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ABSTRACT

Tobacco Sales Prohibition and Teen Smoking*

We evaluate one of the most prevalent prohibitory policies: banning the sales of tobacco to teens. We exploit the staggered introduction of sales bans across Switzerland and the European Union from 1990 to 2016. The estimates indicate a less than 1 percentage point reduction in teen smoking because of the bans. The reduction is substantially lower than the 5 percentage point reduction expected by health officials. We examine additional outcomes relevant to assessing any prohibitory policy. We find that teens circumvent the bans through peers. Moreover, they consider smokers less cool but do not think smoking is more dangerous.

JEL Classification: D12, I12, I18, K42

Keywords: prohibition, tobacco sales bans, youth smoking, attitudes toward smoking, tobacco prevention

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1 Introduction

Smoking is a major cause of cancer, heart disease, and early death (Jha and Peto, 2014; WHO, 2016). In response, governments have introduced strict tobacco control policies for adults and teens to improve public health. Policies that target teens may be particularly effective since early smokers smoke more as adults, and many smokers start as teens (see, e.g., van Ours, 2006; DeCicca, Kenkel and Mathios, 2008).[1] For instance, more than 90% of smokers in the United States tried their first cigarette before they turned 18 (U.S. Department of Health and Human Services, 2014). In Switzerland, more than half of smokers started smoking as teens and in Europe more than a third started smoking as teens (see Appendix, Figure A.1, and van Ours, 2006). The most prevalent policy aimed at reducing smoking is therefore banning the sale of tobacco to teens. Whether sales bans actually reduce teen smoking, however, is difficult to judge given the limited evidence.

Those in favor of sales bans argue that bans reduce teen smoking by making it more difficult for teens to get cigarettes and by signaling the danger of smoking. Those who criticize sales bans counter that smoking may become more appealing — the forbidden fruit effect. They also highlight that teens can circumvent the restrictions by getting cigarettes from other sources, such as their peers, instead of from stores. The arguments about restricted access, circumvention, signaling the danger of drug consumption, and the forbidden fruit effect are fundamental to any assessment of the effects of prohibition (MacCoun, 1993; Miron and Zwiebel, 1995; Sunstein, 1996; Landman, Ling and Glantz, 2002; Bénabou and Tirole, 2011; Jacobi and Sovinsky, 2016; García-Jimeno, 2016). The extent to which these aspects matter is an empirical question.

We examine these aspects in a comprehensive evaluation of tobacco sales bans across Switzerland and the European Union (EU). We exploit two natural experiments based on newly compiled data sets to add causal evidence to the policy debate. So far, evidence from the field on the mechanisms crucial for the success of prohibitory policies — such as signaling the danger of drug consumption or the forbidden fruit effect — is scarce. We exploit the variation in the introduction of sales bans across jurisdictions and time to assess the bans'

[1] The aim to reduce the smoking prevalence among teens motivated 160 countries to promise to "prohibit the sales of tobacco products to persons under the age set by domestic law, national law or eighteen" (WHO, 2003; p. 15). The United States and other countries are currently discussing whether to increase the minimum sales age (Ahmad and Billimek, 2007; New York Times, 2016; Bloomberg, 2015, Morain, Garson and Raphael, 2018).

effect on access to cigarettes and circumvention, perceived danger of smoking, the appeal of smoking, and smoking prevalence. We use hand-collected introduction dates across the 26 cantons of Switzerland and across 32 regions and countries in the EU. We match this information with two data sets for Switzerland and one for the EU, yielding more than 300,000 observations.

An advantage of the institutional setting in Switzerland is that cantons can introduce sales bans on tobacco, but the federal government sets taxes on tobacco and alcohol. This combination of cantonal policy changes within federal institutions shared by all cantons reduces the risk of omitted variable bias and increases the likelihood of identifying the causal effect of sales bans. For example, changes in tobacco taxation could not distort our estimates. Importantly, we can also not reject common-trends in smoking prevalence across cantons before the introduction of sales bans. The Swiss federal system thus makes an intriguing setting in which to examine the impact of sales bans on smoking prevalence.

We find that the prohibition of tobacco sales to teens does not statistically significantly reduce the prevalence of smoking among teens. For Switzerland, the point estimates suggest only a small aggregate reduction of smoking among teens of less than 1 percentage point from an initial smoking prevalence of roughly 20%. This is clearly less of an impact than that expected by the public health officials we surveyed across Swiss cantons. The median expectation of these experts was a 5 percentage point reduction in smoking, an expected effect substantially larger than the one we estimated. This discrepancy could be because health officials face the difficulty of separating policy effects from the general decline in smoking prevalence over time. The replication of the analysis for the member countries of the EU provides almost identical results, with point estimates indicating a less than 1 percentage point reduction in smoking prevalence among teens.

We do not find evidence of a forbidden fruit effect triggered by the prohibition of tobacco sales to teens — one of the main arguments against prohibition. Sales bans do not make smoking more appealing. In contrast, we find that the appeal of smoking decreases with the introduction of sales bans. However, we find no increase in the perceived danger of smoking in reaction to the bans. The latter result suggests sales bans are not an informative signal of the danger of smoking. A possible explanation for the small effect of sales bans on smoking prevalence is that teens circumvent the bans by getting cigarettes from peers instead of stores. Consistent with this argument, we find a reduction in smoking only among teens who do not

have smoking peers. The estimates also suggest that teens substitute getting cigarettes from stores with getting cigarettes from peers after the introduction of a sales ban. The findings indicate that peer effects may work through access to cigarettes in addition to peer pressure.

We contribute to the literature examining the effects of prohibition in general and of prohibition of addictive goods to teens in particular. Previous studies on the prohibition of addictive goods to teens mainly examine the effects of getting access to cannabis and alcohol (Carpenter and Dobkin, 2009; Crost and Guerrero, 2012; Carpenter and Dobkin, 2015; Williams and Bretteville-Jensen, 2014; Anderson, Hansen and Rees, 2015; Jacobi and Sovinsky, 2016; Carpenter, Dobkin and Warman, 2016; Marie and Zölitz, 2017). Studies investigating the impact of tobacco control policies on teen smoking focus on taxes and clean indoor air laws.[2] Policies restricting the access to tobacco, however, have received less attention.

Our evaluation of tobacco sales bans adds in several ways to previous literature on access restrictions for tobacco. First, in addition to providing causal estimates of the effect on smoking prevalence, we study outcomes for which evidence is missing (DiFranza, 2012; Institute of Medicine et al., 2015). In particular, we consider the effect on attitudes toward smoking, perceived danger, and circumvention.

Second, while we use spatial variation across time, existing studies on sales bans mainly use case studies for single countries. These studies compare the smoking prevalence before to the smoking prevalence after raising or introducing a minimum sales age (Rimpelä and Rainio, 2004; Hagquist, Sundh and Eriksson, 2007; Millett et al., 2011). The authors find a negative correlation between smoking prevalence and sales bans. Yet, the time series analysis does not allow the researcher to separate the impact of the sales ban from any general trend in smoking prevalence within countries. The analysis could lead to an overestimation of the effect of sales bans if there is a general decline in smoking.[3] A similar ambiguity about the

[2]The literature is rather broad and includes for example: DeCicca, Kenkel and Mathios (2002); Adda and Cornaglia (2010); Odermatt and Stutzer (2018); Chaloupka and Wechsler (1997); DeCicca, Kenkel and Mathios (2008); Bharadwaj, Johnsen and Løken (2014); Lillard, Molloy and Sfekas (2013); Hawkins, Bach and Baum (2016); Hansen, Sabia and Rees (2017); van Ours and Palali (2017); Pfeifer, Reutter and Strohmaier (2019); Rees-Jones and Rozema (2018).

[3]Trends are also an issue in the study by Schneider et al. (2016), who examine the smoking prevalence among 9 to 12 graders in Needham in Massachusetts after an increase of the minimum sales age from 18 to 21. They compare the smoking prevalence in these communities to sixteen surrounding communities which did not increase the minimum sales age. Unfortunately, the authors can only observe smoking prevalence after the adoption of the higher sales age. The larger decline in smoking prevalence in the adopting community could therefore be either because of different pre-trends or because of an effect of the increase in the minimum sales age.

identification of causal effects of sales bans applies to the study by Kuipers et al. (2017). The authors exploit five increases in minimum age and two introductions of sales bans in comparison to twelve control countries in the European Union. While two waves of cross-sectional data allow the authors to compare smoking prevalence before and after an extension of bans, they are not able to assess pretrends. They find no statistically precisely estimated relationships between an increase in minimum sales ages and smoking prevalence.[4]

Third, rather than the introduction of sales bans, previous studies exploit changes in the enforcement of existing access restrictions for teenagers across the United States. For instance, a randomized control trial in six Massachusetts communities that strengthened enforcement of existing sales bans suggests a null effect on smoking (Rigotti et al., 1997). Abouk and Adams (2017) find that more frequent compliance inspections lead to a reduction in smoking for girls but not for boys. Grucza et al. (2013) find, if anything, a small long-term effect of having been subject to stronger enforcement of access restrictions. Yörük and Yörük (2016) exploit individual-level panel data to estimate the impact of passing the minimum age threshold in a regression discontinuity design. They find a small temporary increase in tobacco consumption of individuals after passing the minimum age.

Lastly, we isolate the effect of sales bans from other tobacco control policies. Other studies use variation in indexes summarizing the strictness of diverse policies for teens in the United States. Findings are mixed, with studies reporting positive, negative, or statistically imprecisely estimated correlations between such indexes and smoking prevalence among teens (see, e.g., Gruber and Zinman, 2000; Cawley, Markowitz and Tauras, 2006; Nesson, 2017).[5] As these indexes are a summary measure for diverse policy tools for preventing teen smoking (including packaging restrictions, regulations on possession, minimum smoking age, restrictions on free distribution of samples, advertising, licensing, and regulation of use) it is

[4]We are only aware of one case study by Macinko and Silver (2018) which uses both, several yearly waves of cross-sectional data prior to the adoption of a higher minimum legal purchase age and a comparison group. In their analysis, they assess the effect of an increase in the minimum legal sales age from 18 to the age of 21 in New York City in August 2014 on youth tobacco consumption in comparison to the rest of New York State as well as in comparison to four cities in Florida. While adolescent tobacco use slightly declined in New York City it declined even more in the control regions. Consequently, the authors estimate a relative increase in smoking prevalence after the increase in the minimum sales age. However, the study population was confined to students in seventh to twelve grade. Most of theses students were not directly affected but only indirectly through their older peers who newly experienced a limited access.

[5]Powell, Tauras and Ross (2005) use cross-sectional variation across states and find a negative correlation between the index and smoking prevalence. Nesson (2017) studies more recent data from the United States and finds a positive association of tobacco control policies and youth smoking prevalence as measured by a biomarker. In Appendix D, we provide a brief evaluation of the use of biomarker data in comparison to survey data to assess teen smoking prevalence.

difficult to infer conclusions about specific policies. The policies could have diverging effects, making it difficult to interpret the effects of a 1-point change in an index.

The remainder of the paper is organized as follows: In Section 2 we introduce the data and explain the empirical strategy. Section 3 shows the main results, first of the analysis for Switzerland and then for the EU. Section 4 provides robustness checks and effect heterogeneity. In Section 5, we provide evidence on the effect of sales bans on the appeal of smoking, perceived danger of smoking, and purchasing behavior. Section 6 is the conclusion.

2 Description of Bans, Data, and Empirical Strategy

2.1 Sales Bans in Switzerland and Europe

Switzerland — Before the introduction of the bans, individuals of any age could purchase tobacco products de jure. The introduction of the bans then prohibited the sale of tobacco to teens under a certain age. The laws cover processed and nonprocessed tobacco, chewing tobacco, snuff, and shisha tobacco.[6]

Swiss cantons started introducing sales bans in 2006.[7] Figure A.2 in the Appendix provides an overview of the spatial distribution of the sales bans and Table A.1 shows the different introduction dates and the minimum sales ages implemented across cantons.[8] Figure A.3 depicts the share of minors living in a canton with a ban by year. Out of 26 cantons, 23 introduced bans on 17 different dates. The minimum legal age in 12 of the 23 cantons that introduced a ban is 16, and in the other 11 cantons it is 18, the age at which individuals are legally considered adults. We refer to individuals below the age of 18 as minors and below the age of 21 as teens. The bans also apply to vending machines.

Most other institutional changes relevant to smoking behavior, such as taxes on tobacco and alcohol, are implemented for all cantons simultaneously on the federal level. There is

[6]The law texts are similar across cantons. Here, as an example, is the law text from the canton of Bern: "HGG Art 16 Sales of Tobacco: 1. The distribution and sale of tobacco to children and adolescents under the age of 18 are prohibited. 2. The sales personnel have to check the age of the customer. To this end, it is allowed to demand an ID." On the website, it is further specified that "if necessary, the personnel must check the age with an ID. Non-adherence is a punishable offence." For details, see `https://www.vol.be.ch/vol/de/index/direktion/organisation/beco/wdb_gewerberecht.thema.70.html`. The fines can be up to $40,000 for an illegal sale.

[7]The introduction dates stem from the Swiss Federal Office of Public Health: `https://www.bag.admin.ch/bag/de/home/themen/mensch-gesundheit/sucht/tabak/tabakpolitik-kantone.html`.

[8]Tables and figures with an alphabetic prefix can be found in the Appendix.

no variation in tobacco taxes across cantons, which allows us to estimate the effect of sales bans separately from effects of tax changes.

Some cantons introduced advertisement bans and clean indoor air laws for public buildings, such as schools, for tobacco in the same time period.[9] To account for these policies, we include indicators for other cantonal laws in robustness checks. In addition, some cantons rolled out information campaigns on tobacco. However, according to our investigations, all the cantons that started such prevention programs implemented them in recent years and at least 3 years after the introduction of their sales ban. E-cigarette regulation does not coincide with sales bans either. The policy did not change in the sample period, with the sale of e-cigarettes being illegal in Switzerland until 2018.[10]

Europe — Many of the law changes in Europe took place after 1990, although some countries, such as Italy and England, introduced bans on selling tobacco to adolescents below the age of 16 back in the 1930s. Table A.2 provides an overview of the different introduction dates of sales bans across 32 European countries and regions. We compiled the information from the sources listed in Table A.3. Except for in Austria and Great Britain, federal rather than regional governments introduce tobacco control policies (see, e.g., the review in Studlar, Christensen and Sitasari, 2011).

Like in Switzerland, some countries introduced a minimum sales age of 16 years and others 18 years. We also observe countries (e.g., France, Germany) that first introduced the minimum age of 16 and in subsequent years increased it to 18. In several cases the introduction of a sales ban was accompanied by a minimum smoking age, which we also take into account. To identify the bans' effect on teen smoking behavior, we exploit 25 law changes between 1990 and 2012. In the same time period all the countries enacted indoor air laws, and in contrast to the Swiss setting, there is variation in changes in cigarette prices across countries. We address potentially confounding policy changes in the robustness checks in Section 4.

[9]Boes, Marti and Maclean (2015) show that clean indoor air laws in Switzerland reduced smoking among adults and affected going-out behavior, and Mazzonna and Salari (2018) show that indoor air laws reduced the incidence of heart attacks.

[10]During our sample period, less than 1% of the Swiss population smoked e-cigarettes and access to e-cigarettes was still difficult. The commercial sale of e-cigarettes containing nicotine has just been allowed in 2018; for details see: `https://www.suchtpraevention-zh.ch/abhaengig-von/e-zigaretten-e-shishas/?L=0`. Before that, one could import a maximum of 150 mg of "e-liquid" containing nicotine per year for self-use.

2.2 Data Description

2.2.1 Data for Switzerland

Tobacco and Addiction Monitoring — We base the main analyses on quarterly cross-sectional data from the Tobacco and Addiction Monitoring survey for the years 2001 to 2016. This survey combines data from the Tobacco Monitoring survey, covering the years 2001 to 2010, with data from the follow-up Addiction Monitoring survey, covering the years 2011 to 2016. The data contain information on smoking behavior, attitudes toward smoking, and the perceived danger of smoking as well as on how teens get tobacco.

The variable capturing smoking prevalence stems from the question: "Do you smoke, even if only rarely?" It takes a value of 1 if the individual answers yes and 0 otherwise. We include 167,376 observations for which we have nonmissing values of the covariates, fixed effects, and smoking status. Given our focus on teen smoking, one advantage of the data is that teens aged 14 to 17 are oversampled for all years; see Figure A.4.

The data further include geographic identifiers as well as information about the date of the interview. For the years 2005 to 2010, we know the exact date. For more recent years, we know the month and year of the interview. The information allows us to assess whether an individual lived in a canton with a ban at the time of the interview. We merge cantonal information on the density of physicians from the Swiss Statistical Office and on youth and adult unemployment from the State Secretariat for Economic Affairs (SECO) offered through Amstat with the survey data.[11] Table A.4 shows the descriptive statistics for the variables from the Tobacco and Addiction Monitoring survey, as well as the merged cantonal variables.

Health Behaviour in School-aged Children — We use data from the Health Behaviour in School-aged Children (HBSC) survey from 2002 to 2014 to examine smoking behavior among teens age 11 to 15 years.[12] The data contain survey responses on health behaviors from high school students every 4 years. In particular, the data provide information on students' current smoking status, whether they have ever tried smoking, and their age at

[11] Youth unemployment is missing for the canton of Appenzell-Innerhoden for the years 2010 to 2013, which we interpolate linearly.

[12] We obtained written consent of the cantons that had a sample that allows for representativity within cantons to use their data. The data were then kindly provided by the organization Addiction Switzerland (Sucht Schweiz).

the first puff.[13] The possible answers to the question of whether the teens smoke are "every day," "at least once a week," "less than once a week," or "I don't smoke." We classify a teenager as a nonsmoker if he or she said "I don't smoke" and as a smoker otherwise.

We also know the canton of the student and the year of the interview. Data from the Health Behaviour in School-aged Children survey exist for only 15 cantons, of which 11 introduced a sales ban in the survey period. In 4 cantons, the sales ban was introduced either before or after the sample period. The reason why we have data for just a subset of cantons is that cantons had to pay extra to get a representative sample, and it is only those cantons for which we could get access to data with cantonal identifiers (for details about the data availability, see Table A.5). We again merge cantonal information as described above with the data set. Table A.4 gives the descriptive statistics.

Expectations of Health Officials and Information on Test Purchases — We surveyed health officials to learn about their expectations of the bans' effectiveness and about the results of test purchases. A test purchase wave is when the canton sends teens below the minimum age to buy cigarettes at different shops. If the shop owner sells cigarettes illegally for the first time, the common practice is for the canton to remind the shop owner of the law and to threaten legal punishment (fines) in the case of a repeated offense. They usually also invite the shop owners to send their personnel to courses where they are taught how to comply with the law. We complement the information on test purchases from the survey with publicly available data on test purchases for all 23 cantons that introduced a ban. The data contain the year of the test purchases, the number of stores tested, and the share of sales made to teens below the minimum age.

