

Tobacco Consumption Habits in Argentina

Evidence from a New Regulation

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Motivation

Modifiable risky behaviors are a major determinant of premature death in developed and developing countries (Blecher, 2008 ; Cawley and Ruhm, 2011).

- ▶ Tobacco use is the leading risk factor in high-income countries (18% of deaths),
- ▶ and the second most important risk factor in middle-income countries (11% of deaths).

Non-price policies have become increasingly common in the last two decades

- ▶ Place-based bans policies & graphic tobacco warnings
- ▶ Particularly attractive in middle- and low-income countries, where tobacco use is concentrated among low-income households.

I study the effect of non-price interventions on smoking, drinking, and health outcomes in the context of a middle-income country—Argentina.

- ▶ High prevalence of smoking—28.6% of population
- ▶ (Very) low prevalence of electronic cigarettes—around 1% of population
- ▶ Smoking is responsible for 13.2% of deaths

This paper

- ▶ What is the causal effect of non-price policies on smoking prevalence, alcohol consumption, and health outcomes?
 - ▶ In 2011 Argentinean government implemented an anti-smoking law.
 - ▶ I exploit state-level differences in the strength of regulation on tobacco products before 2011.
 - ▶ I compare individuals in lenient states (treated states) with individuals in strict states (comparison states).
- ▶ Data
 - ▶ I compile data on tobacco regulation from state statutes and laws.
 - ▶ Individual-level data from two national surveys: smoking habits and alcohol consumption.
 - ▶ Restricted-access administrative data on hospital discharges.
- ▶ Preview of results: policy effectively curbed tobacco consumption.
 - ▶ Reductions in the share of current smokers (-6.17 pp).
 - ▶ Reductions in cigarettes smoked per day (-16.52 pp).
 - ▶ Small effects on health outcomes.

Contribution to the literature

- ▶ Effect of clean indoor-air policies:

- ▶ North America-based research shows mixed impacts of smoking bans on smoking behavior (Adda and Cornaglia, 2010; Bitler, Carpenter and Zavodny, 2010; Carpenter, Postolek and Warman, 2011; Burton, 2020)
- ▶ Europe based research suggests reductions of small magnitude in smoking behavior (Buonanno and Ranzani, 2013; Pieroni et al., 2013; Sureda et al., 2014)
- ▶ Less causal evidence on the effect of these policies on developing countries

This paper employs an identification strategy that provides causal estimates of the impacts of this policy

- ▶ Effect of graphic warnings labels:

- ▶ Main empirical challenge: graphic warnings have often been enacted as part of broader anti-smoking campaigns. (DeCicca, Kenkel and Lovenheim, 2020)
- ▶ Research based on actual consumption behavior is limited (Kuehnle, 2019)

This paper provides estimates of the effects of graphic warnings on extensive margin outcomes

Agenda

- 1 Institutional details
- 2 Data
- 3 Empirical Strategy
- 4 Results
- 5 Conclusions

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Institutional details

Federal law (2011)

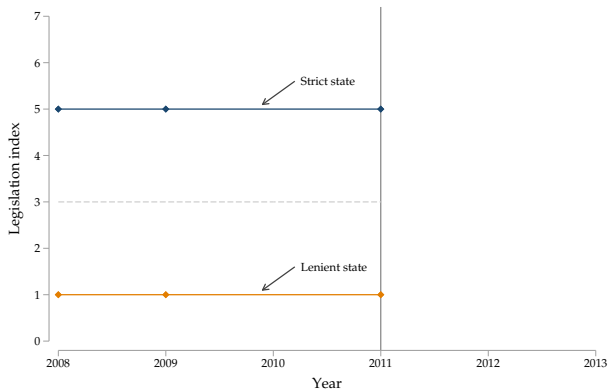
- ▶ Place-based bans: bars, restaurants, public and private work spaces
- ▶ Incorporates graphic tobacco warnings [Example](#)

State laws (before 2011)

- ▶ Each state has autonomy to regulate smoking and access to tobacco products.
- ▶ Compile data on tobacco regulation at the state level (23 states, 47 regional laws)
- ▶ Summarize the state-level regulations in an index:
 - Higher values on the index represent stronger regulation of tobacco products. [Map](#)

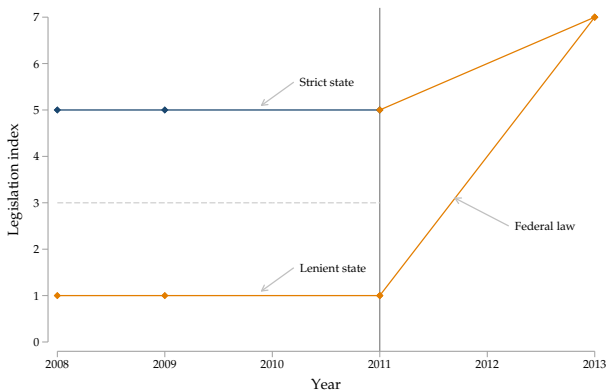
Institutional details

States with lenient regulations were more affected by the new regulation than states with strict regulations.



Institutional details

States with lenient regulations were more affected by the new regulation than states with strict regulations.



⇒ I exploit state-level differences in the strength of tobacco products' regulation before the federal law was enacted.

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Data

- ▶ Tobacco and alcohol consumption data (2008, 2009, 2011, and 2013)
 - ▶ Individual level data from two national surveys
 - ▶ Smoking behavior
 - Probability that an individual is a never smoker
 - Probability that an individual is a current smoker
 - Cigarettes smoked per day
 - ▶ Alcohol consumption in the last month, abusive consumption and binge drinking
- ▶ Health outcomes: Restricted-access administrative data on hospital discharges
 - ▶ Prevalence rate of hospitalization from chronic obstructive pulmonary disease (COPD).
 - ▶ Prevalence rate of hospitalization from respiratory-system-related cancer.

