Smoking, Income and Subjective Well-Being: Evidence from Smoking Bans*

Abel Brodeur

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Abstract

This paper analyses the effects of local smoking bans in the US using county and time variation over the last 20 years. This study investigates three consequences related to smoking bans. 1) First, I show that smoking bans (bars and restaurants) decrease the prevalence of smoking. 2) Well-being is also affected by these policies: smoking bans make former, potential and current smokers more satisfied with their life. Within-family externalities and time-inconsistent family-utility maximization seem to explain these findings. The largest effect of smoking bans on well-being is for parents and married couples where the spouse is predicted to smoke. 3) Finally, I find some evidence that smokers who are exposed to a smoking ban are less-opposed to these policies.

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*Paris School of Economics, 48 Boulevard Jourdan, 75014 Paris. E-mail: abel.brodeur@parisschoolofeconomics.eu. I would like to give thanks to Andrew Clark and Clément de Chaisemartin who helped me along the way. Financial support from the Fonds Québécois de la Recherche sur la Société et la Culture is gratefully acknowledged. Thanks to seminar participants at PSE. I am also grateful to Jérôme Adda, Fabrice Etilé, Sarah Flèche, Pierre-Yves Geoffard, Mathias Lé, Karen Macours, Dimitris Alexandre Mavridis and Arthur Silve for valuable comments. I thank Chris Callahan, at DDB Needham, and Thomas A. Carr, at the American Lung Association, who answered my questions and provided data. Any remaining errors are our own.

Cigarette consumption and quality of life are to a large extent endogenous. Some smoke because they suffer from too much stress while others like sex for the cigarette afterward. It is therefore difficult to measure the impact of cigarettes on well-being. The timing and geographical variation of smoking bans provide useful tools to analyze this relationship. In order to understand the mechanisms and the consequences of bans, this paper investigates three different issues. It first deals with the literature on smoking policies and smoking behavior by verifying if smoking bans decrease the prevalence of smoking. Secondly, it seeks to illustrate certain links between smokers' well-being and smoking bans. Lastly, this study tests some theories of addiction and looks at whether smoking bans affect the preferences of smokers for those policies.

Our first finding is that smokers who are affected by smoking bans (bars and restaurants) are more likely to quit smoking. The estimates are statistically significant and suggest that the probability smokers quit increases by 1.3 percentage points when exposed to a smoking ban. The sizes of the estimates are larger when the sample is restricted to some demographic groups such as parents (2 percentage points). Unfortunately, these estimates do not capture the effect on some smokers who could decrease their cigarette consumption but still continue to smoke. On the other hand, there is no evidence that workplace smoking bans decrease the prevalence of smoking.

This paper then looks at the impact of the bans on utility. Due to the absence of information on the specific date when smokers stopped smoking[1], it is not possible to check that the strongest impact is on smokers who stopped smoking as a result of the policies. Using a measure of propensity to smoke allows us to estimate how smoking bans affect the well-being of smokers who stopped smoking because of the ban, smokers who didn't stop smoking, and finally potential smokers. The self-reported well-being of people likely to smoke to people unlikely to smoke is compared after the implementation of smoking bans. The central finding of this paper is that those who are predicted to be smokers report higher levels of well-being when a smoking ban is implemented. The estimates are large and robust to many specification checks.

[1]Cross-section data does not allow us to establish the evolution of well-being from current to ex-smokers. Unfortunately, virtually no progress can be made without consistent repeated cross-section or panel data in which there are repeated observations on individuals who quit smoking.

Predicted smokers who are parents and married benefit the most from smoking bans. I also show that the results are driven by within-family externalities, since smoking bans have a large effect when the respondents' spouse is predicted to smoke.

A number of theories are proposed to explain these results. The paper's preferred explanation is time-inconsistent family-utility maximization. A question on whether smoking should not be allowed in public places allows us to verify time-inconsistency. *Ex ante*, smokers do not favor the implementation of smoke-free provision of smoking in restaurants or bars. However, these smoking policies make their family better off *ex post* which might explain why they are more likely to agree that smoking should not be allowed in public places once they are affected by these bans[2].

The questions of whether tax changes, smoke-free workplaces and public bans may cause a change in smokers' utility are basic concerns for policy makers. Following the implication of a basic rational addiction model, smoking bans should decrease smokers' well-being which explains why they are relatively more resistant to these policies. Becker and Murphy (1988) explained that smoking policies create a dead-weight loss by changing consumers' consumption choices. Even with addictive goods like cigarettes, taxes and smoking bans would cause a decrease in well-being for smokers. Individuals decide to smoke based on the long-run cost and immediate benefit of such a decision. A ban would thus decrease their direct pleasure by decreasing the number of places in which they are allowed to smoke[3].

This research follows the proposition of Frey and Stutzer (2007) in using the economics of happiness as a methodological approach to evaluate whether a particular behavior (e.g. smoking) is sub-optimal and hence could reduce individuals' well-being. It was emphasized by Gruber and Mullainathan (2005) that higher cigarette taxes could make predicted smokers less unhappy. People who stop smoking are obviously better off because of the health effects and the economic costs of smoking

[2]A 2007 survey by Gallup indicates that about 40 percent of respondents (smoker or not) agree that smoking in all public places should be made 'totally illegal'.

