

# The Effect of Vertical Identification Card Laws on Youth Tobacco Use

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*Presented by:*

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Tobacco Online Policy Seminar

May 20, 2022

# Disclosures

- I am a graduate student and have no current or historical funding.
- The views expressed herein are those of the authors and do not necessarily reflect the views of the author institutions.
- There are no conflicts of interest.

# Preview

- **Motivation and Research Question:** How do vertical ID card laws affect youth tobacco and alcohol use in the United States?
- **Data:** Pooled national and state Youth Risk Behavior Surveillance System (YRBSS); National Youth Tobacco Survey (NYTS); Tobacco Use Supplement to Current Population Surveys (TUS-CPS).
- **Empirical Strategy:** Two Way Fixed Effects model and Stacked Difference-in-Difference strategy that exploits variation in the timing of Vertical ID laws implementation across the states.
- **Results:** We do not find evidence that vertical ID laws reduce underage tobacco and alcohol use.
- This contrasts with one previous study ending in 2009.
- These findings are important considering vertical ID laws are a major feature of IDs that have been adopted by all 50 states and D.C.

# Introduction

- Tobacco use is among the leading cause of preventable diseases, disability, and death in the United states.
- The economic costs related to smoking, both direct health care costs and losses in productivity, are over \$289 billion.
- Strong correlation between teen smoking and smoking later in life.
- 9 out of 10 adults who smoke cigarettes daily first try smoking by age 18 (CDC, 2021).

# Introduction

- Implementation of Vertical ID laws started in the 1990s and Colorado being the first state to pass the law in 1994. Vertical IDs used only for individuals under 21.



- 41% of teens are licensed at or before age 16, and 60% before age 18 (AAA Foundation, 2019) and state IDs.

# Introduction

- Vertical IDs may lower underage tobacco and alcohol use
  - May save time, decrease retailers' human error, and reduce manipulation of age information on IDs.
- However, vertical ID laws may not necessarily translate to lower underage tobacco and alcohol consumption.
  - Retailers could ignore checking IDs.
  - Teens can use fake IDs or legitimate ID of someone older.
  - Teens may obtain the products through legal-of-age straw purchasers.
- Tobacco 21 laws (T21)
  - reduce cigarette smoking amongst 18-year-old high school students (Bryan et al., 2020).
  - lower 8th, 10th, and 12th grade cigarette use and increases perceived risk of cigarette use (Abouk et al., 2021).
  - Could these effects be driven by the presence of vertical ID laws prior to adopting T21?

# Evidence

- Bellou & Bhatt (2013)
  - 1991 - 2009 national YRBSS data and two way fixed effects model.
  - Vertical ID reduces probability that a 16-year-old smokes or drinks by 8 - 10%.
  - The effects in the event study are concentrated within 1 to 2 years after Vertical ID law and not observed in 17-year-olds.
- Nesson & Shrestha (2021)
  - 1998 - 2014 Fatality Analysis Reporting Systems (FARS) and two way fixed effects model.
  - Vertical ID laws do not significantly reduce traffic fatalities that involve alcohol-impaired minor drivers in the USA.

# Contribution

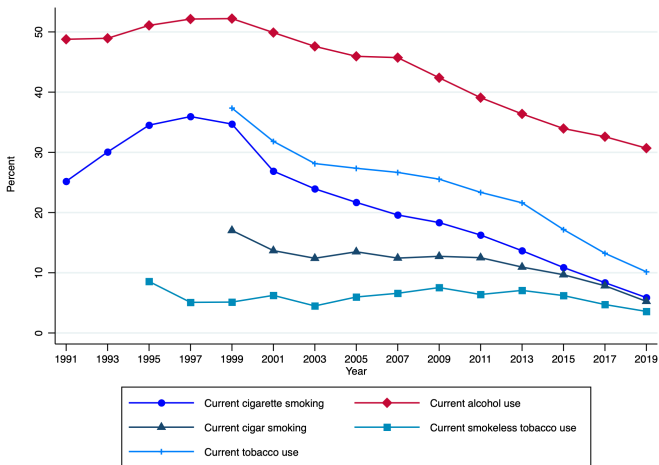
- Add extra years of data in the analysis, 1991 - 2019.
- Use state and national YRBSS to increase coverage and sample size.
- Additionally, use two other data sources.
- Explore other tobacco and alcohol use outcomes.
- Account for time varying policy effects of staggered adoption using a novel **stacked difference-in-difference** approach.