Self-reported consumption vs sales data

Definitions

Summary Statistics, Pre-policy Period

Variable (mean)	All states	Strict states	Lenient states	Equality of means
Never-smokers	0.560	0.561	0.558	0.777
Current smokers	0.286	0.281	0.290	0.587
Mean cigarettes per day				
0 to 5	0.373	0.397	0.352	0.024
6 to 10	0.266	0.260	0.270	0.513
11 to 20	0.297	0.282	0.310	0.073
more than 20	0.064	0.060	0.068	0.382
Prevalence rate (per 1,000)				
COPD	0.203	0.196	0.209	0.765
Lung cancer	0.069	0.061	0.076	0.330
Number of states	24	11	13	

Notes: This table presents summary statistics for the outcomes of interest for the pre-policy period. I pooled 2008 and 2009 for consumption outcomes and 2008 to 2010 for health outcomes. The last column reports the p -value for the test of equality of means for strict and lenient states. The category more than 20 cigarettes per day includes smokers with consumption strictly greater than 20 and less than or equal to 50 cigarettes a day.

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Empirical Strategy

$$y_i = \sum_{\tau=-2}^1 \delta_{\tau} [Treat_s \cdot (Years \text{ After } Treat = \tau)] + \beta' X_{is} + \Gamma' X_{st} + \alpha_s + \alpha_t + \varepsilon_i ,$$

y_i outcome of interest, e.g. dummy for current smoker

Years After Treat = τ indexes time relative to the law's implementation

$Treat_s$ indicates whether state s is a comparison state ($Treat_s = 0$) or a treated state ($Treat_s = 1$)

$\delta_{\tau=-2,-1}$ test for pre-trends in the outcome of interest

$\delta_{\tau=1}$ is the estimate of the effect of the national law 1 year after implementation.

X_{is} is a vector of control variables that comprises individual-level characteristics—e.g., age, gender, educational attainment, and income.

X_{st} is a vector of state-time varying controls: private employment and population

α_s are states' fixed effects and α_t are time fixed effects.

Empirical Strategy

Balance Control and treated states are comparable in terms of outcomes of interest before the policy **Balance test**

Balance Individuals in treated and comparison states are statistically indistinguishable in observable chars **Balance test**

Selection Treatment and comparison status at the state level be exogenous to outcomes of interest **Selection**

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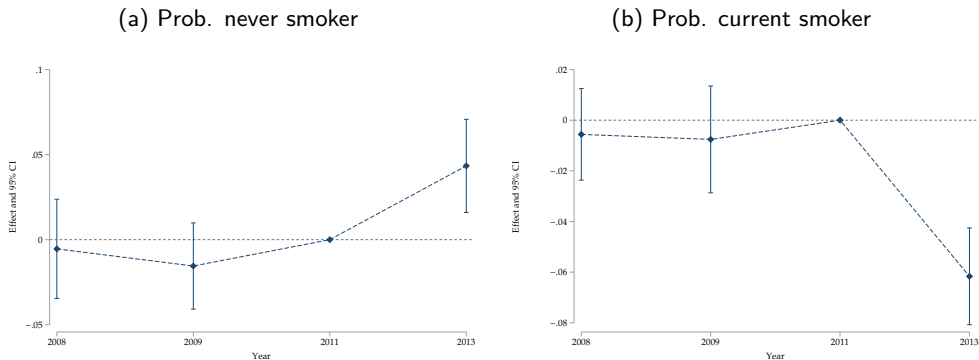
Results

- 1 Extensive margin outcomes
- 2 Intensive margin outcomes
- 3 Heterogeneity
- 4 Alcohol consumption
- 5 Health Outcomes
- 6 Mechanisms

Results

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Smoking participation decreased as a result of the stricter regulation



Notes: This figure presents point estimates and symmetric percentile-*t* confidence intervals of the causal effect of the national regulation on the probability of being a never smoker (left panel) and the probability of being a current smoker (right panel). The omitted year corresponds to 2011, the year the law was passed. Standard errors are block-bootstrapped at the state level with 200 replications.

- ▶ 10% increase in prob. of being a never smoker
- ▶ 22% reduction in the prob. of being a current smoker

[Tables](#)

[Alternative treatment definition](#)

[Alternative samples](#)

[Cigarette prices](#)

Results

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The distribution of cigarettes smoked daily shifts to the right

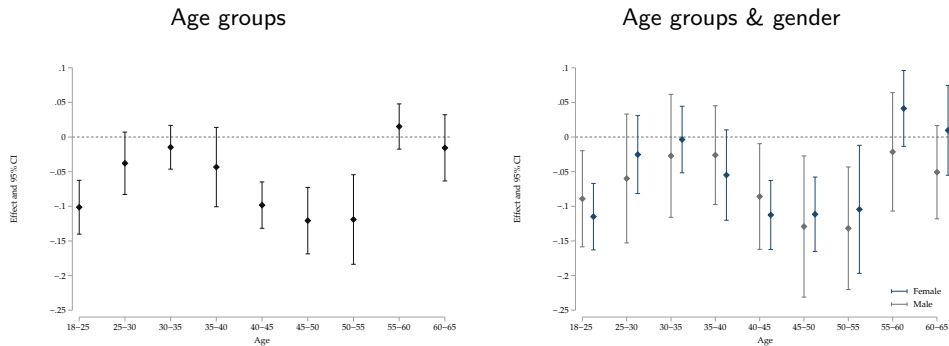
Cigarettes smoked	(0,5] (1)	(5, 10] (2)	(10, 15] (3)	(15, 20] (4)	(20, 30] (5)	(30, 40] (6)	(40, 50] (7)
2008	-0.0201 (0.0293)	0.0225 (0.0161)	-0.0006 (0.0085)	0.0003 (0.0143)	0.0015 (0.0077)	-0.0042 (0.0064)	0.0006 (0.0009)
2009	-0.0052 (0.0276)	0.0603 (0.0227)	0.0008 (0.0092)	-0.0379* (0.0201)	-0.0097* (0.0047)	-0.0101* (0.0052)	0.0018 (0.0018)
2013	-0.1652*** (0.0295)	0.0584* (0.0141)	0.0102* (0.0087)	0.0786*** (0.0150)	0.0216 (0.0050)	-0.0035 (0.0035)	-0.0001 (0.0009)
Mean dep. var.	0.3500	0.2708	0.0966	0.2143	0.0385	0.0272	0.0024
Observations	40,651	40,651	40,651	40,651	40,651	40,651	40,651
R-squared	0.0716	0.0108	0.0071	0.0324	0.0138	0.0181	0.0017
Correctly predicted	0.6242	0.6949	0.8627	0.7526	0.9077	0.9181	0.9398

