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Smoking Bans, Cigarette Prices and Life Satisfaction *

Reto Odermatt† and Alois Stutzer‡

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Abstract

The consequences of tobacco control policies for individual welfare are difficult to assess. We therefore evaluate the impact of smoking bans and cigarette prices on subjective well-being by analyzing data for 40 European countries and regions between 1990 and 2011. We exploit the staggered introduction of bans and apply an imputation strategy to study the effect of anti-smoking policies on people with different propensities to smoke. We find that higher cigarette prices reduce the life satisfaction of likely smokers. Overall, smoking bans are not related to subjective well-being, but increase the life satisfaction of smokers who recently failed to quit smoking. The latter finding is consistent with cue-triggered models of addiction and the idea of bans as self-control devices.

Keywords: Smoking bans, cigarette prices, life satisfaction, addiction, self-control, tobacco control policies

JEL classification: D03, D62, I18, K32

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1 Introduction

Adverse health effects of smoking motivate tobacco control policies in many countries. Smoking bans are introduced at workplaces as well as in restaurants, bars and clubs. Excise taxes are levied on tobacco products that drive up prices. These policies are controversial though as people hold fundamentally different views about their welfare consequences which are difficult to assess based on observed behavior alone.[1] Theoretical accounts, whether from a traditional or a behavioral economic perspective, generally imply that smoking is reduced if the mentioned tobacco control policies are in place. However, the competing theories predict potentially different consequences on the individual welfare of smokers. More fundamentally, the complexity of the phenomenon renders any prediction about welfare consequences rather difficult. We therefore evaluate the policies' impact based on reports of subjective well-being. We draw on the experience in Europe over more than twenty years with generally increasing cigarette prices and the staggered introduction of smoking bans in the EU member countries.

According to the traditional economic view (pioneered in the domain of addictive goods by Becker and Murphy, 1988), public health interventions constrain smokers in their habits, and this tends to make them worse off, while non-smokers are expected to benefit, given that the policies successfully internalize social costs. However, the prediction for smokers differs if a behavioral economics perspective is applied, which takes into account that some people are unable to realize their desired consumption plan. Some smokers may face self-control problems and are therefore unable to make short-term decisions according to their long-term preferences. For them, policies that restrict smoking through either higher prices or bans may have a positive impact on individual well-being. According to the models of O'Donoghue and Rabin (1999) and Gruber and Kőszegi (2001, 2004), high cigarette prices serve as a self-control device and enhance the welfare of people with limited willpower. In contrast, the models of Gul and Pesendorfer (2001) and Bernheim and Rangel (2004) predict that higher prices will have a negative welfare effect on smokers, as they do not help to reduce overconsumption for given levels of addiction. Bernheim and Rangel (2004) emphasize environmental cues that trigger choices with addictive goods. In their model, successful policy interventions have to protect people from tempting situations. Smoking bans might serve such a purpose.

With regard to non-smokers, competing welfare predictions emerge for other reasons. At first sight, non-smokers seem to be better off with bans and cigarette taxes, as these policies reduce the overall level of smoking. However, smoking bans might lead to negative side effects such as the displacement of smoking from the targeted public places to officially unregulated private places. Smoking bans may then have negative welfare effects even for non-smokers. Any evaluation of

[1] On the economics of smoking and tobacco policy, see, e.g., Chaloupka and Warner (2000), Cnossen (2006), Gruber (2001) and Viscousi (1992).

tobacco control policies must therefore consider heterogeneous effects across groups of people and devise measures capable of capturing individual welfare.

We study the effects of tobacco control policies on individual welfare by analyzing reported satisfaction with life. We exploit repeated cross-sectional data from the Eurobarometer surveys which covers 629,930 individuals from 40 European countries and regions between 1990 and 2011. The staggered introduction of smoking bans in the different countries and regions enables us to study the effect of the bans on individual life satisfaction in a difference-in-differences framework. The investigation of the ban introduction process does not indicate concurring (health) policy interventions (the common trend assumption is thus not rejected) and the developments of life satisfaction in regions and countries that do not introduce smoking bans in a given point of time can be studied as counterfactuals. The variation in cigarette prices over time is exploited to identify the consequences of higher prices on subjective well-being. Thereby, the rich data pool allows us to take into account unobserved country-specific effects, survey wave-specific effects, as well as country-specific time trends and macro-economic conditions. To address the concern that other policies of government health prevention might still be correlated with our variables of interest, we statistically control for a set of additional tobacco control policies such as restrictions on advertising and for anti-alcohol policies in terms of taxation.

In order to go beyond average treatment effects and to study the treatment effects for different groups such as likely smokers and non-smokers, the selection into a particular smoking status is taken into account. As tobacco control policies affect smoking status, people who indicate to be smokers pre and post intervention are not comparable. Some marginal smokers might quit and are thus no longer observed in the group of smokers after the intervention. Any measured difference in subjective well-being for actual smokers thus compounds a possible treatment effect and a selection effect. In our analysis, we instead concentrate on a counterfactual smoking status of every person in the sample for the case that there is no smoking ban and cigarette prices are low. For this, we analyze the covariates of someone being a smoker in an auxiliary dataset and impute an individuals propensity to smoke pre intervention in our main dataset. This imputation strategy is also applied to identify smokers who recently tried to stop smoking but failed. People in this latter category are deemed to suffer from weak willpower. This is applied as an indicator for the heterogeneity in individual levels of self-control in order to test the predictions of behavioral economic models.

We find, on average, no systematic partial correlation between the introduction of smoking bans and people's reported life satisfaction. There is also no systematic pattern for people with a high or low propensity to smoke. However, people categorized as smokers who have recently tried to quit smoking but have failed, report a higher level of subjective well-being when smoking bans are in place. For these people, roughly a third of the smokers according to surveys, smoking bans might serve as a self-control device that helps them to pursue their preferred consumption

plan.

Overall, higher cigarette prices are statistically weakly related to a lower level of reported subjective well-being. Thereby, large and statistically significant negative effects of higher prices on the life satisfaction of likely smokers drive the correlation, whereas non-smokers are not affected by higher prices. Within the group of smokers, even people who want to give up smoking suffer from higher prices in terms of reduced subjective well-being. This finding is contrary to the prominent result published in the study by Gruber and Mullainathan (2005) that tobacco taxes are positively related to smokers' happiness. It also questions the idea that higher tobacco taxes act as an effective self-control device. The differential effects of smoking bans and higher prices on smokers who would like to quit are consistent with models of addiction based on cue-triggered decision processes.

In Section 2, we discuss the main theoretical considerations that are related to the welfare effects of tobacco control policies. We complement the arguments by incorporating the previous evidence. Finally, we introduce our alternative empirical approach to measure individual welfare based on reported subjective well-being. Section 3 presents the data. Section 4 reports the findings of our empirical analyses, and Section 5 offers concluding remarks.

2 Welfare Effects of Tobacco Control Policies

In order to understand the predictions on how smoking bans and high cigarette prices affect people's well-being, we highlight the alternative perspectives of traditional and behavioral economic models. Subsequently, we refer to the previous evidence on the impact of tobacco policies on smoking behavior and health outcomes. It reveals possible channels through which these policies affect individual well-being and indicates indirect evidence on the policies potential as self-control devices. We want to complement this important evidence that itself renders conclusions about net welfare effects difficult. We introduce our empirical approach in the third subsection. Reported subjective well-being is proposed as a proxy measure of individual welfare.

2.1 Predictions of Traditional and Behavioral Economic Models

How do smoking bans and high cigarette prices affect people's well-being? Traditional (welfare) economics offers a clear framework in which smokers and non-smokers are in conflict regarding the use of clean air. Since there are no clear entitlements to clean air, smokers who expose third parties to smoke without agreement, smoke more than they would if they had to bear the costs for their externalities. In such a situation, smoking bans might serve as an internalization strategy with low transaction costs. Similar arguments apply to cigarette taxes in their capacity to reduce the externalities of smoking. Overall, if social costs are successfully internalized by

these policies, people should experience a higher level of overall welfare.

There are, of course, distributional consequences. Non-smokers are expected to be the primary beneficiaries. In contrast, with smoking bans and cigarette taxes, smokers face additional constraints when they rationally pursue their consumption habits or addiction, and are therefore potentially made worse off. This conclusion can be derived from the so-called rational addiction model of Becker and Murphy (1988). It emphasizes that even for addictive goods, consumption decisions can be understood as individually optimal. A positive net welfare effect of any tobacco policy for smokers thus depends on whether negative consequences from a constrained opportunity set are offset by the benefits of some internalization of the social costs of smoking.

However, a positive net effect is more likely to be predicted for smokers if they have difficulty in pursuing their preferred consumption plan. This might be, for example, due to limited willpower, where individuals smoke more than their (long-term) preferences would recommend. They might even suffer a negative internality from their past behavior if an unforeseen addiction is incurred. These people might search for self-control devices that help them to smoke less or even to stop smoking altogether. This perspective from behavioral economics is the basis for a series of theoretical models, where preferences with respect to smoking are time-inconsistent and consumers mispredict the difficulty they have in stopping. Interestingly, these models make systematically different predictions for the effectiveness of alternative tobacco policies to help smokers who have limited self-control.

O'Donoghue and Rabin (1999) and Gruber and Kőszegi (2001, 2004) model self-control problems in terms of a person's conflicting short- and long-term preferences. Applied to their framework, individuals plan to smoke less in the long run, but when it comes to act, they fail to follow their plan. Under such circumstances, smoking bans as well as higher cigarette prices might serve as self-control devices. They substantially increase the costs of smoking and thus reduce the need to rely on willpower to adhere to a time-consistent consumption plan. Smoking bans and high cigarette prices can thus enhance the welfare of people with limited self-control.[2]

In the model of Bernheim and Rangel (2004), the mistakes in consumption choices are triggered by environmental cues, which are the result of previous experiences. Individuals operate either in a "hot" or a "cold" decision-making mode. In the hot state, people have no self-control and thus always consume the addictive good, irrespective of underlying preferences. In the cold state, in contrast, decisions are following long-term plans. Within this approach, smoking bans can help smokers to smoke less by reducing the occurrence of cues that bring them into a hot state and trigger smoking. For instance, seeing someone smoke a cigarette in a pub would be a cue that would entice the observer to smoke, and where self-restraint would demand substantial willpower. A smoking ban might break this link and facilitate time-consistent decision-making.

[2]Regarding the optimal excise tax, these models suggest a tax greater than zero, even in the absence of smoking externalities, due to self-control benefits for time-inconsistent agents (O'Donoghue and Rabin, 2006).

In contrast, higher cigarette prices do not serve as a self-control device, because there is no price elasticity in the hot state.[3] Thus, the model predicts that smokers with limited willpower will benefit from smoking bans, but will suffer from higher cigarette prices. Similar conclusions follow from the model presented by Gul and Pesendorfer (2001), where smokers experience direct disutility from being tempted. This disutility can be at least partially avoided if smoking bans are in place, because this policy measure excludes the possibility of smoking inside the restaurant, bar or workplace from the option set. With cigarette taxes, this cannot be achieved.

In sum, depending on the assumed time consistency in smokers' consumption behavior, different predictions for the welfare consequences of anti-smoking policies emerge. This holds even though the different models predict similar reactions to tobacco control policies in terms of smoking behavior. Based on observed consumption behavior, it is thus very difficult to discriminate between the theoretical perspectives. In the empirical analysis, we therefore study how people fare with smoking bans and cigarette price increases. Previous research concentrates mainly on the impact on smoking behavior and health outcomes and has not yet performed a distinctive test of the welfare predictions of the underlying models.

2.2 Impact of Tobacco Policies on Smoking Behavior and Health Outcomes

The introduction of smoking bans and the increase of cigarette prices through excise taxes have become the dominant policies applied in combatting the adverse health effects resulting from tobacco consumption. An extensive body of literature studies the impact of these policies on individual consumption behavior, passive smoking, and related health consequences. This evidence reveals the various empirical channels through which tobacco control policies affect individual welfare.

Passive Smoking and Health Effects

Usually, smoking is not a self-contained consumption activity: Other parties inhale second-hand smoke and are exposed to the same carcinogens as active smokers. Therefore, besides motivating smokers to either smoke fewer cigarettes or to cease smoking, another explanation used in the public health debate for tobacco control policies is to protect people from environmental tobacco smoke (ETS).