We received responses on the expected reduction in smoking prevalence because of sales bans from health officials from 21 of 26 cantons. In case the canton introduced a sales ban, we asked about what health officials ex-post expected reduction was. For the few other cantons we just reformulated the questions as hypothetical.[14] Out of the 21 officials that

[13]The data also contain information on the number of cigarettes smoked from 2006 onward (we do not use the data on the number of cigarettes available for 2002 as students wrote down the exact number of cigarettes themselves, yielding highly unlikely numbers) and the frequency of smoking for the years 2002 through 2014 for smokers. The latter was only asked of the comparatively older students.

[14]The health officials answered three questions: i) "Do you personally think that the introduction of sales bans to teens led to a decrease or an increase in total smoking prevalence among ages 12 to 18?" Officials could tick either of three boxes to respond: "decrease", "no effect", or "increase". ii) "How large do you estimate is the decrease or increase in percentage points in smoking prevalence among teens aged 12 to 18

responded to the questions, 17 not only said whether they expected a decrease, but also gave the expected size of the reduction in smoking prevalence.[15] We use the answers to the question about the expected decrease or increase in percentage points in smoking prevalence to benchmark our estimates against the expectations of the health officials.

2.2.2 Data for Europe

Eurobarometer — We use individual-level data from the Eurobarometer surveys (Commission of the European Communities, 2012) to analyze the impact of sales bans on teen smoking behavior in the EU. Survey respondents are 15 years or older. We follow the sample specifications of Odermatt and Stutzer (2018) and use data from 9 years of the Eurobarometer: 1990, 1992, 1994, 1995, 2002, 2005, 2006, 2009, and 2012.[16]

For these years, the Eurobarometer surveys where respondents are surveyed throughout the year include questions about health-related issues, such as whether and how much respondents smoke. We classify people as smokers when they indicate that they smoke manufactured or roll-your-own cigarettes, cigars, or a pipe. To measure how much people smoke, we exploit the respondents' report of daily cigarette consumption in nine categories, ranging from "fewer than 5 cigarettes" up to "40 or more cigarettes." We approximate the actual number of cigarettes smoked by the median value of each category and for the top category we impute the number of 43 cigarettes.

For the analysis we exploit 25 law changes in 21 countries or regions. We consider the nine regions of Austria and the four regions of Great Britain as separate units, because these

years?" Officials could respond by writing in a blank field which had the word percentage points to its right. iii) "Do you personally think that the introduction of sales bans to teens led to an overall decrease of the smoking intensity among smoking teens, that is, do teens between the age of 12 to 18 who already smoke smoke fewer or more cigarettes?" Officials could respond by ticking either of three boxes: "decrease", "no effect", or "increase".

[15] A few respondents gave a range for the potential reduction in smoking prevalence because of a sales ban of 1 to 5, 5 to 10, or 15 to 20 percentage points. We use the smallest predicted reduction when discussing the expectations of health officials.

[16] The year 2012 is the last year for which comparable cigarette prices across countries and years are available.

regions implemented the laws on the regional level.[17] The final sample consists of 138,311 observations. Table A.6 provides the descriptive statistics of the data for the EU.

We complement the individual-level data with country-level covariates as in Odermatt and Stutzer (2015). Specifically, we include information on cigarette prices from the excise duty tables of the EU. We use the price of the most popular brand in a country. We further include a measure of the comprehensiveness of indoor air laws, including smoking bans for indoor workplaces, indoor public places, public transportation, and bars and restaurants (for details about the construction of the measure, see Odermatt and Stutzer, 2015, p. 178).

2.3 Empirical Strategy

We estimate the effects of the sales bans for Switzerland using the following differences-in-differences specification:

$$\begin{aligned}\text{Smoker}_{ict} =& \beta_1 \text{BindingSalesBan}_{ict} + \beta_2 \text{SalesBan}_{ct} \\ &+ \gamma_a + \eta_{cxteen} + \theta_{yxteen} + X'_{ict}\delta + \varepsilon_{ict}\end{aligned}$$

The dependent variable is Smoker_{ict}, which is 1 if an individual smokes and 0 otherwise. The coefficient of interest is β_1 for the effect of the variable $\text{BindingSalesBan}_{ict}$. $\text{BindingSalesBan}_{ict}$ is 1 if an individual i lives in a canton c with a sales ban in place and is younger than the minimum sales age at time t. The variable SalesBan_{ict} is 1 if a minimum sales age is in place in a canton.[18] It takes the value 1 irrespective of whether the individual is below or above

[17] The sample includes the countries Austria, Belgium, Cyprus (Republic of), Denmark, Estonia, Finland, France, Germany, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom. For Austria, Finland, and Sweden, data are available only from 1995 onward, and for the newest members of the EU (Cyprus, Estonia, Latvia, Lithuania, Malta, Slovenia, and Slovakia) from 2005 onward.

[18] In the specifications based on the Health Behaviour in School-aged Children, we cannot include the variable SalesBan_{ict}, as the sample only covers teens of age 11 to 15 years for which all sales bans are binding. However, we can exploit the staggered introduction of the laws across cantons for identification. The indicator variable of a ban being in place is 1 if the person was interviewed at least 7 days after the introduction of the ban in case we know the exact date of the interview. We include this one week window to allow for a depletion of stock in cigarettes. Since all bans were introduced on the first day of the respective month, it is also 1 if the individual was interviewed in the month of the introduction, in case we only know the month of the interview. For the Health Behaviour in School-aged Children data set we only have the interview year, so we define that the canton introduced the ban if the introduction year is greater than or equal to the year of the survey. The canton of St.Gallen introduced the law in October 2006, but since we do not know the month of the interview we count it as a year where it was not yet introduced. When estimating the same specifications as in Table 1, but dropping the observations from St.Gallen in 2006, the estimates from the Health Behaviour in School-aged Children data are similar in size and statistically insignificant.

the minimum sales age. We expect this term to be 0 if (i) there were no other relevant events correlated with the introduction of sales bans that affected smoking behavior and (ii) if there were no lasting effects on individuals who were once under a ban. We test the latter aspect in an extension. We thus focus on β_1, which reflects the differential effect on individuals younger than the minimum age.[19]

To control for age-specific smoking in the most flexible way, we use age fixed effects, γ_a, for each discrete age. We also control for canton and canton x teen fixed effects, δ_{cxteen}, as well as year and year x teen fixed effects, λ_{yxteen}. Teen is an indicator variable that takes a value of 1 if an individual is aged 11 to 20 years and 0 otherwise. Accordingly, we estimate two fixed effects for each canton and for each year — one for adults and one for teens (denoted by Canton FE, Canton x Teen FE, Year FE, and Year x Teen FE in the tables). We thereby absorb differential canton- and year-specific smoking behavior across the two age groups. Figure A.5 shows there are some differences in smoking trends across younger and older individuals. The fixed effects take into account differential smoking prevalence among adults and teens and are parsimonious enough to maximize power for outcomes when we have data only for individuals younger than 21.

The term X'_{ict} captures additional control variables. For the Tobacco and Addiction Monitoring data we include a dummy for gender, foreign born, and household size. For the Health Behaviour in School-aged Children data we include gender as an individual-level covariate. The reason for the restrictive set of covariates is the limited availability of other sociodemographic information for minors. For both data sets we include physician density, youth unemployment, and general unemployment as cantonal controls.

For the EU, we estimate similar specifications with the dependent variable and the explanatory variables defined the same way as for the analysis for Switzerland.[20] The only difference is a slightly distinct set of control variables. Unlike in Switzerland, where cantons show statistically indistinguishable trends, we observe heterogeneous smoking trends across EU countries. We therefore include country-specific linear time trends in the main specification. Controls at the country level include real GDP per capita in logarithmic form and

[19]This coefficient can be interpreted as a triple difference-in-difference estimate. It is a lower bound for the total effect of sales bans if sales bans affect older smokers either through past experience or directly, such as an impact on norms. We do not see evidence in our data that older smokers were affected by the bans across all outcomes, though.

[20]If the day of the interview is missing, we use the middle date of each survey period to approximate the exact interview date.

the rates of unemployment and inflation. We also include individual-level control variables: dummies for gender, level of education, marital status, number of children in the same household, and occupation of the respondent, captured in 15 categories. We apply sample weights provided in the Eurobarometer data files throughout to reproduce representative samples for each country. Standard errors are clustered on the country and regional level in the case of the EU and on the level of cantons in the case of Switzerland.[21]

3 The Effect of Tobacco Sales Bans on Teen Smoking

3.1 Results for Switzerland and Deviation from Expectations

Descriptive Evidence — Smoking prevalence decreased from roughly 20% to under 17% for ages 14 to 17; see Figure A.5.[22] For adults, smoking prevalence decreased from over 30% to under 25%. From 2002 to 2014, the share of smokers and the share of individuals who tried smoking among younger teens aged 11 to 15 also declined, as can be seen in Figure A.7. At the same time, the average age of the first puff increased. Did the implementation of the sales bans cause the decline in smoking prevalence among teens?

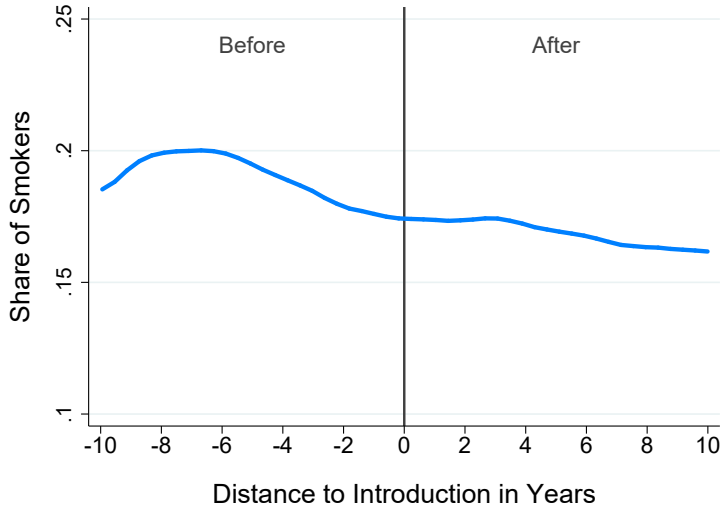
Figure 1 shows the smoking trend among teens aged 14 to 17 years before and after the introduction of the laws. While there is a decrease from 20% smoking prevalence to around 16%, we do not find a change in the trend after the introduction of the laws. Yet, the simple before-and-after comparison does not exploit that cantons introduced laws at different points in time or did not introduce a law.

Regression Results — Table 1 presents the main regression results. In column (1), where we include age, canton, and year fixed effects, the coefficient for the binding sales ban is -0.007 ($se = 0.010$). When we additionally include canton x teen and year x teen fixed effects as well as individual and cantonal controls in column (4), the estimate is -0.002 ($se = 0.009$). This is a less than 1 percentage point change in the propensity to smoke because of the bans or a less than 1.2% decline from the average smoking propensity of 0.18. The estimate is

[21]The standard errors are of similar size for the Swiss and European data in the corresponding main specifications when we use wild cluster bootstrap to account for the small number of clusters (Cameron, Gelbach and Miller, 2008).

[22]This likely affects future smoking behavior as current smokers are often people who started early. Figure A.6 shows the relationship between initiation age and the likelihood of smoking currently.

Figure 1: Smoking Trends for Minors in Switzerland Relative to the Introduction of Sales Bans



Note: The figure shows the share of smokers among individuals from 14 to 17 years of age around the introduction of sales bans. Only cantons with sales bans are included. The black vertical line depicts the introduction date, and the blue line indicates the estimates from local linear regressions with bandwidth 2. The distance in years on the x-axis is continuous and based on the distance to either the precise date of the interview or the month of the interview.
Data source: Tobacco and Addiction Monitoring, 2001–2016.

not statistically different from 0.[23] Similarly, the linear combination of the sales ban and the binding sales ban coefficients in column (4) of -0.004 is statistically insignificant ($se = 0.008$). We also estimate statistically insignificant effects for changes in the numbers of packs smoked by smokers in column (5).

In addition, we do not find statistically significant effects on current smoking, whether a teen ever tried smoking, or the age at first puff for 11- to 15-year-old teens; see columns (6) to (8). We examine additional outcomes that confirm no large reduction in smoking because of sales bans; see Table B.2. We do not see a statistically significant effect on five alternative outcomes, such as smoke frequency or smokers' nicotine intake (see Adda and Cornaglia, 2006, and Cotti, Nesson and Tefft, 2016, for substitution effects in the case of taxation).

Health Officials' Expectations Versus Actual Impact — Figure 2 shows the comparison of the impact of the law with the expectations of health officials. Considering the 90% confidence intervals of the estimated impact of the sales bans in specification (4), we can rule

[23]Table B.1 presents the results for further specifications excluding year fixed effects, excluding the general variable capturing sales ban, or including interactions of all the controls with a dummy for teens.

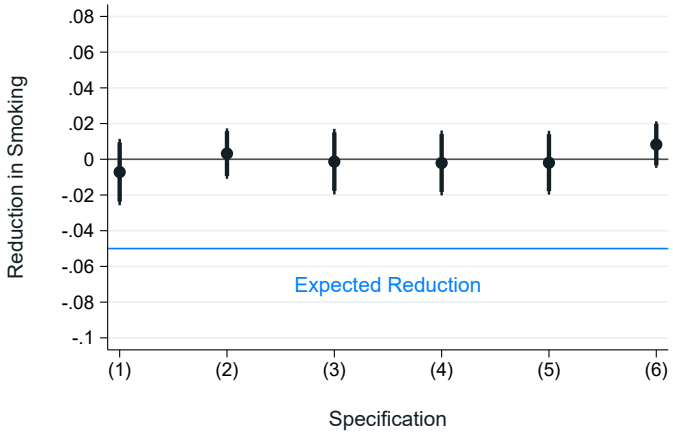
Table 1: Main Results for Switzerland

	Tobacco and Addiction Monitoring All Ages					Health Behaviour in School-aged Children 11–15 Years Old		
Dependent Variable	Smoker				Packs (Smokers)	Smoker	Smoked Ever	Age First Puff
Avg. for Minors	0.178				0.438	0.104	0.287	12.503
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Binding Sales Ban	-0.007	0.003	-0.001	-0.002	-0.009	0.008	0.012	0.001
	(0.010)	(0.007)	(0.009)	(0.009)	(0.020)	(0.007)	(0.014)	(0.051)
Sales Ban	-0.002	-0.002	-0.002	-0.002	0.005			
	(0.003)	(0.003)	(0.003)	(0.003)	(0.008)			
Age FE	X	X	X	X	X	X	X	X
Canton FE	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X
Canton x Teen FE			X	X	X			
Year x Teen FE		X	X	X	X			
Ind. Controls				X	X	X	X	X
Cant. Controls				X	X			
Observations	167,376	167,376	167,376	167,376	35,120	56,335	56,207	13,177
Canton Clusters	26	26	26	26	26	15	15	15
R-squared	0.03	0.03	0.03	0.05	0.08	0.07	0.14	0.25

Note: Estimated effects of sales bans on smoking in percentage points from linear least squares estimations. Binding Sales Ban indicates that an individual is currently subject to a sales ban. Sales Ban indicates that an individual lives in a canton with a sales ban. Standard errors clustered on the level of cantons are in parentheses. Smoker refers to current regular smoking. Packs (Smokers) refers to the number of packs (20 cigarettes) smoked by smokers, derived from the number of cigarettes a smoker smokes per day. Age First Puff indicates the reported age at which a high-school student tried smoking for the first time. It contains fewer observations since this question was posed to only a subsample of students who filled out the long questionnaire of the Health Behaviour in School-aged Children survey. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

out an impact of the sales bans on teen smoking prevalence of more than -1.7 percentage points. This is a substantially and statistically significantly smaller impact than the median expected impact of 5 percentage points stated by the Swiss health officials, depicted by the blue line in Figure 2. Two thirds of the health officials also thought that conditional on being a smoker, there would be a reduction in smoking intensity. The confidence intervals of the estimates for smoking intensity, however, do not rule out no reduction in smoking intensity because of sales bans.

Figure 2: Expectations and Actual Impact



Note: The black dots show the coefficient estimates of being subject to a ban given the specifications shown on the x-axis, which refer to the columns in Table 1. The thick vertical lines show the 90% confidence intervals, the thin vertical lines the 95% confidence intervals. The horizontal blue line represents the median reduction of 5 percentage points expected by Swiss health officials. The dark gray horizontal line indicates 0.
Data source: Tobacco and Addiction Monitoring, 2001–2016.

3.2 Analysis for the European Union

Table 2 shows the results for the introduction of sales bans across countries and regions in the EU. Using only fixed effects we estimate a decrease in smoking prevalence of -1.6 percentage points ($se = 0.022$); see column (1). When taking into account controls on the country and individual level in column (2) and country-specific trends in column (3) we estimate effect sizes of -0.007 and -0.006. The estimates indicate a less than 1 percentage point reduction and are close to the estimates for Switzerland. For the impact on the numbers of packs smoked by smokers in column (4), we estimate small and statistically insignificant effects.