# Data

- Main analysis: **pooled national and state** Youth Risk Behavior Surveillance System (YRBSS), **1991-2019**.
  - Surveys high school students in public and private schools across the USA about their health behaviors biennially.
  - **Outcomes**
    - Main outcomes: cigarette smoking and alcohol use.
    - Any current (Any Use Past 30 Days), casual+ (At Least 3 Days Past 30 Days), frequent+ (At least 20 Days Past 30 Days), and daily (Everyday Past 30 Days).
    - Other outcomes: cigar smoking and smokeless tobacco use.
    - Excluded e-cigarette vaping.
  - **Tobacco use analytical sample**: 16 and 17-year-olds.
  - **Alcohol use analytical sample**: 16, 17 and 18-year-olds.

# Data



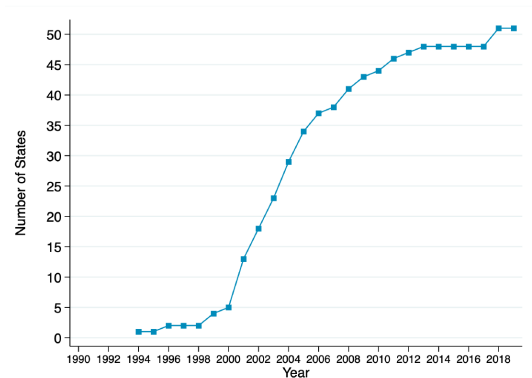
Youth Tobacco and alcohol use in the past month. Youth Risk Behavior Surveillance System (YRBSS). Sample of 16 and 17-year-olds for tobacco outcomes. Sample of 16, 17, and 18-year-olds for alcohol.

# Data

- Supplemental analysis: **National Youth Tobacco Survey** and **Tobacco Use Supplement to Current Population Survey**.
- **National Youth Tobacco Survey (NYTS)**, 2006-2017.
  - Provides nationally representative data on youth in middle and high school in the USA about tobacco-related beliefs, attitudes, and behaviors.
  - Analytical sample: 16 and 17-year-olds.
  - Outcomes: Cigarette smoking (any current, casual+, frequent+, and daily smoking).
- **Tobacco Use Supplement to Current Population Survey (TUS-CPS)**, 1992-2015.
  - Administered approximately 3-4 years as part of the USA Census Bureau Current Population Survey.
  - Analytical sample: 16 and 17-year-olds.
  - Outcomes: Current and daily cigarette smoking.

# Data

- **Vertical ID laws:**
  - All 50 states and D.C implemented Vertical ID law by 2018.



Number of states with vertical Id laws.

# Data

- **Vertical ID laws:**
  - Respondent's date of birth not available in the surveys.
  - For majority of states, no information on the exact effective month of vertical ID laws.
  - Teens with horizontal licenses before the mandate (e.g., 16-year-olds) were not required by law to get vertical licenses, only newly issued licenses were vertical.
  - 16, 17, and 18-year-olds got vertical IDs in and after the effective year, one year, and two years after the state enforces vertical license laws (Bellou & Bhatt, 2013).
  - For example, a state implements vertical ID law in 2010, then 16-year-olds in 2010 and onward, 17-year-olds in 2011 and onward, 18-year-olds in 2012 onward have vertical IDs.
- Control all policies used in Bellou & Bhatt (2013) and add others.

# Empirical Strategy

- Exploits variation in the timing of implementation of vertical ID laws across states.
- **Difference-in-Difference**
  - Requires a treatment group (a state where the vertical ID law was implemented) and a control group (a state with no policy change around the effective date of the treated state).
  - For both groups, requires a pre- and post-period.
- Challenge in staggered policy designs: treated units return as controls for later treated units (Goodman-Bacon, 2021), which is problematic if there are time-varying treatment effects.
- Two Way Fixed Effects in this context leads to estimation error.
- **Solution:** Stacked difference-in-differences uses only control states that are untreated, as a counterfactual for the treated states.
- Since all states adopt at some point, we allow states to return to be potential control states as long as there is no policy adoption four years before or after.