[3]Boyes and Marlow (1996) pointed out another issue related to the Coase Theorem. Owners of restaurants/bars allocate airspace to the demanders (smokers and nonsmokers) in order to maximize expected profits. They argue that smoking bans, by reallocating the ownership of scarce resources (from the owners to the government), transfer income from smokers to nonsmokers. Nonsmokers receive an income transfer since they are not required to compensate smokers nor breathe smoke-filled air.

but these results go further in saying that smoking is an unwanted habit. Taxes provide a self-control device and allow smokers to do something they were not able to do, stop smoking.

They explain their findings with time-inconsistency. In the model of Gruber and Koszegi (2001), smokers would be better off with excise taxes since this provides a self-control device. Individuals would like to stop smoking but they cannot because cigarettes are addictive. The same can be said with smoking ban since, in America, a majority of smokers want to quit. Gruber and Koszegi (2001) reported evidence that approximately eight out of ten smokers express a desire to quit. In this formulation, agents are patient about the future but impatient about the present. Smoking more in the short term increases pleasure, which explains why smoking policies would have positive effects on welfare.

Hinks and Katsaros (2010) and Odermatt and Stutzer (2011) also examined the relationship between well-being and smoking policies using respectively the BHPS and the Eurobarometer. Hinks and Katsaros (2010) analyzed the effect of the 2007 smoking ban in England, Wales and Northern Ireland and found a negative effect on the well-being of smokers who reduced their daily consumption of cigarettes. Odermatt and Stutzer (2011) presented evidence that smoking bans have no effect on life satisfaction of predicted smokers[4]. Additionally, they reported that cigarette taxes affect positively nonsmokers which casts doubts on the validity of the findings of Gruber and Mullainathan (2005). The small number of variations and the use of different methodologies are proposed as explanations for these contradicting findings.

Our main objective is the examination of the impact of smoking bans using a different identification strategy. Counties have implemented smoking bans (workplace, bars or restaurants) at different times over the last 20 years in the US which gives us more time and geographic variation to evaluate their effects. This paper exploits these changes in policies to evaluate the effect of smoking bans on smoking behavior, smokers' subjective well-being and voting behavior. The chronological table of the *American Nonsmokers' Rights Foundation* gives the effective date of the

[4]Hinks and Katsaros (2010) analyzed the effect of the 2007 smoking ban in England, Wales and Northern Ireland. The lack of more time variations is proposed as an explanation for the different findings.

first smoking ban at the county-level. In addition, I use data from the DDB Needham Life Style Survey (LSS) and the Behavioral Risk Factor Surveillance System (BRFSS). These surveys are cross-sectional and include a broad set of variables such as household income, life satisfaction and smoking behavior.

The remainder of this article is structured as follows. The next section is devoted to the description of the data with detailed information on the questions used. Section 2 presents estimates of the impact of smoking policies on smoking behavior. The third introduces the methodology used to assess the impacts of bans on utility. Section 4 presents estimates of the effect of smoking bans on subjective well-being. Section 5 explores the socioeconomic determinants of voting behavior in the context of smoking bans. The last section discusses the validity of the results and their interpretations.

I. Data

A. The Life Style Survey and the Behavioral Risk Factor Surveillance System

Our first data set is the Behavioral Risk Factor Surveillance System. The time period covered with the BRFSS is 1988-2010/10/01 since county-level data are not available for 1984-1987. County of residence is a key variable in this study since it is possible to assess the impact of county-level smoking policies on the residents of these counties. The timing and geographical variation provide an exogenous variation to estimate the effects of smoking bans. The BRFSS is repeated cross section and covers more than two thirds of the counties in the US. It has a total sample of 3,751,651 and contains information on county of residence, smoking behavior and life satisfaction[5].

Another data set is also used to investigate the impact of smoking bans[6]. This

[5]Over the period covered in this analysis, data on smoking is collected in 1988-2010 for the BRFSS. Unfortunately, the BRFSS did not include a life satisfaction question before 2005. County codes are suppressed for counties with fewer than 10,000 residents for confidentiality reasons.

[6]A third data set that could have been used here is the General Social Survey, but this was excluded for three reasons. The first reason is simply space consideration. Second, the public use version does not identify the state and the county of residence. I therefore purchased a restricted use version of the data (over the period 1993-2010). Lastly, data on smoking behavior is not available

allows us to check the robustness of our findings. The DDB Needham Life Style Survey (LSS) is a proprietary data archive that is freely available for the period 1975-1998 on Robert Putnam's *Bowling Alone* website[7]. The Life Style Survey started when the advertising agency DDB Needham commissioned the polling firm Market Facts to conduct an annual survey of Americans' behaviors. This data set is repeated cross-section and includes questions about well-being and whether smoking should not be allowed in public places. The time period covered with this survey is 1985-1998 (except 1990) since county-level data are not available for 1990 and only married people were interviewed over the period 1975-1984. The LSS is nationally representative in the United States and contains information on smoking behavior (except for the year 1998) and socioeconomic characteristics of the respondents. The LSS is an annual questionnaire which has a sample of around 3,500 American per annum. Our analysis is based on a total sample of 49,548 respondents.