Table 2: Main Results for the European Union

Dependent Variable	Smoker			Packs (Smokers)
Avg. for Minors	0.219			0.547
	(1)	(2)	(3)	(4)
Binding Sales Ban	-0.016	-0.007	-0.006	0.006
	(0.022)	(0.021)	(0.021)	(0.030)
Sales Ban	-0.019	-0.019	-0.001	-0.009
	(0.015)	(0.013)	(0.013)	(0.021)
Age FE	X	X	X	X
Country FE	X	X	X	X
Year FE	X	X	X	X
Country x Teen FE	X	X	X	X
Year x Teen FE	X	X	X	X
Country Trends			X	X
Ind. Controls		X	X	X
Country Controls		X	X	X
Observations	138,311	138,311	138,311	38,853
Clusters	32	32	32	32
R-squared	0.06	0.10	0.10	0.12

Note: Estimated effects of sales bans on smoking in percentage points from linear least squares estimations for 32 European countries and regions. Binding Sales Ban indicates that an individual is currently subject to a sales ban. Sales Ban indicates that an individual lives in a country or region with a sales ban. Standard errors clustered on the country/region level are in parentheses. Smoker refers to current regular smoking. Packs (Smokers) refers to the number of packs (20 cigarettes) smoked by smokers, derived from the number of cigarettes a smoker smokes per day.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

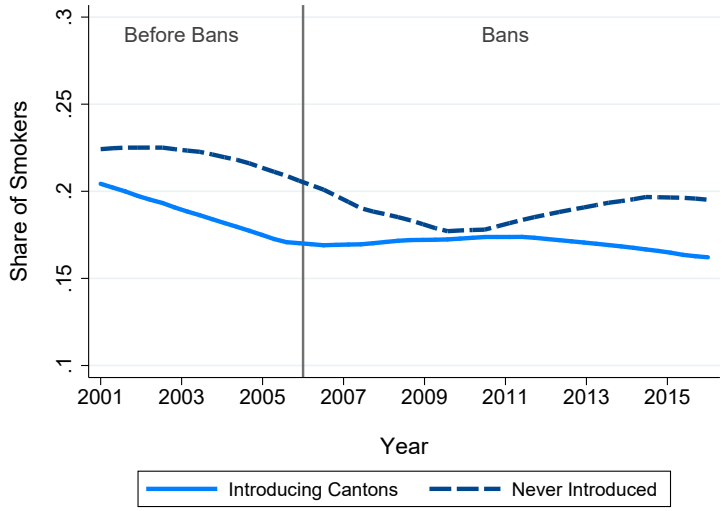
4 Robustness Checks and Heterogeneity

We assess the robustness of the main results by examining the validity of the common-trends assumption and by holding fix other policies. We focus on the Swiss data from the Tobacco and Addiction Monitoring survey because its quarterly surveys make it the most comprehensive data set. All figures and tables with no geographic indication refer to Swiss data. We also present the main robustness checks for the European data. We concentrate on smoking prevalence, since it is the main variable of interest and it simplifies

the exposition of the results. In addition, we provide evidence on heterogeneous effects across sociodemographic groups.

Common-Trends Assumption — Figure 3 shows the trends for cantons that did and did not introduce sales bans. Before the first bans in 2006, the trends look similar across the two groups. Consistent with our main findings, we do not see a reduction in smoking prevalence in cantons that introduced the laws when compared to cantons that did not.

Figure 3: Difference in Trends of Smoking Prevalence Among Minors in Introducing and Control Cantons



Note: The figure indicates the trends in smoking prevalence among teens aged 14 to 17 years for cantons that introduced a sales ban (solid blue line) and cantons that did not (dashed dark-blue line). The vertical gray line marks 2006, the first year cantons started to introduce sales bans. The estimates stem from local polynomial regressions with bandwidth 2.
Data source: Tobacco and Addiction Monitoring, 2001–2016.

We next examine whether the trends differ statistically significantly. Tables B.3 and B.4 provide an array of tests for the common-trends assumption using Swiss data. In Table B.3, columns (1) to (4), we document that cantons with bans, or with bans introduced early or late, did not have statistically significantly different trends in smoking prevalence when compared to cantons that did not introduce the laws. This holds true for smoking prevalence among minors (aged 14 to 17) as well as for adults. We further do not find a difference in trends when restricting the sample to the years before the first introductions in 2006. The cantons with a minimum age of 18 also had similar trends to cantons with a lower or no minimum age, as shown in columns (5) and (6). Further assessing whether differential trends drive our results, we show that the estimated impact of sales bans does not change much

when we add separate canton-specific trends in column (1) and canton-specific trends for teens in column (2) of Table B.4.

Since we exploit variation in the timing of the ban introduction, we check whether there are lead effects of the bans; see Table B.4. If there are lead effects, this might indicate that cantons introduced the laws as a reaction to changes in smoking prevalence. Column (3) shows that we do not see a statistically distinguishable smoking prevalence a year before the introduction of bans. To avoid the possibility that extrapolation from pretrends drives the results, we use only the years from 2003 onward, shown in column (4), which does not affect the coefficient estimates. The results shown in column (5) suggest that cantons that introduced a sales ban in or after the year 2013 do not alter the estimates. In sum, we cannot reject the assumption of common trends.

We repeat two tests of the common-trends assumption for Europe by controlling for trends and including a 1-year lead. In Table B.5, column (1), we test whether the results change if we additionally include a separate country-specific time trend for teens. The results remain almost identical. Column (2) shows there is no statistically significant difference in smoking prevalence for the year before the introduction of a sales ban, neither for the age group that will still be subject to a sales ban the year after nor for the population in general.

Advertisement Bans, Indoor Air Laws, and Cigarette Prices — We further check the sensitivity of the results to the inclusion of other policy changes. We consider indoor air laws and advertisement bans in the analysis for Switzerland as well as indoor air laws and cigarette prices in the analysis for Europe. This is interesting for two reasons: First, it addresses the concern that other policy changes relating to both the introduction of sales bans and smoking behavior might affect the estimates. Second, it allows us to examine the effect of these other policies on adolescents' smoking behavior.

Table B.6 shows the results for Switzerland. When we include variables capturing the variation in advertisement bans and indoor air laws separately, columns (1) and (2), we do not see a statistically significant effect of either of the policies. Adding these policies jointly with the sales bans, as in columns (3) to (5), does not change the estimates for the sales bans much. The coefficient estimate for indoor air laws is marginally statistically significant, as shown in column (5), when we include all variables jointly. Note, however, that the direction of the indoor air law coefficient is not robust to alternative specifications. For instance, if we

use age, canton, and year fixed effects only, the coefficient is -0.024 ($se = 0.011$; regression not shown). In sum, when we condition on other policies, the estimates of the sales bans remain small.

For Europe, we show the sensitivity of the results conditional on cigarette prices and the existence of indoor air laws in columns (3) to (5) of Table B.5. We do not find a statistically significant effect of cigarette prices or indoor air laws on smoking behavior, neither for the whole population nor for minors. With the inclusion of indoor air laws instead of cigarette prices, shown in column (4), the size of the effect of sales bans gets more negative but remains statistically insignificant. The inclusion of cigarette prices in addition to indoor air laws, shown in column (5), leaves the estimated effect for binding sales bans unchanged.

Balance Check and Sample — To provide further evidence that sales bans did not coincide with other large changes, we show a balance check across covariates for Switzerland in Table B.7. One might see statistically significant correlations if the introduction of the sales bans is endogenous with respect to certain covariates or if people move because of sales bans. Across the four specifications, we do not find statistically significant relationships of the sales bans and covariates. For instance, we do not see that the share of minors observed in a canton and year differs conditional on a sales ban.

In Figure B.1, we show the results of a test of the sensitivity to dropping each canton in the analysis for Switzerland. The 95% confidence intervals include both 0 and the point estimate from the main results for all specifications leaving out a certain canton.

Heterogeneity — To assess the heterogeneity of the effect regarding different subgroups, we split the sample according to gender, birthplace, and education of the father. Table B.8 presents the results. Across both data sets there is no statistically discernible difference in the effect of sales bans on smoking prevalence across gender or birthplace. Only teens with a father who has a relatively low educational attainment smoke less if they are subject to a sales ban.

5 Evidence for the Debate Over Prohibition

The settings offer a unique opportunity to test arguments for and against prohibiting the sale of addictive goods to teens. First, we discuss the forbidden fruit effect and the potential information signal of the law by looking at whether the laws shifted attitudes toward smokers and perceived danger of smoking. Second, we analyze purchasing behavior to study whether teens circumvent the restrictions by getting cigarettes from other sources. Third, we examine whether heterogeneity in enforcement leads to different impacts on smoking prevalence and explore whether there are longer term changes in smoking prevalence because of having been subject to a ban.

5.1 Forbidden Fruit and Perceived Danger

The forbidden fruit effect suggests that sales bans increase the appeal of smoking among teens, potentially leading to an increase in smoking prevalence (MacCoun, 1993; Landman, Ling and Glantz, 2002; García-Jimeno, 2016). If smoking gets more appealing because of the introductions of sales bans, it would provide an explanation for why we do not find large negative effects of sales bans on smoking behavior.

We examine whether smoking gets more appealing with data on attitudes toward smokers from teens aged 14 to 20. The youth questionnaire of the Tobacco Monitoring survey for the years 2001 to 2010 contains questions about whether the respondents think smokers are relatively cooler, more attractive, more appreciative, happier, or more successful than nonsmokers. For instance, we code the relative coolness of smokers as 1 if the respondents think smokers are cooler, 0.5 if they think smokers are as cool as nonsmokers, and 0 if they think nonsmokers are cooler than smokers. Furthermore, we use a question on perceived danger of smoking, available from 2001 to 2010 and in 2012 from the Tobacco and Addiction Monitoring survey. The variable "Dangerous to Smoke" in Tables C.1 to C.3 refer to a scale from 1 to 6, where 6 is very dangerous and 1 is not at all dangerous.

The attitudes toward smokers and perceived danger are strongly correlated with smoking behavior; see Table C.1. Finding smokers appealing relates to a higher propensity for being a smoker, while higher perceived danger relates to a lower propensity for being a smoker.

Do these attitudes and the perceived danger change as a consequence of a sales ban? The results shown in Table C.2 indicate, if anything, a reduction in the appeal of smoking

when respondents are subject to a sales ban. After the introduction of a law, teens think smokers are less cool and appreciative; see columns (1) and (3). The point estimates in column (8) show a statistically significant reduction of the relative appeal of smokers, even among smokers themselves. Smokers think that they are less successful when a ban is in place, which is what drives the decline in relative appeal of smokers among smokers; see column (7).

In addition, we study smokers' and nonsmokers' perceived attitudes of peers and parents toward smoking; see Table C.3. In column (1) the dependent variable is 1 if respondents think friends "would find it rather bad if I stopped smoking," 2 if their friends "wouldn't care," and 3 if they "would like if I stopped smoking." In line with the findings on the other attitude measures, a sales ban leads smokers to think more often that their peers would like them to stop smoking. We do not find a statistically significant impact of the perception of nonsmokers about whether their peers want them to start smoking; see column (3). We also explore smokers' and nonsmokers' perceptions of their parents' views, shown in columns (2) and (4). The dependent variable captures whether respondents agree with the statement that parents are (or would be) okay if their children were smoking at home, where the answer "yes" is coded as 1, "no" as 0, and "it depends" as 0.5. We do not find a statistically significant impact of the sales bans on these attitudes. Last, in column (5), we show that we also do not find a statistically significant effect of sales bans on the perceived danger of smoking.

In sum, our analysis shows, if anything, a reduction in the appeal of smoking because of sales bans.[24] This is the opposite of what the forbidden fruit effect suggests. Importantly, we do not find an effect of sales bans on the perceived danger of smoking.

5.2 Circumvention

Circumvention Through Peers — In this subsection, we present our findings on whether teens circumvent the restrictions by getting cigarettes from sources other than stores when a sales ban is in place. For instance, minors may get cigarettes from their friends, siblings, or even from their parents (Hansen, Rees and Sabia, 2013). Figures C.1 and C.2 show the

[24]Consistent with these findings, descriptive evidence from the Health Behaviour in School-aged Children survey suggests that most high-school students who try smoking do it out of curiosity (79%) or because it relaxes them (51%) rather than because they feel cooler doing so (12%). This might also explain why the reduction in the appeal of smoking does not translate into a decline in smoking.

different sources from which teens get cigarettes. Every fourth minor who smokes does not buy the cigarettes herself but gets them from friends, siblings, or parents.[25]

Table 3, column (1) shows the impact of a sales ban on the likelihood of teens purchasing cigarettes for themselves. The dependent variable takes a value of 1 if the smokers purchase the cigarettes themselves, 0.5 if they sometimes do, and 0 if they never do. We find a statistically significant reduction in the likelihood of a teen stating she purchases cigarettes exclusively for herself of 9 percentage points ($se = 4.3$). Teens switch from purchasing cigarettes themselves to getting them through parents or friends.[26]

It seems reasonable that circumventing sales bans by getting cigarettes from sources other than stores is easier for teens with peers who smoke. Accordingly, we also expect a differential effectiveness of sales bans for teens with peers (siblings or friends) who smoke. First, we show the aggregate effect of a sales ban for the sample in this age range in column (2) and for those for whom we have information on peers' smoking behavior in column (3). We then estimate the effect of sales bans separately for teens whose peers do or do not smoke, shown in columns (4) and (5). In line with the argument that teens with peers who smoke can circumvent the bans more easily, we find no statistically significant reduction in smoking prevalence for teens with peers who smoke. However, we do see statistically significant point estimates for teens with peers who do not smoke. Among teens with peers who do not smoke, the introduction of a binding sales ban reduces the likelihood of smoking by more than 6 percentage points. Note, however, that this specification relies on a relatively small subsample.

Differential changes in attitudes toward smoking do not drive the difference in effects across the two groups. If anything, we see a larger reduction in positive attitudes toward smoking among teens whose peers smoke (regressions not shown). The index of positive attitudes with an average of 0.326 among individuals with peers who smoke decreases by 0.039 ($se = 0.018$), whereas it does not statistically significantly change for teens with peers who do not smoke (-0.007, $se = 0.015$, $avg. = 0.254$).

[25]None of the teens answering this question stated that they got the cigarettes on the black market. We have additional data on the sources of the last pack from 2007 to 2011 according to which only 3 of 527 minors said that they bought the cigarettes abroad or on the black market, i.e., in an unofficial store.

[26]Unfortunately, we do not have information on peers' age to assess if they are above the minimum sales age. But it seems plausible that there is variation in the age of peers with some peers being above the minimum sales age.

Table 3: Circumvention Through Peers and Smoking Behavior

	Tobacco and Addiction Monitoring, Ages 14-20				
Dependent Variable	Own Purchase (Smokers)	Smoker			
		Sample			
		All	All with	Peers Are:	Peers Are:
	Yes = 1		Info. on Peers	Smokers	Nonsmokers
Avg. for Minors:	0.756	0.257	0.190	0.371	0.071
	(1)	(2)	(3)	(4)	(5)
Binding Sales Ban	-0.088**	-0.003	-0.014	0.010	-0.069**
	(0.043)	(0.008)	(0.025)	(0.031)	(0.026)
Sales Ban	0.007	-0.009	-0.006	0.014	0.007
	(0.027)	(0.019)	(0.027)	(0.036)	(0.023)
Age FE	X	X	X	X	X
Canton FE	X	X	X	X	X
Year FE	X	X	X	X	X
Canton x Teen FE	X	X	X	X	X
Year x Teen FE	X	X	X	X	X
Ind. Controls	X	X	X	X	X
Cant. Controls	X	X	X	X	X
Observations	2,245	15,735	5,481	2,507	2,974
Canton Clusters	26	26	26	26	26
R-squared	0.08	0.09	0.10	0.08	0.07

Note: Estimated effects of sales bans on purchasing behavior and smoking from linear least squares estimations. Binding Sales Ban indicates that an individual is currently subject to a sales ban. Sales Ban indicates that an individual lives in a canton with a sales ban. Standard errors clustered on the level of cantons are in parentheses. Own Purchase refers to a variable that captures whether smokers bought cigarettes themselves, e.g., in a store, or whether they got them from somewhere else, e.g., through their parents. Own Purchase takes a value of 1 if the smokers purchase the cigarettes themselves, 0.5 if they sometimes do, and 0 if they never do. These data are available only for smokers and the years 2001, 2002, 2004, 2005, 2007–2012, 2014, and 2016 from a subsample of adolescents surveyed in the Tobacco and Addiction Monitoring survey. Columns (2) to (5) only contain data from the Tobacco Monitoring survey for the years 2001–2010. All denotes using all data from these years. All with Info. on Peers refers to the sample where we know whether the individuals have peers who smoke. Peers Are: Smokers is 1 if at least one sibling or at least half of the respondent's friends smoke. Peers Are: Nonsmokers refers to all other observations. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Circumvention Through Traveling — Another possibility to circumvent the sales bans is to travel to cantons without a sales ban. This is possible because of the staggered introduction of the sales bans — some cantons have neighboring cantons that do not have a sales ban in place. Furthermore, teens could also engage in cross-country shopping.

To examine the possibility of cross-canton circumvention, we generate a variable capturing the distance between the municipality the teen lives in and the closest municipality that is in a canton without a binding sales ban in place.[27] We then include an interaction term between the distance to a municipality and sales ban for minors subject to a ban. The corresponding regressions can be found in Table C.4, columns (1) and (2). We find that minors living far from the next municipality where they could buy cigarettes are not differentially affected by the bans.

We then check potential cross-country shopping, shown in column (3). We drop all cantons that had a neighboring country with a lower minimum age at any point, which does not yield larger negative effects of sales bans. In the European context, the traveling explanation seems less likely, since travel distances are much longer.

5.3 Enforcement and Experience

Implementation Lag and Vending Machines — The sales bans might have needed time to become fully effective. To test whether the laws need time to be properly implemented, we include a 1-year lag for the main specification in Table C.4. Column (4) shows that these lags are small and not statistically significant. This means that when we treat the bans as if they were introduced a year later, we still do not see an effect.

One particularity about the lag in the implementation of bans is that 16 cantons granted a grace period to upgrade vending machines with ID readers. The grace period varies from 9 months to 3 years, the median grace period is 1 year. In a further regression, shown in column (5), we include an interaction with whether the grace period for vending machines ended. That is, the indicator variable takes a value of 1 starting on the date when the

[27]To calculate the distance we use municipality centroids based on the inhabited area from the Swiss Federal Statistical Office. We then identify the 10 closest municipalities in another canton. Of those, we calculate the distance to the closest community with a nonbinding minimum sales age for teens subject to a ban in their canton. As we have zip-code-level data available only for 2001 to 2014, we can use data only from this period. We also lose some observations because of an imperfect match between community numbers used by the Swiss Federal Statistical Office and zip codes.

vending machines needed to be equipped with an ID reader. The results show that the lagged updating of vending machines did not attenuate the effect of sales bans.

Test Purchases — We assess the extent to which cigarettes sales violate the sales bans across Switzerland.[28] The median share of sales to minors across cantons and years was 33%, which is a substantial cut compared to full access.

In Figure C.3 we show the share of forbidden sales over time for cantons for which we have data on test purchases. We exploit the information from a total of 53 waves of test purchases from 14 cantons with close to 7,000 tested stores over all years.[29] A wave of test purchases occurs when a canton sends teens below the minimum age to buy cigarettes at different stores. While access was cut drastically after the introduction of the bans, the graph shows only a slightly decreasing trend of sales personnel not adhering to the law.

The heterogeneity underlying this trend is substantial, with some cantons having as little as 25% of sales in stores violating the law, while in other cantons the share is 60%. In Table C.6 columns (1) to (3), we show the results when we take the information on test purchases into account. We do not find differential effects of the sales ban depending on whether the canton conducts test purchases or on whether compliance with the law is high or low.

Heterogeneity in Enforcement Regimes — We further assess whether some enforcement regimes are more successful than others. First, we study the difference in the effect when the introduction of a sales ban goes along with a minimum smoking age. And second, we explore the difference between minimum sales ages of 16 and 18.