# Empirical Strategy

- Data construction to estimate stacked DD:
  - For each **vertical ID law event** select as controls the states where the policy had not changed in the same 9 year window.
  - Each **vertical ID law event** and control states make up a stack.
  - Append the stacks.
  - Repeat the steps for each age-group (16, 17, and 18-year-olds).

# Empirical Strategy

For each age group separately, Stacked DD estimation:

$$Y_{istk} = \alpha + \theta VerticalID_{stk} + X_{ist}\beta_1 + P_{st}\beta_2 + \nu_s + z_t + \eta_k + \epsilon_{istk} \quad (1)$$

- $i$  indexes youth,  $s$  indexes state,  $t$  indexes year, and  $k$  indexes event.
- $Y_{ist}$ : tobacco and alcohol use.
- $VerticalID_{stk}$ : vertical ID laws indicator taking value of one after a state implements the policy.
- $X_{ist}$ : race, gender, and grade level.
- $P_{st}$ : tobacco control and alcohol policies, marijuana laws, and economic climate.
- $\nu_s$ : state fixed effects.
- $z_t$ : year fixed effects.
- $\eta_k$ : stack fixed effects.
- Robust standard errors are clustered at the state-level.



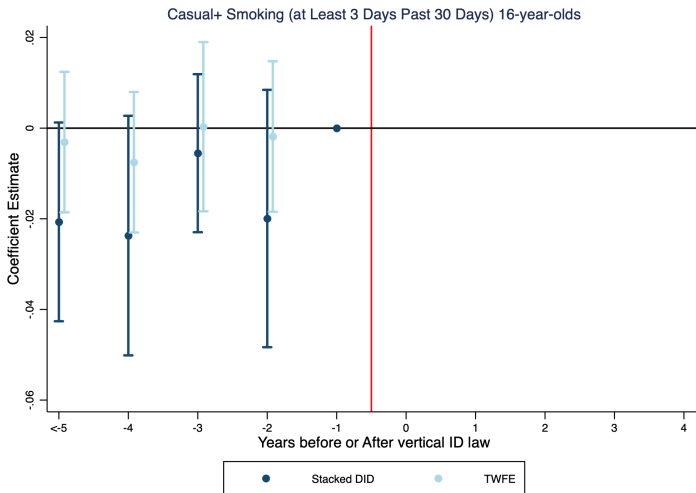
# Estimation Strategy

- Event study analysis

$$Y_{istk} = \alpha + \sum_{\substack{j=-J \\ j \neq \{-1\}}}^J \theta_j VerticalID_{sjk} + X_{ist}\beta_1 + P_{st}\beta_2 + \nu_s + z_t + \eta_k + \epsilon_{istk} \quad (2)$$

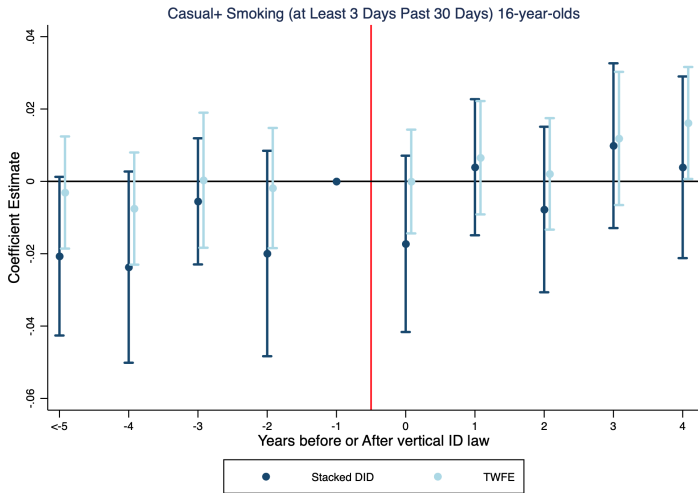
- $VerticalID_{sjk}$ : indicator variables corresponding to the years before, during, and after implementation of vertical ID laws.
- $j$  indexes periods relative to state implementation of vertical ID laws, with 1 year prior as the omitted category.
- Other variables follow similar definitions as in Equation (1).

