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Impact of Tobacco Advertising Restrictions in Switzerland: A Quasi-Experimental Study on the Effect of Billboard Bans on Smoking*

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Disclosures

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- This work is based on research conducted within the project "Evaluation of Tobacco Prevention in Switzerland" (Ger.: "Pilotstudie zur Wirkung der Tabakprävention auf die Gesundheit in der Schweiz: Ein kontrafaktischer Ansatz") funded by the Swiss Tobacco Prevention Fund.

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- No funding from tobacco or pharmaceutical companies.

Tobacco Epidemic and Prevention

Tobacco remains a leading preventable risk factor:

- Despite declining smoking rates, 8.71 million deaths worldwide (15.4% of all deaths) (Murray et al., 2020; Reitsma et al., 2021).
- Europe has the second-highest smoking rate, with 800,000 deaths (European Commission, 2024; World Health Organization, 2024).

  $\rightarrow$ Smoking remains a major public health challenge.

Research gaps in tobacco prevention:

- Policies: Taxation, smoking bans, sales bans, advertising bans, ...
- Interventions: Information campaigns, school programs, quit lines, ...
- Causal studies focus mainly on taxation and smoking bans (DeCicca et al., 2022).

  $\rightarrow$ Causal evidence on advertising restrictions remains limited.

Do Tobacco Advertising Bans Work?

Why advertise for a brand? (Goel and Nelson, 2006; Saffer and Chaloupka, 2000)

- Increase market share by attracting smokers from other brands.
- Initiate non-smokers and increase consumption among smokers.

  $\rightarrow$ Market expansion would justify regulating tobacco advertising.

Contribution:

- Estimate effects of cantonal billboard bans on smoking in Switzerland.
- Provide causal evidence using individual-level data.
- Support the market expansion hypothesis.

  $\rightarrow$ Advertising restrictions can be an important part of comprehensive tobacco prevention.

Tobacco Politics in Switzerland

Political system:

- Switzerland has three levels of government: Confederation, cantons, and municipalities.
- Tobacco prevention policies can be enacted at different administrative levels.

Tobacco politics:

- Confederation: Taxation, health warnings, TV and radio advertising bans, ...
- Cantons: Billboard bans, sales bans for minors, and smoking bans.
- Other: Information campaigns and other interventions by (non-)governmental actors.

Tobacco Billboard Bans

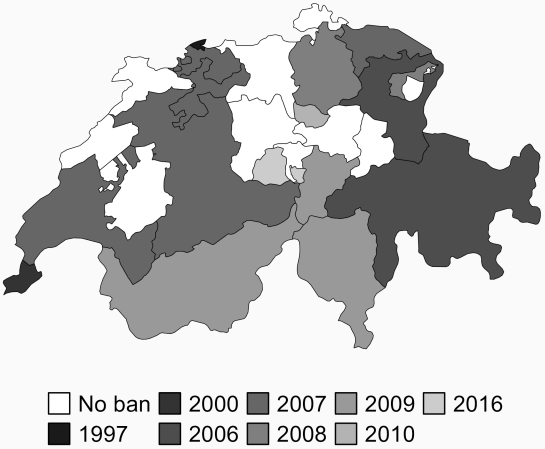


Figure 1: Introduction of cantonal billboard bans (Federal Office of Public Health, 2025)

Survey Data

Swiss Health Survey (Federal Statistical Office, 2024):

- Five cross-sectional waves: 1997, 2002, 2007, 2012, and 2017.
- Information on smoking initiation and cessation allows reconstruction of annual smoking status.

Reconstruction of annual smoking rate:

- Compute individuals' smoking status retrospectively back to 1993 or their 15^{th} birthday.
- Results in over one million observations from 1993–2017.
- Only a few covariates can be retained, namely gender and age.