To test the impact of the introduction of a minimum smoking age, we exploit the variation in the laws across Europe. In five countries and the nine regions of Austria, a minimum smoking age was introduced alongside the sales ban. We exploit this variation and estimate differential effects of the two types of bans. Column (1) in Table C.5 shows the results. The estimate indicates a negative effect of a binding minimum smoking age of 1.1 percentage points over and above the effect of a binding sales ban. The marginal effect is not statistically

[28] Abouk and Adams (2017) find that an increase in random test purchases reduces smoking incidence if a minimum sales ban is in place. In our case, cantons choose the timing and intensity of test purchases.

[29] We have the information on the number of tested stores for 50 of the 53 test purchase waves. The total number of stores tested in these 50 waves is 6,605 with an average of 132 shops tested in each wave. Smaller cantons tend to test fewer shops.

significant and not statistically significantly different from the coefficient for the binding sales ban.

Next, we study the differences in the effects depending on whether the minimum sales age is 16 or 18. We first focus on Europe, as the variation in the minimum sales ages across countries and time is bigger than in Switzerland. Column (2) in Table C.5 gives the results for separate coefficients for minimum sales ages of 16 and 18. We do not find statistically significant differences in the sales bans' effects depending on the minimum sales age.

Table C.6 shows the results for Switzerland in column (4).[30] In contrast to the results for Europe, we find that cantons that introduced a minimum sales age of 18 were more successful in reducing smoking than cantons with a minimum sales age of 16. Compared to cantons with a minimum sales age of 16, cantons with a minimum age of 18 experience a reduction of 3.1 percentage points ($se = 1.1$). This is consistent with additional results showing that the reduction in cigarettes bought in stores is driven by the sales bans with a minimum age of 18. The different results across the EU and Switzerland imply that a higher minimum age is no guarantee for a reduction in smoking prevalence. Even in the case of Switzerland we do not find sustained reductions of smoking prevalence after having experienced a sales ban with a higher minimum age.

Experience — Last, we look at experience effects to assess whether sales bans have an impact on long-term smoking behavior. It could be that the more short-term effect of a binding ban is close to 0, but that the longer term effect is larger. We examine whether experience with a ban affects current smoking behavior by either adding a dummy variable indicating that an individual was subject to a ban in the past or capturing the number of years an individual was subject to a ban. Table C.7 provides the results for Switzerland. We do not see statistically significant effects of having experienced a ban, even if the minimum age was 18.[31] For the EU, we do not find significant experience effects either, indicated by

[30]We focus on the data from the Tobacco and Addiction Monitoring survey because, as in the sample of the Health Behaviour in School-aged Children data set, only five cantons introduced a law with minimum age of 18. Accordingly, it is statistically difficult to tease apart potential heterogeneous effects depending on the minimum age. Diagnostic tests of the variation inflation factor show that there is not enough variation conditional on fixed effects (as the rule of thumb value of 10 is surpassed).

[31]The results are similar when we allow for only up to 4 years' experience, which gives the most weight to individuals who experienced a ban between 12 and 17 years of age. Note that we have to assume that individuals were living in the same canton in the past in all of these specifications.

the dummy variable capturing whether an individual was subject to a binding sales ban in the past; see Table C.5, column (3).

6 Conclusion

Prohibiting the sale of tobacco to teens below a certain age is one of the most widely implemented policies to reduce smoking. However, the evidence on whether the policy discourages teen smoking is scarce. In addition, little is known about factors which may enhance or reduce the impact of tobacco sales bans, such as the expressive function of the law, circumvention, enforcement, and the potential increase in the appeal of smoking. These aspects lie at the core of the general discussion about arguments for and against prohibition.

We contribute to the literature on prohibition by providing evidence on the impact of sales bans on smoking behavior, attitudes toward smoking, perceived danger, and purchasing behavior. We use newly compiled data sets for member states of the EU and Switzerland and exploit unique variation in the introduction of sales bans.

The prohibition of tobacco sales to people younger than 16 or 18 years does not statistically significantly reduce smoking prevalence among teens in Switzerland or the EU. The aggregate effects of sales bans on teen smoking scatter around 0 when we use alternative specifications, alternative dependent variables, and across robustness checks. The set of results sustain the argument of a statistically and substantially small aggregate effect. The failure to reject the null hypothesis of no aggregate effect of sales bans on smoking is not because of imprecise estimates, but because of the small magnitude of the coefficient estimates.

Two factors could drive the small aggregate effect: a forbidden fruit effect or circumvention of the bans. Our estimates suggest that teens substitute getting cigarettes from stores with getting cigarettes from peers and parents. Consistent with this, we document a reduction in smoking prevalence among those teens who have peers who mostly do not smoke. At the same time, the forbidden fruit effect does not drive the small aggregate effect of sales bans on smoking prevalence. The appeal of smoking, if anything, decreases because of the sales bans while the perceived danger of smoking does not change.

Our results have several implications. First, in comparison to alcohol sales restrictions that seem to reduce teen drinking (see, e.g., Carpenter et al., 2007; Carpenter, Dobkin and Warman, 2016), tobacco sales bans turn out to have little effect, if any. Policy priorities

in tobacco prevention might thus be reconsidered. However, future research should also investigate the possible reasons for the discrepancy. A crucial aspect might be differences in the minimum legal purchase age. Research on alcohol sales restrictions is often about the US with a minimum sales age of 21. With this age restriction, many teens might not have direct access to a peer who can legally buy alcohol. Second, the limited effectiveness is not because of failed enforcement. The observed second-best enforcement is part of any policy in a nonpolice state. In fact, we have to expect that the very limited effect in Switzerland and the EU would also be observed in other regions as smoking rates across Europe and Switzerland are high and law enforcement is comparatively strong. Third, as a complement to previous literature arguing peers affect smoking through social pressure (Powell, Tauras and Ross, 2005; Clark and Etilé, 2006; Lucks, Lührmann and Winter, 2017), our results indicate that peers play a crucial role in teens' access to addictive goods (see also Hansen, Rees and Sabia, 2013). Fourth, given the limited effectiveness of bans and taxes, considering and testing behavioral interventions such as pictorial warnings on cigarette packs (Noar et al., 2016) may be fruitful.

References

Abouk, Rahi, and Scott Adams. 2017. "Compliance Inspections of Tobacco Retailers and Youth Smoking." *American Journal of Health Economics*, 3(1): 10–32.

Adda, Jérôme, and Francesca Cornaglia. 2006. "Taxes, Cigarette Consumption, and Smoking Intensity." *American Economic Review*, 96(4): 1013–1028.

Adda, Jérôme, and Francesca Cornaglia. 2010. "The Effect of Bans and Taxes on Passive Smoking." *American Economic Journal: Applied Economics*, 2(1): 1–32.

Ahmad, Sajjad, and John Billimek. 2007. "Limiting Youth Access to Tobacco: Comparing the Long-Term Health Impacts of Increasing Cigarette Excise Taxes and Raising the Legal Smoking Age to 21 in the United States." *Health Policy*, 80(3): 378–391.

Anderson, D. Mark, Benjamin Hansen, and Daniel I. Rees. 2015. "Medical Marijuana Laws and Teen Marijuana Use." *American Law and Economics Review*, 17(2): 495–528.

Bénabou, Roland, and Jean Tirole. 2011. "Laws and Norms." NBER Working Paper No. 17579, Cambridge.

Benowitz, Neal L., John T. Bernert, Ralph S. Caraballo, David B. Holiday, and Jiantong Wang. 2009. "Optimal Serum Cotinine Levels for Distinguishing Cigarette Smokers and Nonsmokers Within Different Racial/Ethnic Groups in the United States Between 1999 and 2004." *American Journal of Epidemiology*, 169(2): 236–248.

Bharadwaj, Prashant, Julian V. Johnsen, and Katrine V. Løken. 2014. "Smoking Bans, Maternal Smoking and Birth Outcomes." *Journal of Public Economics*, 115: 72–93.

Bloomberg Editorial Board. 2015. "Raise the Smoking Age to 21." Bloomberg View. Available from: https://www.bloomberg.com/view/articles/2015-11-30/raise-the-smoking-age-to-21.

Boes, Stefan, Joachim Marti, and Johanna C. Maclean. 2015. "The Impact of Smoking Bans on Smoking and Consumer Behavior: Quasi-Experimental Evidence from Switzerland." *Health Economics*, 24(11): 1502–1516.

Cameron, A. Colin, Jonah B. Gelbach, and Douglas L. Miller. 2008. "Bootstrap-Based Improvements for Inference with Clustered Errors." *Review of Economics and Statistics*, 90(3): 414–427.

Caraballo, Ralph, Gary Giovino, and Terry Pechacek. 2004. "Self-Reported Cigarette Smoking vs. Serum Cotinine Among U.S. Adolescents." *Nicotine & Tobacco Research*, 6(1): 19–25.

Carpenter, Christopher, and Carlos Dobkin. 2009. "The Effect of Alcohol Consumption on Mortality: Regression Discontinuity Evidence from the Minimum Drinking Age." *American Economic Journal: Applied Economics*, 1(1): 164–182.

Carpenter, Christopher, and Carlos Dobkin. 2015. "The Minimum Legal Drinking Age and Crime." *Review of Economics and Statistics*, 97(2): 521–524.

Carpenter, Christopher, Carlos Dobkin, and Casey Warman. 2016. "The Mechanisms of Alcohol Control." *Journal of Human Resources*, 51(2): 328–356.

Carpenter, Christopher, Deborah D. Kloska, Patrick O'Malley, and Lloyd Johnston. 2007. "Alcohol Control Policies and Youth Alcohol Consumption: Evidence from 28 Years of Monitoring the Future." *B.E. Journal of Economic Analysis & Policy*, 7(1): 1–21.

Cawley, John, Sara Markowitz, and John Tauras. 2006. "Obesity, Cigarette Prices, Youth Access Laws and Adolescent Smoking Initiation." *Eastern Economic Journal*, 32(1): 149–170.

Chaloupka, Frank J., and Henry Wechsler. 1997. "Price, Tobacco Control Policies and Smoking Among Young Adults." *Journal of Health Economics*, 16(3): 359–373.

Charrier, Lorena, Paola Berchialla, Daniela Galeone, Lorenzo Spizzichino, Alberto Borraccino, Patrizia Lemma, Paola Dalmasso, and Franco Cavallo. 2014. "Smoking Habits Among Italian Adolescents: What Has Changed in the Last Decade?" *BioMed Research International*, 2014: 287139.

Clark, Andrew E., and Fabrice Etilé. 2006. "Don't Give Up on Me Baby: Spousal Correlation in Smoking Behaviour." *Journal of Health Economics*, 25(5): 958–978.

Commission of the European Communities. 2012. "Eurobarometer." Cologne: GESIS Data Archive.

Cotti, Chad, Erik Nesson, and Nathan Tefft. 2016. "The Effects of Tobacco Control Policies on Tobacco Products, Tar, and Nicotine Purchases Among Adults: Evidence from Household Panel Data." *American Economic Journal: Economic Policy*, 8(4): 103–123.

Crost, Benjamin, and Santiago Guerrero. 2012. "The Effect of Alcohol Availability on Marijuana Use: Evidence from the Minimum Legal Drinking Age." *Journal of Health Economics*, 31(1): 112–121.

DeCicca, Philip, Donald Kenkel, and Alan Mathios. 2002. "Putting Out the Fires: Will Higher Taxes Reduce the Onset of Youth Smoking?" *Journal of Political Economy*, 110(1): 144–169.

DeCicca, Philip, Donald Kenkel, and Alan Mathios. 2008. "Cigarette Taxes and the Transition from Youth to Adult Smoking: Smoking Initiation, Cessation, and Participation." *Journal of Health Economics*, 27(4): 904–917.

DiFranza, Joseph R. 2012. "Which Interventions Against the Sale of Tobacco to Minors Can Be Expected to Reduce Smoking?" *Tobacco Control*, 21(4): 436–442.

Dolcini, M. Margaret, Nancy E. Adler, Patricia Lee, and Karl E. Bauman. 2003. "An Assessment of the Validity of Adolescent Self-Reported Smoking Using Three Biological Indicators." *Nicotine & Tobacco Research*, 5(4): 473–83.

García-Jimeno, Camilo. 2016. "The Political Economy of Moral Conflict: An Empirical Study of Learning and Law Enforcement Under Prohibition." *Econometrica*, 84(2): 511–570.

Gruber, Jonathan, and Jonathan Zinman. 2000. "Youth Smoking in the U.S.: Evidence and Implications." NBER Working Paper No. 7780, Cambridge.

Grucza, Richard A., Andrew D. Plunk, Pamela R. Hipp, Patricia Cavazos-Rehg, Melissa J. Krauss, Ross C. Brownson, and Laura J. Bierut. 2013. "Long-Term Effects of Laws Governing Youth Access to Tobacco." *American Journal of Public Health*, 103(8): 1493–1499.

Hagquist, Curt, Mona Sundh, and Charli Eriksson. 2007. "Smoking Habits Before and After the Introduction of a Minimum-Age Law for Tobacco Purchase: Analysis of Data on Adolescents from Three Regions of Sweden." *Scandinavian Journal of Public Health*, 35(4): 373–379.

Hansen, Benjamin, Daniel I. Rees, and Joseph J. Sabia. 2013. "Cigarette Taxes and How Youths Obtain Cigarettes." *National Tax Journal*, 66(2): 371–394.

Hansen, Benjamin, Joseph J. Sabia, and Daniel I. Rees. 2017. "Have Cigarette Taxes Lost Their Bite? New Estimates of the Relationship between Cigarette Taxes and Youth Smoking." *American Journal of Health Economics*, 3(1): 60–75.

Hawkins, Summer S., Nicoline Bach, and Christopher F. Baum. 2016. "Impact of Tobacco Control Policies on Adolescent Smoking." *Journal of Adolescent Health*, 58(6): 679–685.

Helakorpi, Satu A., Tuija P. Martelin, Jorma O. Torppa, Kristiina M. Patja, Urpo A. Kiiskinen, Erkki A. Vartiainen, and Antti K. Uutela. 2008. "Did the Tobacco Control Act Amendment in 1995 Affect Daily Smoking in Finland? Effects of a Restrictive Workplace Smoking Policy." *Journal of Public Health*, 30(4): 407–414.

Hornung, Rainer, Roger Keller, and Theda Radtke. 2010. "Tobacco Monitoring Switzerland." Zurich: University of Zurich.

Institute of Medicine, Board on Population Health and Public Health Practice, Committee on the Public Health Implications of Raising the Minimum Age for Purchasing Tobacco Products, Richard J. Bonnie, Kathleen Stratton, and Leslie Y. Kwan. 2015. *Public Health Implications of Raising the Minimum Age of Legal Access to Tobacco Products.* Washington:National Academies Press.

Jacobi, Liana, and Michelle Sovinsky. 2016. "Marijuana on Main Street? Estimating Demand in Markets with Limited Access." *American Economic Review*, 106(8): 2009–2045.

Jha, Prabhat, and Richard Peto. 2014. "Global Effects of Smoking, of Quitting, and of Taxing Tobacco." *New England Journal of Medicine*, 370(1): 60–68.

Kuipers, Mirte A. G., Stephanie D. Brandhof, Karin Monshouwer, Karien Stronks, and Anton E. Kunst. 2017. "Impact of Laws Restricting the Sale of Tobacco to Minors on Adolescent Smoking and Perceived Obtainability of Cigarettes: An Intervention-control Pre-post Study of 19 European Union Countries." *Addiction*, 112(2): 320–329.

Landman, Anne, Pamela M. Ling, and Stanton A. Glantz. 2002. "Tobacco Industry Youth Smoking Prevention Programs: Protecting the Industry and Hurting Tobacco Control." *American Journal of Public Health*, 92(6): 917–930.

Lillard, Dean R., Eamon Molloy, and Andrew Sfekas. 2013. "Smoking Initiation and the Iron Law of Demand." *Journal of Health Economics*, 32(1): 114–127.

Lucks, Konstantin, Melanie Lührmann, and Joachim K. Winter. 2017. "Peer Effects in Risky Choices Among Adolescents." IFS Working Papers W17/16, London.

MacCoun, Robert J. 1993. "Drugs and the Law: A Psychological Analysis of Drug Prohibition." *Psychological Bulletin*, 113(3): 497–512.

Macinko, James, and Diana Silver. 2018. "Impact of New York City's 2014 Increased Minimum Legal Purchase Age on Youth Tobacco Use." *American Journal of Public Health*, 108(5): 669–675.

Marie, Olivier, and Ulf Zölitz. 2017. "High' Achievers? Cannabis Access and Academic Performance." *Review of Economic Studies*, 84(3): 1210–1237.

Mazzonna, Fabrizio, and Paola Salari. 2018. "Can a Smoking Ban Save Your Heart?" *Health Economics*, in press.

Millett, Christopher, John T. Lee, Daniel C. Gibbons, and Stanton A. Glantz. 2011. "Increasing the Age for the Legal Purchase of Tobacco in England: Impacts on Socio-Economic Disparities in Youth Smoking." *Thorax*, 66(10): 862–865.

Miron, Jeffrey A., and Jeffrey Zwiebel. 1995. "The Economic Case Against Drug Prohibition." *Journal of Economic Perspectives*, 9(4): 175–192.

Morain, Stephanie R., Arthur Garson, and Jean L. Raphael. 2018. "State-Level Support for Tobacco 21 Laws: Results of a Five-State Survey." *Nicotine & Tobacco Research*, 20(11): 1407–1411.

Nesson, Erik. 2017. "The Impact of Tobacco Control Policies on Adolescent Smoking: Comparing Self-Reports and Biomarkers." *American Journal of Health Economics*, 3(4): 507–527.

New York Times Editorial Board. 2016. "Raise the Legal Age for Cigarette Sales to 21." The New York Times Sunday Review Editorial. Available from: https://www.nytimes.com/2016/03/06/opinion/sunday/raise-the-legal-age-for-cigarette-sales-to-21.html.

Noar, Seth M., Marissa G. Hall, Diane B. Francis, Kurt M. Ribisl, Jessica K. Pepper, and Noel T. Brewer. 2016. "Pictorial Cigarette Pack Warnings: A Meta-Analysis of Experimental Studies." *Tobacco Control*, 25(3): 341–354.

Odermatt, Reto, and Alois Stutzer. 2015. "Smoking Bans, Cigarette Prices and Life Satisfaction." *Journal of Health Economics*, 44: 176–194.

Odermatt, Reto, and Alois Stutzer. 2018. "Tobacco Control Policies and Smoking Behavior in Europe: More than Trends?" WWZ Working Paper 2018/24, Basel.