Notes: This table presents estimated effects on cigarettes smoked in the last 30 days. The omitted category corresponds to 2011, the year the federal law was passed. All regressions include individual-level controls: age, gender, educational attainment, employment status, and income category of the household. State-time varying controls include total private employment and total population. All regressions include state and time fixed effects. Correctly predicted indicates the percentage of times the predicted outcome matches the actual outcome. Standard errors are block-bootstrapped at the state-level with 200 replications. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Results

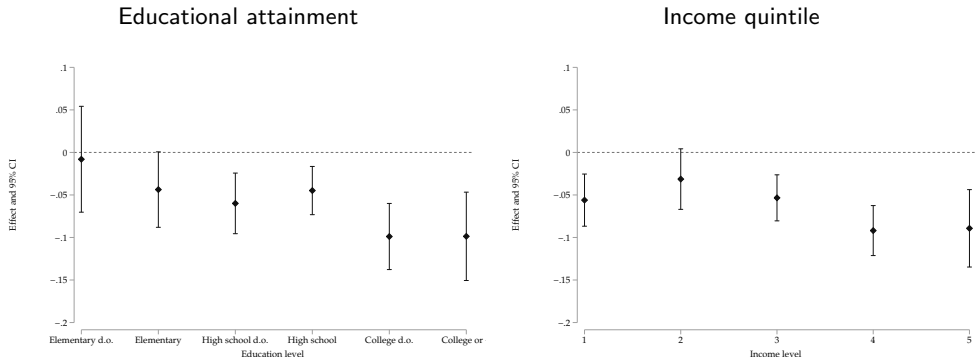
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Reductions in the prob. of current smoker are driven by individuals aged 18-25 and 40-55



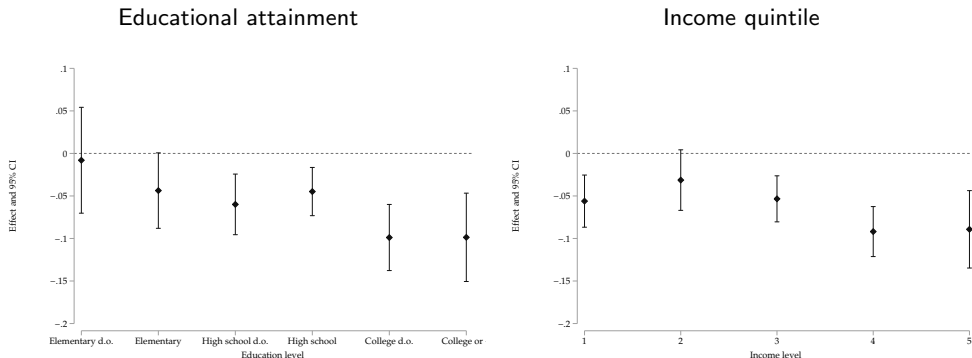
Notes: This figure presents point estimates and symmetric percentile-t confidence intervals of the causal effect of the national regulation on the probability of being a smoker in 2013 by subgroups. Standard errors are block-bootstrapped at the state-level with 200 replications.

Elementary school grad is 4.37 pp. less likely to be a current smoker, while for a college grad this reduction is of 9.86 pp.



Notes: This figure presents point estimates and symmetric percentile-*t* confidence intervals of the causal effect of the national regulation on the probability of being a smoker in 2013 by subgroups. Standard errors are block-bootstrapped at the state-level with 200 replications. Panel (a) presents results by educational attainment, in which d.o. stands for drop-out; panel (b) presents results by household income ranking. The 1st quintile corresponds to the lowest 20% of households in the income distribution. Analogously, the 5th quintile corresponds to the highest 20% of households in the income distribution.

Effects are 3 pp higher in abs. value for an individual in the richest quintile relative to the first quintile.

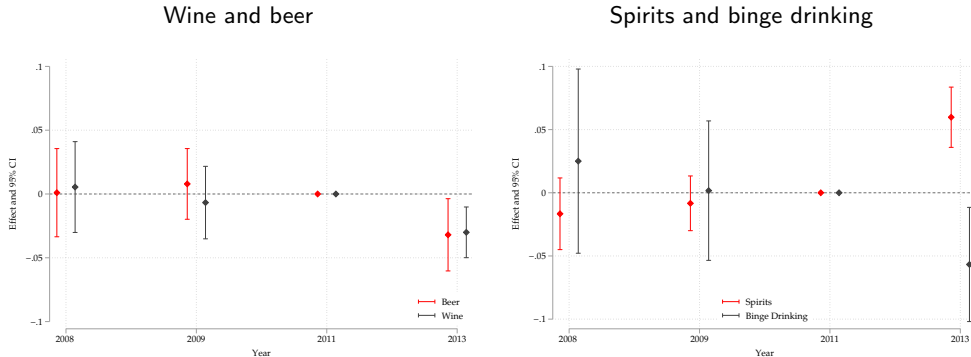


Notes: This figure presents point estimates and symmetric percentile-*t* confidence intervals of the causal effect of the national regulation on the probability of being a smoker in 2013 by subgroups. Standard errors are block-bootstrapped at the state-level with 200 replications. Panel (a) presents results by educational attainment, in which d.o. stands for drop-out; panel (b) presents results by household income ranking. The 1st quintile corresponds to the lowest 20% of households in the income distribution. Analogously, the 5th quintile corresponds to the highest 20% of households in the income distribution.

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Effects on the Risky Consumption of Alcoholic Beverages among Smokers



Notes: This figure presents estimates of the marginal effects and confidence intervals of the 2011 national law on the probability of abusive consumption of beer, wine, and spirits and binge drinking across smokers. Abusive consumption thresholds and binge drinking are defined in the main text. The omitted category corresponds to 2011, the year the federal law was passed. Standard errors are clustered at the state level.