The following question is asked over the period 2005-2010 in the BRFSS: "In general, how satisfied are you with your life?" where respondents have 4 choices (4=very satisfied, 3=satisfied, 2=dissatisfied and 1=very dissatisfied)[8]. Similarly, the LSS includes a question on life satisfaction each year: "I am very satisfied with the way things are going in my life these days" where respondents have 6 possible choices (6=definitely agree, 5=generally agree, 4=moderately agree, 3=moderately disagree, 2=generally disagree and 1=definitely disagree). Over the period covered, 45,27% (16,24% for the LSS) of the respondents reported that they were very satisfied with their life. On the other hand, 1,03% (8,19% for the LSS) answered that they very dissatisfied (see Appendix, Tables 2 and 3).

These surveys also include questions on smoking behavior: "Do you now smoke cigarettes every day, some days, or not at all?" in the BRFSS and "How often you, yourself, use cigarettes at home or elsewhere?" in the LSS. Respondents who

after 1994. Nonetheless, most of the findings are confirmed when turning to this data set (available upon request). Smoking bans have a positive effect on self-reported happiness of predicted smokers. For instance, the effect is very large and statistically significant when the sample is restricted to parents.

[7] http://bowlingalone.com/

[8] One should note that studies pointed out that life satisfaction questions tend to elicit answers that are more reflective of life circumstances, and less reflective of ephemeral events, than do happiness questions (e.g. Deaton and Kahneman, 2010).

answer 52 or more times a year to the previous question are considered as daily smokers. In both surveys, 22% of the respondents (weighted) report themselves as daily smokers (see Appendix, Tables 2 and 3). This rate is going down over the waves which is consistent with prevalence rates of other surveys. Table 1 shows the mean and standard deviation of the variables in the BRFSS over the period 2005-2010 (see Appendix, Table 1 for the LSS). Column 1 first presents these statistics for all the respondents, and then columns 2 and 3 do the same for respectively daily and non-daily smokers (occasional and nonsmokers).

B. Smoking Bans

Data on smoking policies come from the *American Nonsmokers' Rights Foundation*. The chronological table of the *American Nonsmokers' Rights Foundation* indicates the effective date of smoke-free provision at the municipality and county-level for workplaces, bars and restaurants. It is then possible to know exactly which county has at least one municipality who implemented a smoking ban. In many counties, however, smoking in public places was prohibited by county-level laws. The first 100 percent smoke-free provision[9] of smoking in a restaurant or a bar was the municipality of San Luis Obispo in 1990. Since the municipality of San Luis Obispo is located in the county of San Luis Obispo, all residents of this county are considered to be affected by the smoking ban. Using this methodology, respondents of 363 counties have been affected by smoking bans over the period 1990-2010/10. In addition, more than 30 states (Utah was the first in 1995) have implemented smoking bans. All the respondents in these states are thus affected by these smoking policies. Nowadays 75 percent of the U.S. population is covered by a smoking ban either for bars or restaurants.

Since our goal is to capture the impact of these smoking bans on smokers, pre-smoking ban periods are defined as the years/months/days before the law was effective. A variable for whether the county of residence[10] was affected by a complete

[9] Only counties with ordinances or laws that do not allow smoking in attached bars or separately ventilated rooms are considered as being 100 percent smoke-free.

[10] In the United States, a county is a subdivision of a state. The average number of counties per state is 62 (3 for Delaware and 254 for Texas).

interdiction of smoking is constructed. This indicator called "Smoking Ban" is then equal to one for all respondents living in the county that is affected by the smoking ban in each subsequent years/months/days, since the law is still valid (see the Appendix on data construction for more information on the construction of "Smoking Ban"). Date of interview is available in the BRFSS but not in the LSS. For the latter, post-smoking ban periods are defined as the years during and after the implementation of the bans.

II. Smoking Behavior and Smoking Bans

A considerable literature exists on the effect of smoking bans on smoking behavior. A meta-analysis of more than 20 studies in Australia, Canada, Germany and US found that workplace smoking bans reduce active smoking by 3.8 percentage points (Fichtenberg and Glantz (2002)). Callinan *et al.* (2010) reviewed 50 studies in 13 countries and concluded that there is some evidence that smoking bans reduce smoking prevalence. Origo and Lucifora (2010) estimated that European countries who introduced comprehensive smoking bans have been able to reduce the probability of exposure to smoke and the presence of respiratory problems for workers by 1.6 percent. In the US, Adda and Cornaglia (2010) used state and time variation in smoking policies to look at the effects of smoking bans in workplace, bars and restaurants. They do find a decrease in prevalence only for bars and restaurants, but it vanishes when controlling for state specific trends.