Smoking Rate: Original Data Vs. Reconstructed Panel

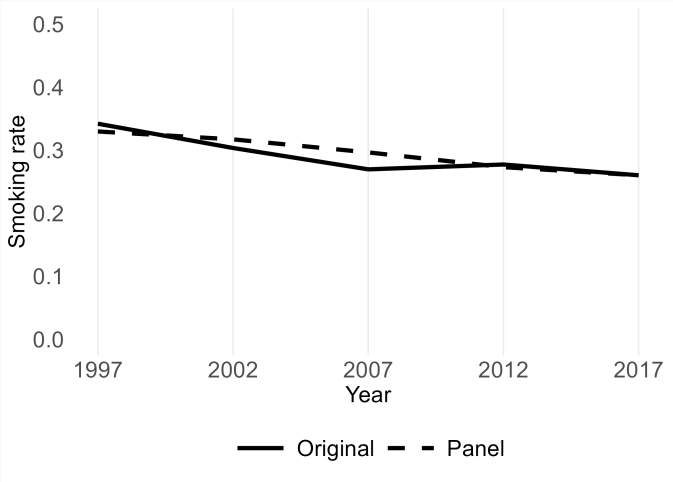


Figure 2: Comparison of smoking rate between original data and reconstructed panel, 1997–2017

Estimation

Estimate the effect of cantonal billboard bans on smoking:

- Dynamic effects on smoking rate up to 5 years after billboard ban introduction.
- Heterogeneous effects by gender and age.
- Control for gender, age, sales bans, and smoking bans.

Staggered difference-in-differences estimator (Callaway and Sant'Anna, 2021):

- Based on 2×2 DiD comparisons for all treatment group and time combinations, to avoid potential biases due to negative weights.
- Event-study design aggregates treatment effects by timing of policy introduction.
- Requires common trends and standard DiD identification assumptions.

Reduction of up to 0.9 PP (or 3%) in Smoking Rate

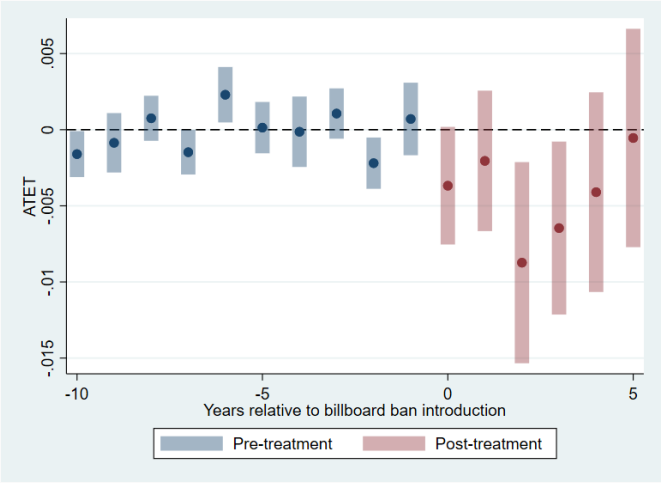


Figure 3: Effect of billboard bans on the smoking rate based on the staggered difference-in-differences approach

Relax Common Trends Assumption

Conditional common trends do not hold across all treatment groups:
$\rightarrow$ The identifying assumption of staggered DiD is violated.

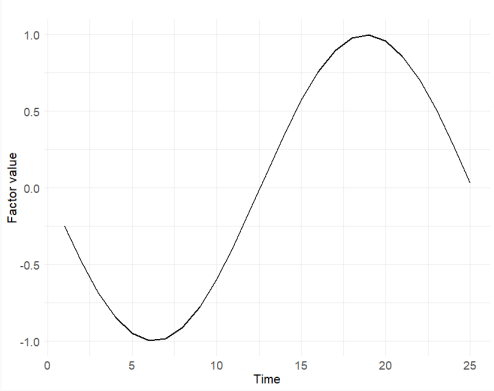
Interactive fixed effects counterfactual estimator (Liu et al., 2024):

- Trains a factor model on all control and pre-treatment treated observations.
- Latent unit-specific loadings and time-specific factors allow treated units to follow different counterfactual trends, thus relaxing the common trends assumption.
- Imputes counterfactual outcomes for treated units to estimate treatment effects.