To assess the health effects of clean-air laws, empirical research has produced many studies that investigate their association with hospital admissions. In a meta-analysis based on eleven reports, Meyers et al. (2009) focus on hospital admissions for acute myocardial infarction, which is most often assessed in studies. Overall, they find that the risk of acute myocardial infarction is reduced by 17% following the introduction of a public smoking ban. The largest

[3] This applies as long as cigarettes are affordable for an individual and cigarette price increases do not decrease the level of addiction to a sufficient extent in the long run due to reduced smoking in the cold state.

effects are found for younger individuals and non-smokers. Based on a difference-in-differences analysis for Great Britain, Pell et al. (2008) also report the largest effects for people who have never smoked and for former smokers. These findings suggest that the positive health effects of bans are primarily driven by the negative impact on the exposure to ETS. However, in a large-scale analysis on workplace smoking bans for the United States, Shetty et al. (2011) find no statistically significant short-term effects either on mortality or on hospital admissions for myocardial infarction.[4]

Besides the reported health effects, several studies discuss potential negative side effects of smoking bans and cigarette taxes. Adda and Cornaglia (2010) find for the United States that smoke-free laws led to a displacement of smoking to places shared with non-smokers who then experience increased exposure to ETS. However, in a related study for public-place smoking bans in Canada, Carpenter et al. (2011) do not find evidence of a displacement effect to private homes, while, as expected, exposure to ETS in bars and restaurants was reduced. Adaptive but unintended behavior is also possible in reaction to higher cigarette prices. As Adda and Cornaglia (2006, 2012) show, smokers compensate for tax hikes by extracting more nicotine per cigarette, which in turn is detrimental to health.

Smoking Behavior

A number of studies explore the price elasticity of demand for cigarettes. In general, a negative price elasticity is found, ranging from -0.3 to -0.5 (Chaloupka and Warner, 2000), whereby young individuals are more price-sensitive than older people and men are more price sensitive than women (Cawley and Ruhm, 2012). However, in a study for the United States, refined estimates of elasticities are found to be around -0.1 and thus rather small if complementary state-specific tobacco control policies are taken into account (Tauras, 2006).

The effects of spatial smoke-free policies on cigarette smoking have also been widely analyzed. In a systematic review of 26 studies, Fichtenberg and Glantz (2002) report an average reduction in the prevalence of smoking of 3.8 percentage points and of cigarettes smoked of 3.1 percent for continuing smokers. In another review of 21 studies, Hopkins et al. (2010) report at the median a decline in the prevalence of tobacco use of 3.4 percentage points. But, similar to the studies on prices, the findings differ widely across studies, and recent analyses with refined identification strategies have found smaller effects: In a comprehensive study across states in the U.S., Adda and Cornaglia (2010) find no statistically robust effect of bans, either in workplaces or in bars and restaurants, on cigarette consumption and smoking cessation. Regarding smoking bans in the hospitality sector in the German Laender, Anger et al. (2011) find a reduction of cigarette consumption only for individuals who frequently go to restaurants. However, even if

[4] In a simulation of smaller studies, Shetty et al. (2011) find effects that range from steep declines in hospital admissions to large increases, which thus reflect the wide year-to-year variation in myocardial infarction death in small geographic areas.

we observe reduced consumption due to the tobacco policies, we can not draw any conclusion about the welfare consequences of such behavioral changes. They depend on whether people have difficulties in pursuing their preferred consumption plan or not.

Tobacco Control Policies as Collective Self-Binding Mechanisms

If systematic errors in tobacco consumption due to weak willpower are relevant, tobacco control policies might help people to follow their preferred consumption plan. Kan (2007) provides empirical evidence for the view that with limited willpower, smokers who want to cease smoking have a demand for self-control devices. Based on survey data for Taiwan, he shows that a smoker's intention to quit smoking has a positive effect on his or her support for smoking bans or for an increase in the cigarette excise tax. Hersch (2005) comes to the same conclusion in support of clean-air laws in the United States. Additionally, he studies the effect for smokers who have tried to quit smoking in the past, but having failed, and who plan to try again. This group favors smoking bans more than smokers who plan to cease smoking for the first time. Rather than attitudes, Fletcher et al. (2009) study elasticities to explore whether higher cigarette prices might serve as a self-control device. They use U.S. data on adolescents in finite mixture models to examine differences in cigarette tax elasticity for different levels of self-control. They find that the biggest fraction of adolescents is sensitive to prices, while some are largely unresponsive. The crucial point is that low responsiveness is strongly related to low levels of self-control. This finding is consistent with theories of cue-triggered addiction suggesting that higher cigarette prices do not serve as a self-control device.

2.3 Reported Subjective Well-Being as a Proxy Measure for Individual Welfare

Previous evidence reveals that tobacco control policies have a multitude of behavioral consequences affecting people's health and welfare in various ways with sometimes countervailing effects. Net welfare effects for different groups are very difficult to assess; even more so when tobacco consumption is not time consistent. Therefore, we propose the analysis of subjective well-being as a complementary approach to study the welfare consequences of policies in areas that might involve suboptimal consumption choices.[5] In particular, two extensions of the traditional emphasis on ex ante evaluation and observed decision-making are insightful in the study of individual welfare. First, the standard economic concept of revealed preference is complemented with the concept of a self-evaluation of the quality of life. This separation of concepts makes it possible for us to systematically distinguish between judgments about experiences and ranked options derived from observed behavior. The second extension is closely related and emphasizes

[5]For a general account see Kőszegi and Rabin (2008), Stutzer (2009) and Hsee et al. (2012). Introductions to the economic analysis of subjective well-being are, e.g., provided in Frey and Stutzer (2002), Layard (2005) and Stutzer and Frey (2010). Applications to suboptimal consumption choices are, e.g., Stutzer (2007) on obesity and Benesch et al. (2010) on TV viewing.

ex post evaluations as a valuable source of information about the possibility of bounded rationality in people's decision-making. The key idea is thus that people's self-evaluations of their quality of life are captured as a proxy for their individual welfare.[6]

For tobacco taxes, Gruber and Mullainathan (2005) perform an analysis with reported happiness as a proxy for individual welfare. In two longitudinal analyses across states of the United States and Canada, they analyze the effect of changes in state tobacco taxes on the reported happiness of people who are predicted to smoke at the prevailing tobacco tax. They find that a real cigarette tax of 50 cents[7] significantly reduces the likelihood of being unhappy among those who have a high propensity to smoke compared to those who have a low propensity to smoke. In fact, smokers with a high propensity to smoke would be just as likely to report being unhappy with a 50 cents tax as those with a low propensity to smoke (i.e., the proportion of smokers in the lowest happiness category would fall by 7.5 percentage points). Brodeur (2012) applies the same strategy to analyze the impact of smoking bans in the United States on people's subjective well-being. In initial results, he reports a positive effect of smoking bans in bars and restaurants on people who are predicted to be smokers. As this effect is not robust to the inclusion of the propensity to smoke of the smoker's spouses, he concludes that within-family externalities are present, which explains the main results.

Beside the replication of the analyses for the United States with data from the European Union, we go beyond existing and emerging research by simultaneously analyzing the welfare effect of smoking bans and cigarette prices. This allows us to assess the relative effectiveness of the two policies not only for smokers and non-smokers, but also for smokers who failed to stop smoking what potentially reveals a lack of sufficient willpower. This approach also enables us to test two classes of models that are prominent in behavioral economics.

3 Data

3.1 Individual and Country Level Data

Our empirical analysis is based on individual-level data from the Eurobarometer surveys (EB) that include a question on people's subjective well-being (European Commission 2012). The EB is a repeated cross-section survey in the member states of the European Union. Our analysis consists of 22 European countries; i.e., Austria, Belgium, Cyprus (Republic of), Denmark,

[6]Thereby, the standards underlying people's judgments are assumed to be those that the individuals also apply when pursuing their personal idea of a good life. Thus, the identification of differences in welfare hinges on the presumption that individuals pursue personal welfare based on some stable evaluation standard. Moreover, whether differences in welfare are properly identified depends on whether the evaluation metric fits people's self-evaluation of the quality of their lives.

[7]The average real (in 1999 USD) cigarette tax in the United States is 31.6 cents in the sample (Gruber and Mullainathan 2005, 5).

Estonia, Finland, France, Germany, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom. For the United Kingdom, the entities England, Scotland, Wales and Northern Ireland and for Germany, the 16 German Laender are considered as separate geographical units, since the smoking bans were not introduced nationwide simultaneously in these places. We use data from 41 survey waves between 1990 and 2011. For Austria, Finland and Sweden data is only available from the beginning of 1995 and for the newest members of the EU (i.e. Cyprus, Estonia, Latvia, Lithuania, Malta, Slovenia, Slovakia and Romania) from the beginning of 2004.

Our dependent variable is based on a survey question on people's life satisfaction. On a four-point scale, people answer the question "On the whole, are you very satisfied, fairly satisfied, not very satisfied, or not at all satisfied with the life you lead?". "Very satisfied" is coded as four, "not at all satisfied" as one. The average satisfaction level in the sample is 3.05 with a standard deviation of 0.74. Based on further survey questions, a number of socio-demographic and socio-economic characteristics are taken into account. Table A.1 in the Appendix offers descriptive statistics for the included individual-level variables from the EB and Table A.2 lists the used surveys and data sources. From the listed survey waves, we include all observations except for people who refused to indicate their marital status or who did not know their age when they have finished their education. Individuals who do not report the number of children in the household are indicated by a separate indicator. The final sample consists of 629,930 observations.

The empirical analysis takes a number of aggregate economic indicators into account as control variables: i.e., the country-specific nominal GDP per capita, the inflation rate, and the rate of unemployment. Information is derived from the national statistics of the European Commission and the OECD. Data on the region-specific unemployment rate for Germany is provided by the German Federal Employment Agency (for 1991 to 2011) and for the United Kingdom by the Welsh Government (see Table A.2 in the Appendix for further information on the data sources). To control for potential correlation between the excise tax on cigarettes and other excise taxes, we additionally compiled yearly data on the country-specific taxation of beer per degree of alcohol (European Commission 1990-2011a). We adjust the beer tax with the country-specific price level to obtain the real tax (in 2005 euros).

3.2 Tobacco Control Policies in the European Union

The two main policy variables in our analysis are smoking bans and cigarette taxes as reflected in prices. Smoking bans are public policies particularly promoted by the WHO Framework Convention in Tobacco Control (FCTC). In response to the ratification of the treaty, many countries introduced smoking bans in indoor workplaces, indoor public places, public transport

and in bars and restaurants; i.e., the hospitality sector. The first country in Europe that banned smoking comprehensively was Ireland in March 2004. In the meantime, almost all European countries know some sort of spatial smoking restriction. While in some countries and regions the introduction of the ban occurred on the same date, by spring 2011, there were a total of 30 different introduction dates for bans in the 40 countries and regions in our sample.

Some countries first introduced bans only in workplaces. In a second step, the bans were then extended to the hospitality sector. This occurred in Austria, Belgium, Estonia, France, the Netherlands and Slovakia. In Latvia the ban in the hospitality sector was tightened four years after its implementation. We also take account of the fact that the comprehensiveness of the bans differs across the countries and regions. For these particularities, we use the scores of the *Tobacco Control Scale* (TCS) (Joossens and Raw 2006, 2007, 2011) to qualify the bans. The TCS reflects the results of expert surveys regarding tobacco control activities in the European countries. We use the sum of the sub-scale scores for smoke-free policies in workplaces (max. ten points) and for the bans in the hospitality sector (max. eight points) and divide it by the maximum achievable scores to build an index [0,1] that reflects the comprehensiveness of the bans. In turn, our variable *smoking ban*$_{jt}$ takes the value of the index for country/region j at time t when a ban is introduced. For example, for Italy the variable smoking ban takes the value zero before November, 10, 2005, and the value 0.78 afterwards (with sub-scale scores of eight out of ten for the ban in workplaces and six out of eight for the ban in the hospitality sector). Table A.3 in the Appendix gives an overview about the introduction dates of the countries and regions in our sample together with the assigned scores from the TCS.

A precondition for the identification of smoking ban effects in a difference-in-differences framework is that the introduction of the bans did not occur simultaneously with other (health related) policies. An examination of the introduction processes in the countries reveals that only in England and Wales, the implementation of the ban was part of a health act governing different aspects of public health.[8] The exclusion of these regions from the sample does not lead to qualitatively different interpretations of the results in the empirical analysis though. However, other tobacco control policies might still be correlated with the implementation of bans and/or changes in cigarette taxes. Therefore we again make use of the TCS, that provides an evaluation of other tobacco control measures in European countries. We use the sub-scale scores for regulations regarding direct health warnings on cigarette packages (max. ten points), bans on advertising and promotion (max. thirteen points), and treatments that help dependent smokers stop smoking (max. ten points). For every country, we apply the sum of the sub-scale scores, provided for the years 2005, 2007 and 2010, as an overall tobacco control measure to control for the possible correlation with bans and cigarette prices.

[8]The examination is based on information from official documents of the European Commission and from a project of the International Legal Consortium that is part of the campaign for Tobacco-Free Kids (see www.tobaccocontrollaws.org).