- ▶ Smoking and the abusive consumption of beer, wine and binge drinking behave as complementary goods.
- ▶ Tobacco and spirits—vodka, gin, tequila, rum, and whiskey—have a substitution relationship.

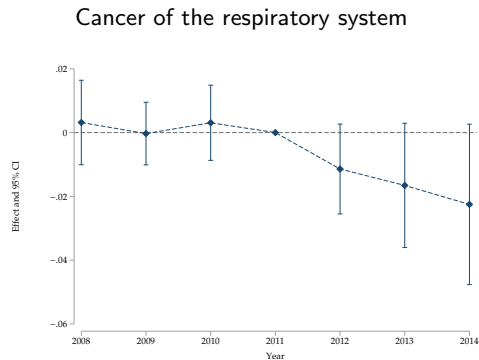
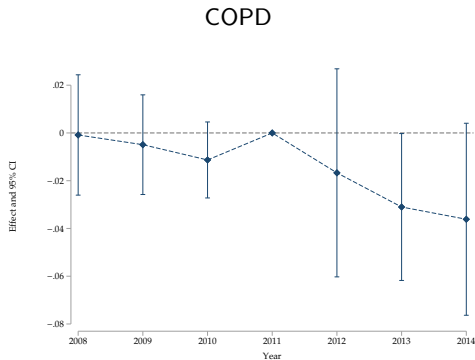
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Health outcomes

- ▶ Smoking causes about 90% of all lung cancer deaths and 80% of all deaths from COPD (Surgeon General, 2014).
- ▶ Reduced smoking in public places could entail important health benefits on both nonsmokers and smokers.
- ▶ I estimate the effects of the clean-indoor-air policy and the introduction of graphic tobacco warnings using hospital discharge data.
- ▶ Outcomes of interest are defined as the prevalence rate for disease c , e.g. COPD prevalence rate for population aged 18 to 65

Health outcomes



Notes: This figure presents point estimates and symmetric percentile-*t* confidence intervals of the causal effect of the national regulation on the prevalence rate of COPD (left panel) and lung cancer (right panel). The omitted year corresponds to 2011, the year the law was passed. Standard errors are block-bootstrapped at the state level with 200 replications.

- ▶ The prevalence of COPD decreased about 3.6 percentage points relative to 2011.
- ▶ The prevalence of respiratory system cancer decreased by about 2.2 percentage points.

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Mechanisms

- ▶ The implementation of Argentina's 2011 policy features a common characteristic across countries: The government implemented two anti-tobacco policies at the same time.
- ▶ Can we isolate the effect of each policy? Yes, under some assumptions..
 - ▶ Exploit an additional source of variation in my data
 - ▶ Impose structure on policy treatment effects
- ▶ Place-based component of the policy:
 - ▶ Place-based bans were adopted by some states before 2011
 - ▶ Use bans early adopters to identify the ban component of the national law

$$y_i = \sum_{\tau=-2}^1 \delta_{\tau}^{bans} [Bans_s \cdot (Years\ after\ treat = \tau)] + \beta' X_{is} + \Gamma' X_{st} + \alpha_s + \alpha_t + \varphi_i,$$

$Bans_s$ is a dummy variable that equals 1 if the state s is a late-adopter of place-based bans

Mechanisms

- ▶ Additional assumptions to construct estimates of the effects of graphic tobacco warnings:
 - ▶ Treatment effects are constant across states and time (homogeneous treatment effects)
 - ▶ The effects of each policy branch are additive (linearity)
- ▶ Under these assumptions, the total effect can be decomposed as:

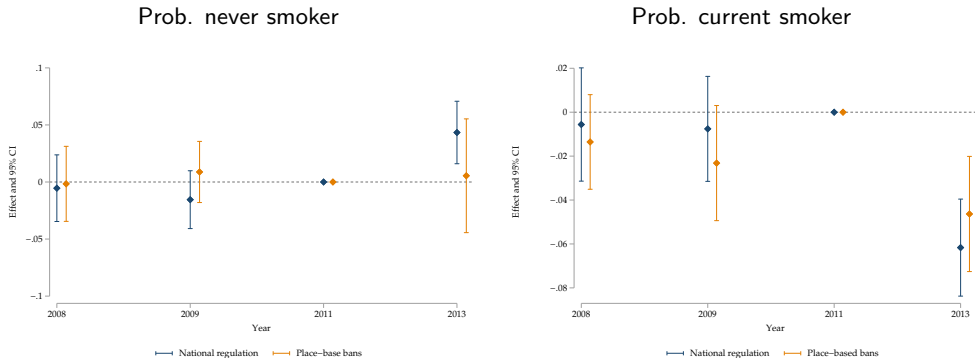
$$\delta = \delta^{tgw} + \omega \delta^{bans}$$

ω is the proportion of states that have not implemented a place-based ban before the national regulation (late adopters).

Derivation

- ▶ Caveats:
 - ▶ Spillover effects may arise from complementarities in policy intervention.
 - ▶ These effects can not be disentangled from the effect of place-based bans.
 - ▶ If these spillover effects are positive the estimates of δ^{bans} provide an upper-bound.

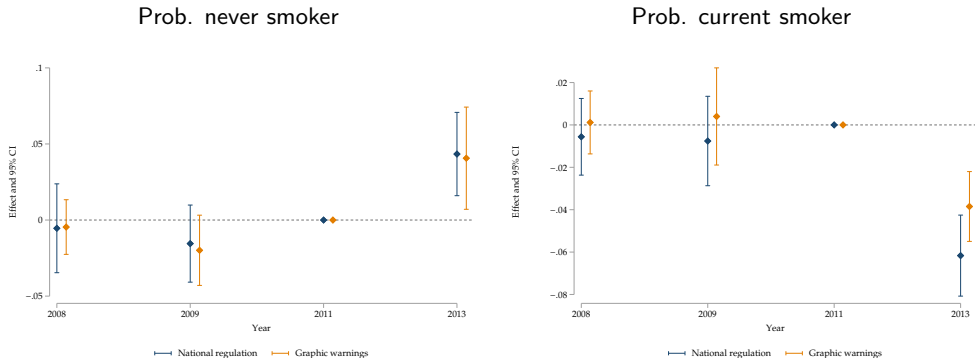
Effects of Place-based Bans



Notes: This figure presents point estimates and symmetric percentile- t confidence intervals of the causal effect of the national regulation and place-base bans on the probability of being a never smoker (left panel) and the probability of being a current smoker (right panel). The omitted year corresponds to 2011, the year the law was passed. Standard errors are block-bootstrapped at the state level with 200 replications.