# Results

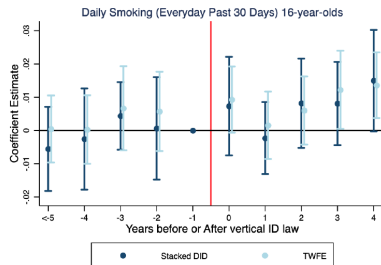
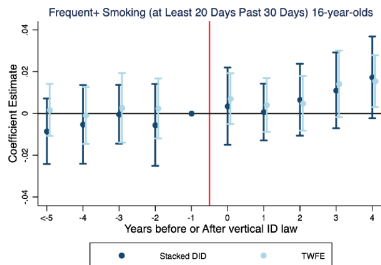
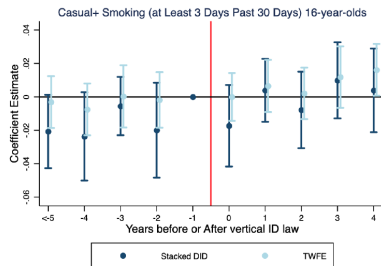
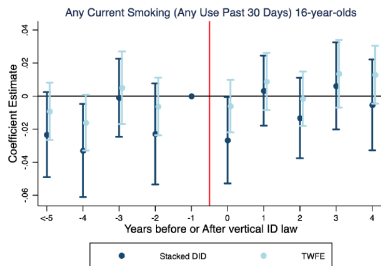


Cigarette Smoking. Sample of 16-year-olds. Youth Risk Behavior Surveillance System (YRBSS).

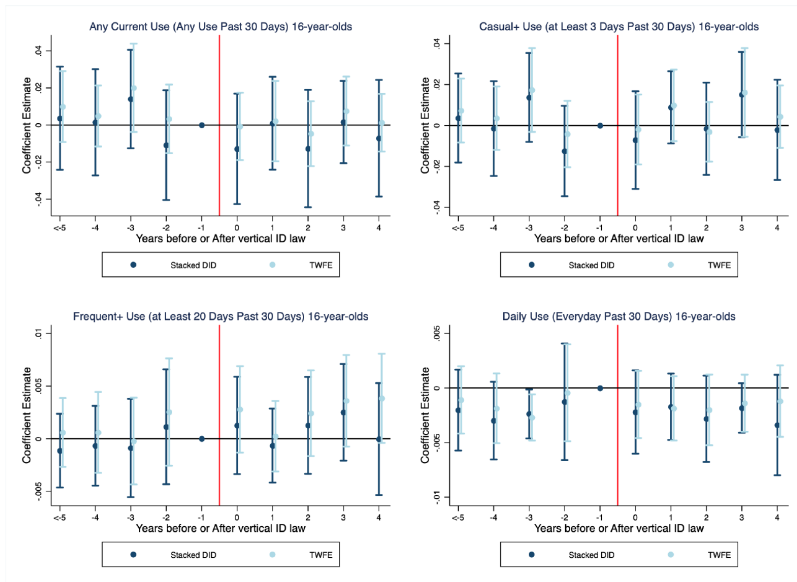
# Results



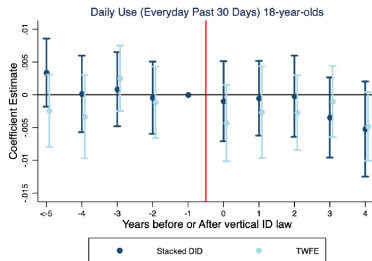
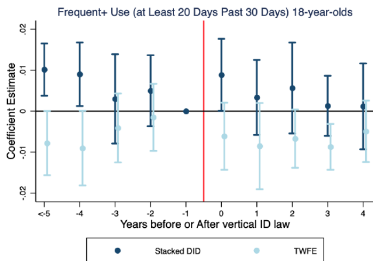
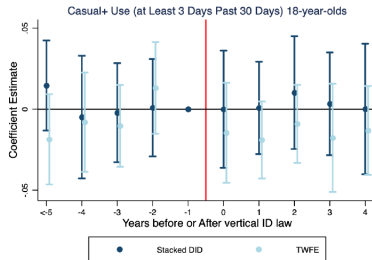
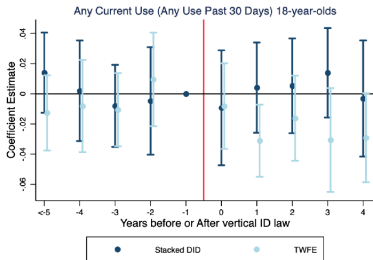
Cigarette Smoking. Sample of 16-year-olds. Youth Risk Behavior Surveillance System (YRBSS).