This section investigates the impact of anti-smoking policies (workplace smoking bans, public smoking bans, cigarette taxes and tobacco control programs) on smoking behavior using county and time variation over the period 1988-2010. The BRFSS includes the following measures of smoking behavior: smoking prevalence, the percentage of former smokers and the number of attempted quits over the last year. I follow the literature and include in the model state-level changes in taxes but also state-level changes in tobacco control programs/funding (from the American Lung Association: State of Tobacco Control). The latter measure is available only over the period 2000-2010 and is included in some specifications. Each state's

total funding for these programs (including federal funding provided by the CDC) is calculated on a variety of specific factors such as state and community interventions, health communication interventions, cessation interventions, surveillance and evaluation and administration and management.

State and year fixed effects are included in our model. These fixed effects completely control for any fixed differences between states and between years, which means that only within-state variation is used in the estimation. For all our equations in this paper, the personal sampling weights (the variables finalwt in the BRFSS) from each cycle are re-scaled to sum up to one for each year[11]. Moreover, the standard errors are corrected for autocorrelation by clustering at the county-level (Bertrand, Duflo and Mullainathan (2004)).

Table 2 reports the coefficients of the variables "Smoking Ban (restaurants and bars)", "Smoking Ban (workplaces)" and state-level changes in taxes from linear probability models of smoking cessation. The first four columns display the effects of anti-smoking policies on the prevalence of smoking. Socioeconomic characteristics and county-level variables (only for columns 2, 5 and 6) are included. Negative results suggest that smoking bans reduce the prevalence of smoking. Unsurprisingly, the coefficient is negative and statistically significant for the variable "Smoking Ban (restaurants and bars)". A total ban in bars or restaurants leads to a decrease in prevalence of 1.3 percentage points. Unfortunately, these estimates do not capture the fact that some smokers could also decrease their cigarette consumption but still continue to smoke. Moreover, our indicator "Smoking Ban" might underestimate the real effect of the bans (see the Appendix on data construction for more details). Smoking laws sometimes cover only one city within a county. Controlling for state-level changes in tobacco control programs/funding and state-level changes in taxes does not affect the significance of this finding. Surprisingly, these variables do not affect the prevalence of smoking. This is also true for workplace smoking bans.

Column 5 looks at a different variable of interest, the percentage of former

[11]See Pfeffermann (1993) and Angrist and Pischke (2008) for a discussion on the role of sampling weights. Sampling weights are used in this study to have nationally representatives sample. The number of observations varies from wave to wave which explains our choice to re-scale equally each year. Also, our choice to include sampling weights has no impact on our analysis. Similar findings are obtained when sampling weights are not included.

smoker. The coefficient is positive for smoking bans in bars or restaurants but not significant. The following question from the BRFSS is the dependent variable for columns 6 and 8: "During the past 12 months, have you stopped smoking for one day or longer because you were trying to quit smoking?". The estimated coefficient is not significant for public smoking bans. There is evidence of a relationship between the number of attempted quits over the last 12 months and cigarette taxes.

Columns 7 and 8 restrict the period to 2005-2010. I focus on this period since next sections will analyze the effects of the bans on smokers' life satisfaction over this period of time. This does not alter the result that public smoking bans decrease the prevalence of smoking. Interestingly, the effect of smoking bans is much larger when the sample is restricted to some demographic groups. Appendix Table 4 shows the estimated coefficients of the same variables as before but restrict respectively the sample to parents, non-parents, unmarried (divorced, single, separated and widowed), married, young (less than 50 years old), and old (more than 50 years old) respondents. There is evidence that smoking bans in bars and restaurants decrease the prevalence of smoking for all these groups, but especially for parents, unmarried and young individuals.

III. Smoking Bans and Well-Being: Empirical Strategy

Section III and IV test empirically the hypothesis that smoking bans are important tools for increasing the utility of predicted smokers: for former smokers, smoking bans helped them to realize their intentions to quit which are often not achieved; for current smokers, since cigarettes are addictive substances, any policies that reduce the frequencies of smoking might make them better off; and even for potential smokers, who could be discouraged to start to smoke. The finding of Gruber and Mullainathan (2005) that tax hikes provide a self-control device and thus increase the utility of predicted smokers has been challenged by Adda and Cornaglia (2006). In their paper, they pointed out that smokers compensate for taxes by extracting

more nicotine per cigarette.

Moreover, there is no consensus among researchers whether unhappiness may or not have an impact on smoking behavior. Veenhoven (2008) explains that happiness does not cure illness but could prevent it. Happy people tend to do more activities, and tend to be more reasonable with drinking and smoking. On the other hand, many people enjoy smoking and there is no clear evidence that happiness predicts starting or stopping smoking (Graham *et al.*, 2004). Much research has shown that daily smokers report lower levels of well-being (Jurges, 2004; Shahab and West, 2009; Veenhoven, 2008)[12]. Unfortunately, these studies do not tackle the causality issue which is one of the weaknesses of this literature[13]. Using longitudinal data (British Household Panel Survey), Moore (2009) showed that there is a robust relationship between change in daily cigarette consumption and well-being: a reduction of cigarette consumption improves self-reported happiness. Once again, this could mask reverse causality since smokers could feel better and then smoke less.