Information on the tax structures of tobacco products and cigarette prices in European countries is provided at least once a year in the *Excise Duty Tables* from the European Commission (1990-2011b). From this data, we use the information on the overall excise tax as well as the price of cigarettes from the most popular price category (MPPC) per 1000 cigarettes in euros.[9] To make the prices comparable across countries, we adjust them for the country-specific price levels and report them in 2005 euros. The average real cigarette price (in 2005 euros) in the sample is 162.1 euros per 1000 cigarettes (or 3.42 euro per package of 20 cigarettes) with a standard deviation of 60.8. The associated average overall excise tax is 122.3 euros. In some countries, the tax constitutes up to 90 percent of the retail price. Figure A.1 provides an overview of the variation in the price and the overall excise tax on cigarettes across countries and over time. It is clearly visible that taxes are the main driver of cigarette prices.

4 Empirical Analysis

In the first part, we investigate the average effects of bans and cigarette prices on the reported life satisfaction in the population. In the second part, we study whether smokers and non-smokers are differentially affected by the policies. In the third part, we focus on smokers who tried to quit smoking in the recent past but relapsed. We explore how these people's life satisfaction is affected by the alternative tobacco policies. This sheds light on the relative effectiveness of collective self-binding mechanisms. The fourth part considers the robustness of the results.

4.1 Overall Effects of Smoking Bans and Cigarette Prices

With reported satisfaction with life as the dependent variable, we directly assess the consequences of smoking bans and cigarette prices for our proxy for individuals' welfare. To identify the effect of smoking bans, we exploit the staggered introduction of smoking bans across European countries and regions. The effect for cigarette prices is identified based on price variation within countries over time. Specifically, we estimate regression equations of the following form:

$$LS_{ijt} = \beta_0 + \beta_1 ban_{jt} + \beta_2 ln(price)_{jt} + \beta_3 X_i + \beta_4 Z_{jt} + \beta_5 D_j + \beta_6 D_t + \beta_7 (D_j * trend) + \varepsilon_{ijt} \quad (1)$$

The life satisfaction LS_{ijt} of individual i in country/region j at time t is regressed on an index variable ban_{jt} [0,1] that captures the manifestation of the policies in the specific country/region at the time of the survey. The second policy variable is $ln(price)_{jt}$ for the country-specific level of cigarette prices. As control variables, we include individual socio-demographic characteristics X_i; i.e., age, sex, level of education, marital status, number of children in the same household,

[9] For France, Latvia, Lithuania, Luxembourg, Poland and the UK, no MPPC cigarette prices are reported in 2011. Accordingly, no EB observations from these countries are included in 2011.

and the occupation of the respondent. The country-level control variables Z_{jt} consist of the real GDP per capita in logarithmic form, the rates of unemployment and inflation, the real state-specific tax on beer per degree of alcohol, and the indicator of other tobacco control measures, described in Section 3.3. In addition, we control for country-/region-specific effects D_j, survey wave-specific time effects D_t, and country-specific time trends D_j*$trend$. Standard errors are clustered at the country/region level to correct for serial and intraclass correlation across individuals of the same country/region. We apply sample weights provided in the EB data file throughout to reproduce the real number of cases for each country.

Table 1 presents the estimations for the overall effects of smoking bans and cigarette prices on life satisfaction based on OLS estimates.[10] Panel I shows that there is no systematic change of life satisfaction after countries or regions have introduced or extended smoking bans, ceteris paribus. For cigarette prices, we find a sizeable negative partial correlation with life satisfaction in Panel II that is not statistically significant though. The estimate indicates that a fifty-percent price increase (slightly more than one standard deviation vis-à-vis the mean) is associated with a decrease in the average level of satisfaction by 0.03 points on the four-point scale.

[Table 1 about here]

The separate evaluation of the two tobacco control policies might, however, be misleading if the policies are correlated and reflect different aspects of governments' activism in health prevention. Panel III takes this concern into account and includes the two main policy measures together. Further, variation in cigarette prices as well as the implementation of a ban might be correlated with legislatitors' and/or voters' sentiments regarding unhealthy behavior in general. To address this concern, we include the information on other concurrent tobacco control policies and on the tax on beer in each country as additional control variables in Panel IV. Both, the beer tax and other tobacco control policies, are not systematically related to subjective well-being. In Panel V, we add control variables that capture the macro-economic conditions in a country/region, i.e., GDP per capita, the rate of unemployment, and the rate of inflation. Smoking bans might be easier to introduce and enforce in a boom phase than when the economic climate is harsh.[11] Similarly, cigarette taxes might be less likely to be increased when economic conditions are bad and many smokers already experience economic strain. The results indicate that the correlations for smoking bans and cigarette prices are not driven by the state of the economy. The negative

[10] We apply OLS instead of ordered probit or ordered logit – which would take into account the ordinal nature of the dependent variable – because we include interaction terms later on, which makes the interpretation and comparison of effect sizes problematic with non-linear models (see, e.g. Ai and Norton 2003). However, the results from ordered probit estimations are qualitatively similar to the OLS estimates. Footnote 12 reports them for the estimation including all the control variables. Table A.4 reports the full regression outputs of the OLS specifications in Table 1.

[11] Gallet et al. (2006), for example, show that the probability of a U.S. state adopting smoking restrictions favorably depends on its per capita income.

effect of cigarette prices remains sizeable, but is still imprecisely measured. The effect of a fifty percent price increase in life satisfaction corresponds to an increase of the rate of unemployment by 2.4 percentage points.[12]

To investigate whether the overall effects are driven by observations from a single country, we perform a sensitivity analysis regarding the selection of samples. We repeatedly estimate the specification of Panel V, each time excluding observations from one of the countries from the sample.

[Figure 1 and 2 about here]

Figures 1 and 2 provide an overview of the estimated coefficients (and the 90% confidence intervals) for the variables smoking ban and cigarette prices, respectively. A visual test reveals that there are observations from some countries that seem to pull the coefficients in a specific direction. If observations from the UK are left out, a negative partial correlation between smoking bans and life satisfaction is estimated. In contrast, a larger positive partial correlation is estimated if France is excluded. However, these estimates are not significantly different from the coefficient that is estimated with the full sample. For cigarette prices a smaller negative correlation is estimated if observations from Portugal and the new German Laender are excluded. In contrast, the negative coefficient is slightly more than twice as big and becomes statistically significant at the 10% level if observations from Spain are dropped from the sample. An explanation might be that price increases in Spain started from one of the lowest price levels in Europe and affected consumers moderately. We do not consider Spain an outlier though, and keep the respective observations in our sample. If sensitivity checks excluding Spain are applied to all further specifications, the direction of the results is not affected. If anything, the effects get more pronounced and the level of statistical significance increases.

4.2 Differential Effects Depending on the Propensity to Smoke

Economic theory predicts different welfare consequences of anti-tobacco policies for smokers and non-smokers. Differential effects can, however, not be studied based on individuals' current smoking status. Non-smokers in a regime with smoking bans might well be smokers if this kind of restriction were not in place. Any observed effect for non-smokers would thus confound consequences for previous non-smokers and people who changed their status, and lead to a sample selection bias. Instead, we calculate for every individual in the sample the probability that he or she smokes given his or her individual characteristics. We call this probability the

[12] If we estimate the specification in Panel V with an ordered probit model, we get the following coefficients for the main variables ban_{jt}: β_1=0.005 (t-value=0.16) and $ln(price)_{jt}$: β_2=–0.087 (t-value=–1.17). They are thus very similar in relative size and statistical significance to the coefficients based on the OLS estimation.

propensity to smoke. Based on this information, we test for differential effects of the policies following the strategy of Gruber and Mullainathan (2005).

We first estimate the partial correlations for a large number of covariates of being a current smoker. We rely on an auxiliary data set drawn from the Eurobarometer. It consists of survey information from eight waves between 1990 and 2009. In this first step, all variables included in specification V in Table 1 above are taken into account as covariates of smoking. We estimate the model separately for males and females (equivalent to specifying a full interaction model). This allows for differences in the pattern of men's and women's smoking behavior. Table A.5 shows the respective results of the logistic regression models. The estimated correlations are in line with empirically established relationships between socio-economic characteristics and smoking behavior: high levels of education, being married, and not being unemployed are related to a lower probability of being a smoker for men as well as for women. GDP per capita is positively related to smoking prevalence, while for women the rate of unemployment is positively and the rate of inflation is negatively related with the status of being a smoker. The three variables capturing tobacco control policies are not systematically correlated with self-reported smoking behavior.

The estimated partial correlations are then used in a second step to calculate for every individual in the main data set a probability that he or she is a smoker based on his or her characteristics. The imputed propensity is denoted $p(smoke)_i$. Thereby, the propensity to smoke is calculated for the counterfactual situation with no smoking ban in place, and cigarette prices set to the lowest level in the time series of the respective country. Figure A.2 in the Appendix shows the distribution of the imputed probabilities of being a smoker in the main data set.[13]

The two-step approach allows us to directly study the differential hypotheses about the welfare consequences of smoking bans and cigarette prices for people with low and high propensities to smoke. The regression model is extended to the following form:

$$\begin{aligned} LS_{ijt} = \beta_0 + \beta_1 ban_{jt} + \beta_2 p(smoke)_i + \beta_3 ban_{jt} \times p(smoke)_i + \beta_4 ln(price)_{jt} + \\ \beta_5 ln(price)_{jt} \times p(smoke)_i + \beta_6 X_i + \beta_7 Z_{jt} + \beta_8 D_t + \beta_9 D_j + \beta_{10}(D_j * trend) + \varepsilon_{ijt} \end{aligned} \tag{2}$$

Technically, we include interaction terms between the variables for the tobacco control policies

[13] An idea of the predictive power of our specification based on within sample predictions is provided by Figure A.3 in the Appendix. Of the people for whom we predict the lowest smoking propensities (1^{st} quartile), 12.4 percent report that they smoke. At the other end, for people with the highest smoking propensities (4^{th} quartile), 52.3 percent of the respondents declare that they are current smokers. We also check the goodness-of-fit from a cross tabulation of observed and predicted outcomes. To classify whether an individual is a smoker, we define the threshold-value for the predicted propensity to smoke in a way that produces the same number of predicted smokers as there are actual smokers in the data set. Overall, we predict 71.1 percent of the cases correctly for females and 64.7 percent for males. The respective probabilities that we identify correctly an actual smoker (sensitivity) are 44.7 and 53 percent, while the fractions of correctly predicted non-smokers (specificity) are 80.4 for females and 71.8 percent for males.

and the variable capturing the estimated propensity to smoke. The main effect for smoking bans (or cigarette prices) then indicates the consequence of a ban (or a higher price) for people with a predicted probability to smoke of zero. The linear combination of the main effect plus the interaction effect indicates the consequence of a ban or a price increase for people with a predicted probability to smoke equal to one.

Table 2 reports the results for the extended specification. Based on Panel I, there is no systematic difference in the effect of smoking bans on the life satisfaction of people with low and high smoking propensities. In contrast, the effect of higher cigarette prices depends systematically on an individual's propensity to smoke. The life satisfaction of people with a predicted smoking propensity of zero is not statistically significantly affected by changes in cigarette prices. However, for people with a high propensity to smoke, higher cigarette prices are related to systematically lower levels of subjective well-being. Note that for the net effect of higher cigarette prices on likely smokers, the coefficients for the main effect and for the interaction term have to be combined. In Panel II, the linear combination of the two variables is reported. For a propensity of one, a fifty percent price increase amounts to a reduction in life satisfaction of 0.09 points (i.e., $\ln(1.5)\times$ (0.026 + -0.247)). This partial correlation holds, ceteris paribus, for an individual's propensity to smoke. The latter is, on average, negatively correlated with reported satisfaction with life. As the variable for cigarette prices is mean adjusted, the coefficient of -0.27 for the propensity to smoke indicates that for average cigarette prices, people with a propensity to smoke equal to one report, on average, a 0.27 points lower satisfaction with life than people with a propensity equal to zero.

[Table 2 about here]

The negative effect of higher cigarette prices for people with a high propensity to smoke is the exact opposite of the prominent previous finding in Gruber and Mullainathan (2005).[14] A possible explanation for the different results might be an omitted variable bias in the specification used by Gruber and Mullainathan. They do not control for the prevalence of smoking bans and other tobacco control policies that might be positively correlated with tobacco taxes.

In Panel III, we report the results of a more flexible form of the interaction between the propensity to smoke and the two tobacco control policies than in Panel I where a linear relationship is imposed. We assign each observation based on the smoke propensity in ascending order to one of four quartiles and include interaction terms with the variables smoking ban and cigarette prices. This allows us to estimate a separate level effect or slope coefficient for every quartile

[14]This also holds when we estimate the effect of cigarette prices on the probability that people report not being at all satisfied with their life; i.e., the lowest category on the subjective well-being scale. The respective coefficient for the main effect is 0.015 (t-value=1.34), and for the interaction effect, it is 0.014 (t-value=1.20). The linear combination of the two coefficients that shows the net effect for likely smokers amounts to 0.028 (t-value=2.22)

of the propensity to smoke. The results indicate that people with a higher propensity to smoke fare better than people in the lowest quartile when a smoking ban is introduced. However, the effects for all quartiles reported in Panel III and Panel IV are small and statistically not significantly different from zero. For cigarette prices, the negative effect increases monotonically with ascending propensity to smoke. For the top quartile, the linear combination results in a statistically significant negative partial correlation of -0.091. For a fifty percent price increase, this implies a reduction of reported satisfaction with life of 0.04 points.