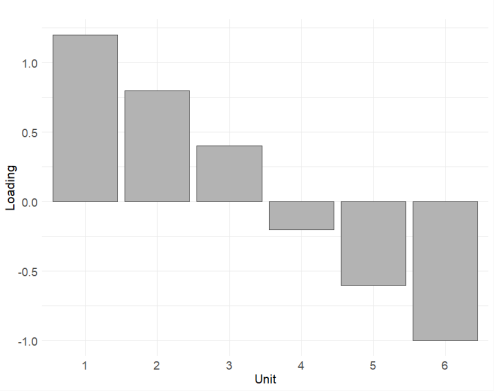
Relaxing common trends comes with new requirements:

- Many pre-treatment periods.
- Latent factor structure is correctly specified and not too complex.

Graphical Illustration of Factors and Loadings



(a) Factors



(b) Loadings

Figure 4: Loadings and factors learned based on control and pre-treatment treated observations

Average Reduction of 0.9 PP (or 3%) in Smoking Rate

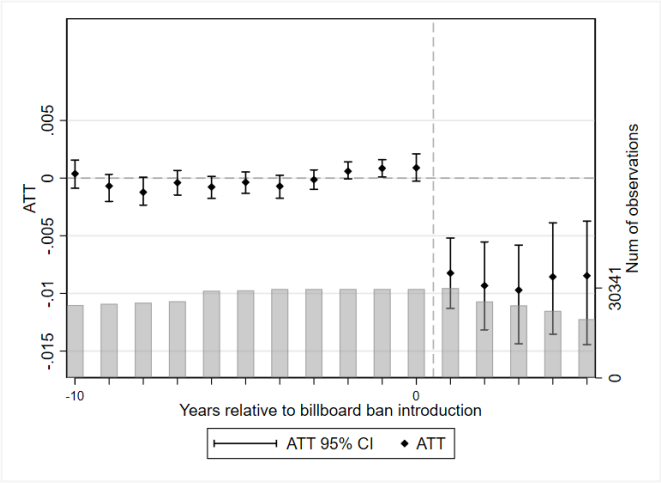


Figure 5: Effect of billboard bans on the smoking rate based on the interactive fixed effects counterfactual estimator

Reduction Driven by Women and Individuals Aged 25–44 and 65+

Table 1: Average year-specific effects of tobacco billboard bans on the smoking rate

	Gender		Age			
	Men	Women	15–24	25–44	45–64	65+
0–1 years after adoption						
ATET	0.004	**−0.008*** **	0.004	**−0.007***	0.005	**−0.009***
Std. error	(0.003)	(0.002)	(0.007)	(0.003)	(0.003)	(0.004)
0–3 years after adoption						
ATET	0.001	**−0.010*** **	0.000	**−0.008***	0.001	**−0.010***
Std. error	(0.003)	(0.003)	(0.009)	(0.004)	(0.004)	(0.005)
0–5 years after adoption						
ATET	0.001	**−0.009** **	0.004	−0.007	0.000	−0.011
Std. error	(0.004)	(0.003)	(0.010)	(0.005)	(0.005)	(0.006)
N	523,544	632,162	172,938	468,979	366,316	145,680

Heterogeneous Effects

Why no effect among youth?

- They may be more strongly influenced by other factors, such as prices and social influences.
- Substitution from billboards to other advertising channels that may be targeted especially at youth.

Why stronger effects among women and individuals aged 25–44?

- This group is more likely to consider smoking cessation due to pregnancy and family planning.
- Reduced exposure to tobacco advertising may therefore facilitate smoking cessation.

Robustness Checks and Limitations

Robustness checks:

- Reconstructed panel: Individuals' changes in canton of residence are unobserved.
  $\rightarrow$ Smoking history only for the past 5, 10, and 15 years yields similar results.
- Staggered DiD uses not-yet treated units as control.
  $\rightarrow$ Using never-treated units as control yields similar results.
- Different covariate sets: None, only individual, only policy, all interacted.
  $\rightarrow$ Sensitive to adding policy controls.

