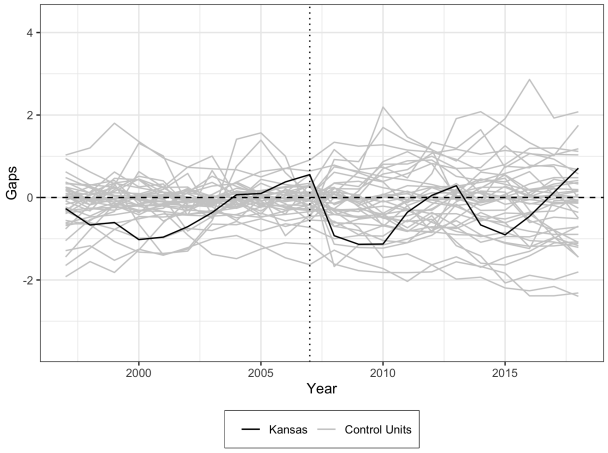
(a) Illinois Firearm Suicides



(b) Illinois Firearm Suicides Placebo



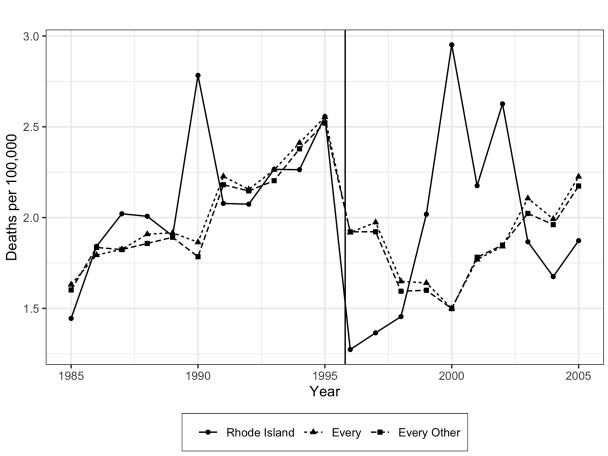
(c) Kansas Firearm Suicides



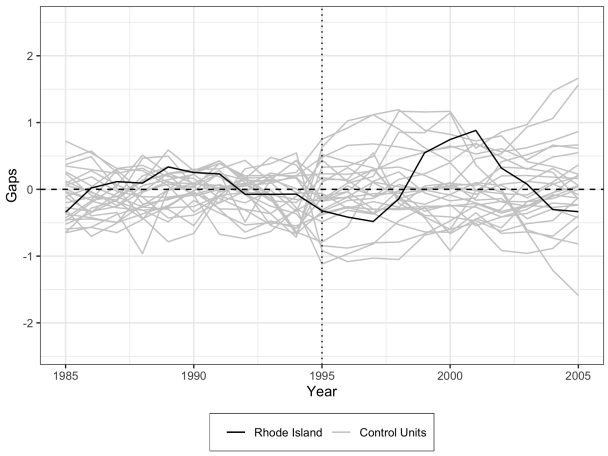
(d) Kansas Firearm Suicides Placebo

Figure E.7: Kansas and Illinois Synthetic Control: Firearm Suicides

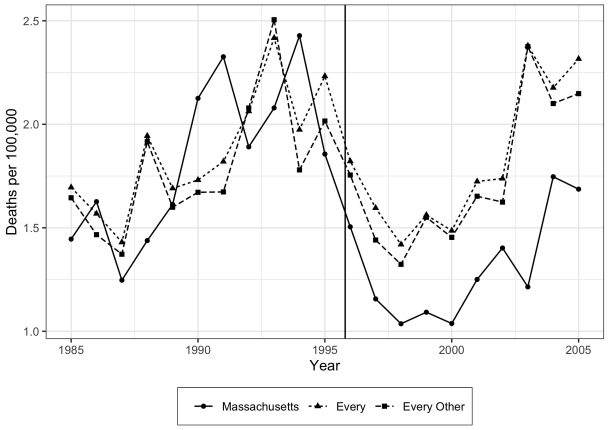
Looking at the spillover states to check if there was an increase in suicides around the same time as Missouri's policy change.