- ▶ No effect of place-based bans on the proportion of non-smokers.
- ▶ Roughly 40% of the change in the proportion of current smokers can be attributed to place-based bans.

Effects of Graphic Tobacco Warnings



Notes: This figure presents point estimates and symmetric percentile- t confidence intervals of the causal effect of the national regulation and place-base bans on the probability of being a never smoker (left panel) and the probability of being a current smoker (right panel). The omitted year corresponds to 2011, the year the law was passed. Standard errors are block-bootstrapped at the state level with 200 replications.

- ▶ Most of the effect on the prob. of being a never-smoker is explained by graphic warnings.
- ▶ Graphic warnings reduce the probability of being a current smoker by 3.85 percentage points.

Conclusions & Policy Implications

- ▶ This paper exploits regional variation in the leniency of tobacco regulation before 2011 to identify the effects of this regulation on various outcomes.
- ▶ I find that the new regulations effectively curbed smoking initiation and consumption:
 - ▶ 10% increase in prob. of being a never smoker
 - ▶ 22% reduction in the prob. ob begin a current smoker
- ▶ The policy disproportionately benefited more educated and richer individuals
 - ▶ Elementary school grad is 4.37 pp. less likely to be a current smoker, while for a college grad this reduction is of 9.86 pp.
 - ▶ Effects are 3 pp higher in abs. value for an individual in the richest quintile relative to the first quintile.

Appendix

Institutional details



Figure: Examples of law-regulated packaging.

Notes: Big font messages: (i) smoking reduces years of life, (ii) smoking causes cancer, (iii) smoking might cause legs amputation, (iv) pregnant women who smoke harms her child (v) smoking causes death by suffocation.

- Images are designed by the National Department of Health and are updated every less than two years and more than one year.
- Producers have up to six months to incorporate the designs once they are released.

Definitions of main outcomes

Smoking behaviors

- ▶ Never smoker: i has never smoked or she has smoked less than 100 cigarettes in her life.
- ▶ Current smoker: i has ever smoked more than 100 cigs and she smokes every or some days.
- ▶ Intensive margin: daily consumption between 1 and 50 cigarettes in the last 30 days.

Alcohol consumption among smokers

- ▶ Alcohol consumption in the last month.
- ▶ Alcohol abuse: more than 8 drinks of beer, 5 drinks of wine or 3 drinks of spirits per day.
- ▶ Binge drinking: consuming five or more drinks on a single occasion in the past 30 days.

Health outcomes (population level)

- ▶ COPD is defined using ICD 10th revision codes J41, J42, J43, & J44.
- ▶ Respiratory-system-related cancer is defined using ICD 10th revision codes C30, C33, & C34.

Evolution of Cigarette Sales and Consumption

Year	Sales data		Survey data	
	Consumption	Percent change	Consumption	Percent change
2008	181.06		106.75	
2009 ^(a)	177.64	-1.89%	103.42	-3.11%
2010	174.86			
2011 ^(b)	182.65	1.40%	105.84	1.16%
2012	178.36			
2013 ^(b)	174.07	-2.38%	99.39	-3.09%

Notes: Consumption measures are expressed in millions of 20 cigarettes packages a month. Sales data is collected by the Ministry of Agriculture, time series are expressed in 20 cigarettes packages in a year. Consumption from survey data is constructed as the average consumption per day multiplied by 30. Summary statistics indicates that 62% of smokers smoke every day, this is the modal frequency. Percent changes are: (a) relative to the previous calendar year; (b) relative to the $n - 2$ year.

Balance in Terms of Outcomes in Strict versus Lenient States

Variable (mean)	All states	Strict states	Lenient states	Equality of means
Never-smokers	0.560	0.561	0.558	0.777
Current smokers	0.286	0.281	0.290	0.587
Mean cigarettes per day				
0 to 5	0.373	0.397	0.352	0.024
6 to 10	0.266	0.260	0.270	0.513
11 to 20	0.297	0.282	0.310	0.073
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Prevalence rate (per 1,000)				
COPD	0.203	0.196	0.209	0.765
Lung cancer	0.069	0.061	0.076	0.330
Number of states	24	11	13	

Notes: This table presents summary statistics for the outcomes of interest for the pre-policy period. I pooled 2008 and 2009 for consumption outcomes and 2008 to 2010 for health outcomes. The last column reports the p -value for the test of equality of means for strict and lenient states. The category more than 20 cigarettes per day includes smokers with consumption strictly greater than 20 and less than or equal to 50 cigarettes a day.

Balance in Terms of Individual Characteristics in Strict versus Lenient States

Variable (mean)	All states	Strict states	Lenient states	Equality of means
Average age	37.719	37.745	37.698	0.896
Male	0.491	0.495	0.487	0.581
Young (< 25 years old)	0.236	0.239	0.234	0.749
Married or cohabitant	0.579	0.570	0.587	0.316
Employed	0.701	0.702	0.700	0.878
Educational level				
Elementary school	0.196	0.195	0.196	0.973
High school	0.237	0.234	0.239	0.598
College	0.146	0.150	0.141	0.451
Income category				
First quintile	0.134	0.131	0.136	0.605
Second quintile	0.294	0.355	0.242	0.000
Third quintile	0.214	0.199	0.227	0.038
Forth quintile	0.222	0.181	0.257	0.000
Fifth quintile	0.136	0.135	0.137	0.876
Observations	60,449	23,830	36,619	
Number of states	24	11	13	

Notes: This table presents summary statistics for demographic characteristics for the pre-policy period. I pooled 2008 and 2009. Demographic characteristics other than age indicate the proportion of individuals with a given attribute. The last column reports the p -value for the test of equality of means for strict and lenient states.