In sum, the analysis for people with different propensities to smoke does not reveal statistically significant differential effects of smoking bans. In contrast, the weak overall negative effect of higher cigarette prices on life satisfaction of Table 1 is driven by the negative well-being consequences for the people with the highest smoking prevalence.

4.3 Smoking Bans as a Potential Self-Control Device

Whether tobacco control policies might serve as a self-control device for smokers is difficult to assess even with data on subjective well-being. The effect of smoking bans turned out not to be statistically significantly positive for likely smokers in Section 4.2, and higher cigarette prices are even sizeably negatively correlated with the life satisfaction of people in this group. However, these results reflect average effects over all likely smokers. The prediction of a beneficial effect of restrictions does apply to people with limited willpower though. In order to test the predictions from behavioral economics, we analyze whether likely smokers who recently tried but failed to quit smoking, are affected differently as a result of anti-smoking policies than smokers who have not recently tried to stop smoking. We interpret a relapse as an indication of limited willpower. This setting allows us to explore not only whether likely "wannabe quitters" are affected differently, but also whether the effects differ between smoking bans and cigarette prices, as suggested by models of cue-triggered decision making.

Information on people's attempts to cease smoking is from EB surveys in 2006 and 2009. In these surveys, current smokers are asked whether they tried to give up smoking within the last twelve month. Individuals who tried to give up smoking but failed potentially suffer from self-control problems the most. We choose a neutral term and refer to them as *marginal smokers*.

We categorize every individual as either being a current smoker with no recent attempt to quit, a non-smoker or a marginal smoker. In our data, about 30 percent of all the smokers are such marginal smokers. We again apply a two-step approach to impute propensities for being a non-smoker, a current smoker or a marginal smoker in our main dataset. In a first step, we estimate a multinomial logit model that we use in a second step to predict the respective propensities.[15]

[15]The estimation results of the multinomial logit model are reported in Table A.6. Figure A.4 in the Appendix shows the distribution of the predicted propensities to be a non-smoker, a smoker or a marginal smoker.

Every individual has probability values for all the three possible statuses that sum up to one. Their propensities thus show the relative likelihood of being either a non-smoker, a smoker or a marginal smoker. Again we use these propensities to estimate differential effects of smoking bans and cigarette prices on people's life satisfaction.

Table 3 presents the results. Panel I shows the estimated coefficients for simple interaction terms of the tobacco control policies with the particular propensities, and Panel II reports the respective marginal effects and values for the linear combinations. The estimated effects suggest, first, that smoking bans do not affect non-smokers, reduce the life satisfaction of people who are likely smokers (and who have not recently tried to cease smoking), but substantially increase the life satisfaction of marginal smokers, and, second, that higher cigarette prices do also not affect non-smokers but reduce the life satisfaction of likely smokers, and particularly of marginal smokers. However, this interpretation has to be treated with caution as the marginal effects and the values for the linear combinations refer to out of sample predictions, i.e., they indicate the effect for a propensity of one for a particular status, while being zero for the other two statuses. These combinations do not occur in the data.

[Table 3 about here]

In order to attain meaningful values for the policy effects on subjective well-being, we define separate groups of people who are characterized by large propensities in one of the three dimensions. This approach also overcomes the linearity assumption in specifications with simple interaction terms. For the specification in Panel III, we determine the people who are in the top quartile with regard to their propensity to smoke, to be a marginal smoker and to be a non-smoker. As we try to identify those people in each country who are most likely to suffer from reduced willpower when it comes to smoking, we build the quartiles separately for every country. The remaining individuals are in the category *others*. As there is a partial overlap between the top quartiles of smokers and marginal smokers, the respective individuals are assigned a separate group (q4(smoker + marginal)). Based on this grouping, interaction terms with the tobacco control policies are included in the estimation, whereby the top quartile of non-smokers is left out and forms the reference group.

The estimation results in Panel III and the reported marginal effects and values for the linear combinations in Panel IV reveal systematic differences in how the groups are affected by smoking bans and cigarette prices. For people in the reference group (i.e., likely non-smokers) a negative correlation between the introduction of a smoking ban and subjective well-being is measured. The life satisfaction of likely smokers (who have not recently tried to cease smoking) is not correlated with the introduction of a smoking ban. There is, however, a significant difference for smokers who have recently tried to give up smoking. The introduction of a smoking ban is related to a statistically significant 0.08 points increase in their reported satisfaction with life.

Differential effects are also observed for cigarette prices. While smokers as well as marginal smokers are similarly negatively affected by higher cigarette prices, the largest negative effect that is also most precisely estimated is found for people who simultaneously belong to the top quartiles of the propensity to be smoker and marginal smoker. For likely non-smokers, higher cigarette prices are not correlated with their life satisfaction. These results suggest that the negative effect of higher prices on smokers' well-being also holds for smokers with limited willpower, while this latter group is positively affected by smoking bans.

4.4 Robustness Analysis

Before we further interpret the findings, we investigate the robustness of the results reported in Table 3. In particular, we address the possibility that the heterogeneity in the effects of tobacco policies on people with different smoking statuses picks up differential trends in these people's well-being. There is, however, no simple test to exclude this alternative explanation, as there might well be substantive lead effects to smoking bans. People might react once the bans are announced. But more importantly, any mandated smoking restriction might be implemented in firms ahead of time.

To approach the issue, we first include lead terms for the particular top quartiles that are equal to the smoking ban variable for the year before the introduction of the ban and zero otherwise. We present the result of this strategy in Table 4. Panel I and Panel II with the respective marginal effects and linear combinations show that particularly likely non-smokers, who again form the reference group, have a lower satisfaction level already in the year before the bans are introduced. This indicates either that there exist substantial lead effects for non-smokers and partly also for likely smokers or that the negative main effect reflects some underlying group-specific trend. Relative to non-smokers, marginal smokers, however, experience an increase in subjective well-being with smoking bans. The respective marginal effect is 0.075 (t-value=2.59), while it amounts to 0.024 (t-value=0.83) during the lead phase.

[Table 4 about here]

Second, to control for potential underlying group-specific trends, we allow for a flexible development of life satisfaction over time for the differentiated groups by including country-specific time trends for all of them. The results of this flexible specification in the Panels III and IV suggest that the negative effect of smoking bans for non-smokers and likely smokers in Panel II is a statistical artifact. In contrast, the size of the well-being gain of marginal smokers remains considerable. The interaction term which captures the increase in the life satisfaction of marginal smokers relative to non-smokers amounts to 0.052 (t-value=1.31); the linear combination reflecting the absolute increase relative to the reference period (more than one year before

the introduction of a smoking ban) is 0.039 (t-value=0.94); and the effect size relative to the life satisfaction of marginal smokers during the lead phase is estimated to be 0.061 (t-value=1.96). The latter effect is even bigger than the respective difference according to Panel II. The differential results for cigarette prices across people of alternative smoking statuses remain similar to the results in Table 3.

In Table 5 we pursue three additional strategies to address the potential influence of underlying trends. First, we capture short-term effects by restricting the sample to observations within a fixed time window around the country specific implementation date of the ban. Panel I shows a specification where we use only those observations in a country or region that are surveyed within three years before or after the implementation and Panel II presents the respective marginal effects and linear combinations. Comparable to the results in Table 4, we observe a net effect for marginal smokers of 0.045 (t-value=1.67) when a ban is introduced. For the reduced sample, effects similar to Tables 3 and 4 are also estimated for cigarette prices.[16]

[Table 5 about here]

Second, any underlying trend for the different groups might also be driven by differential exposure to macro-economic conditions. The specifications in Panels III and IV take this concern into account. For every group different partial correlations with the macro-economic variables as well as the other tobacco control policies and the beer taxes are considered by including interaction terms. Again a positive differential effect for marginal smokers is estimated. The respective interaction term is 0.112 (t-value= 4.25), amounting to a total effect of 0.078 (t-value=3.18).

Third, in our most flexible specification, we allow a specific level-effect for observations from any country/region in a particular survey wave, i.e., we include country/region x wave specific fixed effects. The focus is thus on the change in the difference between smokers or marginal smokers vis-à-vis non-smokers when smoking bans are introduced. This is the same triple difference reported as marginal effects before. Due to the flexible specification, however, the main effect for the variable smoking ban can no longer be identified. This exercise produces a marginal effect of the ban for marginal smokers of 0.105 (t-value=3.92), i.e., any difference between marginal smokers and non-smokers increases in favor of the marginal smokers by 0.105 units on the four point life satisfaction scale if a smoking ban is introduced. As for the previous robustness checks, the differential effects for cigarette prices across groups remain very similar to the baseline findings in Table 3.

In sum, we interpret the results as evidence that smoking bans can serve as a self-control device for individuals with limited willpower, while cigarette prices seem not useful for this purpose. In

[16]When we vary the range of included observations between one and ten years before and after the ban, the biggest net effect for marginal smokers amounts to 0.080 (t-value=2.45, one year before and after the ban), while the smallest effect is 0.028 (t-value=0.98, five years before and after the ban).

turn, this supports models building on cue-triggered decision-making processes, as they predict that smoking bans, but not cigarette taxes, help to reduce overconsumption for given levels of addiction.

5 Conclusions

The public health debate on tobacco consumption is highly controversial. Some policy briefs are oriented towards solving an intervention problem to reduce smoking no matter what the cost. Other voices see recent developments in anti-smoking policy as modern witch-hunts and plea for the freedom of consumers. Inherently, it is difficult to assess whether someone who smokes less or gives up smoking because of some policy intervention is made better or worse off. Recent developments in the economic analysis of people's subjective well-being offer new opportunities to explore the effects of policies on people's welfare.

We assess the welfare consequences of tobacco control policies by analyzing information on individuals' satisfaction with life for more than half a million people in Europe. Thereby, we concentrate on the introduction of smoking bans in the workplace and in the hospitality sector as well as on differences in cigarette prices that reflect variation in tobacco excise taxes to a large extent. We investigate 40 interventions that were implemented across European countries and regions, and apply an empirical strategy that concentrates on the variation of reported life satisfaction around a country-specific time trend to identify potential policy effects.

Based on policy implementations spanning the last twenty years in Europe, we find that smoking bans, on average, neither increase nor decrease people's subjective well-being to a sizable and statistically significant degree. Higher cigarette prices are related to overall lower reported levels of satisfaction with life, ceteris paribus. The partial correlation is, however, measured with a large standard error. Still, the effect is economically meaningful (and corroborated by our differential analysis for people with different smoking propensities). For a fifty percent price increase, we estimate a reduction in average life satisfaction of 0.02 points (on a four point scale). This is about one tenth of the effect of being unemployed rather than employed or equivalent to the effect of a 2.4 percentage points higher rate of unemployment on the population at large. This finding does not lend support to the effectiveness of cigarette taxes as an internalization strategy. Higher cigarette prices at least have overall negative short-term effects. When assessing the attractiveness of excise taxes as instruments of welfare policy, these short-term costs should be taken into account and balanced against any potential long-term effects that positively affect average subjective well-being. The traditional argument is that due to the price elasticity of smoking and the social multipliers involved in smoking behavior (see, e.g., Christakis and Fowler, 2008), people smoke less with higher taxes, which in turn lead to a generally healthier population in the long-run.

We further find that the negative effects of higher cigarette prices are concentrated on smokers. Non-smokers neither benefit nor suffer in terms of subjective well-being. This finding highlights the distributional consequences of tobacco taxation, as smoking is much more prevalent in poorer socio-economic groups. Tobacco taxation thus has a regressive component. In fact, the large negative effects of higher prices might well reflect income effects to some extent. For example, in our sample, the average real price per package of cigarettes in the most popular price class amounts to 3.45 euros in 2005, whereof total taxes are 75 percent. In comparison, in 2005 the average legal real minimum wage per hour is about five euros in the same set of countries. For low income households, consumption expenditure on cigarettes therefore potentially erodes a substantial part of their budget.

Additionally, smoking bans turn out to be beneficial to smokers who would like to stop smoking (or not start again). For those smokers who are most likely to find themselves in a situation where they have recently tried to give up smoking but have relapsed, life satisfaction increases between 0.03 to 0.08 points with smoking bans (depending on the specification). This is evidence that supports the idea that smoking bans can serve as a self-control device. Interestingly, the same group of people does not benefit from higher cigarette prices. Rather to the contrary, these people seem to suffer to the same extend as other smokers do who have not recently tried to stop in response to higher prices. The negative effect of higher cigarette prices on smokers, particularly those who are likely to have self-control problems, runs counter to the prominent finding by Gruber and Mullainathan (2005) for the United States where positive effects of higher cigarette taxes on the well-being of smokers are identified.