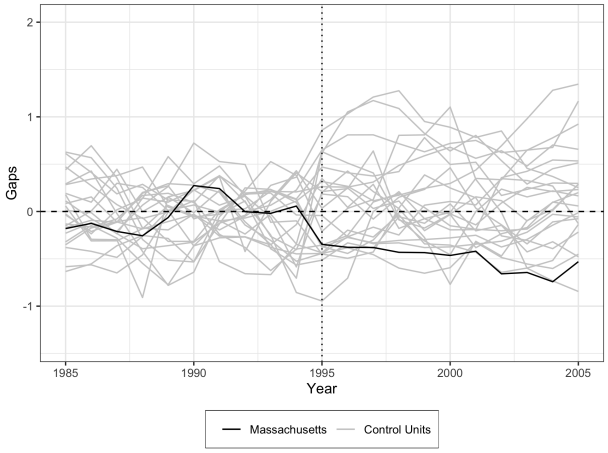
(a) Rhode Island Firearm Homicides



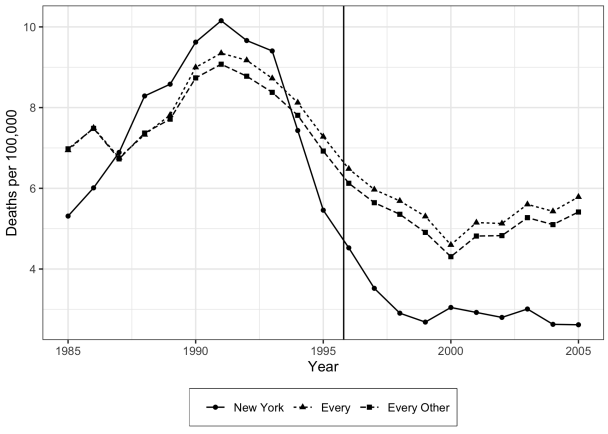
(b) Rhode Island Homicides Placebo



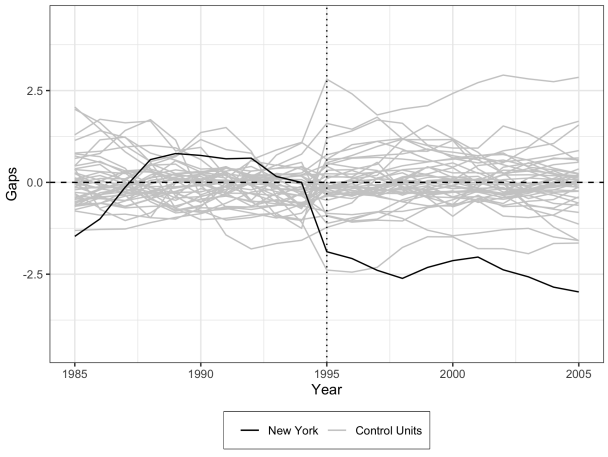
(c) Massachusetts Firearm Homicides



(d) Massachusetts Firearm Homicides Placebo



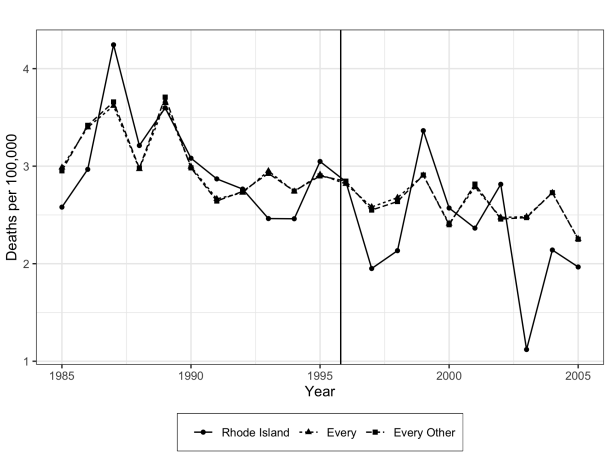
(e) New York Firearm Homicides



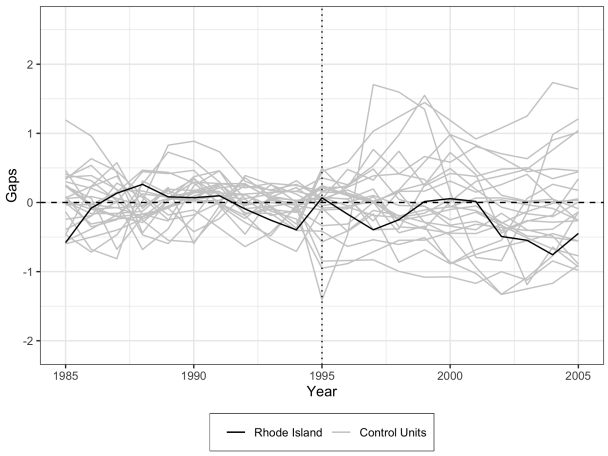
(f) New York Firearm Homicides Placebo

Figure E.8: RI, MA, and NY Synthetic Control: Firearm Homicides

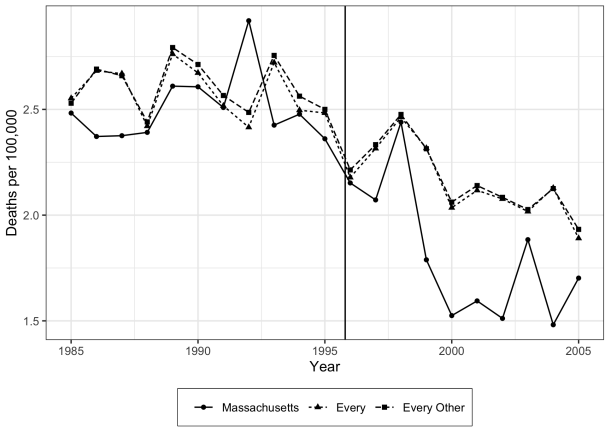
Looking at the spillover states to check if there was an increase in homicides around the same time as Connecticut's policy change. The left hand side shows both matching procedures while the right hand side shows the placebo test for every year matching.