Our methodology is the following: compare the subjective well-being of people likely to smoke to people unlikely to smoke after the implementation of smoking bans. Since much of the second-hand tobacco smoke effect on health occurs in the long-run, predicted non-daily smokers are our control group. Many of the socioeconomic determinants in our data sets differ between daily and non-daily smokers (see Table 1 and Appendix Table 1). Daily smokers are, on average, less educated, younger, less likely to attend churches or place of worship, more likely to be unemployed, divorced, and to have children. These characteristics help us to predict if the respondent is a daily smoker. Regressions that relate smoking behavior to the following list of variables are estimated: age, age-squared, sex, interaction between age and sex, household income categories[14], education categories, marital status,

[12]A study by psychologists (Acaster *et al.* 2007) revealed that abstinent smokers reported relatively lower levels of happiness than satiated smokers (recent smoked) when viewing pleasurable film clips. By contrast, sadness ratings weren't affected by having smoked recently.

[13]The literature on subjective well-being in economics has grown rapidly over the last decades (Kahneman and Krueger, 2006). See Clark *et al.* (2008), Di Tella and MacCulloch (2006) and Frey and Stutzer (2002) for literature reviews.

[14]Income is available only categorically in the LSS. I created a variable representing the log real family income per equivalent = 1 + 0.5 [other adults] + 0.3 kids. Using this measure or the 12 income categories does not affect the results of this paper.

number of children, dwelling (only in the LSS), attend place of worship (only in the LSS), working status, and state dummies. Also, the state-level changes in tobacco control programs/funding and the state-level changes in excise taxes were used in some specifications (not shown) to predict smoking.

Regressions are estimated for each year that has smoking behavior information[15] in order to give to each respondent a predicted probability of smoking (PSMOKE). An example of this equation is shown in Appendix Table 3. The pseudo R-squared goes from 0.10 to 0.14 for the BRFSS (0.14 for the LSS). Some variables like age, education, and attend place of worship are clearly important determinants of smoking. The correlation coefficient between PSMOKE and being a daily smoker is 0.42 (0.32 to 0.35 for the LSS). Our basic specification does not include an exclusion restriction in the equation that predicts smoking. Some alternative specifications (see Section V) will include such restrictions.

Our econometrics model is as follows:

$$SWB_{ijt} = \alpha + \beta_s + \eta_t + \delta SB_{jt} + \theta PSMOKE_{ijt} + \gamma SB_{jt} * PSMOKE_{ijt} + \zeta X_{ijt} \quad (1)$$

where SWB is the outcome variable (for instance: life satisfaction) for respondent i in county j in year t, β_s and η_t are state and year fixed effects, SB is an indicator for smoking bans (either for workplaces, bars or restaurants) which is set to 0 if the county had not such a policy, PSMOKE is the predicted probability of smoking, and X is a set of covariates that were used to predict smoking. In this setting, γ is the coefficient of interest.

One could worry that other time-varying factors correlated with the implementation of smoking bans would explain our results. This is why state-specific trends and county-level variables Z are added for some specifications:

[15]Since there is no question on smoking behavior in 1998 in the LSS, the last year available (1997) is used to predict smoking for respondents of the wave 1998. Also, the methodology that is used to predict smoking does not affect the findings of this paper. Predicting PSMOKE with a regression for each year or with the first year in which there is a smoking ban or with all the years do not change the main estimates.

$$SWB_{ijt} = \alpha + \beta_s + \eta_t + \delta SB_{jt} + \theta PSMOKE_{ijt} + \gamma SBjt * PSMOKE_{ijt} + \zeta X_{ijt} + \lambda Z_{jt} + t_{jt} \quad (2)$$

I estimate OLS on a standardized variable (life satisfaction answers are standardized for all respondents within each wave to have a mean of zero and a standard deviation of one), but also alternative specifications like ordered probit models and linear probability models to explore whether the results are robust. As before, the personal sampling weights (finalwt and WEIGHT) from each wave are re-scaled to sum up to one for each year. Standard errors are clustered at the county-level.

IV. Smoking Bans and Well-Being: Findings

A. Basic Results

Table 3 shows our basic findings of equation (1) using the BRFSS (columns 1, 3 and 6) and the LSS. While columns 2, 4 and 7 look at the life satisfaction question of the LSS described in Section I, the dependent variable of column 5 is: "I wish I could leave my present life and do something entirely different". This is a 6-point scale question which goes from "Definitely Disagree" to "Definitely Agree". This second question is highly correlated with the life satisfaction question (correlation coefficient of 0.42) and gives similar findings. The first row of Table 3 presents the effect of smoking bans (only bars and restaurants) on the whole sample. Then, the next row shows the effect of being a predicted smoker on self-reported well-being.