Cigarette Smoking. Sample of 16-year-olds. Youth Risk Behavior Surveillance System (YRBSS).



Alcohol use. Sample of 16-year-olds. Youth Risk Behavior Surveillance System (YRBSS)



Alcohol Use. Sample of 18-year-olds. Youth Risk Behavior Surveillance System (YRBSS).

# Results

- In general, results are qualitatively similar, thus, we find that vertical IDs do not significantly lower probability that a teen smokes:
  - for 16 and 17-year-olds in pooled national and state YRBSS.
  - 16 and 17-year-olds in NYTS and TUS-CPS.
- Vertical ID laws do not significantly reduce alcohol use for 16, 17, and 18-year-olds in pooled national and state YRBSS.
- We do not find evidence that the vertical ID laws lower use of other tobacco products, cigar smoking and smokeless tobacco use.
- Precisely estimated zeros effect for most of the outcomes except for less common outcomes, smokeless tobacco.
  - 95% confident that we can rule out a decrease greater than 11.5%, 5%, and 7.5% for 16-year-olds current smoking and 16 and 18-year-olds current alcohol drinking.

## Robustness tests

- Replicated Bellou and Bhatt (2013) using national YRBSS 1991-2009 and 1991-2019.
- Two Way Fixed Effects model.
- Including state-specific time trend.
- Using weights.
- Individuals' day of birth within that particular calendar year.



# Conclusion

- Overall, we find no significant impact of vertical ID laws on youth tobacco use and alcohol use.
- The effect seems to disappear over the last decade which could reflect changes in the market of tobacco products (for example e-cigarette use).
  - What has happened over the last decade that has made vertical IDs no longer effective in reducing youth substance use?
- The effect of vertical ID laws may be limited by their enforcement and alternative sources of tobacco products, such as social sources.
- The study focuses on vertical ID laws because it seems in many ways to be a major policy change that has been adopted by all 50 states.
- In future work, we plan to examine the impact of other ID laws and features.

# Thank You

Comments and suggestions are appreciated.

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Table 3: The effect of vertical ID on youth cigarette smoking. A sample of 16-year-olds. Youth Risk Behavior Surveillance System (YRBSS).

	(1)	(2)	(3)	(4)	(5)	(6)
	TWFE	StackedDD	TWFE	StackedDD	TWFE	StackedDD
Any Current Smoking (Any Use Past 30 Days)						
Vertical ID	0.009 (0.007)	0.011 (0.007)	0.009 (0.006)	0.007 (0.007)	0.005 (0.005)	-0.001 (0.008)
N	409,989	508,966	409,989	508,966	409,989	508,966
Pre-Treatment Mean DV	0.261	0.249	0.261	0.249	0.261	0.249
Casual+ Smoking (at Least 3 Days Past 30 Days)						
Vertical ID	0.008 (0.007)	0.013* (0.007)	0.008 (0.005)	0.010 (0.007)	0.007 (0.005)	0.003 (0.008)
N	409,989	508,966	409,989	508,966	409,989	508,966
Pre-Treatment Mean DV	0.203	0.193	0.203	0.193	0.203	0.193
Frequent+ Smoking (at Least 20 Days Past 30 Days)						
Vertical ID	0.008 (0.005)	0.012** (0.005)	0.007* (0.004)	0.010* (0.005)	0.007* (0.004)	0.005 (0.006)
N	409,989	508,966	409,989	508,966	409,989	508,966
Pre-Treatment Mean DV	0.120	0.114	0.120	0.114	0.120	0.114
Daily Smoking (Everyday Past 30 Days)						
Vertical ID	0.006 (0.004)	0.007 (0.004)	0.006 (0.004)	0.006 (0.004)	0.005 (0.003)	0.002 (0.005)
N	409,989	508,966	409,989	508,966	409,989	508,966
Pre-Treatment Mean DV	0.089	0.085	0.089	0.085	0.089	0.085
Individual covariates	No	No	Yes	Yes	Yes	Yes
State covariates	No	No	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State linear time trend	No	No	No	No	Yes	Yes

Table 5: The effect of vertical ID on youth alcohol use. A sample of 16-year-olds. Youth Risk Behavior Surveillance System (YRBSS).