The differential effects of alternative tobacco control policies on people who are likely to suffer from limited willpower lend some smoking gun evidence in support of behavioral economic models of cue-triggered decision-making (Bernheim and Rangel 2004). These models emphasize the importance of situational cues and temptations and the limited effectiveness of prices as a self-control device when consumers are in a "hot" state.

We advocate the emerging research that integrates the analysis of peoples reported subjective well-being in policy evaluation. This is particularly important with regard to policies that aim to internalize social costs or to help people make better decisions, what often is denoted as paternalistic. Complementary insights are possible when studying direct measures of individual welfare.

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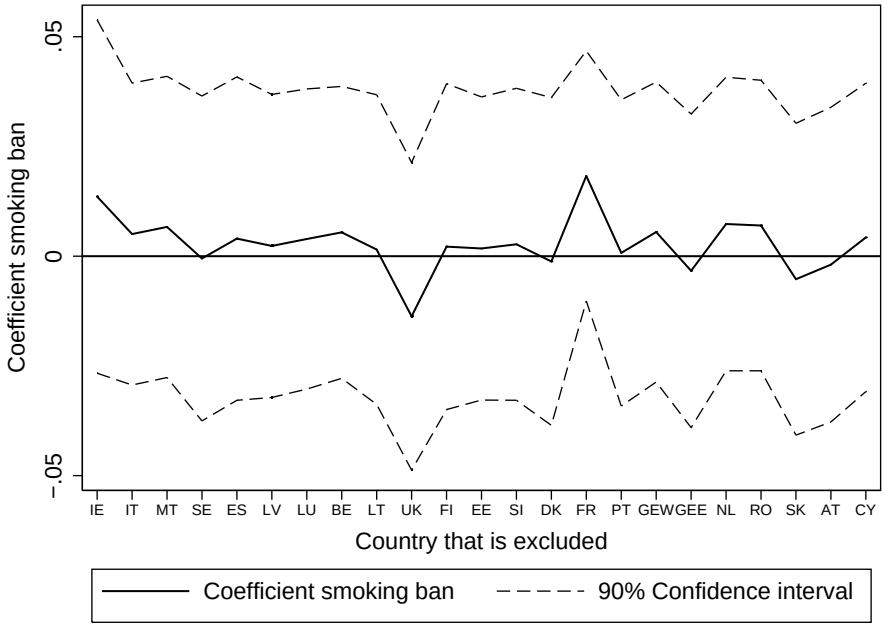
Table 1: Smoking bans, cigarette prices and life satisfaction in 40 European countries and regions, 1990-2011

Dependent variable: Life satisfaction					
	I	II	III	IV	V
Smoking ban	0.006		0.001	0.005	0.002
	(0.37)		(0.07)	(0.25)	(0.12)
ln(cigarette price)		–0.083	–0.082	–0.069	–0.054
		(–1.38)	(–1.37)	(–1.32)	(–1.19)
Other tobacco policies				–0.000	0.002
				(–0.02)	(0.31)
ln(beer tax)				–0.025	–0.008
				(–0.71)	(–0.20)
ln(GDP per capita)					–0.043
					(–0.19)
Unemployment rate					–0.009*
					(–1.79)
Inflation rate					–0.001
					(–0.32)
Individual characteristics	Yes	Yes	Yes	Yes	Yes
Country/region FE	Yes	Yes	Yes	Yes	Yes
Survey wave FE	Yes	Yes	Yes	Yes	Yes
Country-spec. time trends	Yes	Yes	Yes	Yes	Yes
No. of observations	629,930	629,930	629,930	629,930	629,930
No. of clusters	40	40	40	40	40
R^2	0.21	0.21	0.21	0.21	0.22

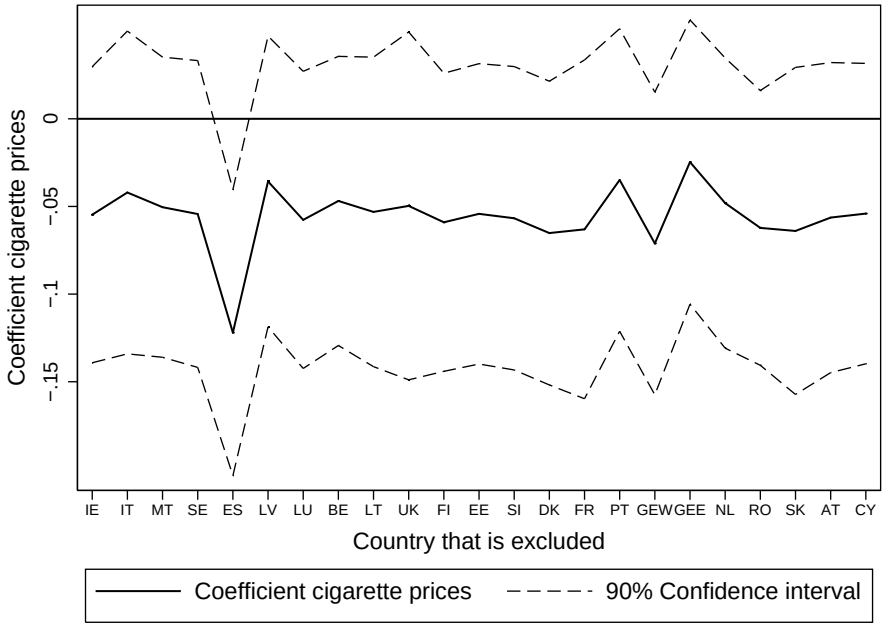
Notes: OLS estimations. T-values in parentheses. Standard errors are clustered on the country/region level.
Significance levels: * $.05 < p < .1$, ** $.01 < p < .05$, *** $< .01$.

Figure 1: Average effects of smoking bans on life satisfaction: sensitivity to the exclusion of single countries



Notes: Based on repeated estimations of specification V in Table 1. GEW and GEE stand for Germany West and Germany East, respectively. The order of the labeled countries corresponds to the sequence of the introduction of smoking bans.

Figure 2: Average effects of cigarette prices on life satisfaction: sensitivity to the exclusion of single countries



Notes: Based on repeated estimations of specification V in Table 1. GEW and GEE stand for Germany West and Germany East, respectively. The order of the labeled countries corresponds to the sequence of the introduction of smoking bans.

Table 2: Differential effects with regard to individuals' propensity to smoke

Dependent variable: Life satisfaction				
	I	II ME/LC[a]	III	IV ME/LC[a]
Smoking ban	–0.012	–0.012	–0.015	–0.015
	(–0.46)	(–0.46)	(–0.65)	(–0.65)
Ban x p(smoker)	0.040	0.029		
	(0.65)	(0.60)		
q2(smoker) x ban			0.015	0.001
			(1.01)	(0.03)
q3(smoker) x ban			0.029	0.014
			(1.56)	(0.72)
q4(smoker) x ban			0.018	0.004
			(0.73)	(0.15)
ln(cigarette prices)	0.026	0.026	0.012	0.012
	(0.70)	(0.70)	(0.31)	(0.31)
Price x p(smoker)	–0.247***	–0.221**		
	(–3.44)	(–2.62)		
q2(smoker) x price			–0.051**	–0.039
			(–2.66)	(–0.89)
q3(smoker) x price			–0.095***	–0.083
			(–3.21)	(–1.55)
q4(smoker) x price			–0.103***	–0.091*
			(–3.52)	(–1.76)
p(smoker)	–0.265***	–0.265***		
	(–4.65)	(–4.65)		
q2(smoker)			–0.010	–0.010
			(–1.15)	(–1.15)
q3(smoker)			–0.033***	–0.033***
			(–2.98)	(–2.98)
q4(smoker)			–0.070***	–0.070***
			(–5.45)	(–5.45)
No. of observations	629,930	629,930	629,930	629,930
No. of clusters	40	40	40	40
R^2	0.22	0.22	0.22	0.22

Notes: OLS estimations. T-values in parentheses. Standard errors are clustered on the country/region level. All regressions control for individual characteristics, macroeconomic variables, other tobacco control measures, beer tax, country/region and survey wave fixed effects and country-specific time trends. ln(cigarette price) is mean adjusted.

[a)] Marginal effects (ME) for main effects. Linear combinations (LC) of main (policy) effect with interaction effects of interaction terms.

Significance levels: * $.05 < p < .1$, ** $.01 < p < .05$, *** $< .01$.

Table 3: Differential effects on smokers who want to quit smoking (marginal smokers)

Dependent variable: Life satisfaction				
	I	II ME/LC[a]	III	IV ME/LC[a]
Smoking ban[b]	–0.003	–0.003	–0.035	–0.035
	(–0.12)	(–0.12)	(–1.57)	(–1.57)
Ban x p(smoker[c])	–0.241***	–0.244***		
	(–3.40)	(–3.64)		
Ban x p(marginal smoker[c])	0.548***	0.546***		
	(3.53)	(3.78)		
q4(smoker) x ban			0.044*	0.009
			(1.89)	(0.43)
q4(marginal smoker) x ban			0.115***	0.080***
			(4.41)	(2.91)
q4(smoker + marginal) x ban			0.040	0.005
			(1.57)	(0.22)
other x ban			0.044***	0.009
			(2.93)	(0.48)
ln(cigarette prices)	0.015	0.015	0.022	0.022
	(0.36)	(0.36)	(0.60)	(0.60)
Price x p(smoker)	–0.109	–0.094		
	(–1.35)	(–1.35)		
Price x p(marginal smoker)	–0.375**	–0.360**		
	(–2.20)	(–1.86)		
q4(smoker) x price			–0.097***	–0.075*
			(–4.35)	(–1.82)
q4(marginal smoker) x price			–0.097**	–0.076
			(–2.18)	(–1.16)
q4(smoker + marginal) x price			–0.126***	–0.105**
			(–4.69)	(–2.24)
other x price			–0.078***	–0.057
			(–3.16)	(–1.17)
No. of observations	629,930	629,930	629,930	629,930
No. of clusters	40	40	40	40
R^2	0.22	0.22	0.22	0.22

Notes: OLS estimations. T-values in parentheses. Standard errors are clustered on the country/region level. All regressions control for individual characteristics, macroeconomic variables, other tobacco control measures, beer tax, country/region and survey wave fixed effects and country-specific time trends. ln(cigarette price) is mean adjusted. All specifications also include the main effects for smokers, non-smokers and marginal smokers.

[a)] Marginal effects (ME) for main effects. Linear combinations (LC) of main (policy) effect with interaction effects of interaction terms.

[b)] The reference category refers to people with a high propensity to be non-smokers (top quartile).

[c)] Propensity to be a smoker is for smokers who have not tried to quit smoking, while the propensity to be a marginal smoker refers to smokers who tried to stop smoking.

Significance levels: * $.05 < p < .1$, ** $.01 < p < .05$, *** $< .01$.

Table 4: Differential effects on marginal smokers: robustness checks for lead effects and group-specific time trends

Dependent variable: Life satisfaction				
	I	II ME/LC[a]	III	IV ME/LC[a]
Smoking ban[b]	–0.045*	–0.045*	–0.013	–0.013
	(–1.81)	(–1.81)	(–0.60)	(–0.60)
q4(smoker[c]) x ban	0.045*	0.000	0.001	–0.012
	(1.90)	(0.02)	(0.03)	(–0.40)
q4(marginal smoker[c]) x ban	0.120***	0.075**	0.052	0.039
	(4.48)	(2.59)	(1.31)	(0.94)
q4(smoker + marginal) x ban	0.044	–0.001	0.016	0.003
	(1.60)	(–0.05)	(0.89)	(0.12)
Other x ban	0.050***	0.005	0.003	–0.010
	(3.20)	(0.23)	(0.15)	(–0.53)
Lead ban	–0.047**	–0.047**	–0.022	–0.022
	(–2.64)	(–2.64)	(–1.46)	(–1.46)
Lead q4(smoker) x ban	0.017	–0.030*	–0.000	–0.022
	(0.78)	(–1.85)	(–0.01)	(–1.29)
Lead q4(marginal smoker)	0.071**	0.024	0.001	–0.021
x ban	(2.07)	(0.83)	(0.02)	(–0.79)
Lead q4(smoker + marginal)	0.038	–0.009	0.008	–0.014
x ban	(1.39)	(–0.41)	(0.33)	(–0.59)
Lead other x ban	0.057***	0.011	0.021	–0.001
	(3.70)	(0.64)	(1.52)	(–0.06)
ln(cigarette prices)	0.020	0.020	–0.020	–0.020
	(0.55)	(0.55)	(–0.62)	(–0.62)
q4(smoker) x price	–0.098***	–0.077*	–0.037	–0.057
	(–4.38)	(–1.84)	(–1.27)	(–1.32)
q4(marginal smoker) x price	–0.099**	–0.079	–0.045	–0.065
	(–2.23)	(–1.20)	(–1.07)	(–1.12)
q4(smoker + marginal) x price	–0.128***	–0.107**	–0.113***	–0.133**
	(–4.69)	(–2.28)	(–2.81)	(–2.30)
Other x price	–0.080***	–0.060	–0.033	–0.053
	(–3.26)	(–1.23)	(–1.05)	(–1.03)
q4(smoking statuses) x country-spec. time trends	No	No	Yes	Yes
No. of observations	629,930	629,930	629,930	629,930
No. of clusters	40	40	40	40
R^2	0.22	0.22	0.22	0.22

Notes: OLS estimations. T-values in parentheses. Standard errors are clustered on the country/region level. All regressions control for individual characteristics, macroeconomic variables, other tobacco control measures, beer tax, country/region and survey wave fixed effects and country-specific time trends. ln(cigarette price) is mean adjusted. All specifications also include the main effects for smokers, non-smokers and marginal smokers.