Limitations:

- Spillover effects: Mobility across cantons may create partial exposure in the control group and partial non-exposure in the treatment group.
  $\rightarrow$ Underestimation as smoking rate for controls $\downarrow$ and smoking rate for treated $\uparrow$.
- Confounding: Not all tobacco prevention policies and programs can be controlled for due to the lack of systematic canton-level data.

Conclusion

Evidence suggests that:

- Staggered DiD and IFEct estimates are consistent, pointing to a reduction in smoking rates.
- Tobacco billboard bans reduce smoking rates by up to 0.9 pp (or 3%).
- This effect is comparable to that of a 12% increase in tobacco prices.
- Effects are driven by women and individuals aged 25–44 and 65+.

Implications:

- The findings support the market-expansion hypothesis that tobacco advertising affects total demand.
- Advertising restrictions can effectively complement other tobacco prevention tools.

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References i

Callaway, B., & Sant'Anna, P. H. C. (2021). **Difference-in-differences with multiple time periods.** *Journal of Econometrics*, *225*(2), 200–230. https://doi.org/10.1016/j.jeconom.2020.12.001

DeCicca, P., Kenkel, D., & Lovenheim, M. F. (2022). **The economics of tobacco regulation: A comprehensive review.** *Journal of Economic Literature*, *60*(3), 883–970. https://doi.org/10.1257/jel.20201482

European Commission. (2024). **Eu burden from non-communicable diseases and key risk factors [Accessed 2025 August 21].** https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/eu-burden-non-communicable-diseases-key-risk-factors_en

References ii

- Federal Office of Public Health. (2015). **Basisinformation zur tabakwerbung.** Federal Office of Public Health. Bern. https://www.bag.admin.ch/dam/bag/de/dokumente/npp/tabak/basisinformation-tabakwerbung.pdf.download.pdf/2015_Basisinformation_Tabakwerbung_DE.pdf
- Federal Office of Public Health. (2025). **Tabakpolitik in den kantonen [Accessed: 2025-10-18].** https://www.bag.admin.ch/de/tabakpolitik-in-den-kantonen
- Federal Statistical Office. (2024). **Swiss health survey, 1997–2017.**
- Goel, R. K., & Nelson, M. A. (2006).**The effectiveness of anti-smoking legislation: A review.** *Journal of Economic Surveys*, *20*(3), 325–355. https://doi.org/10.1111/j.0950-0804.2006.00282.x

References iii

Liu, L., Wang, Y., & Xu, Y. (2024). **A practical guide to counterfactual estimators for causal inference with time-series cross-sectional data.** *American Journal of Political Science*, *68*(1), 160–176. https://doi.org/10.1111/ajps.12723

Murray, C. J. L., Aravkin, A. Y., Zheng, P., Abbafati, C., Abbas, K. M., Abbasi-Kangevari, M., Abd-Allah, F., Abdelalim, A., Abdollahi, M., Abdollahpour, I., et al. (2020). **Global burden of 87 risk factors in 204 countries and territories, 1990–2019: A systematic analysis for the global burden of disease study 2019.** *The Lancet*, *396*(10258), 1223–1249. https://doi.org/10.1016/S0140-6736(20)30752-2

References iv

Reitsma, M. B., Kendrick, P. J., Ababneh, E., Abbafati, C., Abbasi-Kangevari, M., Abdoli, A., Abedi, A., Abhilash, E., Abila, D. B., Aboyans, V., et al. (2021). **Spatial, temporal, and demographic patterns in prevalence of smoking tobacco use and attributable disease burden in 204 countries and territories, 1990–2019: A systematic analysis from the global burden of disease study 2019.** *The Lancet*, *397*(10292), 2337–2360. https://doi.org/10.1016/S0140-6736(21)01169-7

Saffer, H., & Chaloupka, F. (2000). **The effect of tobacco advertising bans on tobacco consumption.** *Journal of Health Economics*, *19*(6), 1117–1137. https://doi.org/10.1016/S0167-6296(00)00054-0

References v

World Health Organization. (2024). **Who global report on trends in prevalence of tobacco use 2000–2030.** World Health Organization. Geneva. https://www.who.int/publications/i/item/9789240088283