Patrick, Donald L., Allen Cheadle, Diane C. Thompson, Paula Diehr, Thomas Koepsell, and Susan Kinne. 1994. "The Validity of Self-Reported Smoking: A Review and Meta-Analysis." *American Journal of Public Health*, 84(7): 1086–1093.

Pfeifer, Gregor, Mirjam Reutter, and Kristina Strohmaier. 2019. "Goodbye Smokers' Corner: Health Effects of School Smoking Bans." *Journal of Human Resources*, forthcoming.

Powell, Lisa M., John A. Tauras, and Hana Ross. 2005. "The Importance of Peer Effects, Cigarette Prices and Tobacco Control Policies for Youth Smoking Behavior." *Journal of Health Economics*, 24(5): 950–968.

Rees-Jones, Alex, and Kyle Rozema. 2018. "Price Isn't Everything: Behavioral Response around Changes in Sin Taxes." Mimeo, University of Chicago.

Rigotti, Nancy A., Joseph R. DiFranza, YuChiao Chang, Thelma Tisdale, Becky Kemp, and Daniele E. Singer. 1997. "The Effect of Enforcing Tobacco-Sales Laws on Adolescents' Access to Tobacco and Smoking Behavior." *New England Journal of Medicine*, 337(15): 1044–1051.

Rimpelä, Arja H., and Susanna U. Rainio. 2004. "The Effectiveness of Tobacco Sales Ban to Minors: The Case of Finland." *Tobacco Control*, 13(2): 167–174.

Schneider, Shari K., Stephen L. Buka, Kim Dash, Jonathan P. Winickoff, and Lydia O'Donnell. 2016. "Community Reductions in Youth Smking After Raising the Minimum Tobacco Sales Age to 21." *Tobacco Control*, 25(3): 355–359.

Studlar, Donley T., Kyle Christensen, and Arnita Sitasari. 2011. "Tobacco Control in the EU-15: The Role of Member States and the European Union." *Journal of European Public Policy*, 18(5): 728–745.

Sucht Schweiz. 2017. "Addiction Monitoring in Switzerland." Lausanne: Sucht Schweiz.

Sucht Schweiz and Swiss Cantons. 2014. "Health Behaviour in School-aged Children." Lausanne: Sucht Schweiz.

Sunstein, Cass. 1996. "On the Expressive Function of Law." *University of Pennsylvania Law Review*, 144(5): 2021–2053.

U.S. Department of Health and Human Services. 2014. *The Health Consequences of Smoking: 50 Years of Progress. A Report of the Surgeon General.* Atlanta:U.S. Department of Health and Human Services and Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

van Ours, Jan C. 2006. "Dynamics in the Use of Drugs." *Health Economics*, 15(12): 1283–1294.

van Ours, Jan C., and Ali Palali. 2017. "The Impact of Tobacco Control Policies on Smoking Initiation in Europe." Tinbergen Institute DP 17074/V, Amsterdam.

Williams, Jenny, and Anne L. Bretteville-Jensen. 2014. "Does Liberalizing Cannabis Laws Increase Cannabis Use?" *Journal of Health Economics*, 36: 20–32.

World Health Organization. 2003. "WHO Framework Convention on Tobacco Control." Available from: http://apps.who.int/iris/bitstream/handle/10665/42811/9241591013.pdf.

World Health Organization. 2016. "Tobacco Fact Sheet." Available from: http://www.who.int/news-room/fact-sheets/detail/tobacco.

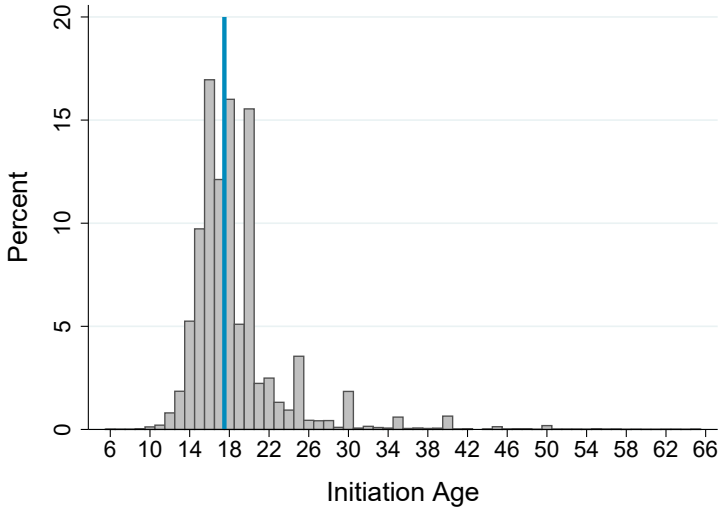
Yörük, Ceren E., and Bar K. Yörük. 2016. "Do Minimum Legal Tobacco Purchase Age Laws Work?" *Contemporary Economic Policy*, 34(3): 415–429.

Appendix (For Online Publication)

A Institutions, Data, and Empirical Strategy

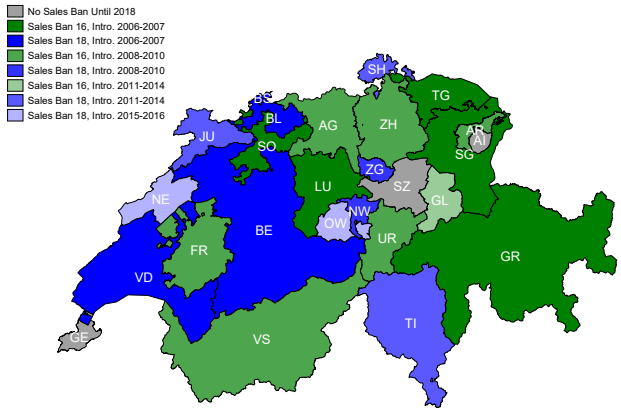
A.1 Figures

Figure A.1: Smoking Initiation Ages in Switzerland



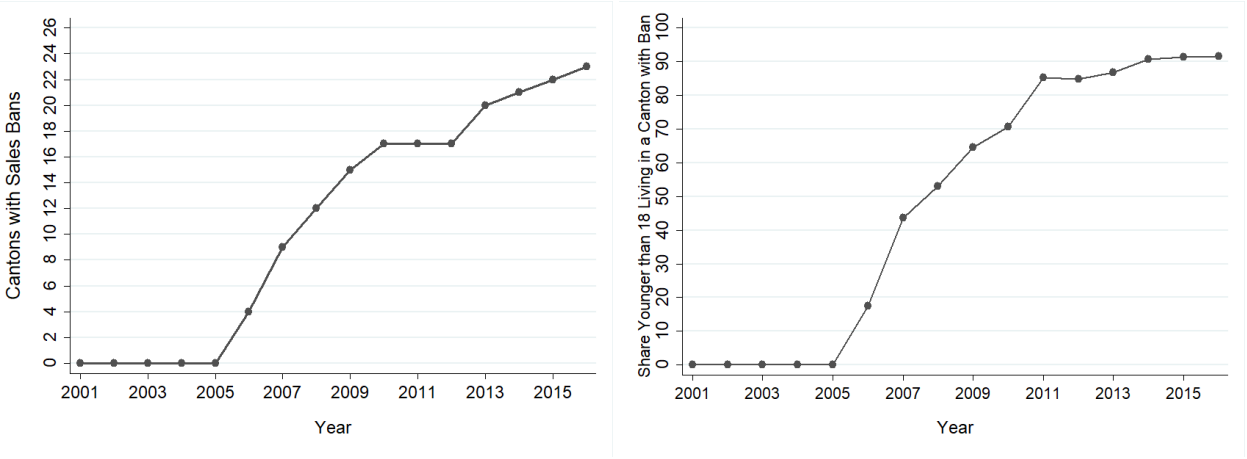
Note: The histogram shows the initiation ages of people who currently smoke. The blue solid line indicates the age threshold 18, which is the one proposed for minimum sales age laws by the WHO. The median age of starting to smoke regularly is 18 in the depicted distribution of initiation ages from 6 to 66. The figure is based on 22,569 retrospective assessments of smokers aged 15 to 98.
Data source: Addiction Monitoring, 2011–2016.

Figure A.2: Introduction of Sales Bans Across Switzerland



Note: The figure shows the staggered introduction of sales bans across cantons (minimum age of 16, green on the map, or 18, blue on the map). Gray cantons had not introduced a sales ban by June 2018. The letters are the abbreviations for the respective cantons.
Data source: Swiss Federal Office for Public Health.

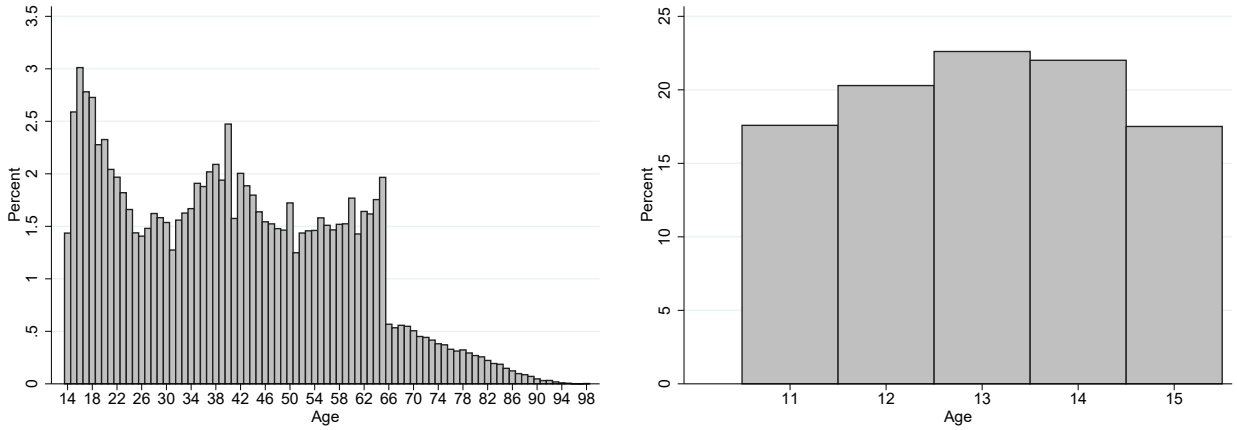
Figure A.3: Staggered Introduction of Sales Bans



(a) Cantons with Bans by Year **(b) Share of Minors in Cantons with Bans**

Note: The graphs show the gradual introduction of the sales bans across Swiss cantons from 2006 onwards. Panel (a) depicts the absolute number of cantons that have introduced a ban up to and including the given year on the x-axis. Panel (b) indicates the share of minors surveyed in the Tobacco and Addiction Monitoring that lives in a canton with a ban.
Data source: Tobacco and Addiction Monitoring, 2001–2016.

Figure A.4: Age Histograms of the Swiss Samples

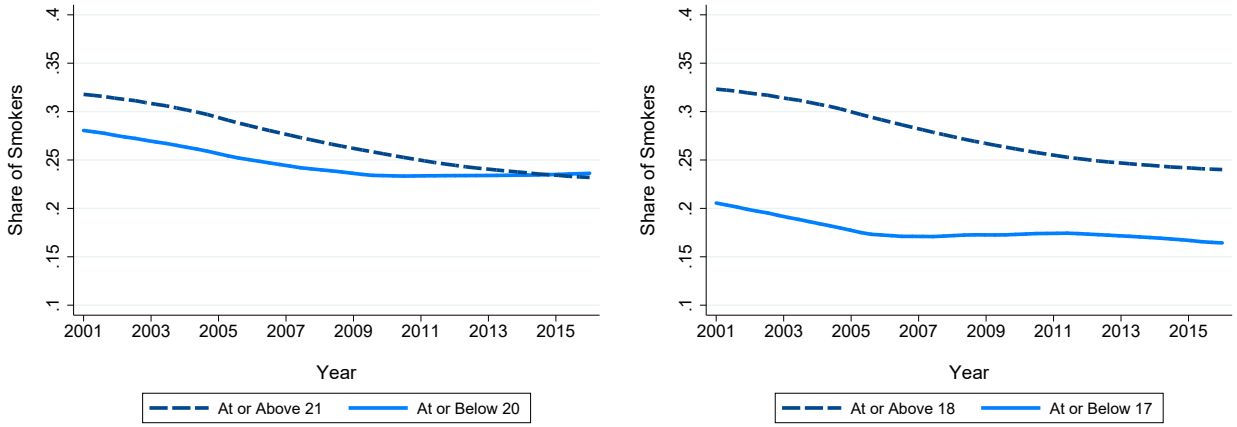


(a) Tobacco and Addiction Monitoring

(b) Health Behaviour in School-aged Children

Note: The graphs show the distribution of exact ages in the Tobacco and Addiction Monitoring in panel (a) and the Health Behaviour in School-aged Children in panel (b).

Figure A.5: Smoking Trends in Switzerland by Age Groups



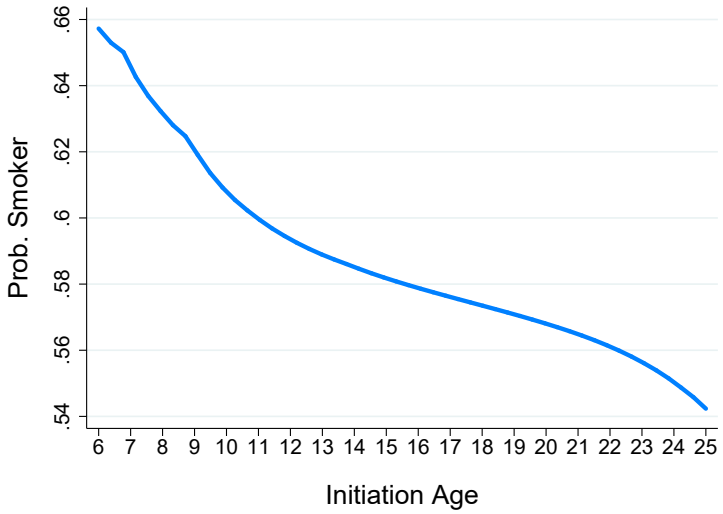
(a) Smoking Among Teens and Ages 21 and Older

(b) Share of Smokers Among Minors and Adults

Note: Panel (a) shows the trends in the share of current smokers among teens age 14 to 20 years, solid blue line, and the share of smokers among adults strictly older than 20, dashed blue line. Panel (b) shows the trends in the share of current smokers among teens age 14 to 18 years, solid blue line, and the share of smokers among adults older than 18, dashed blue line. The lines show the respective estimates from a local linear regression with bandwidth 2.

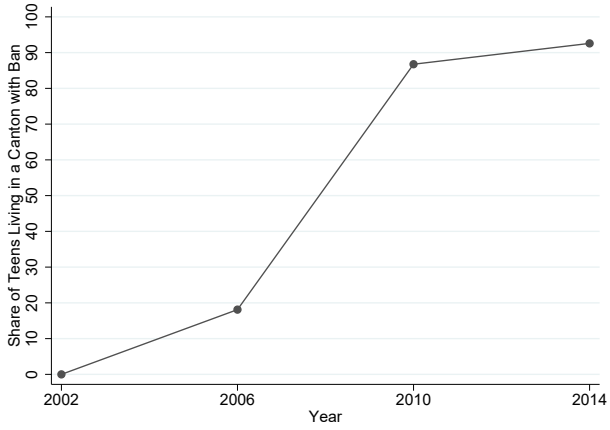
Data source: Tobacco and Addiction Monitoring, 2001–2016.

Figure A.6: Smoking Initiation Ages and Current Smoking in Switzerland

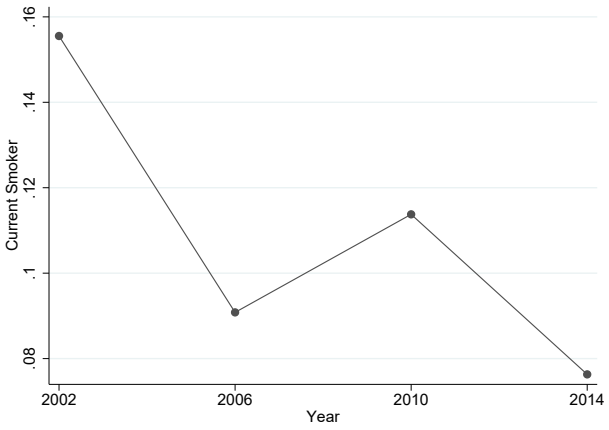


Note: The figure shows the probability of being a regular smoker today conditional on the initiation age. The blue line gives the estimates from local polynomial regressions with bandwidth 5. The figure is based on 21,276 observations. Note that the sample answering this question over-represents smokers when compared to the general survey population.
Data source: Addiction Monitoring, 2011–2016.

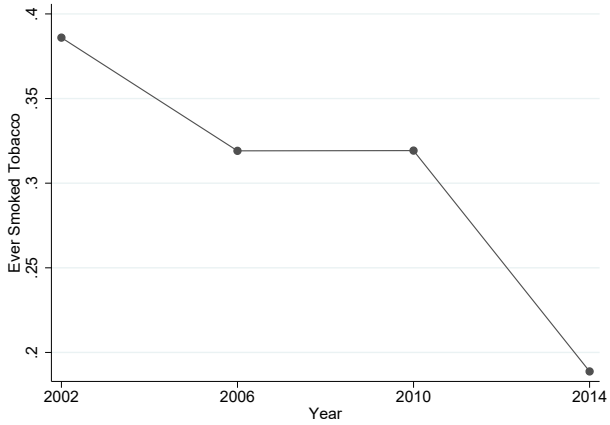
Figure A.7: Ban Coverage and Smoking Trends Among Teens Age 11–15 in Switzerland



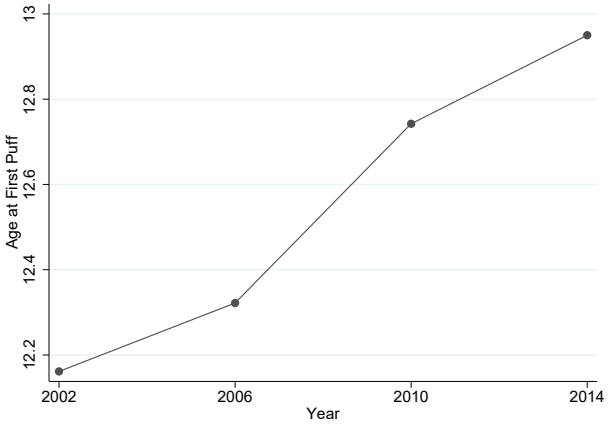
(a) Share Under a Ban



(b) Share of Smokers



(c) Share Who Tried Smoking



(d) Average Age at First Puff

Note: The graphs show trends in coverage of the bans, panel (a) and smoking behavior among teens age 11–15, panels (b) through (d). Current Smokers refers to the share of individuals currently smoking. Ever Tried Tobacco captures individuals who at some point tried tobacco. Age at First Puff gives the average from responses about when individuals first tried a cigarette.
Data source: Health Behaviour in School-aged Children, 2002–2014.