[a)] Marginal effects (ME) for main effects. Linear combinations (LC) of main (policy) effect with interaction effects of interaction terms.

[b)] The reference category refers to people with a high propensity to be non-smokers (top quartile).

[c)] Propensity to be a smoker is for smokers who have not tried to quit smoking, while the propensity to be a marginal smoker refers to smokers who tried to stop smoking.

Significance levels: * $.05 < p < .1$, ** $.01 < p < .05$, *** $< .01$.

Table 5: Differential effects on marginal smokers: further robustness checks

Dependent variable: Life satisfaction					
	I	II ME/LC[a]	III	IV ME/LC[a]	V
Smoking ban[b]	0.026	0.026	–0.034	–0.034	
	(1.11)	(1.11)	(–1.55)	(–1.55)	
q4(smoker[c]) x ban	0.009	0.035	0.044**	0.010	0.037
	(0.28)	(1.18)	(2.08)	(0.51)	(1.59)
q4(marginal smoker[c]) x ban	0.019	0.045	0.112***	0.078***	0.105***
	(0.55)	(1.67)	(4.25)	(3.18)	(3.92)
q4(smoker + marginal) x ban	–0.020	0.007	0.044*	0.010	0.034
	(–0.64)	(0.25)	(1.70)	(0.40)	(1.32)
Other x ban	–0.014	–0.012	0.042***	0.008	0.041***
	(–0.72)	(–0.66)	(2.75)	(0.46)	(2.80)
ln(cigarette prices)	0.018	0.018	–0.009	–0.009	
	(0.36)	(0.36)	(–0.21)	(–0.21)	
q4(smoker) x price	–0.092**	–0.074	–0.049*	–0.059	–0.087***
	(–2.69)	(–1.55)	(–1.91)	(–0.29)	(–3.69)
q4(marginal smoker) x price	–0.159***	–0.141***	–0.051	–0.060	–0.114**
	(–7.17)	(–3.04)	(–1.48)	(–1.09)	(–2.34)
q4(smoker + marginal) x price	–0.115***	–0.097**	–0.110***	–0.119**	–0.117***
	(–4.11)	(–2.59)	(–3.11)	(–2.70)	(–4.42)
Other x price	–0.093***	–0.075*	–0.038	–0.047	–0.072***
	(–4.91)	(–1.80)	(–1.48)	(–0.94)	(–2.82)
Sample reduced to 3 years before & after ban intro	Yes	Yes	No	No	No
q4(smoking statuses) x macroeconomic variables	No	No	Yes	Yes	No
Fixed effects: country/region x survey wave	No	No	No	No	Yes
No. of observations	271,188	271,188	629,930	629,930	629,930
No. of clusters	40	40	40	40	40
R^2	0.26	0.26	0.22	0.22	0.22

Notes: OLS estimations. T-values in parentheses. Standard errors are clustered on the country/region level. All regressions control for individual characteristics, macroeconomic variables, other tobacco control measures and for the beer tax. ln(cigarette price) is mean adjusted. All specifications also include the main effects for smokers, non-smokers and marginal smokers.

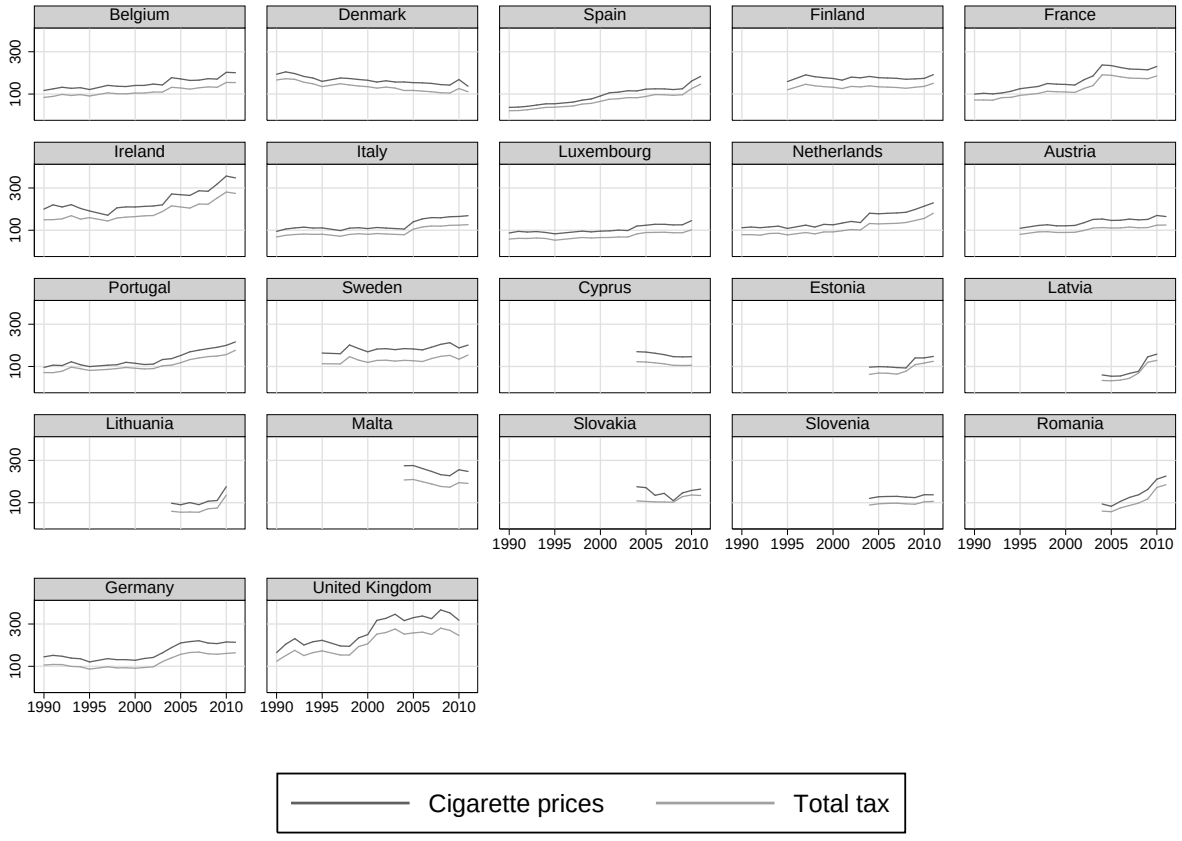
[a)] Marginal effects (ME) for main effects. Linear combinations (LC) of main (policy) effect with interaction effects of interaction terms.

[b)] The reference category refers to people with a high propensity to be non-smokers (top quartile).

[c)] Propensity to be a smoker is for smokers who have not tried to quit smoking, while the propensity to be a marginal smoker refers to smokers who tried to stop smoking.

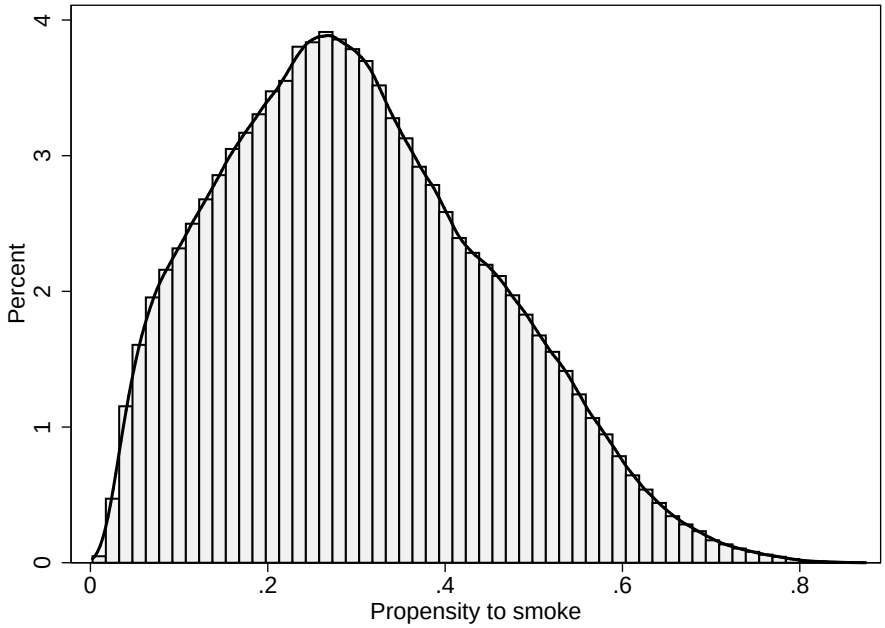
Significance levels: * $.05 < p < .1$, ** $.01 < p < .05$, *** $< .01$.

Figure A.1: Real cigarette prices and real cigarette taxes (in 2005 Euros) per 1000 cigarettes



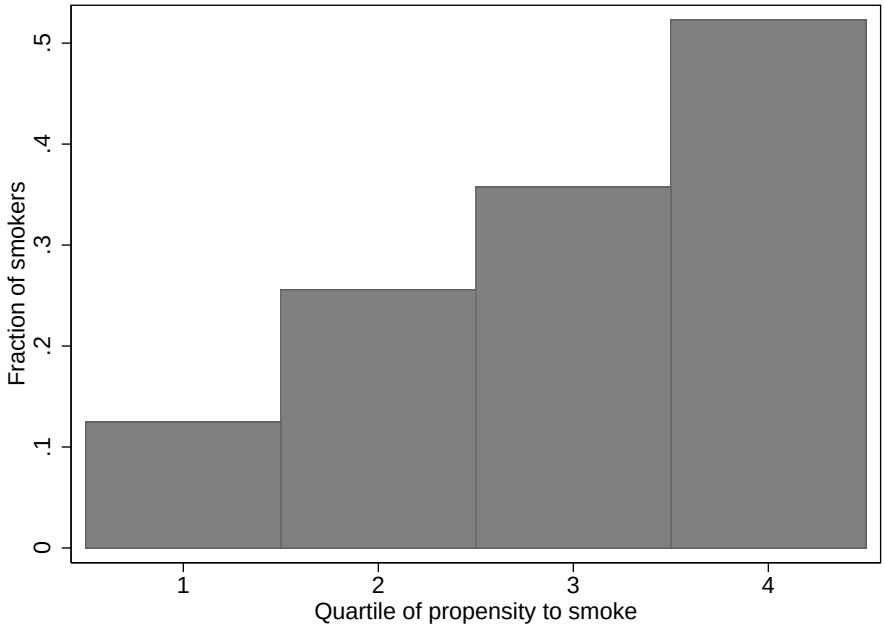
Source: Own calculations based on the *Excise Duty Tables* provided by the European Commission (1990-2011a) and on the country-specific price level (source: see Table A.2)

Figure A.2: Distribution of predicted propensities to smoke



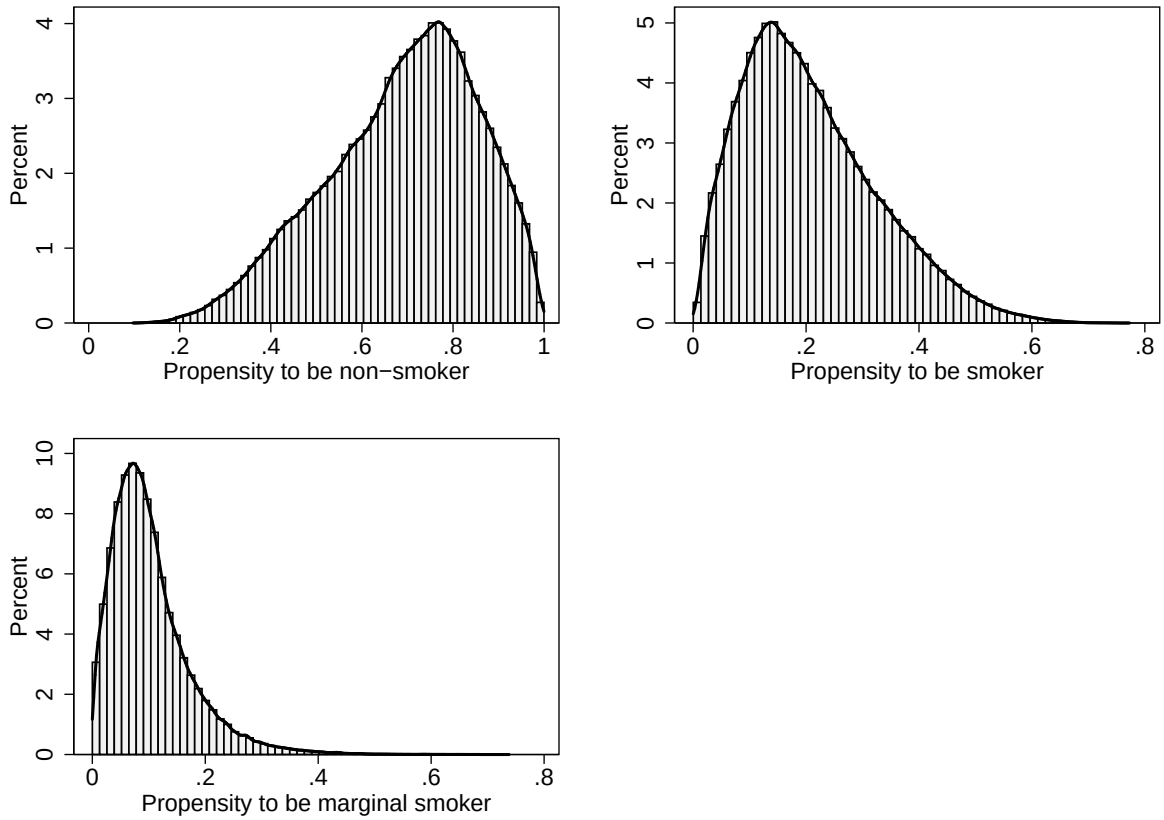
Note: Distribution is for the sample of people studied in Table 2.