	(1)	(2)	(3)	(4)	(5)	(6)
	TWFE	StackedDD	TWFE	StackedDD	TWFE	StackedDD
<b>Any Current Use (Any Use Past 30 Days)</b>						
Vertical ID	-0.005 (0.004)	-0.003 (0.005)	-0.006 (0.004)	-0.007 (0.005)	-0.007* (0.004)	-0.006 (0.007)
N	409,989	508,966	409,989	508,966	409,989	508,966
Pre-Treatment Mean DV	0.446	0.436	0.446	0.436	0.446	0.436
<b>Casual+ Use (at Least 3 Days Past 30 Days)</b>						
Vertical ID	0.003 (0.005)	0.006 (0.004)	0.000 (0.004)	0.003 (0.005)	-0.000 (0.004)	0.007 (0.005)
N	409,989	508,966	409,989	508,966	409,989	508,966
Pre-Treatment Mean DV	0.246	0.237	0.246	0.237	0.246	0.237
<b>Frequent+ Use (at Least 20 Days Past 30 Days)</b>						
Vertical ID	0.002 (0.001)	0.001 (0.001)	0.002 (0.001)	0.001 (0.001)	0.001 (0.001)	-0.001 (0.002)
N	409,989	508,966	409,989	508,966	409,989	508,966
Pre-Treatment Mean DV	0.019	0.018	0.019	0.018	0.019	0.018
<b>Daily Use (Everyday Past 30 Days)</b>						
Vertical ID	-0.000 (0.001)	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.002 (0.001)
N	409,989	508,966	409,989	508,966	409,989	508,966
Pre-Treatment Mean DV	0.009	0.009	0.009	0.009	0.009	0.009
Individual covariates	No	No	Yes	Yes	Yes	Yes
State covariates	No	No	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State linear time trend	No	No	No	No	Yes	Yes

Table 7: The effect of vertical ID on youth alcohol use. A sample of 18-year-olds. Youth Risk Behavior Surveillance System (YRBSS).

	(1)	(2)	(3)	(4)	(5)	(6)
	TWFE	StackedDD	TWFE	StackedDD	TWFE	StackedDD
Any Current Use (Any Use Past 30 Days)						
Vertical ID	-0.005 (0.010)	0.000 (0.014)	-0.002 (0.010)	0.008 (0.010)	-0.002 (0.010)	0.006 (0.010)
N	177,233	263,374	177,233	263,374	177,233	263,374
Pre-Treatment Mean DV	0.537	0.523	0.537	0.523	0.537	0.523
Casual+ Use (at Least 3 Days Past 30 Days)						
Vertical ID	0.006 (0.008)	0.006 (0.013)	0.004 (0.007)	0.006 (0.009)	0.001 (0.007)	-0.001 (0.012)
N	177,233	263,374	177,233	263,374	177,233	263,374
Pre-Treatment Mean DV	0.334	0.317	0.334	0.317	0.334	0.317
Frequent+ Use (at Least 20 Days Past 30 Days)						
Vertical ID	0.000 (0.002)	-0.003 (0.003)	0.002 (0.002)	0.003 (0.003)	0.002 (0.002)	0.003 (0.004)
N	177,233	263,374	177,233	263,374	177,233	263,374
Pre-Treatment Mean DV	0.034	0.032	0.034	0.032	0.034	0.032
Daily Use (Everyday Past 30 Days)						
Vertical ID	-0.002 (0.002)	-0.004** (0.002)	-0.002 (0.002)	-0.001 (0.002)	-0.002 (0.002)	0.001 (0.003)
N	177,233	263,374	177,233	263,374	177,233	263,374
Pre-Treatment Mean DV	0.014	0.015	0.014	0.015	0.014	0.015
Individual covariates	No	No	Yes	Yes	Yes	Yes
State covariates	No	No	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State linear time trend	No	No	No	No	Yes	Yes