In the case of life satisfaction, smoking bans (either for bars or restaurants) have very small effects on life satisfaction. Column 3 introduces two variables (smoking ban in bars and restaurants and the interaction between smoking ban and predicted smoking) which affect negatively the coefficient on smoking ban. Predicted smokers are reporting relatively lower levels of life satisfaction which is consistent with the literature (Jurges, 2004; Shahab and West, 2009; Veenhoven, 2008). Our variable of interest, SB*PSMOKE, is on the third row. The estimated coefficient is positive and

statistically significant. This means that smoking bans in bars and restaurants have a small and insignificant impact for the whole population, but have positive effects on predicted smokers' life satisfaction. Our estimates suggest predicted smokers expose to a smoking ban saw an increase in self-reported well-being which goes from 0.075 to 0.533 of a standard deviation. The estimated coefficient is positive and statistically significant at the 4 percent level for the BRFSS[16].

The findings presented in this section are not confirmed when turning to workplace smoking bans. This is not surprising since workplace smoking bans do not seem to decrease the prevalence of smoking. The fourth row of Table 3 presents the effect of workplace smoking bans (SBW) on the whole sample. Then, the next row shows the effect of workplace smoking bans on the life satisfaction of predicted smokers. The interaction between SBW*PSMOKE is not statistically significant and very small when using the BRFSS. On the other hand, the effect is negative when turning to the LSS which is surprising. The remainder of this paper will focus on public smoking bans (bars or restaurants).

These findings advocate that bans in bars and restaurants result in a welfare improvement for three types of individuals: former smokers, current smokers, and potential smokers[17]. An explanation could be that the positive effect on people who stopped smoking daily is offset by the decrease in well-being for those who are not smoking. If this is accurate, our estimates on smoking bans (first row) could be driven by two opposing forces. It might seem surprising that the effect of smoking

[16]In addition to the period covered, many explanations could be proposed to explain the difference in the size of the coefficient of interest between the two data sets. First of all, the variables used to predict smoking are different (see Appendix Table 5). Secondly, more smoking bans have been implemented during the period 2005-2010 which make us believe that the estimates are more precise with the BRFSS. Lastly, the sample size is proposed as an explanation.

[17]An alternative specification would be to interact smoking ban with being a smoker. As explained previously, this is inappropriate because smoking bans may have an impact on many types of smokers. Using smokers and not predicted smokers would not capture the effect of the bans on people who stop smoking, potential smokers and smokers who are now smoking occasionally. One way to show this fact is to present estimations of an altered version of equation (1) where the variable "Predicted Smoking" is replaced by "Smoker". Appendix Table 7 shows the results of this estimation. For the LSS, there is a positive (statistically significant at the 16 percent level) impact of smoking bans on smokers' life satisfaction but the coefficient is much smaller than the one estimated on the interaction between predicted smokers and smoking bans. Column 2 shows similar findings using the BRFSS (relatively smaller and not statistically significant). This means that much of the effect of smoking bans on smokers goes through smokers who decreased their cigarette consumption or stopped smoking.

bans is insignificant for the whole population. But, as shown by Adda and Cornaglia (2010), smoking bans can intensify the exposure of nonsmokers to tobacco smoke by displacing smokers to private places. Additionally, smoking bans could encourage use of cigarettes among nonsmokers since smoking looks less harmful (Bernheim and Rangel, 2004). In order to verify the effect on nonsmokers, a dummy indicating if the respondent has a low propensity to smoke (below the 25th percentile) is generated. I then regress on the same covariates as before but the variable PSMOKE is replaced by the dummy low propensity to smoke. Estimating the model with low propensity to smoke gives a negative coefficient on the interaction SB*PSMOKE but it is small and insignificant (not shown for space consideration).

The positive outcome for smokers is quite surprising because this group does not favor the implementation of smoking bans (see section V). On the other hand, the absence of positive effects for nonsmokers is unexpected since the only reason why smoking bans may cause a welfare improvement, in the model of Becker and Murphy (1988), is externalities. A complication in interpreting the consequences of bans on nonsmokers' well-being is the evolution of life satisfaction. It is possible that our measure is under-estimating the long-run benefits of these smoking policies.

Moreover, it is conceivable that people who smoke less than once a day (before or after the smoking bans) are negatively/positively affected by smoking bans. If they were occasional smokers before the ban but weren't able to stop to smoke, then one could possibly imagine that they are better or worse off. To verify this hypothesis, a predicted probability of smoking (PSMOKE) is re-estimated for each respondent by considering people who smoked at least once over the last year as smokers (in the previous analysis, only daily smokers were considered as smokers). Occasional smokers might be affected as well by smoking bans. If it is the case, including this group should give a positive effect of smoking bans on predicted smokers. Once again, smoking bans have large, positive, and statistically significant effects on predicted smokers (Appendix 6, column 1). This means that both daily and occasional smokers benefit from smoking bans. Given that the smoking bans affect both types of smokers, our analysis focuses on these individuals for the remainder of this research.