Figure A.3: Actual smoking behavior for people with different smoking propensities



Note: Mean values per quartile are based on within sample predictions of 126,264 observations.

Figure A.4: Distribution of predicted propensities to be non-smoker, smoker and marginal smoker



Note: Distributions are for the sample of people studied in Table 3.

Table A.1: Descriptive statistics

	Mean	Std. dev.	Min.	Max.
Individual level				
Life satisfaction	3.048	0.742	1.000	4.000
Age	45.892	18.218	15.000	99.000
Female	0.535	0.499	0.000	1.000
Education up to age 17	0.252	0.434	0.000	1.000
Education up to age 18-21	0.394	0.489	0.000	1.000
Education up to age 22 and more	0.262	0.440	0.000	1.000
Student	0.092	0.289	0.000	1.000
No fulltime education	0.003	0.055	0.000	1.000
Married	0.529	0.499	0.000	1.000
Single with partner	0.081	0.272	0.000	1.000
Single	0.218	0.413	0.000	1.000
Divorced	0.072	0.259	0.000	1.000
Widowed	0.090	0.287	0.000	1.000
Other	0.009	0.095	0.000	1.000
No child in HH under age 15	0.605	0.489	0.000	1.000
One child in HH under age 15	0.131	0.337	0.000	1.000
Two children in HH under age 15	0.093	0.290	0.000	1.000
Three children in HH under age 15	0.026	0.159	0.000	1.000
Four children in HH under age 15	0.009	0.094	0.000	1.000
No info about children in HH	0.137	0.344	0.000	1.000
Working	0.497	0.500	0.000	1.000
Unemployed	0.064	0.244	0.000	1.000
Out of labour force	0.439	0.496	0.000	1.000
Country level				
Smoking ban	0.200	0.311	0.000	1.000
Cigarette prices	162.123	60.843	36.700	366.919
ln(cigarette prices)	5.018	0.384	3.603	5.905
Beer tax	3.051	2.934	0.279	14.784
ln(beer tax)	0.732	0.859	–1.276	2.694
Other tobacco policies	20.678	4.996	8.000	27.000
GDP per capita	23670.544	7241.468	7787.305	65864.922
ln(GDP per capita)	10.028	0.303	8.960	11.095
Unemployment rate	8.200	3.827	1.600	21.600
Inflation rate	2.880	2.247	–1.700	15.300
No. of observations	629,930			

Data Sources: Individual-level data is from Eurobarometer Survey Series. HH stands for household. For country level data see Table A.2.

Table A.2: Data sources

Individual level data from Eurobarometer

Cumulated data from the Mannheim Trend File are extended by individual survey waves up to 2011 and variables are coded accordingly. Additional surveys included: 60.1; 62.0; 62.2; 63.4; 64.2; 65.2; 66.1; 67.2; 68.1; 69.2; 70.1; 71.1; 71.2; 71.3; 73.4; 74.2; 75.3.

Smoking behavior
- Surveys: 34.1; 38.0; 41.0; 43.0; 58.2; 64.1; 66.2; 72.3.
- Question and answers: Which of the following applies to yourself? 1. You smoke manufactured cigarettes; 2. You smoke roll-your-own cigarettes; 3. You smoke cigars or a pipe; 4. You used to smoke but you have stopped; 5. You have never smoked.

Attempts to quit smoking
- Surveys: 66.2; 72.3.
- Question and answers: Have you tried to give up smoking in the last 12 months (only current smokers)? 1. Yes, once; 2. Yes, between 2 and 5 times; 3. Yes, more than 5 times; 4. No.

Country level data

Gross domestic product
- Eurostat: epp.eurostat.ec.europa.eu (data file nama_aux_gph)
- World Bank: data.worldbank.org (for Ireland and Portugal)

Unemployment rate
- Eurostat: epp.eurostat.ec.europa.eu (data file une_rt_a)
- German Federal Employment Agency: statistik.arbeitsagentur.de (for German Laender)
- Welsh Government: statswales.wales.gov.uk (for UK regions)

Inflation rate
- Eurostat: epp.eurostat.ec.europa.eu (data file prc_hicp_aind)
- OECD: stats.oecd.org (for 1990 and Sweden)
- European Central Bank: sdw.ecb.europa.eu (for EU-27)

Price level index
- Eurostat: epp.eurostat.ec.europa.eu (data file prc_ppp_indn)
- OECD: stats.oecd.org (for 1990-1994)

Table A.3: Introduction dates of public smoking bans in 40 European countries and regions

	Workplace ban		Hospitality sector ban	
Country	Introduction date	Scope [1-10]	Introduction date	Scope [1-8]
Austria	01.01.09	2	01.07.10	2
Belgium	01.01.06	6	01.01.07	4
Cyprus (Republic of)	01.01.10	2	01.01.10	6
Denmark	15.08.07	4	15.08.07	4
Estonia	04.06.05	4	05.06.07	6
Finland	01.06.07	8	01.06.07	6
France	01.02.07	8	01.01.08	6
Germany[a] (East):				
Berlin	01.01.08	4	01.01.08	4
Brandenburg	01.01.08	4	01.01.08	4
Mecklenburg-West Pomerania	01.01.08	4	01.01.08	4
Saxony	01.02.08	4	01.02.08	4
Saxony-Anhalt	01.01.08	4	01.01.08	4
Thuringia	01.07.08	4	01.07.08	4
Germany (West):				
Baden-Wurttemberg	01.08.07	4	01.08.07	4
Bavaria	01.01.08	4	01.01.08	4
Bremen	01.01.08	4	01.01.08	4
Hamburg	01.01.08	4	01.01.08	4
Hesse	01.10.07	4	01.10.07	4
Lower Saxony	01.08.07	4	01.08.07	4
North Rhine-Westphalia	01.07.08	4	01.07.08	4
Rhineland-Palatinate	15.02.08	4	15.02.08	4
Saarland	01.02.08	4	01.02.08	4
Schleswig-Holstein	01.01.08	4	01.01.08	4
Ireland	29.03.04	10	29.03.04	8
Italy	10.01.05	8	10.01.05	6
Latvia	01.07.06	4	01.07.06	4
			01.10.10	8[b]
Lithuania	01.01.07	4	01.01.07	6
Luxembourg	05.09.06	4	05.09.06	4
Malta	01.04.05	8	01.04.05	6
Netherlands	01.01.04	6	01.07.08	4
Portugal	01.01.08	4	01.01.08	4
Romania	01.01.09	2	01.01.09	2
Slovakia	01.04.09	4	01.09.09	4
Slovenia	01.08.07	6	01.08.07	6

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Table A.3: (continued)

Spain	01.01.06	10	01.01.06	2
Sweden	01.06.05	6	01.06.05	6
United Kingdom:				
Wales	02.04.07	10	02.04.07	8
Scotland	01.03.06	10	01.03.06	8
England	01.07.07	10	01.07.07	8
Northern Ireland	30.04.07	10	30.04.07	8

Notes: [a)] According to Joossens and Raw (2007, 2011) tobacco control in workplaces in Germany became more restrictive between 2007 and 2010; i.e., the index of the Tobacco Control Scale increased from 2 to 4. As there is no change in the federal law, we assume that the change occured parallel to the implementation of bans in the hospitality sector.
[b)] In Latvia the ban in the hospitality sector was tightened on May 1st, 2010.
Sources: European countries and regions in the UK: European Commission (2010), European Network for Smoking Prevention (2010); German Laender: Aufmuth (2010), Kvasnicka (2010); Tobacco Control Scale: Joossens and Raw (2006, 2007, 2011).

Table A.4: Smoking bans, cigarette prices and life satisfaction in 40 European countries and regions, 1990-2011: full regression outputs

Dependent variable: Life satisfaction					
	I	II	III	IV	V
Smoking ban	0.006		0.001	0.005	0.002
	(0.37)		(0.07)	(0.25)	(0.12)
ln(cigarette price)		–0.083	–0.082	–0.069	–0.054
		(–1.38)	(–1.37)	(–1.32)	(–1.19)
Other tobacco policies				–0.000	0.002
				(–0.02)	(0.31)
ln(beer tax)				–0.025	–0.008
				(–0.71)	(–0.20)
ln(GDP per capita)					–0.043
					(–0.19)
Unemployment rate					–0.009*
					(–1.79)
Inflation rate					–0.001
					(–0.32)
Age	–0.021***	–0.021***	–0.021***	–0.021***	–0.021***
	(–13.16)	(–13.16)	(–13.16)	(–13.14)	(–13.12)
Age^2/100	0.021***	0.021***	0.021***	0.021***	0.021***
	(14.31)	(14.32)	(14.32)	(14.30)	(14.28)
Female	0.021***	0.021***	0.021***	0.021***	0.021***
	(3.21)	(3.22)	(3.22)	(3.22)	(3.21)
Education until less than age 15			Reference category		
Education until age 15	0.031***	0.031***	0.031***	0.031***	0.031***
	(2.77)	(2.77)	(2.77)	(2.76)	(2.76)
Education until age 16	0.043***	0.043***	0.043***	0.043***	0.043***
	(4.65)	(4.64)	(4.64)	(4.64)	(4.62)
Education until age 17	0.065***	0.065***	0.065***	0.064***	0.065***
	(5.78)	(5.77)	(5.77)	(5.78)	(5.82)
Education until age 18	0.093***	0.093***	0.093***	0.093***	0.093***
	(7.58)	(7.57)	(7.57)	(7.57)	(7.63)
Education until age 19	0.116***	0.115***	0.115***	0.115***	0.116***
	(11.29)	(11.27)	(11.28)	(11.27)	(11.39)
Education until age 20	0.127***	0.127***	0.127***	0.127***	0.127***
	(13.64)	(13.61)	(13.63)	(13.62)	(13.74)
Education until age 21	0.144***	0.144***	0.144***	0.144***	0.145***
	(14.90)	(14.88)	(14.89)	(14.88)	(14.94)
Education until age 22+	0.156***	0.156***	0.156***	0.156***	0.156***
	(14.56)	(14.55)	(14.57)	(14.56)	(14.57)
Student	0.220***	0.220***	0.220***	0.220***	0.221***
	(14.62)	(14.60)	(14.65)	(14.65)	(14.74)
No fulltime education	–0.099***	–0.100***	–0.100***	–0.100***	–0.100***
	(–2.98)	(–2.98)	(–2.98)	(–2.97)	(–2.97)
Married			Reference category		
Single with partner	–0.084***	–0.084***	–0.084***	–0.084***	–0.084***
	(–17.67)	(–17.73)	(–17.72)	(–17.78)	(–17.54)
Single	–0.154***	–0.155***	–0.155***	–0.154***	–0.154***
	(–13.04)	(–13.05)	(–13.05)	(–13.01)	(–12.98)
Divorced	–0.275***	–0.275***	–0.275***	–0.275***	–0.275***
	(–22.70)	(–22.77)	(–22.77)	(–22.75)	(–22.78)
Widowed	–0.208***	–0.208***	–0.208***	–0.208***	–0.208***
	(–17.96)	(–17.99)	(–18.01)	(–17.97)	(–17.88)
Other marital status	–0.105***	–0.104***	–0.104***	–0.104***	–0.106***
	(–3.98)	(–3.96)	(–3.95)	(–3.95)	(–4.00)
No children in HH under age 15			Reference category		
One child in HH	–0.012***	–0.012***	–0.012***	–0.012***	–0.012**