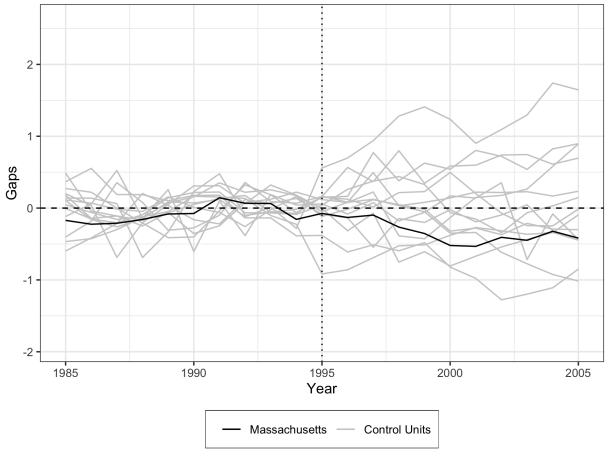
(a) Rhode Island Firearm Suicides



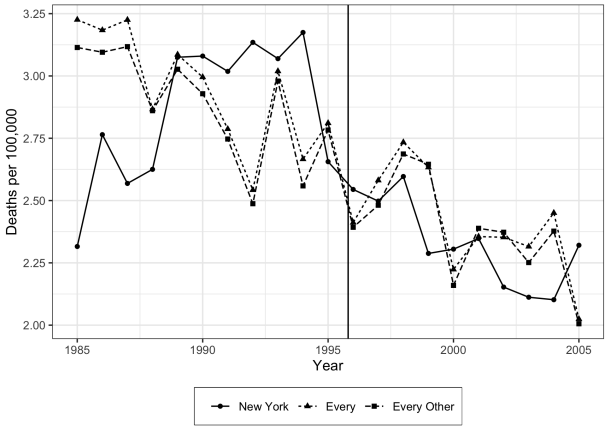
(b) Rhode Island Suicides Placebo



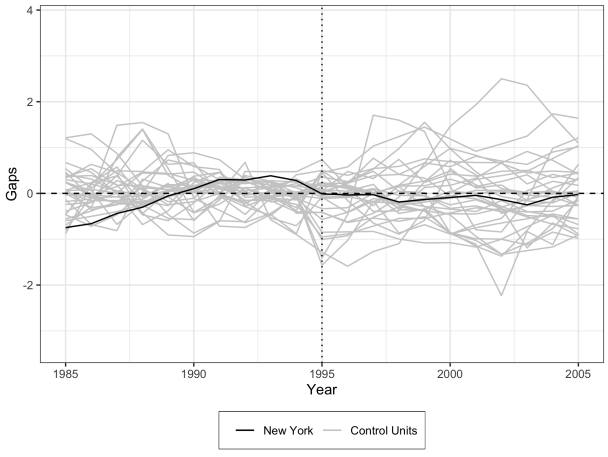
(c) Massachusetts Firearm Suicides



(d) Massachusetts Firearm Suicides Placebo



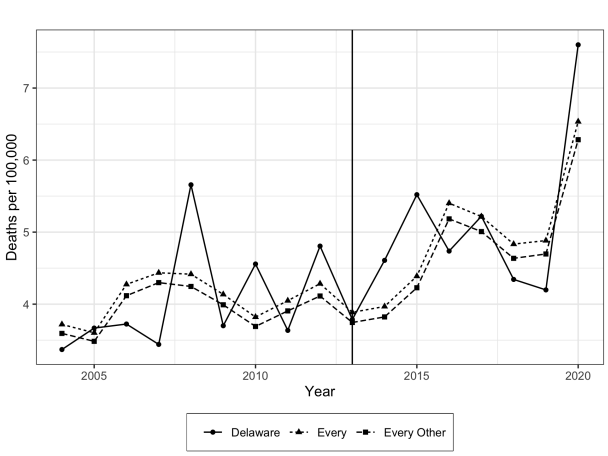
(e) New York Firearm Suicides



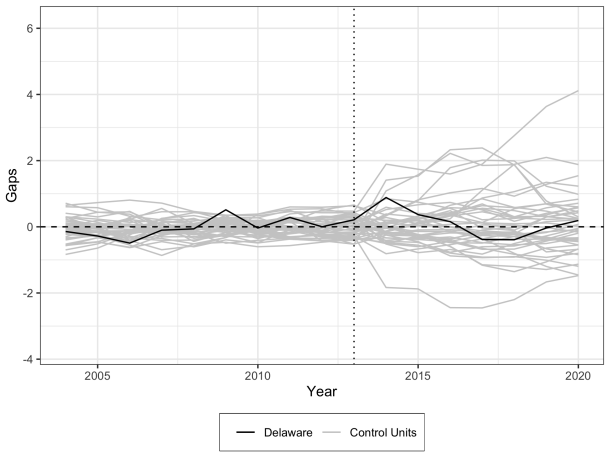
(f) New York Firearm Suicides Placebo

Figure E.9: RI, MA, and NY Synthetic Control: Firearm Suicides

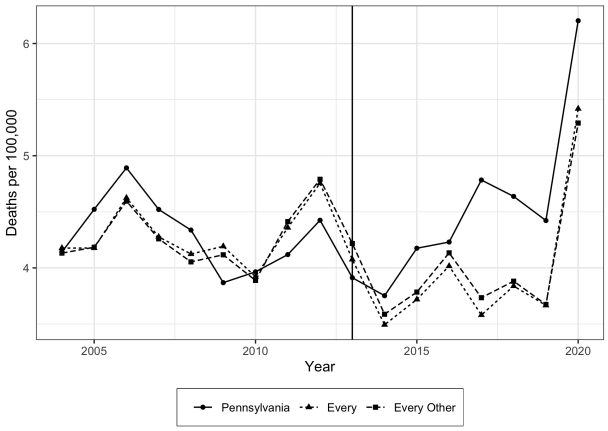
Looking at the spillover states to check if there was an increase in suicides around the same time as Connecticut's policy change. The left hand side shows both matching procedures while the right hand side shows the placebo test for every year matching.