A.2 Tables

Table A.1: Introduction of Sales Bans Across Switzerland

Canton	Abbreviation	Introduction Date	Minimum Age
Waadt	VD	01.01.2006	18
Luzern	LU	01.01.2006	16
Graubünden	GR	01.07.2006	16
St. Gallen	SG	01.10.2006	16
Solothurn	SO	01.01.2007	16
Basel-Land	BL	01.01.2007	18
Thurgau	TG	01.01.2007	16
Bern	BE	01.01.2007	18
Basel-Stadt	BS	01.08.2007	18
Apenzell-Ausserrhoden	AR	01.01.2008	16
Wallis	VS	01.01.2008	16
Zürich	ZH	01.07.2008	16
Fribourg	FR	01.01.2009	16
Nidwalden	NW	01.03.2009	18
Uri	UR	01.09.2009	16
Aargau	AG	01.01.2010	16
Zug	ZG	01.03.2010	18
Jura	JU	01.01.2013	18
Schaffhausen	SH	01.01.2013	18
Tessin	TI	01.09.2013	18
Glarus	GL	01.01.2014	16
Neuenburg	NE	01.01.2015	18
Obwalden	OW	01.02.2016	18
Schwyz	SZ	–	–
Genf	GE	–	–
Apenzell-Innerrhoden	AI	–	–

Note: This table shows the introduction dates across cantons in the order of introduction. SZ, GE, and AI had not introduced a sales ban by June 2018. The introduction dates are available from the Swiss Federal Office of Public Health.

Table A.2: Introduction of Sales Bans Across the EU

Country	Sales Ban 16 (Min. Smoking Age 16)	Sales Ban 18 (Min. Smoking Age 18)
Belgium	01.12.2004 (0)	
Cyprus (Republic of)		01.01.1980 (0)
Denmark	01.07.2004 (0)	01.09.2008 (0)
Estonia		01.01.1988 (1)
Finland	01.03.1977 (0)	01.03.1995 (0)
France	03.08.2003 (0)	23.07.2009 (0)
Germany	01.04.2003 (1)	01.09.2007 (1)
Ireland	12.07.1988 (0)	27.03.2002 (0)
Italy	24.12.1934 (1)	01.01.2013 (1)
Latvia		21.01.1997 (0)
Lithuania		07.02.1996 (0)
Luxembourg	05.09.2006 (0)	
Malta	12.12.1986 (0)	12.09.2003 (0)
Netherlands	01.01.2003 (0)	01.01.2014 (0)
Portugal	04.04.2005 (0)	01.01.2008 (0)
Slovakia		26.05.2004 (0)
Slovenia		19.10.1996 (0)
Spain		01.01.2006 (0)
Sweden		01.01.1997 (0)
Regions of Austria:		
Burgenland	06.06.2002 (1)	
Kärnten	03.01.1998 (1)	
Niederösterreich	01.10.2007 (1)	
Salzburg	01.10.2006 (1)	
Steiermark	01.10.2013 (1)	
Tirol	01.01.1988 (1)	
Oberösterreich	01.10.2001 (1)	
Wien	22.02.2007 (1)	
Vorarlberg	09.04.1999 (1)	
Regions of UK:		
England	1933 (0)	01.10.2007 (0)
Northern Ireland	21.01.1979 (0)	01.09.2008 (0)
Scotland	1937 (0)	01.10.2007 (0)
Wales		01.10.2007 (0)

Note: In the table (0) indicates that only a sales ban was introduced while (1) indicates the introduction of a sales ban and a minimum smoking age (Min. Smoking Age) for the respective age group. The sources of the introduction dates are given in Table A.3.

Table A.3: Sources for the Introduction Dates of Sales Bans Across the EU

Country	Source
Belgium	Communication with the Federal Public Service (FPS) Health, Food Chain Safety and Environment
Cyprus (Repulic of)	Communication with the Ministry of Health, Medical and Pubic Health Services
Denmark	LOV nr 213 af 31/03/2004 (Art. 1 (1)) and LOV nr 536 af 17/06/2008 (Art. 2 (2))
Estonia	Communication with the Ministry of Social Affairs
Finland	Tobacco Act No. 693/1976 and Helakorpi et al. (2008)
France	Code de la sant publique - Article L3511-2-1. Loi n2003-715 (Art. 3) and Loi n2009-879 (Art. 98 (V))
Germany	Jugendschutzgesetz – BGBl. I S. 2730 and Gesetz zum Schutz vor den Gefahren des Passivrauchens (Art. 3)
Ireland	Tobacco (Health Promotion and Protection) Act, 1988 (Art. 3(1)) and Public Health (Tobacco) Act, 2002 (Art. 45(1))
Italy	Regio Decreto 24 dicembre 1934, n. 2316 (Art. 25) and Legislative Decree 158/2012 (Art. 7(1)), converted into Law 189/2012, see Charrier et al. (2014)
Latvia	Communication with the Ministry of Health, Public Health Department
Lithuania	Lietuvos Respublikos tabako kontrols statymas 1995 m. gruodio 20 d. Nr. I-1143
Luxembourg	Law on Tobacco Control, 2006
Malta	Act XLII of 1986 and Act IX of 2003
Netherlands	Communication with the Ministry of Health, Welfare and Sports
Portugal	Lei n. 76/2005 and Lei n. 37/2007
Slovakia	Act of 26 May 2004 (Art. 1, Paragraph 6(2))
Slovenia	Restriction of the Use of Tobacco Products Act 1996 (Art. 14)
Spain	Law 28/2005
Sweden	The Tobacco Act (1993:581)
Regions of Austria:	
Burgenland	Gesetz zum Schutze der Jugend, Bgld. JSG 2002 (Art. 5-7)
Kärnten	Gesetz ber den Schutz der Jugend, K-JSG
Niederösterreich	Änderung des NÖ Jugendgesetzes, LGBl. 4600-9 (Art. 18(1-2))
Oberösterreich	Oö. Jugendschutzgesetz 2001
Salzburg	Salzburger Jugendgesetz, LGBl Nr. 98/2006
Steiermark	Gesetz über den Schutz und die Förderung von Kindern und Jugendlichen, StJG 2013 (Art. 18(1))
Tirol	Communication with the Department of Society and Labor (Amt der Tiroler Landesregierung)
Wien	Wiener Jugendschutzgesetz 2002 (Art. 11(2))
Vorarlberg	Gesetz über die Förderung und den Schutz der Jugend (Art. 17(1))
Regions of UK:	
Wales	Children and Young Persons Act, 1933 (Art. 7(1)) and The Children and Young Persons (sale of Tobacco etc.) Order 2007 (Art. 2(a))
Scotland	Children and Young Persons (Scotland) Act, 1937 and Smoking, Health and Social Care (Scotland) Act, 2005
England	Children and Young Persons Act, 1933 (Art. 7(1)) and The Children and Young Persons Order 2007 (Art. 2(a))
Northern Ireland	The Health and Personal Social Services (Northern Ireland) Order 1978 (Art. 3(1)) and The Children and Young Persons Regulations (Northern Ireland) 2008 (Regulation 2(b))

Table A.4: Descriptive Statistics of the Data for Switzerland

	Tobacco and Addiction Monitoring†									
	All Ages					Minors				
Variable	Mean	SD	Min.	Max.	N	Mean	SD	Min.	Max.	N
Dependent Variables										
Smoker	0.27	0.44	0	1	167,376	0.18	0.38	0	1	16,433
No. of Packs (Smokers)	0.64	0.47	0	10	35,120	0.44	0.35	0	4	1,684
No. of Packs	0.13	0.34	0	10	167,376	0.04	0.17	0	4	16,433
Main Independent Variables										
Sales Ban	0.51	0.50	0	1	167,376	0.51	0.50	0	1	16,433
Binding Sales Ban	0.03	0.17	0	1	167,376	0.31	0.46	0	1	16,433
Individual Level Covariates										
Age	40.77	17.83	14	98	167,376	15.73	1.03	14	17	16,433
Male	0.42	0.49	0	1	167,376	0.51	0.50	0	1	16,433
No. of Persons in Househ.	2.87	1.39	1	13	167,376	4.14	1.07	1	11	16,433
Foreigner	0.32	0.47	0	1	167,376	0.29	0.45	0	1	16,433
Cantonal Level Covariates										
Youth Unemployment Rate	3.73	1.99	0	9	167,376	3.69	1.94	0	9	16,433
Unemployment Rate	2.84	1.35	0	7	167,376	2.82	1.34	0	7	16,433
No. of Physicians per 10,000	171.42	64.96	86	425	167,376	172.80	67.29	86	425	16,433
Indoor Air Law	0.49	0.50	0	1	167,376	0.50	0.50	0	1	16,433
Advertisement Ban	0.46	0.50	0	1	167,376	0.46	0.50	0	1	16,433

	Health Behaviour in School-aged Children				
Variable	Mean	SD	Min.	Max.	N
Dependent Variables					
Current Smoker	0.10	0.30	0	1	56,335
Age of First Puff	12.50	1.22	11	15	13,177
Ever Smoked Tobacco	0.29	0.45	0	1	56,207
Smoke Frequency	1.94	0.86	1	3	5,832
Cigarettes per Day	0.32	1.63	0	20	35,242
Main Independent Variables					
Binding Sales Ban	0.58	0.49	0	1	56,893
Age in Years	13.02	1.35	11	15	56,893
Gender	1.50	0.50	1	2	56,893
Cantonal Level Covariates					
Youth Unemployment Rate	3.90	1.46	2	8	56,893
Unemployment Rate	3.10	1.06	1	7	56,893
No. of Physicians per 10,000	192.82	50.92	131	371	56,893

Note: Smoker refers to individuals who currently smoke at least sometimes. No. of Packs is derived from the number of cigarettes smoked per day. †Roughly 980 smokers say they smoke 0 cigarettes on average per day. Although this is mathematically not possible, it may be that they smoke a cigarette per week and therefore consider this to be too little to merit mentioning one cigarette per day. We therefore keep those observations in our data. Smoke Frequency is available only for smokers and takes the values 1 "less than once a week", 2 "at least once a week", and 3 "daily". No. of Cigarettes in the Health Behaviour in School-aged Children data is available for smokers and non-smokers for the years 2006, 2010, and 2014. It takes the values 0, 1 (which means less than or equal to 1), 5 (<=5), 11 (<=11), 19 (<= 19), or 20 (>=20) per day.

Table A.5: Health Behaviour in School-aged Children Data for Switzerland — Availability by Canton

Canton	2002	2006	2010	2014	Introduction Date
AG	X	X	X	X	1/1/2010
BE	X	X	X	X	1/1/2007
BL		X	X		1/1/2007
FR	X	X	X	X	1/1/2009
GE	X		X	X	–
GR	X		X	X	7/1/2006
JU	X	X			1/1/2013
LU		X	X	X	1/1/2006
SG		X	X	X	10/1/2006
TG			X	X	1/1/2007
TI	X	X	X	X	9/1/2013
VD			X	X	1/1/2006
VS	X	X	X	X	1/1/2008
ZG		X	X	X	3/1/2010
ZH	X	X	X	X	7/1/2008

Note: This table shows the availability of the Health Behaviour in School-aged Children Data by canton and survey year as well as the cantonal introduction dates of sales bans.

Table A.6: Descriptive Statistics of the Data for the European Union

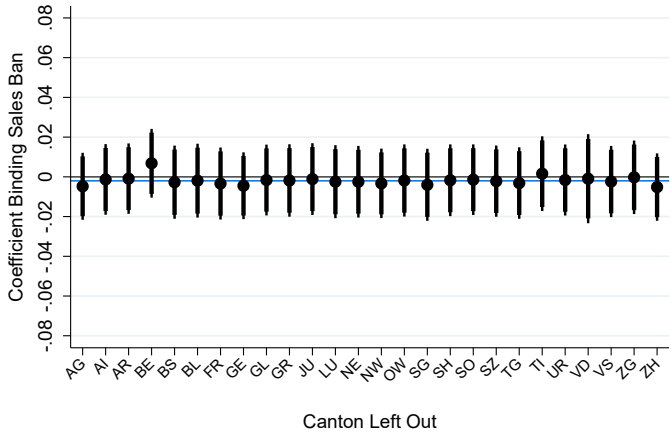
	All Ages					Aged 17 or Below				
Variable	Mean	SD	Min.	Max.	N	Mean	SD	Min.	Max.	N
Dependent Variables										
Smoker	0.31	0.46	0	1	138,311	0.22	0.41	0	1	5,397
No. of Packs (Smokers)	0.80	0.46	0	2	38,853	0.55	0.37	0	2	1,067
Main Independent Variables										
Binding Sales Ban	0.02	0.12	0	1	138,311	0.41	0.49	0	1	5,397
Sales Ban	0.67	0.47	0	1	138,311	0.66	0.47	0	1	5,397
Individual Level Covariates										
Age	46.15	18.35	15	98	138,311	16.10	0.81	15	17	5,397
Female	0.54	0.50	0	1	138,311	0.49	0.50	0	1	5,397
Education up to Age 16–19	0.39	0.49	0	1	138,311	0.06	0.24	0	1	5,397
Education up to Age 20 or More	0.26	0.44	0	1	138,311	0.01	0.07	0	1	5,397
Education, Still Studying	0.09	0.29	0	1	138,311	0.89	0.31	0	1	5,397
Single with Partner	0.12	0.33	0	1	138,311	0.04	0.20	0	1	5,397
Single	0.18	0.39	0	1	138,311	0.75	0.44	0	1	5,397
Divorced	0.06	0.24	0	1	138,311	0.00	0.05	0	1	5,397
Widowed	0.07	0.26	0	1	138,311	0.00	0.01	0	1	5,397
Other Marital Status	0.01	0.11	0	1	138,311	0.04	0.21	0	1	5,397
1 Child in HH Under Age 15	0.13	0.34	0	1	138,311	0.28	0.45	0	1	5,397
2 Child. in HH Under Age 15	0.10	0.30	0	1	138,311	0.10	0.30	0	1	5,397
3 Child. in HH Under Age 15	0.03	0.17	0	1	138,311	0.03	0.16	0	1	5,397
4+ Child. in HH Under Age 15	0.06	0.24	0	1	138,311	0.07	0.25	0	1	5,397
No Info. About Children in HH	0.11	0.31	0	1	138,311	0.10	0.30	0	1	5,397
Unemployed	0.06	0.24	0	1	138,311	0.03	0.18	0	1	5,397
Without Occupation	0.21	0.41	0	1	138,311	0.89	0.31	0	1	5,397
Retired	0.24	0.43	0	1	138,311	0.00	0.04	0	1	5,397
Farmer/Fisherman	0.01	0.11	0	1	138,311	0.00	0.04	0	1	5,397
Professional	0.01	0.12	0	1	138,311	0.00	0.02	0	1	5,397
Self-Employed	0.03	0.18	0	1	138,311	0.00	0.04	0	1	5,397
Business Propriator	0.02	0.13	0	1	138,311	0.00	0.02	0	1	5,397
Emloyed Professional	0.02	0.14	0	1	138,311	0.00	0.03	0	1	5,397
General Management	0.01	0.11	0	1	138,311	0.00	0.00	0	0	5,397
Middle Management	0.07	0.25	0	1	138,311	0.00	0.03	0	1	5,397
Employed Position (Desk)	0.08	0.27	0	1	138,311	0.01	0.07	0	1	5,397
Employed Position (Travel)	0.03	0.16	0	1	138,311	0.00	0.05	0	1	5,397
Service Sector	0.07	0.26	0	1	138,311	0.01	0.11	0	1	5,397
Supervisor	0.01	0.10	0	1	138,311	0.00	0.03	0	1	5,397
Country Level Covariates										
Real Cigarette Price (per 1000)	162.45	61.68	37	357	138,311	154.51	62.80	37	357	5,397
ln(Real Cigarette Price)	5.02	0.39	4	6	138,311	4.95	0.44	4	6	5,397
Indoor Air Law	0.21	0.31	0	1	138,311	0.16	0.28	0	1	5,397
ln(GDP)	10.03	0.28	9	11	138,311	9.98	0.30	9	11	5,397
Unemployment Rate	8.35	3.41	2	20	138,311	8.69	3.64	2	20	5,397
Inflation Rate	2.70	1.85	-2	13	138,311	3.15	2.20	-2	13	5,397

Note: Smoker refers to individuals who currently smoke at least sometimes. No. of Packs is derived from the number of cigarettes smoked per day.

B Main Results, Robustness Checks, and Heterogeneity

B.1 Figures

Figure B.1: Sensitivity to Dropping Cantons



Note: The figure depicts the coefficient estimates, the black dots, from the main specification (5) of Table 1 conditional on leaving out a specific canton denoted on the x-axis. The blue line indicates the point estimate for the full sample. The thin line shows the 90% confidence interval, the thick line the 95% confidence interval.
Data source: Tobacco and Addiction Monitoring, 2001–2016.