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Table A.4: (continued)

under age 15	(–2.73)	(–2.74)	(–2.74)	(–2.73)	(–2.61)
Two children in HH	–0.008	–0.008	–0.008	–0.008	–0.008
under age 15	(–1.38)	(–1.38)	(–1.38)	(–1.39)	(–1.32)
Three children in HH	–0.019*	–0.019*	–0.019*	–0.019*	–0.018*
under age 15	(–1.97)	(–1.99)	(–1.99)	(–2.00)	(–1.91)
Four or more children in HH	–0.041**	–0.041**	–0.041**	–0.041**	–0.040**
under age 15	(–2.51)	(–2.52)	(–2.52)	(–2.52)	(–2.43)
No info about children in HH	0.001	0.000	0.001	0.002	0.001
	(0.04)	(0.02)	(0.02)	(0.06)	(0.03)
Manual worker			Reference category		
Unemployed	–0.307***	–0.307***	–0.307***	–0.307***	–0.304***
	(–21.37)	(–21.43)	(–21.44)	(–21.51)	(–21.13)
Without occupation	0.026**	0.026**	0.026**	0.026**	0.026**
	(2.23)	(2.23)	(2.23)	(2.23)	(2.23)
Retired	0.007	0.007	0.007	0.007	0.008
	(0.40)	(0.42)	(0.42)	(0.42)	(0.44)
Farmer/fisherman	0.012	0.012	0.012	0.012	0.012
	(0.52)	(0.51)	(0.51)	(0.51)	(0.49)
Professional	0.178***	0.178***	0.178***	0.178***	0.178***
	(10.28)	(10.31)	(10.30)	(10.27)	(10.31)
Self-employed	0.068***	0.069***	0.069***	0.069***	0.069***
	(3.92)	(3.91)	(3.91)	(3.92)	(3.93)
Business propriator	0.153***	0.153***	0.153***	0.153***	0.153***
	(8.98)	(8.96)	(8.95)	(8.91)	(8.93)
Emloyed professional	0.159***	0.159***	0.159***	0.159***	0.160***
	(11.95)	(11.92)	(11.92)	(11.95)	(12.04)
General management	0.216***	0.217***	0.217***	0.217***	0.216***
	(12.57)	(12.51)	(12.51)	(12.53)	(12.55)
Middle management	0.142***	0.142***	0.142***	0.142***	0.142***
	(12.74)	(12.66)	(12.66)	(12.59)	(12.58)
Employed position (desk)	0.088***	0.088***	0.088***	0.088***	0.088***
	(8.18)	(8.14)	(8.14)	(8.15)	(8.16)
Employed position (travel)	0.057***	0.057***	0.057***	0.057***	0.057***
	(6.25)	(6.22)	(6.23)	(6.23)	(6.22)
Service sector	0.070***	0.070***	0.070***	0.070***	0.070***
	(10.80)	(10.79)	(10.78)	(10.85)	(10.87)
Supervisor	0.069***	0.069***	0.069***	0.069***	0.069***
	(5.45)	(5.45)	(5.45)	(5.46)	(5.47)
No. of observations	629,930	629,930	629,930	629,930	629,930
No. of clusters	40	40	40	40	40
R^2	0.21	0.21	0.21	0.21	0.22

Notes: OLS estimations. T-values in parentheses. Standard errors are clustered on the country/region level. All regressions control for country/region and survey wave fixed effects and country-specific time trends.
Significance levels: * $.05 < p < .1$, ** $.01 < p < .05$, *** $< .01$.

Table A.5: Covariates of individual smoking behavior in 40 European countries and regions, 1990-2009

	Dependent variable: smoking (=1)	
	Male	Female
Smoking ban	0.091	–0.067
	(1.56)	(–1.42)
ln(cigarette price)	0.168	0.004
	(1.27)	(0.04)
ln(GDP per capita)	0.500**	0.720***
	(2.25)	(2.63)
Unemployment rate	0.010	0.028***
	(1.33)	(2.85)
Inflation rate	0.005	–0.029**
	(0.49)	(–2.48)
Other tobacco policies	0.008	–0.021***
	(0.74)	(–2.70)
ln(beer tax)	–0.151**	–0.140**
	(–2.46)	(–2.12)
Age	0.117***	0.089***
	(9.09)	(4.51)
$Age^2/100$	–0.222***	–0.191***
	(–8.14)	(–3.96)
$Age^3/1000$	0.010***	0.007**
	(5.45)	(2.13)
Education until less than age 15	Reference category	
Education up to age 16-19	–0.072	0.102
	(–1.25)	(1.00)
Education up to age 20 or more	–0.402***	–0.304**
	(–5.89)	(–2.27)
Student	–0.745***	–0.694***
	(–4.48)	(–4.25)
Married	Reference category	
Single with partner	0.253***	0.318***
	(5.90)	(6.58)
Single	0.187***	0.411***
	(6.17)	(10.73)
Divorced	0.742***	0.852***
	(14.90)	(19.64)
Widowed	0.427***	0.378***
	(7.52)	(8.41)
Other marital status	0.229**	0.246***
	(2.57)	(3.23)
No children in HH under age 15	Reference category	
One child in HH under age 15	–0.081**	–0.035
	(–2.22)	(–1.15)
Two children child in HH under age 15	–0.125***	–0.177***
	(–3.04)	(–4.36)
Three children in HH under age 15	–0.173**	–0.153***
	(–2.45)	(–2.83)
Four children in HH under age 15	0.034	0.001
	(0.69)	(0.02)
No info about children in HH	0.190***	0.231***
	(6.09)	(6.34)
Manual worker	Reference category	
Unemployed	0.376***	0.137***
	(7.19)	(2.97)
Without occupation	–0.252*	–0.165***
	(–1.84)	(–3.43)

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Table A.5: (continued)

Retired	–0.156***	–0.021
	(–2.80)	(–0.22)
Farmer/fisherman	–0.663***	–1.020***
	(–7.31)	(–5.55)
Professional	–0.326***	–0.171
	(–4.31)	(–1.17)
Self-employed	–0.176***	–0.038
	(–2.62)	(–0.58)
Business propriator	–0.327***	–0.057
	(–5.24)	(–0.53)
Emloyed professional	–0.536***	–0.499***
	(–5.84)	(–5.92)
General management	–0.500***	–0.273***
	(–6.26)	(–2.84)
Middle management	–0.521***	–0.445***
	(–9.28)	(–7.35)
Employed position (desk)	–0.533***	–0.336***
	(–8.24)	(–5.34)
Employed position (travel)	–0.156***	0.008
	(–2.73)	(0.12)
Service sector	–0.241***	–0.158***
	(–4.65)	(–2.82)
Supervisor	–0.252***	–0.287*
	(–2.80)	(–1.80)
No. of obs.	57,774	68,490
Pseudo R^2	0.09	0.07

Notes: Logit estimations. Z-values in parentheses. Standard errors are clustered on the country/region level. Country fixed effects and country-specific time trends are included in the regression.
Significance levels: * $.05 < p < .1$, ** $.01 < p < .05$, *** $< .01$.

Table A.6: Covariates in the multinomial logit model for smokers, non-smokers and marginal smokers

Reference category: Non-smoker (=1)

	Male		Female	
	Smoker	Marginal smoker	Smoker	Marginal smoker
Smoking ban	0.061	–0.080	–0.188**	–0.364**
	(0.35)	(–0.46)	(–2.00)	(–2.56)
ln(cigarette price)	–0.394***	–0.165	–0.236**	–0.017
	(–3.08)	(–0.80)	(–2.12)	(–0.10)
ln(GDP per capita)	1.580	0.074	0.002	0.336
	(1.59)	(0.07)	(0.00)	(0.38)
Unemployment rate	–0.017	0.042**	0.000	0.056***
	(–0.87)	(2.32)	(0.02)	(3.27)
Inflation rate	–0.083**	0.112**	–0.039	0.029
	(–2.08)	(2.30)	(–1.08)	(0.80)
Other tobacco policies	–0.013	0.028	–0.033***	–0.025*
	(–1.54)	(1.40)	(–3.02)	(–1.77)
ln(beer tax)	–0.090	–0.786	–0.805**	–0.464
	(–0.20)	(–0.79)	(–2.22)	(–0.60)
Age	0.117***	0.031	0.124***	–0.089**
	(3.60)	(0.92)	(3.19)	(–2.22)
$Age^2/100$	–0.187***	–0.031	–0.208**	0.229**
	(–2.86)	(–0.44)	(–2.42)	(2.54)
$Age^3/1000$	0.005	–0.005	0.005	–0.024***
	(1.22)	(–1.01)	(0.86)	(–3.95)
Education until less than age 15		Reference category		
Education up to age 16-19	–0.111	–0.209*	0.073	0.016
	(–1.63)	(–1.83)	(0.74)	(0.17)
Education up to age 20 or more	–0.449***	–0.578***	–0.559***	–0.535***
	(–4.88)	(–4.69)	(–4.67)	(–3.50)
Student	–1.339***	–0.710***	–0.983***	–1.118***
	(–4.33)	(–2.64)	(–5.57)	(–6.68)
Married		Reference category		
Single with partner	0.370***	0.511***	0.653***	0.754***
	(4.91)	(4.86)	(7.21)	(9.24)
Single	0.405***	0.297***	0.766***	0.477***
	(7.51)	(2.89)	(11.44)	(5.39)
Divorced	0.825***	0.861***	0.889***	0.992***
	(9.82)	(6.41)	(15.11)	(14.58)
Widowed	0.522***	0.365**	0.411***	0.546***
	(4.70)	(2.42)	(4.30)	(5.67)
Other marital status	0.292*	0.195	0.318	0.447**
	(1.79)	(1.19)	(1.16)	(2.27)
No children in HH under age 15		Reference category		
One child in HH under age 15	–0.099	0.122	–0.111*	0.093
	(–1.51)	(1.30)	(–1.73)	(1.55)
Two children child in HH under age 15	–0.176**	–0.035	–0.303***	0.063
	(–2.48)	(–0.30)	(–4.24)	(0.62)
Three children in HH under age 15	–0.221	0.123	–0.273***	–0.113
	(–1.34)	(0.69)	(–2.78)	(–0.87)
Four children in HH under age 15	–0.023	–0.168	–0.364	–0.04
	(–0.11)	(–0.50)	(–1.62)	(–0.26)
Manual worker		Reference category		
Unemployed	0.354***	0.441***	0.204***	0.501***
	(5.12)	(2.91)	(2.70)	(5.16)
Without occupation	0.043	–0.456*	–0.044	0.022
	(0.18)	(–1.73)	(–0.53)	(0.18)

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Table A.6: (continued)

Retired	–0.241**	0.076	–0.067	0.284*
	(–2.30)	(0.77)	(–0.50)	(1.79)
Farmer/fisherman	–0.722***	–0.694***	–1.529***	0.060
	(–3.39)	(–3.07)	(–4.54)	(0.18)
Professional	–0.510***	0.009	–0.279	0.090
	(–2.83)	(0.04)	(–1.26)	(0.39)
Self-employed	–0.174	–0.027	–0.093	–0.319
	(–1.34)	(–0.18)	(–0.65)	(–1.31)
Business propriator	–0.306***	–0.692***	–0.018	–0.180
	(–2.80)	(–6.42)	(–0.09)	(–0.60)
Emloyed professional	–0.741***	–0.855***	–0.369*	–0.362
	(–4.98)	(–5.62)	(–1.87)	(–1.47)
General management	–0.761***	–0.877***	–0.083	–0.586
	(–5.99)	(–3.42)	(–0.47)	(–1.60)
Middle management	–0.676***	–0.481***	–0.375***	–0.634***
	(–6.23)	(–3.84)	(–3.72)	(–4.88)
Employed position (desk)	–0.829***	–0.750***	–0.273**	–0.373**
	(–7.14)	(–4.26)	(–2.44)	(–2.54)
Employed position (travel)	–0.222**	–0.324**	–0.025	0.285
	(–2.29)	(–1.97)	(–0.18)	(1.52)
Service sector	–0.304***	–0.334**	–0.223**	–0.082
	(–3.41)	(–2.15)	(–2.41)	(–0.56)
Supervisor	–0.136	–0.048	–0.076	–0.202
	(–0.82)	(–0.20)	(–0.30)	(–0.33)
No. of obs.	18,687	18,687	23,868	23,868
No. of clusters	40	40	40	40
Pseudo R^2	0.08	0.08	0.09	0.09

Notes: Multinomial logit estimations separately for women and men. Z-values in parentheses. Standard errors are clustered on the country/region level. Country fixed effects are included in the regression.
Significance levels: * $.05 < p < .1$, ** $.01 < p < .05$, *** $< .01$.