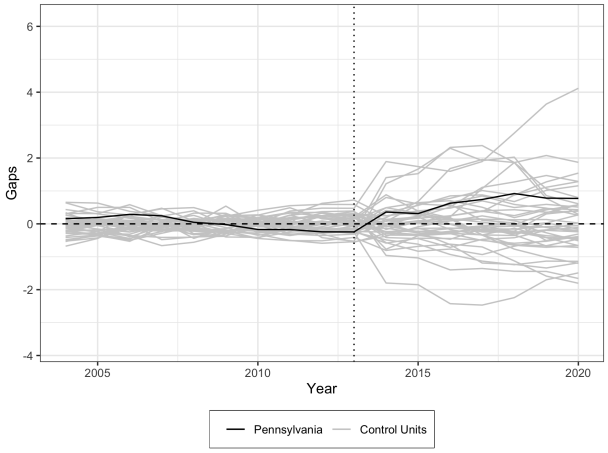
(a) Delaware Firearm Homicides



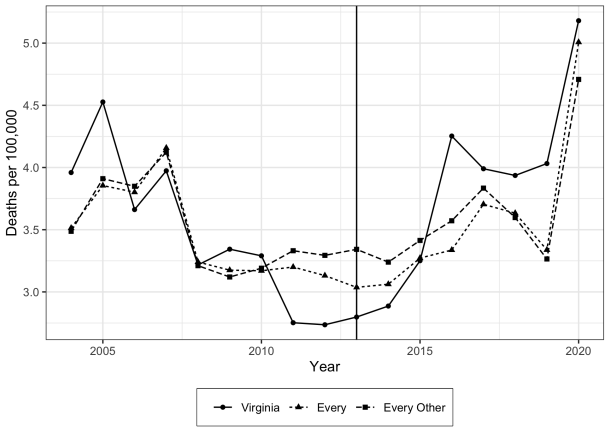
(b) Delaware Firearm Homicides Placebo



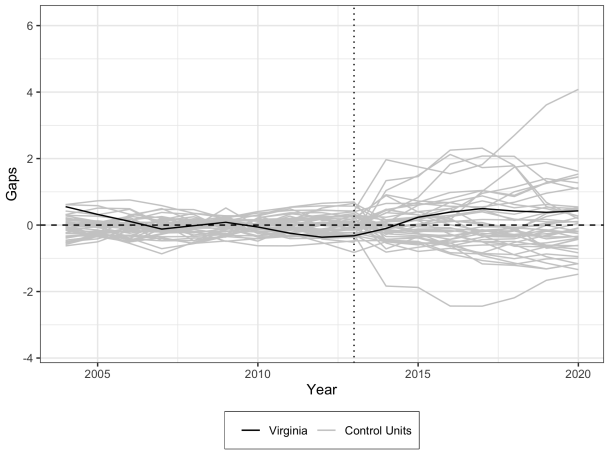
(c) Pennsylvania Firearm Homicides



(d) Pennsylvania Firearm Homicides Placebo



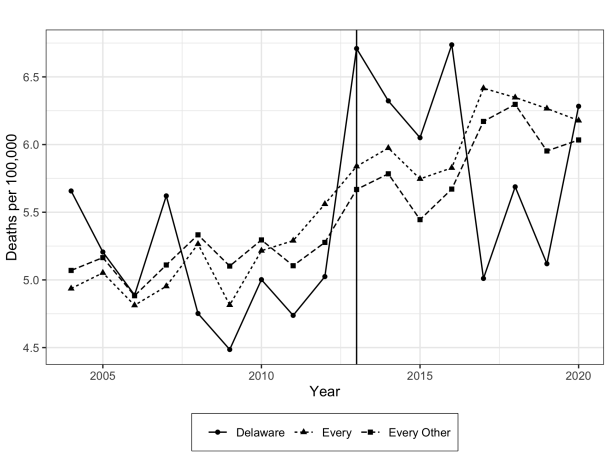
(e) Virginia Firearm Homicides



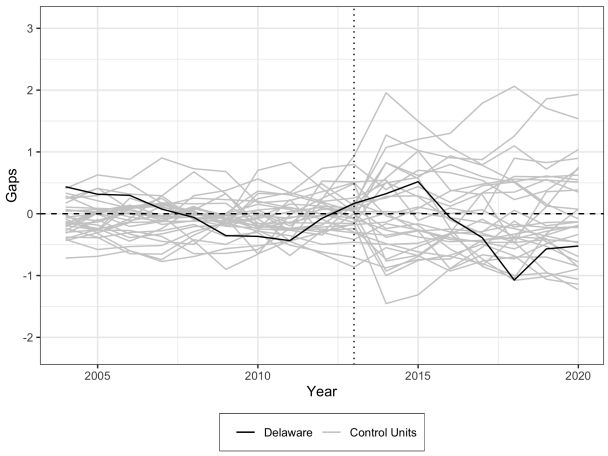
(f) Virginia Firearm Homicides Placebo

Figure E.10: DE, PA, and VA Synthetic Control: Firearm Homicides

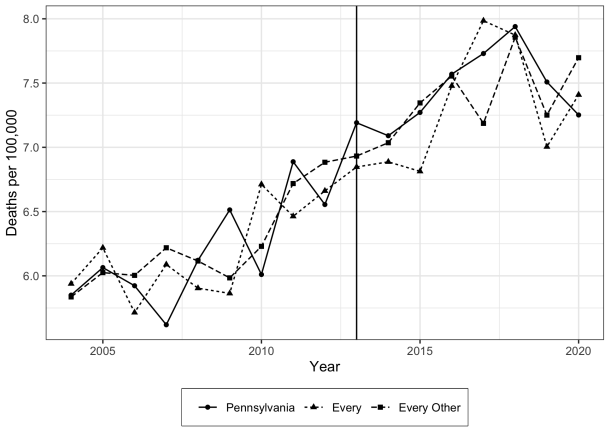
Looking at the spillover states to check if there was an increase in homicides around the same time as Maryland's policy change. The left hand side shows both matching procedures while the right hand side shows the placebo test for every year matching.