Determinants of Strong Regulation prior to 2011

Dep variable:	Indicator for strong regulation		Dep variable:	Indicator for strong regulation	
	Coefficient	Marginal effect		Coefficient	Marginal effect
	(1)	(2)		(3)	(4)
Peronist party (state office)	0.390 (0.266)	0.133 (0.090)	Prevalence of COPD	1.156*** (0.378)	0.394*** (0.130)
State is tobacco producer (=1)	0.598 (0.372)	0.204 (0.128)	Sh. pop. 0 - 14 yo	0.066 (16.370)	0.022 (5.584)
Ln employment	-0.172 (0.516)	-0.058 (0.177)	Sh. pop. 15 - 24 yo	48.93*** (17.580)	16.687*** (5.832)
Unemployment rate	4.769 (5.197)	1.626 (1.783)	Sh. pop. 25 - 44 yo	20.400 (16.510)	6.958 (5.682)
Proportion of smokers	-0.327 (3.060)	-0.112 (1.044)	Sh. pop. 45 - 64 yo	44.210 (30.110)	15.077 (10.360)
			Ln population	0.542 (0.529)	0.185 (0.183)
			Observations	142	142
			Pseudo R^2	0.220	

Notes: This table presents the results of a probit model estimating the determinants of enacting a strong regulation before 2011. The second column presents estimated coefficients from the probit model and the last column presents the corresponding marginal effects computed at the means. The Peronist party was responsible of enacting the 2011 National Law; thus, the coefficient of this dummy tests whether the Peronist party is more likely to regulate tobacco consumption at the state level than the opposition parties. States that are considered tobacco producers are Jujuy (36% of the country's tobacco production), Misiones (29%), Salta (25%), Tucuman (7%), Catamarca (1%), Corrientes (1%) and Chaco (1%). Standard errors are robust to heteroskedasticity. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Effects on Extensive Margin Outcomes

Probability of	Never smokers (1)	Current smokers (2)
2008	-0.0054 (0.0147)	-0.0056 (0.0104)
2009	-0.0155 (0.0162)	-0.0076 (0.0087)
2013	0.0434** (0.0175)	-0.0617*** (0.0103)
Mean dep. var. in 2011	0.4608	0.2825
Observations	153,093	153,093
R-squared	0.0329	0.0259
Correctly predicted	0.5536	0.6881
Individual controls	Yes	Yes
State \times time controls	Yes	Yes
State FE	Yes	Yes
Time FE	Yes	Yes

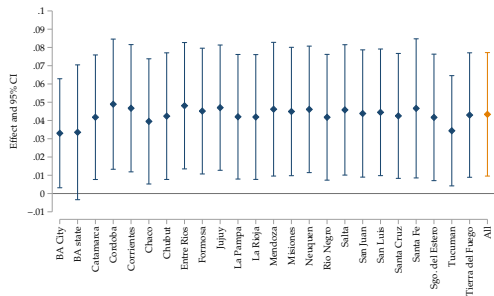
Notes: The omitted category corresponds to 2011, the year the federal law was passed. Treatment is a dichotomous variable, $Treat_{st}$, that equals one if the legislation index for state s in moment t is less than or equal to 3 before 2011. Individual-level controls include age, gender, educational attainment, employment status and income category of the household. State \times time controls include total private employment and total population. Standard errors are block-bootstrapped at the state-level with 200 replications.

Alternative treatment definition

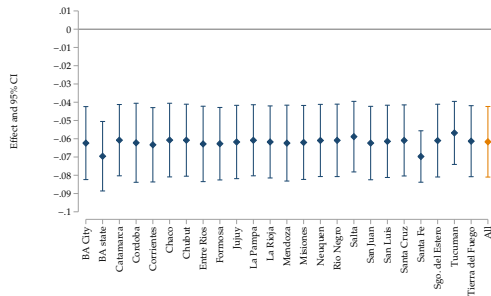
Probability of	Never smokers (1)	Current smokers (2)
2008	-0.0205 (0.0149)	-0.0055 (0.0120)
2009	-0.0238 (0.0165)	-0.0138 (0.0099)
2013	0.0402** (0.0187)	-0.0594*** (0.0100)
Mean dep. var. in 2011	0.4608	0.2825
Observations	153,093	153,093
R-squared	0.0328	0.0259
Correctly predicted	0.5536	0.6881
Individual controls	Yes	Yes
State \times time controls	Yes	Yes
State FE	Yes	Yes
Time FE	Yes	Yes

Notes: The omitted category corresponds to 2011, the year the federal law was passed. Treatment as a dichotomous variable, $Treat_s$, that equals one if the legislation index for state s in moment t is strictly less than 3 before 2011. After 2011, all states *are treated* thus $Treat_s$ equals one for all states s after 2011. Individual controls include age, gender, educational attainment, employment status and income category of the household. State \times time controls include total private employment and total population. Standard errors are block-bootstrapped at the state-level with 200 replications.

Extensive margin outcomes - excluding one state at the time



Never Smokers



Current Smokers

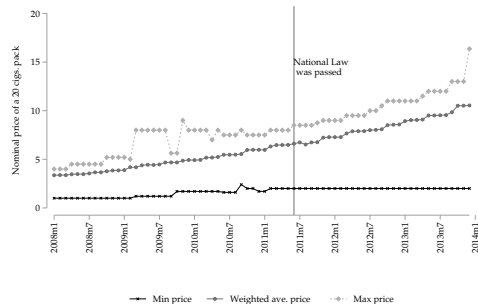
Notes: This figure presents estimates of the marginal effect and confidence intervals of the 2011 national law on the probability never smokers (panel a) and never smokers (panel b). Treatment is a dichotomous variable, $Treat_t$, that equals one if the legislation index for state s in moment t is less than or equal to 3 before 2011. All regressions include individual-level controls: age, gender, educational attainment, employment status, and income category of the household. The category "All" refers to the sample that includes all the states. Standard errors are clustered at the state-level.

Cigarette prices

Real prices



Nominal prices



Notes: This figure presents time series of real and nominal prices paid by consumers split into three price ranges: the minimum price, the average price, and the highest price. I use the price index constructed by Cavallo (2013) to deflate prices. Data is at the price-monthly level and comes from price series constructed by the Ministry of Agriculture.