B.2 Tables

Table B.1: Alternative Specifications

	Tobacco and Addiction Monitoring					Health Behaviour in School-aged Children	
	All Ages					Ages 11–15	
Dependent Variable	Smoker, Avg. for Minors 0.178					Smoker, Avg. 0.104	
					All x Teen		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Binding Sales Ban	-0.007	-0.007	-0.003		-0.002	-0.029***	0.006
	(0.010)	(0.010)	(0.009)		(0.009)	(0.007)	(0.008)
Sales Ban	-0.041***	-0.002		-0.002	-0.002		
	(0.003)	(0.003)		(0.002)	(0.003)		
Age FE	X	X	X	X	X	X	X
Canton FE	X	X	X	X	X	X	X
Year FE		X	X	X	X		X
Canton x Teen FE			X	X	X		
Year x Teen FE			X	X	X		
Ind. Controls			X	X	X		
Cant. Controls			X	X	X		
Observations	167,376	167,376	167,376	167,376	167,376	56,335	56,335
Canton Clusters	26	26	26	26	26	15	15
R-squared	0.03	0.03	0.05	0.05	0.05	0.07	0.07

Note: Estimated effects of sales bans on smoking in percentage points from linear least squares estimations. Binding Sales Ban indicates that an individual is currently subject to a sales ban. Sales Ban indicates that an individual lives in a canton with a sales ban. Standard errors clustered on the level of cantons in parentheses. All x Teen means that all controls and fixed effects in column (7) are interacted with a dummy variable indicating whether the individual is below age 21. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.2: Additional Dependent Variables for Switzerland

	Tobacco and Addiction Monitoring All Ages			Health Behaviour in School-aged Children 11–15 Years Old	
Dependent Variable	Daily Smoker	ln(Nicotine) Smokers	>=100 Cigar.	Smoke Freq.	Cigarettes per Week
Avg.	0.130	1.741	0.187	1.939	0.318
	(1)	(2)	(3)	(4)	(5)
Binding Sales Ban	-0.001	-0.138	0.011	-0.057	0.008
	(0.013)	(0.119)	(0.014)	(0.060)	(0.023)
Sales Ban	0.004	0.035	0.004		
	(0.004)	(0.048)	(0.006)		
Age FE	X	X	X	X	X
Canton FE	X	X	X	X	X
Year FE	X	X	X	X	X
Canton x Teen FE	X	X	X		
Year x Teen FE	X	X	X		
Ind. Controls	X	X	X	X	X
Cant. Controls	X	X	X		
Observations	116,145	11,867	66,378	5,832	35,242
Canton Clusters	26	26	26	15	15
R-squared	0.16	0.09	0.14	0.09	0.03

Note: Estimated effects of sales bans from linear least squares estimations. Binding Sales Ban indicates that an individual is currently subject to a sales ban. Sales Ban indicates that an individual lives in a canton with a sales ban. Standard errors clustered on the level of cantons in parentheses. Daily Smoker refers to whether individuals are daily smokers as opposed to more than once a week, once a week, less than once a week, or nonsmokers. The data on nicotine is only available until 2010 in the Tobacco Monitoring Data and was calculated in the survey by multiplying the number of cigarettes times the nicotine of the brand the individual smokes. >=100 Cigar. refers to an individual having smoked more than 100 cigarettes in their life. Smoke Freq. is available only for smokers in all waves of the Health Behaviour in School-aged Children data and takes the values 1 "less than once a week", 2 "at least once a week", and 3 "daily". Cigarettes per Week is available for both, smokers and nonsmokers, for the years 2006, 2010, and 2014. It takes the values 0, 1 (which means less or equal to 1), 5 (<=5), 11 (<=11), 19 (<= 19), or 20 (>=20). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.3: Tests of the Common-Trends Assumption I

Dependent Variable	Tobacco and Addiction Monitoring					
	Smoker, Avg. for Minors: 0.178					
	Before 2006		Before 2006			Before 2006
	(1)	(2)	(3)	(4)	(5)	(6)
Binding Sales Ban	-0.000		0.001		0.004	
	(0.010)		(0.009)		(0.012)	
Sales Ban	-0.002		-0.003		-0.002	
	(0.003)		(0.003)		(0.003)	
Ever Introd. Trend x Minor	-0.001	-0.013				
	(0.001)	(0.009)				
Ever Introd. Trend	0.000	-0.004				
	(0.001)	(0.004)				
Early Introd. Trend x Minor			-0.001	-0.013		
			(0.001)	(0.009)		
Early Introd. Trend			0.000	-0.005		
			(0.001)	(0.004)		
Late Introd. Trend x Minor			-0.000	-0.012		
			(0.001)	(0.009)		
Late Introd. Trend			-0.000	-0.002		
			(0.001)	(0.006)		
Min. Age 18 Ever Introd. Trend					0.001	-0.004
					(0.001)	(0.003)
Min. Age 18 Ever Introd. Trend x Minor					-0.001	-0.009
					(0.001)	(0.006)
Age FE	X	X	X	X	X	X
Canton FE	X	X	X	X	X	X
Year FE	X	X	X	X	X	X
Canton x Teen FE	X	X	X	X	X	X
Year x Teen FE	X	X	X	X	X	X
Ind. Controls	X	X	X	X	X	X
Cant. Controls	X	X	X	X	X	X
Observations	167,376	49,854	167,376	49,854	167,376	49,854
Canton Clusters	26	26	26	26	26	26
R-squared	0.05	0.04	0.05	0.04	0.05	0.04

Note: Estimated effects of sales bans on smoking in percentage points from linear least squares estimations. Binding Sales Ban indicates that an individual is currently subject to a sales ban. Sales Ban indicates that an individual lives in a canton with a sales ban. Standard errors clustered on the level of cantons in parentheses. Trends are constructed based on the month and year of the interview. Ever Introd. Trend denotes the trend for cantons that introduced a sales ban. Early Introd. Trend denotes the trend for cantons that introduced the sales ban before or in 2008. Late Introd. Trend denotes the trend for cantons that introduced the sales ban after 2008. Min. Age 18 Ever Introd. Trend is a trend for cantons that introduced a sales ban for below 18 year olds. Minor is an indicator variable that is 1 if the individual is strictly less than 18 years old.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.4: Tests of the Common-Trends Assumption II

Dependent Variable	Tobacco and Addiction Monitoring				
	Smoker, Avg. for Minors: 0.178				
				After 2002	Intro. < 2013
	(1)	(2)	(3)	(4)	(5)
Binding Sales Ban	0.003	0.008	-0.005	-0.001	-0.002
	(0.007)	(0.012)	(0.013)	(0.009)	(0.010)
Sales Ban	0.002	0.001	0.002	-0.002	-0.002
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Binding Sales Ban Lead 1			0.006		
			(0.013)		
Sales Ban Lead 1			-0.005		
			(0.004)		
Binding Sales Ban After or in 2013					0.002
					(0.018)
Sales Ban After or in 2013					-0.003
					(0.006)
Age FE	X	X	X	X	X
Canton FE	X	X	X	X	X
Year FE	X	X	X	X	X
Canton x Teen FE	X	X	X	X	X
Year x Teen FE	X	X	X	X	X
Ind. Controls	X	X	X	X	X
Cant. Controls	X	X	X	X	X
Cant. Trends	X	X			
Cant. Trends x Teen		X			
Observations	167,376	167,376	167,376	147,367	167,376
Canton Clusters	26	26	26	26	26
R-squared	0.05	0.30	0.05	0.05	0.05

Note: Estimated effects of sales bans on smoking in percentage points from linear least squares estimations. Binding Sales Ban indicates that an individual is currently subject to a sales ban. Sales Ban indicates that an individual lives in a canton with a sales ban. Standard errors clustered on the level of cantons in parentheses. Trends are constructed based on the month and year of the interview. Binding Sales Ban Lead 1 is one if the interview date was at most a year before the introduction of the sales ban and if the teen was at an age where she would be likely subject to the ban in a year (i.e., younger than 15 if the minimum age was 16 or younger than 17 if the minimum age was 18). Sales Ban Before 2013 is equal to the Sales Ban indicator, except that it is 0 for all cantons that introduced the ban after or in 2013. The same holds true for Sales Ban Binding Before 2013. Minor is an indicator variable that is 1 if the individual is strictly less than 18 years old. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.5: Robustness Checks, European Union

Dependent Variable	Smoker				
Avg. for Minors	0.219				
	(1)	(2)	(3)	(4)	(5)
Binding Sales Ban	–0.007	–0.005	–0.006	–0.012	–0.012
	(0.021)	(0.020)	(0.020)	(0.018)	(0.018)
Sales Ban	–0.001	0.001	–0.001	–0.001	–0.001
	(0.013)	(0.015)	(0.013)	(0.013)	(0.013)
1y Lead Binding Sales Ban		0.064			
		(0.082)			
1y Lead Sales Ban		0.002			
		(0.009)			
ln(Real Cigarette Price)			0.012		0.013
			(0.017)		(0.016)
ln(Real Cigarette Price) x Minor			0.004		0.000
			(0.021)		(0.019)
Indoor Air Law				0.001	0.002
				(0.010)	(0.010)
Indoor Air Law x Minor				0.023	0.023
				(0.034)	(0.033)
Age FE	X	X	X	X	X
Country FE	X	X	X	X	X
Year FE	X	X	X	X	X
Country x Teen FE	X	X	X	X	X
Year x Teen FE	X	X	X	X	X
Country Trends	X	X	X	X	X
Country Trends x Teen	X				
Ind. Controls	X	X	X	X	X
Country Controls	X	X	X	X	X
Observations	138,311	138,311	138,311	138,311	138,311
Clusters	32	32	32	32	32
R-squared	0.10	0.10	0.10	0.10	0.10

Note: Estimated effects of sales bans on smoking in percentage points from linear least squares estimations for 32 European countries and regions. Binding Sales Ban indicates that an individual is currently subject to a sales ban. Sales Ban indicates that an individual lives in a country or region with a sales ban. Standard errors clustered on the country/region level are in parentheses. Smoker refers to current regular smoking. Binding Sales Ban Lead 1 is one if the interview date was at most a year before the introduction of the sales ban and if the teen was at an age where she would be likely subject to the ban in a year (i.e., younger than 15 if the minimum age was 16 or younger than 17 if the minimum age was 18). Minor is an indicator variable that is 1 if the individuals is strictly less than 18 years old. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B.6: Advertisement Bans and Indoor Air Laws

Dependent Variable	Tobacco and Addiction Monitoring				
	Smoker, Avg. for Minors: 0.178				
	(1)	(2)	(3)	(4)	(5)
Binding Sales Ban			-0.005	-0.006	-0.007
			(0.011)	(0.009)	(0.011)
Sales Ban			-0.005	-0.001	-0.004
			(0.003)	(0.003)	(0.003)
Advertisement Ban	0.006		0.008		0.009
	(0.005)		(0.005)		(0.005)
Advertisement Ban x Minor	0.005		0.007		0.002
	(0.010)		(0.011)		(0.010)
Indoor Air Law		0.006		0.006	0.006
		(0.007)		(0.007)	(0.007)
Indoor Air Law x Minor		0.014		0.016	0.015*
		(0.010)		(0.010)	(0.009)
Age FE	X	X	X	X	X
Canton FE	X	X	X	X	X
Year FE	X	X	X	X	X
Canton x Teen FE	X	X	X	X	X
Year x Teen FE	X	X	X	X	X
Ind. Controls	X	X	X	X	X
Cant. Controls	X	X	X	X	X
Observations	167,376	167,376	167,376	167,376	167,376
Canton Clusters	26	26	26	26	26
R-squared	0.05	0.05	0.05	0.05	0.05

Note: Estimated effects of sales bans on smoking in percentage points from linear least squares estimations. Binding Sales Ban indicates that an individual is currently subject to a sales ban. Sales Ban indicates that an individual lives in a canton with a sales ban. Standard errors clustered on the level of cantons in parentheses. Indoor Air Law is an indicator variable that takes value 1 if the individual was interviewed after the introduction of an indoor air law and 0 otherwise. The same is the case for Advertisement Ban. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.7: Balance Check

	Tobacco and Addiction Monitoring			
Dependent Variable	Unempl.	Youth Unempl.	Physician Density	Share Minors
Avg. for Minors	2.82	3.69	172.8	0.100
	(1)	(2)	(3)	(4)
Binding Sales Ban	0.015	0.073	-2.736	-0.001
	(0.035)	(0.063)	(2.189)	(0.001)
Sales Ban	-0.027	-0.086	-4.375	-0.003
	(0.130)	(0.215)	(3.223)	(0.004)
Age FE	X	X	X	X
Canton FE	X	X	X	X
Year x Teen FE	X	X	X	X
Observations	167,376	167,376	167,376	167,376
Canton Clusters	26	26	26	26
R-squared	0.94	0.92	0.97	0.59

Note: Estimated effects of sales bans on individual and cantonal controls from linear least squares estimations. Binding Sales Ban indicates that an individual is currently subject to a sales ban. Sales Ban indicates that an individual lives in a canton with a sales ban. Standard errors clustered on the level of cantons in parentheses. Unempl. refers to general unemployment and Youth Unempl. denotes youth unemployment. Share Minors denotes the share of minors in our data set. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.8: Heterogeneous Effects

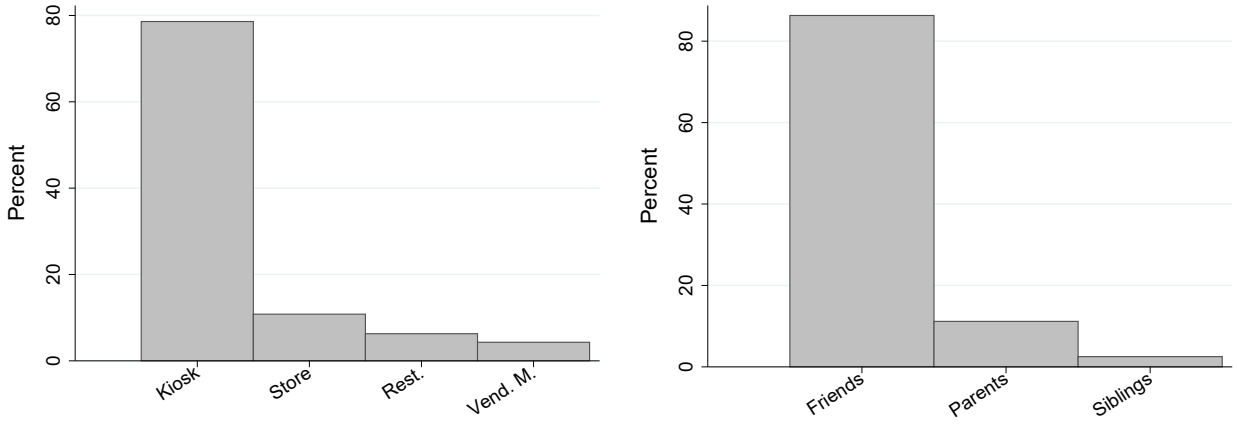
	Tobacco and Addiction Monitoring						HBSC	
	All Ages				Ages 14–20		Ages 11–15	
Dependent Variable	Smoker							
Sample	Male	Female	Foreign B.	Swiss B.	High Edu.	Low Edu.	Male	Female
Avg. for Minors	0.184	0.171	0.168	0.182	0.175	0.192	0.109	0.098
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Binding Sales Ban	-0.002	-0.000	-0.000	0.002	0.018	-0.035**	0.000	0.016
	(0.013)	(0.012)	(0.012)	(0.011)	(0.022)	(0.013)	(0.010)	(0.011)
Sales Ban	0.000	-0.003	-0.014	-0.000	0.020	-0.009		
	(0.005)	(0.003)	(0.010)	(0.004)	(0.032)	(0.028)		
Age FE	X	X	X	X	X	X	X	X
Canton FE	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X
Canton x Teen FE	X	X	X	X	X	X		
Year x Teen FE	X	X	X	X	X	X		
Ind. Controls	X	X	X	X	X	X		
Cant. Controls	X	X	X	X	X	X		
Observations	70,927	96,449	53,695	113,681	4,648	6,970	27,958	28,377
Canton Clusters	26	26	26	26	26	26	15	15
R-squared	0.05	0.04	0.06	0.05	0.09	0.09	0.07	0.08

Note: Estimated effects of sales bans on smoking in percentage points from linear least squares estimations. Binding Sales Ban indicates that an individual is currently subject to a sales ban. Sales Ban indicates that an individual lives in a canton with a sales ban. Standard errors clustered on the level of cantons in parentheses. HBSC is the abbreviation for Health Behaviour in School-aged Children. Foreign B. refers to individuals who were born outside of Switzerland and Swiss B. to individuals who were born in Switzerland. Low Edu. or High Edu. refer to the fathers' education which we only have for individuals aged 14 to 20 from a subsample of the Tobacco Monitoring. We classify fathers as High Edu. if they have a high-school degree ("Matura"), higher degree after vocational training (e.g., "Meister"), a school of applied sciences degree, or a university degree. We classify fathers as Low Edu. if they have no degree, only mandatory schooling, or a vocational degree. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

C Evidence for the Debate Over Prohibition

C.1 Figures

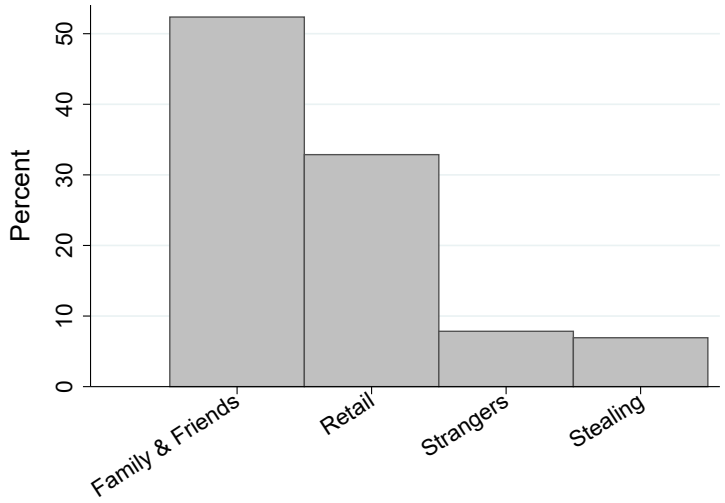
Figure C.1: Sources of Cigarettes, Smokers (14 to 20 Years of Age)



(a) Self-Purchased **(b) Not Self-Purchased**

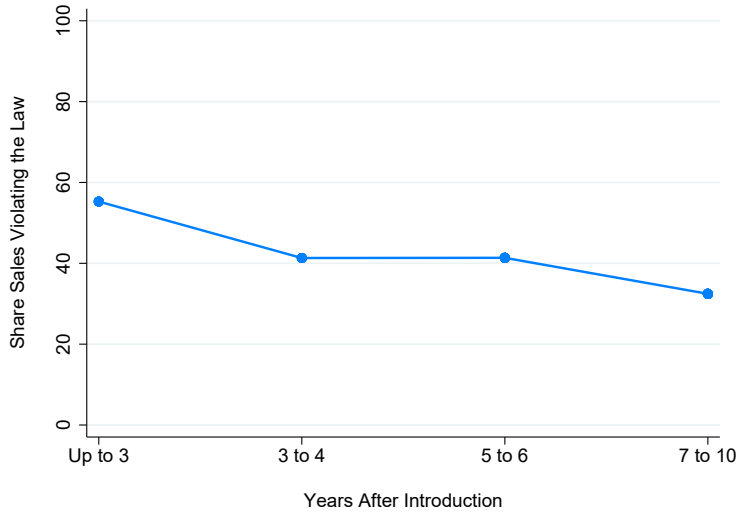
Note: The graphs show the relative share of sources for cigarettes separately for whether smokers purchased the cigarettes themselves, panel (a), or not, panel (b). Vend. M. refers to vending machines outdoors or in railway stations. Restaurant refers to cigarettes bought from the personnel or at vending machines inside the restaurant. Friends refers to both, friends and acquaintances. Kiosks are equivalent to newspaper stands where one can buy newspapers, refreshments, sweets, and cigarettes.
Data source: Tobacco and Addiction Monitoring, 2001, 2002, 2004, 2005, 2007–2012, 2014, and 2016.

Figure C.2: Sources of Cigarettes, Individuals Who Tried Smoking (11 to 15 Years of Age)



Note: The figure shows where teens 11 to 15 years of age conditional on ever having tried smoking get their cigarettes from.
Data source: Health Behaviour in School-aged Children, 2010 and 2014.