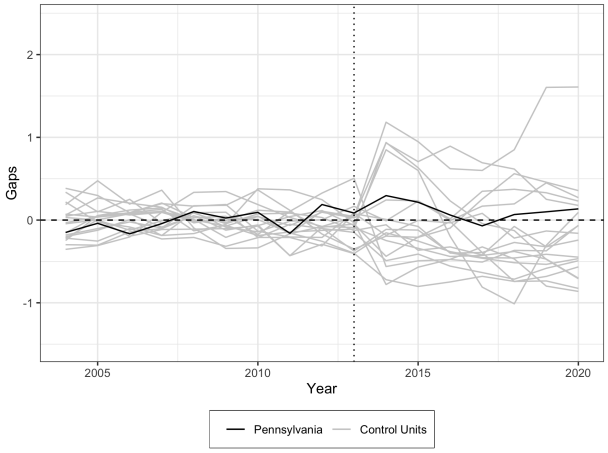
(a) Delaware Firearm Suicides



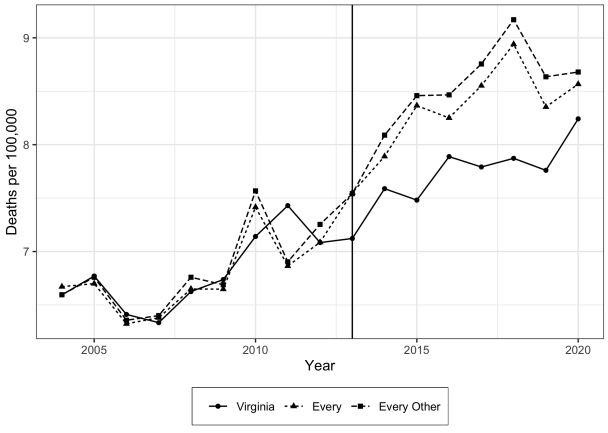
(b) Delaware Firearm Suicides Placebo



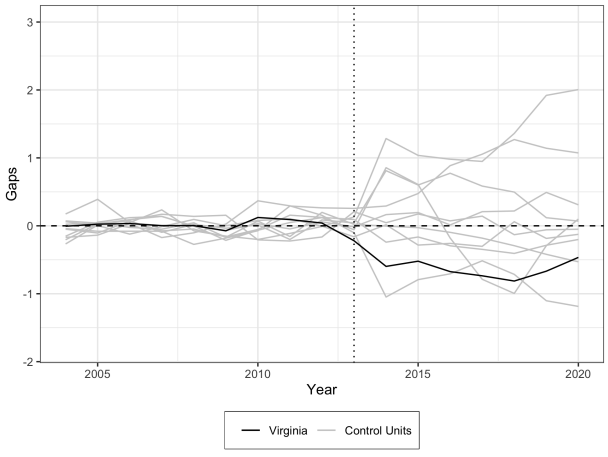
(c) Pennsylvania Firearm Suicides



(d) Pennsylvania Firearm Suicides Placebo



(e) Virginia Firearm Suicides



(f) Virginia Firearm Suicides Placebo

Figure E.11: DE, PA, and VA Synthetic Control: Firearm Suicides

Looking at the spillover states to check if there was an increase in suicides around the same time as Maryland's policy change. The left side shows both matching procedures while the right side shows the placebo test for every year matching.

E.2. Spillover Analysis: Full State p-values

Table E.5: Spillover States' p-values: Firearm Homicides

State	Control States Included	Every Year	Every Other Year
Panel A: Missouri's Spillover States			
Kansas	<20 MSPE	0.378	0.378
	<5 MSPE	0.395	0.405
	<2 MSPE	0.471	0.516
Illinois	<20 MSPE	0.435	0.522
	<5 MSPE	0.444	0.533
	<2 MSPE	0.455	0.533
Panel B: Connecticut's Spillover States			
Rhode Island	<20 MSPE	0.077	0.171
	<5 MSPE	0.111	0.233
	<2 MSPE	0.250	0.250
Massachusetts	<20 MSPE	0.053	0.054
	<5 MSPE	0.042	0.077
	<2 MSPE	0.167	0.167
New York	<20 MSPE	0.068	0.111
	<5 MSPE	0.068	0.114
	<2 MSPE	0.071	0.114
Panel C: Maryland's Spillover States			
Delaware	<20 MSPE	0.622	0.444
	<5 MSPE	0.614	0.487
	<2 MSPE	0.658	0.500
Pennsylvania	<20 MSPE	0.333	0.378
	<5 MSPE	0.357	0.364
	<2 MSPE	0.393	0.424
Virginia	<20 MSPE	0.756	0.822
	<5 MSPE	0.756	0.822