B. Specification Checks

A further set of robustness checks (Appendix Table 6) explore whether the findings are sensitive to the structure imposed by the OLS. Our choice to present OLS estimates is based upon the findings of Ai and Norton (2003) who pointed out that interpreting interaction terms in a nonlinear model is not straightforward. Nonetheless, using an ordered probit yields similar outcomes on predicted smokers. I also verify issues of political economy and omitted factors that could explain the findings. Counties who implemented smoking bans might have different characteristics which could explain the positive effects of the ban on life satisfaction. A way to verify this concern is to include a dummy that equals to one the year before the effectiveness of the law. Appendix Table 6 includes this variable "1B-SB" and an interaction between this variable and "Predicted Smoking". The interaction is insignificant and very small.

An alternative way to address this concern is to include county-level variables in the specification. Table 4 presents results of altered versions of equation (1) for the BRFSS (see Appendix Table 8 for the LSS). Column 1 interacts the county unemployment rate with "Predicted Smoking" to capture any business cycle effects that would affect differently smokers and nonsmokers. Column two includes interaction between state dummies and state-specific linear time trends to take into account any movement in smoking bans and well-being. The third column does include an interaction between time trends and the variable "Predicted Smoking" to allow for different trends in self-reported life satisfaction. Column 4 includes an interaction of each state dummies with "Predicted Smoking" which allows the impact to vary across states.

All these interactions do not affect the finding that smoking bans increase the life satisfaction of predicted smokers. The inclusion of the interactions of state dummies and a time trend does not change the magnitude of the coefficient of interest. Besides, adding an interaction between the time trend and the variable predicted smoking (occasional and daily smokers) lowers slightly the effects of smoking bans on predicted smokers. On the whole, the introduction of these controls does not

affect the robustness of our findings.

Column 5 includes the following list of county-level variables: the median household income, smoking prevalence rates (only the BRFSS)[18], an interaction between smoking prevalence rates and "Predicted Smoking", unemployment rate, the percentage of high school graduates, the percentage of owner-occupied housing, urbanization and population density. These county-level characteristics were included in the equation that predicts if the respondent is a smoker. Including or not the county-level variables to predict smoking does not affect the findings of column 5. The coefficient of interest slightly decreases/increases in the LSS/BRFSS. Lastly, column 6 of Appendix Table 8 presents a specification where county dummies are included.

There is also a positive relationship between smoking prevalence rate and life satisfaction (not shown). The coefficient of the interaction smoking prevalence rates and "Predicted Smoking" is very large (0.703 (std.: 0.123)) which means that smokers' disutility of smoking decreases with the prevalence of smoking. Smoking bans decrease smoking prevalence and increase the disutility of smoking. Recent researches by economists have shown that the behavior of peer groups affects decisions of individuals. This means that well-being is influenced by decisions of peers. In the case of cigarettes, the decision to stop smoking is going to affect the behavior and the well-being of relatives. If my own disutility of smoking decreases with the prevalence of smoking of my peer groups, then spillover effects will occur. With the implementation of smoking bans, the prevalence among my relatives drops and my own disutility increases.

[18]The BRFSS was used to estimate county adult smoking prevalence. Smokers were defined as adults who reported having smoked more than 100 cigarettes in their lifetime and now smoke every day or some days. Using this information, I test whether the effect of the bans is larger when the smoking prevalence is lower/higher at the county-level. Interestingly, the effect on life satisfaction is larger when the smoking prevalence is lower which is consistent with models of social interactions.

V. Theories of Addiction and Preferences of Smokers

A. Theories of Addiction

One way to understand the mechanisms that explain why predicted smokers are more satisfied with their lives when they are exposed to smoking bans is to evaluate the impact of smoking policies on different demographic groups. Jehiel and Lilico (2010) proposed a model in which the agent has limited foresight. They argued that young people have a limited foresight (short horizon) and stop smoking when they get older as a result of having better foresight. Smoking bans would thus affect differently young and old smokers. Since smoking bans have a bigger effect on the prevalence of smoking of young individuals, *a priori*, one could expect that the positive effect of smoking bans is larger for this demographic group. Estimating separately for young (less than 50 years old) and old respondents (more than 50 years old) the impact of smoking bans on life satisfaction confirms this intuition. There is a positive effect for both groups but it is significantly larger for young in both the BRFSS and the LSS (not shown).

In the framework of a rational addiction model, smoking bans could increase smokers' well-being if there are externalities within the family. The implementation of smoke-free public places may also change smokers' behavior. Anderson *et al.* (2006) showed that smoke-free laws seem to stimulate adoption of smoke-free homes which is a strategy associated with the success of these attempts. Recall that our previous finding did not confirm this hypothesis. Smoking bans seem to decrease the prevalence of smoking relatively more for unmarried than married respondents[19].