Alternative treatment definition: Effects on intensive margin outcomes

Cigarettes smoked	(0,5] (1)	(5, 10] (2)	(10, 15] (3)	(15, 20] (4)	(20, 30] (5)	(30 , 40] (6)	(40 , 50] (7)
2008	0.0017 (0.0317)	0.0237 (0.0185)	-0.0033 (0.0104)	0.0084 (0.0123)	0.0051 (0.0067)	-0.0100 (0.0062)	0.0010 (0.0011)
2009	-0.0839** (0.0370)	0.0394* (0.0201)	0.0020 (0.0056)	-0.0182 (0.0150)	-0.0111*** (0.0035)	-0.0097* (0.0054)	0.0008 (0.0014)
2013	-0.2335*** (0.0233)	-0.0224 (0.0159)	-0.0147** (0.0069)	0.0110 (0.0144)	0.0073 (0.0045)	-0.0073** (0.0034)	-0.0003 (0.0007)
Mean dep. var. in 2011	0.3397	0.2628	0.0937	0.2080	0.0374	0.0265	0.0024
Observations	45,585	45,585	45,585	45,585	45,585	45,585	45,585
R-squared	0.0797	0.0114	0.0069	0.0257	0.0108	0.0170	0.0014
Correctly predicted	0.8013	0.7775	0.7333	0.7634	0.7211	0.7182	0.7123

Notes: The omitted category corresponds to 2011, the year the federal law was passed. Treatment is a dichotomous variable, $Treat_s$, that equals one if the legislation index for state s in moment t is strictly less than 3 before 2011. After 2011, all states are treated thus $Treat_s$ equals one for all states s after 2011. Individual controls include age, gender, educational attainment, employment status and income category of the household. State \times time controls include total private employment and total population. Standard errors are block-bootstrapped at the state-level with 200 replications.

Effects on the probability of being a current smoker by age group

Age:	18-25 (1)	25-30 (2)	30-35 (3)	35-40 (4)	40-45 (5)	45-50 (6)	50-55 (7)	55-60 (8)	60-65 (9)
2008	0.0009 (0.0293)	-0.0252 (0.0267)	-0.0363 (0.0235)	-0.0212 (0.0319)	0.0125 (0.0303)	-0.0253 (0.0267)	0.0074 (0.0257)	0.0177 (0.0179)	0.0365 (0.0201)
2009	0.0038 (0.0157)	0.0089 (0.0225)	-0.0209 (0.0212)	-0.0363 (0.0224)	-0.0216 (0.0166)	0.0163 (0.0249)	-0.0227 (0.0302)	-0.0038 (0.0201)	-0.0088 (0.0158)
2013	-0.1014*** (0.0307)	-0.0379 (0.0251)	-0.0148 (0.0200)	-0.0434 (0.0217)	-0.0983*** (0.0163)	-0.1207*** (0.0250)	-0.1191*** (0.0275)	0.0152 (0.212)	-0.0156 (0.0187)
Mean dep. var. in 2011	0.27	0.31	0.29	0.29	0.26	0.30	0.32	0.27	0.23
Observations	24,822	19,409	20,329	18,804	16,121	14,205	13,576	11,992	13,835
R-squared	0.0497	0.0278	0.0377	0.0341	0.0348	0.0247	0.0253	0.0232	0.0240
Correctly predicted	0.6899	0.6604	0.6564	0.7059	0.5085	0.6758	0.6591	0.7331	0.8005

Notes: The omitted category corresponds to 2011, the year the federal law was passed. Treatment is defined as a dichotomous variable, $Treat_{st}$, that equals one if the legislation index for state s in moment t is less than or equal to 3 before 2011. Individual-level controls include gender, educational attainment, employment status and income category of the household. State \times time controls include total private employment and total population. Standard errors are block-bootstrapped at the state-level with 200 replications. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

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Probability of being a current smoker by age group and gender

Age:	18-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>2013</i>									
Female	-0.1150 (0.0252)***	-0.0253 (0.0381)	-0.0036 (0.0386)	-0.0549 (0.0266)	-0.1125 (0.0259)***	-0.1115 (0.0308)***	-0.1044 (0.0401)***	0.0413 (0.0343)	0.0096 (0.0283)
Male	-0.0891 (0.0510)***	-0.0599 (0.0384)	-0.0271 (0.0342)	-0.0261 (0.0282)	-0.0859 (0.0324)***	-0.1292 (0.0473)***	-0.1318 (0.0304)***	-0.0215 (0.0437)	-0.0508 (0.0348)
$H_0 : \delta_{FEMALE} = \delta_{MALE}$.432	.1235	.6888	.9247	.5955	.9301	.9443	.8385	.3941
<i>Mean dep. var. in 2011</i>									
Female	0.27	0.31	0.29	0.29	0.26	0.30	0.32	0.27	0.23
Male	0.33	0.36	0.36	0.35	0.32	0.35	0.37	0.30	0.25

Notes: The omitted category corresponds to 2011, the year the federal law was passed. Treatment is defined as a dichotomous variable, $Treat_s$, that equals one if the legislation index for state s in moment t is less than or equal to 3 before 2011. Individual-level controls include educational attainment, employment status and income category of the household. State \times time controls include total private employment and total population. Standard errors are block-bootstrapped at the state-level with 200 replications. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

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Prob. of being a current smoker by educational attainment

Educational level:	Elementary d/o (1)	Elementary (2)	HS d/o (3)	HS (4)	College d/o (5)	College + (6)
2008	-0.0312 (0.4700)	-0.0310 (0.0175)	0.0030 (0.0272)	0.0336 (0.0212)	0.0036 (0.0260)	-0.0093 (0.0238)
2009	-0.0630*** (0.0210)	0.0093 (0.0170)	-0.0177 (0.0139)	-0.0141 (0.0179)	0.0049 (0.0220)	0.0167 (0.0223)
2013	-0.0080 (0.0361)	-0.0437* (0.0185)	-0.0599*** (0.0216)	-0.0448*** (0.0303)	-0.0989*** (0.0296)	-0.0986*** (0.0193)
Mean dep. var. in 2011	0.31	0.30	0.35	0.28	0.24	0.228
Observations	12,261	30,388	27,877	35,538	21,195	23,811
R-squared	0.0713	0.0434	0.0258	0.0217	0.0199	0.0134
Correctly predicted	0.5073	0.6906	0.6370	0.6173	0.7181	0.7607