	<2 MSPE	0.795	0.822

The p-values in this table are the ratio of donor pool states with a more extreme MSPE in the post-intervention period that qualify by MSPE size in the pre-intervention period and come from the placebo procedure listed in the Method section.

Table E.6: Spillover States' p-values: Firearm Suicides

State	Control States Included	Every Year	Every Other Year
Panel A: Missouri's Spillover States			
Kansas	<20 MSPE	0.659	0.630
	<5 MSPE	0.707	0.659
	<2 MSPE	0.706	0.707
Illinois	<20 MSPE	0.872	0.872
	<5 MSPE	0.889	0.889
	<2 MSPE	0.905	0.907
Panel B: Connecticut's Spillover States			
Rhode Island	<20 MSPE	0.389	0.417
	<5 MSPE	0.480	0.583
	<2 MSPE	0.579	0.650
Massachusetts	<20 MSPE	0.115	0.174
	<5 MSPE	0.133	0.273
	<2 MSPE	0.000	0.167
New York	<20 MSPE	0.975	0.975
	<5 MSPE	0.969	0.967
	<2 MSPE	0.960	0.952
Panel C: Maryland's Spillover States			
Delaware	<20 MSPE	0.513	0.487
	<5 MSPE	0.594	0.594
	<2 MSPE	0.760	0.720
Pennsylvania	<20 MSPE	0.935	0.758
	<5 MSPE	0.895	0.800
	<2 MSPE	0.857	0.750
Virginia	<20 MSPE	0.040	0.040
	<5 MSPE	0.091	0.091
	<2 MSPE	NA	NA

The p-values in this table are the ratio of donor pool states with a more extreme MSPE in the post-intervention period that qualify by MSPE size in the pre-intervention period and come from the placebo procedure listed in the Method section. Virginia synthetic control fit is such that restricting the fit requirement to 2x the MSPE in the pre-intervention period other states do not qualify for comparison.