Figure C.3: The Share of Sales in Cantons Doing Testpurchases



Note: The figure shows the trend in the average share of sales violating the sales bans per year for cantons which conducted test purchases. Data is from surveys of cantonal health authorities. We asked whether they conducted test purchases and if they did, what the outcomes were. The data also include cantons for which we retrieved information from internet searches. We observe a total of 53 test purchase waves from 14 cantons: AG, AR, BE, BL, BS, FR, NW SG, SO, TG, UR, VD, VS, and ZH. Note that for some cantons we only have one observation and cantons enter and exit the sample depending on whether they did test purchases.
Data source: Own compilation and our survey of public health officials.

C.2 Tables

Table C.1: Attitudes Toward Smoking and Smoking

	Tobacco and Addiction Monitoring Data Available for Ages 14–20							Ages 14–25
Dependent Variable	Smoker							Smoker
Avg.	0.255							0.260
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Smokers Are Cooler	0.128***					0.063**		
	(0.017)					(0.023)		
Smokers Are More Attractive		0.226***				0.168***		
		(0.029)				(0.024)		
Smokers Are More Appreciative			0.158***			0.120***		
			(0.013)			(0.014)		
Smokers Are Happier				0.106***		0.061***		
				(0.014)		(0.013)		
Smokers Are More Succesful					0.084***	0.025		
					(0.024)	(0.020)		
Positive Attitude to Smokers (Avg.)							0.439***	
							(0.033)	
Dangerous to Smoke								-0.045***
								(0.004)
Age FE	X	X	X	X	X	X	X	X
Canton FE	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X
Canton x Teen FE	X	X	X	X	X	X	X	X
Year x Teen FE	X	X	X	X	X	X	X	X
Ind. Controls	X	X	X	X	X	X	X	X
Cant. Controls	X	X	X	X	X	X	X	X
Observations	6,010	5,983	5,988	5,950	5,939	5,662	5,662	7,632
Canton Clusters	26	26	26	26	26	26	26	26
R-squared	0.11	0.12	0.11	0.10	0.10	0.14	0.13	0.10

Note: Estimated relationship between attitudes toward smoking and smoking behavior from linear least squares estimations. Standard errors clustered on the level of cantons in parentheses. Cool, attractive, appreciative, happy, successful are variables on a scale from 0 to 1, where 0 is nonsmokers are, e.g., cooler than smokers, 0.5 means equally cool, 1 refers to smokers are cooler. Positive Attitude to Smokers (Avg.) refers to the average of the five variables mentioned. Data on these attitudes is available for the years from 2001 to 2010 only from a subsample of adolescents surveyed in the Tobacco Monitoring. Smoking is dangerous refers to a scale from 1 to 6, where 6 is very dangerous and 1 is not at all dangerous. This variable is available from 2001 to 2010 and in 2012 from the Tobacco and Addiction Monitoring. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C.2: Effects on Attitudes Toward Smoking I

Sample	Tobacco and Addiction Monitoring Ages 14–20							
	All						Smokers	
	Smokers Are More:							
Dependent Variable	Cool	Attractive	Appreciative	Happy	Successful	Avg.	Succesful	Avg.
Avg.	0.307	0.230	0.320	0.263	0.312	0.288	0.368	0.367
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Binding Sales Ban	-0.026*	0.008	-0.041**	-0.020	-0.017	-0.021	-0.077*	-0.031*
	(0.013)	(0.018)	(0.018)	(0.021)	(0.021)	(0.013)	(0.037)	(0.017)
Sales Ban	-0.012	-0.005	-0.018	0.011	-0.005	-0.003	0.050	0.020
	(0.018)	(0.014)	(0.023)	(0.017)	(0.015)	(0.008)	(0.045)	(0.023)
Age FE	X	X	X	X	X	X	X	X
Canton FE	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X
Canton x Teen FE	X	X	X	X	X	X	X	X
Year x Teen FE	X	X	X	X	X	X	X	X
Ind. Controls	X	X	X	X	X	X	X	X
Cant. Controls	X	X	X	X	X	X	X	X
Observations	6,010	5,983	5,988	5,950	5,939	5,662	1,532	1,446
Canton Clusters	26	26	26	26	26	26	26	26
R-squared	0.03	0.07	0.08	0.02	0.07	0.06	0.06	0.05

Note: Estimated effects of sales bans on attitudes toward smoking from linear least squares estimations. Binding Sales Ban indicates that an individual is currently subject to a sales ban. Sales Ban indicates that an individual lives in a canton with a sales ban. Standard errors clustered on the level of cantons in parentheses. Cool, attractive, appreciative, happy, successful are variables on a scale from 0 to 1, where 0 is nonsmokers are, e.g., cooler than smokers, 0.5 means equally cool, 1 refers to smokers are cooler. Avg. refers to the average from the dependent variables in columns (1) through (5). Data on these attitudes is available for the years from 2001 to 2010 only from a subsample of adolescents surveyed in the Tobacco Monitoring.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C.3: Effects on Attitudes Toward Smoking II

	Tobacco and Addiction Monitoring Ages 14–20				Ages 14–25
Sample	Smokers		Nonsmokers		All
Dependent Variable	Peers for Stopping	Parents Ok w. Smoking	Peers for Starting	Parents Ok w. Smoking	Smoking is Dangerous
Avg.	2.595	0.502	1.397	0.244	3.719
	(1)	(2)	(3)	(4)	(5)
Binding Sales Ban	0.121*	0.051	-0.006	-0.004	-0.005
	(0.063)	(0.033)	(0.028)	(0.023)	(0.053)
Sales Ban	-0.032	-0.002	-0.042	-0.013	0.043
	(0.047)	(0.039)	(0.030)	(0.027)	(0.055)
Age FE	X	X	X	X	X
Canton FE	X	X	X	X	X
Year FE	X	X	X	X	X
Canton x Teen FE	X	X	X	X	X
Year x Teen FE	X	X	X	X	X
Ind. Controls	X	X	X	X	X
Cant. Controls	X	X	X	X	X
Observations	1,572	1,552	4,466	4,378	7,632
Canton Clusters	26	26	26	26	26
R-squared	0.09	0.12	0.04	0.09	0.06

Note: Estimated effects of sales bans on attitudes toward smoking from linear least squares estimations. Binding Sales Ban indicates that an individual is currently subject to a sales ban. Sales Ban indicates that an individual lives in a canton with a sales ban. Standard errors clustered on the level of cantons in parentheses. Peers for Stopping refers to a variable ranging from 1 to 3, where 1 indicates that friends "would find it rather bad if I stopped smoking" and 3 "would like if I stopped smoking". Peers for Starting refers to a variable ranging from 1 to 3, where 3 indicates that friends would find it rather good if a nonsmoker began smoking. Parents Ok w. Smoking refers to whether parents are or would be ok with their children were smoking at home where individuals could say yes=1, no=0, or 0.5=it depends. Data on these attitudes is available for the years from 2001 to 2010 only from a subsample of adolescents surveyed in the Tobacco Monitoring. Smoking is dangerous refers to a scale from 1 to 6, where 6 is very dangerous and 1 is not at all dangerous. This variable is available from 2001 to 2010 and in 2012 from the Tobacco and Addiction Monitoring. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C.4: Implementation Lag, Vending Machines, and Travelling

Dependent Variable	Tobacco and Addiction Monitoring All Ages				
	Smoker				
Avg. for Minors	0.178		No Circumv. 0.182	0.178	
	(1)	(2)	(3)	(4)	(5)
Binding Sales Ban	-0.006	-0.009	0.002	-0.008	-0.001
	(0.018)	(0.015)	(0.014)	(0.012)	(0.011)
Sales Ban	-0.002	-0.002	0.000	-0.005	-0.005
	(0.003)	(0.003)	(0.004)	(0.005)	(0.004)
Binding Sales Ban x Distance to Nonb. in 10k km	0.001				
	(0.007)				
Binding Sales Ban x Distance > 75 perc.		0.013			
		(0.013)			
Binding Sales Ban Lag 1				0.007	
				(0.012)	
Sales Ban Lag 1				0.005	
				(0.005)	
Binding Sales Ban x Vending Machine Contr.					-0.001
					(0.013)
Sales Ban x Vending Machine Contr.					0.006
					(0.006)
Age FE	X	X	X	X	X
Canton FE	X	X	X	X	X
Year FE	X	X	X	X	X
Canton x Teen FE	X	X	X	X	X
Year x Teen FE	X	X	X	X	X
Ind. Controls	X	X	X	X	X
Cant. Controls	X	X	X	X	X
Observations	164,533	164,533	121,613	167,376	167,376
Canton Clusters	26	26	22	26	26
R-squared	0.05	0.05	0.05	0.05	0.05

Note: Estimated effects of sales bans on smoking from linear least squares estimations. Binding Sales Ban indicates that an individual is currently subject to a sales ban. Sales Ban indicates that an individual lives in a canton with a sales ban. Standard errors clustered on the level of cantons in parentheses. Distance to Nonb. in 10k km is the distance from the municipality an individual subject to a sales ban lives in to the closest municipality in a canton with a nonbinding sales ban in 10,000 kilometers. Distance >75 perc. is a dummy variable which is 1 if the distance to the closest community in a canton with a nonbinding sales ban is above the 75th percentile of distances. The number of observations is smaller when we use the distance measures since we only have zip codes in the Tobacco and Addiction Monitoring for the years 2001–2014. In column (3) we drop four border cantons who had a higher minimum age than the neighboring country for any period. These are cantons which introduced the laws early on: BL (bordering France and Germany), BS (bordering France and Germany), TI (bordering Italy), and VD (bordering France). Vending Machine Contr. refers to a dummy variable that is 1 if the grace period to equip vending machines with an ID reader is over. In the 16 cantons with a grace period, the indicator variable takes value 0 during 9 months to 3 years after the introduction of a sales ban.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C.5: Other Policies and Experience, European Union

Dependent Variable	Smoker		
Avg. for Minors	0.219		
	(1)	(2)	(3)
Binding Sales Ban	-0.005	-0.000	-0.004
	(0.025)	(0.023)	(0.026)
Sales Ban	0.002	-0.005	0.005
	(0.013)	(0.013)	(0.013)
Binding Minimum Smoking Age	-0.011		
	(0.020)		
Minimum Smoking Age	-0.013		
	(0.020)		
Binding Sales Ban – Age 18		-0.002	
		(0.023)	
Sales Ban – Age 18		-0.005	
		(0.011)	
Experienced a Binding Sales Ban			-0.023
			(0.015)
Age FE	X	X	X
Country FE	X	X	X
Year FE	X	X	X
Country x Teen FE	X	X	X
Year x Teen FE	X	X	X
Country Trends	X	X	X
Ind. Controls	X	X	X
Country Controls	X	X	X
Observations	138,311	138,311	138,311
Clusters	32	32	32
R-squared	0.10	0.10	0.10

Note: Estimated effects of sales bans on smoking in percentage points from linear least squares estimations for 32 European countries and regions. Binding Sales Ban indicates that an individual is currently subject to a sales ban. Sales Ban indicates that an individual lives in a country or region with a sales ban. Standard errors clustered on the country/region level are in parentheses. Smoker refers to current regular smoking. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C.6: Heterogeneities in Enforcement Across Cantons

Dependent Variable Avg. for Minors	Tobacco and Addiction Monitoring Smoker 0.178			
	(1)	(2)	(3)	(4)
Binding Sales Ban	0.006 (0.028)	-0.019 (0.014)	0.007 (0.011)	0.017 (0.010)
Sales Ban	-0.000 (0.013)	0.001 (0.006)	-0.004 (0.004)	-0.005 (0.004)
Binding Sales Ban x Share Sold in Test Purch.	-0.009 (0.039)			
Sales Ban x Share Sold in Test Purch.	0.005 (0.017)			
Binding Sales Ban x Test Purchase		0.020 (0.018)		
Sales Ban x Test Purchase		-0.003 (0.006)		
Binding Sales Ban x Early Test Purchase			-0.014 (0.014)	
Sales Ban x Early Test Purchase			0.004 (0.006)	
Binding Sales Ban – Age 18				-0.031*** (0.011)
Sales Ban – Age 18				0.007 (0.005)
Age FE	X	X	X	X
Canton FE	X	X	X	X
Year FE	X	X	X	X
Canton x Teen FE	X	X	X	X
Year x Teen FE	X	X	X	X
Ind. Controls	X	X	X	X
Cant. Controls	X	X	X	X
Observations	117,752	167,376	167,376	167,376
Canton Clusters	14	26	26	26
R-squared	0.05	0.05	0.05	0.05

Note: Estimated effects of sales bans on smoking from linear least squares estimations. Standard errors clustered on the level of cantons in parentheses. Test Purchase is an indicator variable that takes value 1 if a canton did conduct test purchases as indicated by survey responses of cantonal officials or by internet research. Early Test Purchase is takes value 1 if cantons started test purchases in the year 2011 or before. Note that cantons can conduct test purchases whether or not they introduced the laws. However, only cantons that introduced the laws conducted test purchases (Test Purch.). The analysis includes the cantons which did not introduce a ban setting test purchases there to 0. Share Sold in Test Purch. captures the average share in percent of sold cigarettes over all test purchases within a canton from 2007–2016. The analysis in column (3) only considers cantons which did test purchases. The results are similar when taking into account all cantons and setting the share of sold cigarettes in the other cantons to 1. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C.7: Having Experienced a Sales Bans

Dependent Variable Avg. for Minors	Tobacco and Addiction Monitoring Smoker 0.178			
	(1)	(2)	(3)	(4)
Binding Sales Ban	-0.007 (0.014)	0.002 (0.013)	0.011 (0.013)	0.015 (0.013)
Sales Ban	-0.001 (0.003)	-0.002 (0.003)	-0.004 (0.003)	-0.004 (0.003)
Binding Sales Ban – Age 18			-0.031* (0.014)	-0.026 (0.014)
Sales Ban – Age 18			0.007 (0.006)	0.006 (0.005)
Experienced a Binding Sales Ban	-0.007 (0.009)		-0.010 (0.010)	
Years of Experience with a Binding Sales Ban		0.001 (0.002)		-0.001 (0.001)
Experienced a Binding Sales Ban x Min. Age 18			0.004 (0.017)	
Years of Experience with a Binding Sales Ban x Min. Age 18				0.003 (0.004)
Age FE	X	X	X	X
Canton FE	X	X	X	X
Year FE	X	X	X	X
Canton x Teen FE	X	X	X	X
Year x Teen FE	X	X	X	X
Ind. Controls	X	X	X	X
Cant. Controls	X	X	X	X
Observations	167,376	167,376	167,376	167,376
Canton Clusters	26	26	26	26
R-squared	0.05	0.05	0.05	0.05

Note: Estimated effects of sales bans from linear least squares estimations. Binding Sales Ban indicates that an individual is currently subject to a sales ban. Sales Ban indicates that an individual lives in a canton with a sales ban. Standard errors clustered on the level of cantons in parentheses. Experience is based on the canton an individual lives in currently and assumes that the individual did not move. Experienced a Binding Sales Ban takes value 1 if an individual was subject to a ban in a canton given her age. This is the case if age <= (minimum age – 1 year) + distance in years to the introduction. For instance, an 18 year old will get experience = 1 if the minimum age is 18 and the distance to the introduction is greater than 1 year. This is not perfect, as we code individuals who may have a short experience with minimum age laws as a 0. Years of Experiencing a Binding Sales Ban gives the number of years an individual was subject to a ban ranging from 0 year to 11 years ($avg. = 0.26$). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

D Survey Data for Assessing Teen Smoking

How reliable are measures of self-reported smoking behavior? Here, we briefly discuss the validity in the context of our paper. Self-reported smoking is very closely related to biomarkers indicating smoking for adults and teens (Patrick et al., 1994; Benowitz et al., 2009; Nesson, 2017). The main drawback of biomarkers is that researchers cannot track smokers who rarely smoke because cotinine depletes completely within 1 week. For smokers who smoke less than one cigarette per day, this measure may miss their smoking behavior (Caraballo, Giovino and Pechacek, 2004). In addition, biomarkers have some difficulties discriminating between passive and active smoking (Benowitz et al., 2009). In comparison to biomarkers, surveys have the advantage of being able to pick up smokers who smoke less than one cigarette per day or capturing experimentation (Dolcini et al., 2003; Caraballo, Giovino and Pechacek, 2004). Experimentation or smoking a little is crucial for building up addictive capital and is relevant for young smokers. Therefore, survey measures may be more accurate in capturing smoking behavior among teen smokers (Dolcini et al., 2003; Caraballo, Giovino and Pechacek, 2004).

A drawback of self-reported smoking may be that policies may affect social desirability of smoking and therefore change reported smoking but not actual smoking. Nesson (2017) examines whether the divergence in self-reports and biological markers relates to policy changes such as tax hikes and changes in an index including purchasing, possession, and use restrictions for adolescent smoking. He finds that teens report slightly less smoking but have somewhat higher serum cotinine levels in states with higher restrictions for adolescents. This divergence could occur because of an increase in secondhand smoke or because teens answer in compliance with the law.

Applied to our setting, this implies that any decrease in reported smoking behavior would be an upper bound for the actual decrease in smoking exposure if the laws increase the social desirability of reporting being a nonsmoker. Our evidence of a negative impact of sales bans on attitudes toward smoking — if anything — implies a negative bias of the coefficient estimates on smoking behavior. However, across our data sets, individuals were answering the survey questions anonymously, which gives little incentive to misreport. For instance, in the Health Behaviour in School-aged Children data, high-school students were surveyed without the teacher being in the room and they did not have to give their name or anything else that could identify an individual student.

E Details About the Data

Tobacco and Addiction Monitoring — For the years 2001 through 2010 we have data only on the zip code of where the individuals live. We use this information to link individuals to cantons. For the years 2011 to 2014 we have data on zip codes and data on the cantons. To be consistent with the years 2001 through 2010 we also use the zip-code information for these years before using the canton information. For 2015 and 2016 we have information only on cantons of residency because of privacy concerns. For most zip codes we can identify the cantons using a correspondence table provided by the Swiss Statistical Office. For the ones we cannot identify with this first step, we use information from the Swiss Postal Service and Internet research. Fewer than 200 observations cannot be matched to a canton in both data sets.

Health Behaviour in School-aged Children — In 2002 students could state the age at which they started to smoke by writing it out. We replace all ages lower than 11 years by setting the values to 11. Across all data we have some students who state that they started at age 16, in spite of the maximum age in the data being 15. We drop the individuals who stated they started at 16. We have information on the intensive margin of smoking in terms of cigarettes per week only from students who filled out the long questionnaire (those students are a bit older on average).