Notes: The omitted category corresponds to 2011, the year the federal law was passed. Treatment is defined as a dichotomous variable, $Treat_{st}$, that equals one if the legislation index for state s in moment t is less than or equal to 3 before 2011. Individual-level controls include age, gender, educational attainment, employment status and income category of the household. State \times time controls include total private employment and total population. HS stands for High School and d/o stands for drop-out. Standard errors are block-bootstrapped at the state-level with 200 replications. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

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Probability of being a current smoker by income

Income category	1 st quintile (1)	2 nd quintile (2)	3 rd quintile (3)	4 th quintile (4)	5 th quintile (5)
2008	-0.0239 (0.0246)	-0.0288 (0.0241)	-0.0080 (0.0201)	0.0282 (0.0195)	-0.0028 (0.0318)
2009	-0.0433 (0.0211)	-0.0513** (0.0216)	0.0297 (0.0200)	0.0093 (0.0146)	-0.0213 (0.0404)
2013	-0.0561*** (0.0135)	-0.0313* (0.0187)	-0.0534*** (0.0137)	-0.0919*** (0.0183)	-0.0892*** (0.0207)
Mean dep. var. in 2011	0.29	0.29	0.31	0.28	0.25
Observations	23,427	33,418	32,291	37,006	16,507
R-squared	0.0530	0.0291	0.0248	0.0231	0.0217
Correctly predicted	0.6846	0.7049	0.7032	0.7057	0.7023

Notes: The 1st quintile corresponds to the lowest 20 percent households in the income distribution. Analogously, the 5th quintile corresponds to the highest 20 percent households in the income distribution. The omitted category corresponds to 2011, the year the federal law was passed. Treatment is defined as a dichotomous variable, $Treat_s$, that equals one if the legislation index for state s in moment t is less than or equal to 3 before 2011. Individual-level controls include age, gender, educational attainment, and employment status. State \times time controls include total private employment and total population. Standard errors are block-bootstrapped at the state-level with 200 replications. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Probability of risky alcohol consumption

Dependent variable	Alcohol consumption	Beer abuse	Wine abuse	Spirits	Binge drinking
	(1)	(2)	(3)	(4)	(5)
2008	-0.0845 (0.0591)	-0.0085 (0.1297)	0.0132 (0.1108)	-0.2020 (0.1645)	0.0534 (0.1109)
2009	0.0091 (0.0741)	0.0342 (0.0985)	-0.0807 (0.0901)	-0.1013 (0.1329)	-0.0277 (0.0816)
2013	0.0288 (0.0355)	-0.2256** (0.1079)	-0.1527** (0.0556)	0.6968*** (0.1553)	-0.1526** (0.0730)
Marginal Effects (at means)					
2013	0.0091 (0.0113)	-0.0282** (0.0133)	-0.0241** (0.0089)	0.0589*** (0.0117)	-0.0512** (0.0246)
<i>Mean dep. var. in 2011</i>	0.7232	0.1095	0.1291	0.0318	0.3605
Observations	29,391	21,561	21,561	21,561	21,561
Pseudo R-squared	0.0534	0.1768	0.1035	0.1613	0.1054
Correctly predicted	0.9816	0.8605	0.8663	0.9258	0.6909

Notes: The omitted category corresponds to 2011, the year the federal law was passed. Treatment is defined as a dichotomous variable, $Treat_{st}$, that equals one if the legislation index for state s in moment t is less than or equal to 3 before 2011. The sample is restricted to current smokers who have reported drinking alcohol in the last month. Individual controls include age, gender, educational attainment, employment status and income category of the household. State \times time controls include total private employment and total population. Standard errors in parentheses are clustered at the state-level.

Health outcomes

Diagnosis	COPD (1)	Lung cancer (2)
2008	-0.00085 (0.01393)	0.00317 (0.00658)
2009	-0.00492 (0.01240)	-0.00031 (0.00518)
2010	-0.01130 (0.01043)	0.00309 (0.00641)
2012	-0.01670 (0.01955)	-0.01140 (0.01019)
2013	-0.031** (0.01810)	-0.0166 (0.01387)
2014	-0.0361* (0.02235)	-0.0255 (0.01704)
Mean dep. var.	0.1061	0.0644
Observations	1,512	1,512
R-squared	0.447	0.539

Notes: This table presents estimated effects on health outcomes. The omitted category corresponds to 2011, the year the national law was passed. Standard errors are block-bootstrapped at the state-level with 200 replications. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Derivation

y_{0i} smoking status of individual i in state s in absence of the federal policy

y_{1i} smoking status of individual i in state s if the federal policy is implemented

If the policy effect is constant across states (s) and time (t):

$$E[y_{1i}|s, t] = E[y_{0i}|s, t] + \delta$$

S_1 bans early adopters

S_2 states that have not implemented bans until the national law—bans late adopters

If effects of each policy branch are additive and allowing for the presence of spillover effects among the clean-indoor-air policy and the tobacco graphic warnings:

$$S_1 \text{ states: } E[y_{1i}|s \in S_1, t] = E[y_{0i}|s \in S_1, t] + \delta^{tgw}$$

$$S_2 \text{ states: } E[y_{1i}|s \in S_2, t] = E[y_{0i}|s \in S_2, t] + \delta^{bans} + \delta^{tgw} + f(\delta^{bans}, \delta^{tgw})$$

Define $\omega = P(s \in S_2)$ and rearrange:

$$\delta = (1 - \omega) (E[y_{1i}|s \in S_1, t] - E[y_{0i}|s \in S_1, t]) + \omega (E[y_{1i}|s \in S_2, t] - E[y_{0i}|s \in S_2, t])$$

$$\delta = \delta^{tgw} + \omega \delta^{bans} + \omega f(\delta^{bans}, \delta^{tgw})$$