The question of whether within-interpersonal externalities may explain our findings can be answered by looking separately at married and single respondents. If

[19]Using British data (BHPS), Clark and Etile (2006) found that there are intra-spousal correlations in smoking status in the raw data. They test whether these correlations come from the similarity of partners' fixed traits (matching) or from decision-making over health investment. There is little evidence for spillovers in cigarette consumption between partners during marriage, but their estimates support the matching of partners' preferences for smoking.

smoking bans make smokers' family members more satisfied with their lives, then the impact could be larger on married people. I use two methodologies for investigating this issue. First, Table 5 separately estimates our baseline model for married and unmarried using the LSS (see Appendix Table 9 for the BRFSS). Columns 1 and 2 present the estimates of an OLS for unmarried and married people. There is some evidence that the impact of smoking bans is bigger, among predicted smokers, for married relatively to unmarried individuals. The coefficient is larger and only statistically significant for the interaction between predicted smoking and smoking ban when the sample is restricted to married people. When the sample is limited to unmarried people, the impact of smoking bans do seem to be positive but the standard deviation is quite large. This is a first piece of evidence that within-family externalities might be driven our findings.

Columns 3 and 4 separately estimate our model for parents and non-parents. If our effects are due to intra-family externalities, there are reasons to believe that the impact of smoking bans is greater for parents than for non-parents. If relatives are better off with less smoking, then smokers are more likely to report higher levels of utility. This responsibility effect is found since the estimated coefficients on the interaction between smoking bans and predicted smoking are only statistically significant when the sample is restricted to parents. The estimated coefficients are both positive but the effect is much larger for parents.

Our second methodology in order to verify if there are externalities within the couple is to estimate spousal predicting smoking. The LSS is well suited to do so since age, working status and education level of the spouse are available. I estimate spousal predicted smoking as a function of the covariates used previously for the respondent, but using the spouse's age, working status and education level[20]. These variables are considered to determine the probability of smoking but are not determinants of well-being: these variables are exclusion restrictions and identify

[20]Age, working status and education level of the respondent are not included in the spousal predicted smoking, but they are in the well-being equation. On the other hand, spousal characteristics help us to predict if the spouse is smoking but they are not included in the well-being equation. The period is restricted to 1986-1998 (except 1990) for the LSS because the age of the respondent's spouse is not available in 1985. The F-Stat for the first-stage varies from 45 to 90 depending of the year.

the model.

Our specification also follows Wooldridge (2002) who proposes to use the nonlinear fitted values as the instrument in the well-being equation (1). First, the spousal predicted smoking equation is estimated with the exclusion restrictions described above. Then, the predicted variable "Spousal Predicted Smoking" is introduced as the only independent variable in a regression where the dependent variable is once again being a smoker. This gives us a second prediction of the spousal predicted smoking variable. Lastly, this second "Spousal Predicted Smoking" variable is used as previously in equation (1). Using this strategy or simply plugging in equation (1) the "Spousal Predicted Smoking" variable yields similar results.

Columns 5 and 6 show the estimated effect of equation (1) where the sample is restricted to married people. The first row presents, as before, the effect of the smoking bans on respondents' life satisfaction. The fourth and the fifth rows show the predicted smoking of the spouse and the interaction between smoking bans in bars and restaurants and the latter variable. Column 5 does not include the variable PSMOKE and the interaction SB*PSMOKE. The effect of the smoking bans is identified through spouse's predicted smoking. The interaction between spouse's predicted smoking and smoking bans on the fifth row clearly shows large and positive effects on life satisfaction of married persons. The impact is statistically significant which suggests that smoking bans affect positively respondent's life satisfaction when the spouse is a predicted smoker. Column 6 simply adds the variable PSMOKE and the interaction SB*PSMOKE. Once again, married couples where the spouse is predicted to smoke are made better off by the smoking bans. But the inclusion of these two terms affect considerably the interaction "Smoking Ban*Predicted Smoking". The coefficient becomes negative, very small and insignificant. This means that within-family externalities are present and appear to explain our main results.

B. Preferences for Smoking Bans

Previous findings would suggest, *a priori*, that the time-inconsistent model is well suited to explain why predicted smokers are better off with smoking bans. As pointed out by Gruber and Koszegi (2001), most smokers want to quit but are not

able. This self-control problem is problematic because smokers are impatient about the present. They desire to smoke less in the future but are incapable of doing so in the short term. Because of this time-inconsistency, any smoking policies that would help smokers to quit would increase their well-being.

This section tests whether smokers who are exposed to a smoking ban are less-opposed to these policies. In 2002, a large telephone survey, conducted only on smokers (in Australia, Canada, United States and United Kingdom), reported that support for smoke-free environments is stronger when individuals have experienced bans (restaurants or bars). Gender and age are also good predicators of support: men and older smokers were in a greater proportion in favor of public smoking bans (Borland *et al.*, 2006). Using data from a 1992 survey of 764 individuals in San Luis Obispo (CA), Boyes and Marlow (1996) found that the probability of supporting a ban in bars and restaurants is lower for smokers than for nonsmokers. Being an ex-smoker only influences negatively support for a ban in bars.

A question on smoking in public places in the LSS allows us to verify the findings of Boyes and Marlow (1996). Respondents are asked over the period 1985-1995 if: "Smoking should not be allowed in public places". This is a 6-point scale question which goes from "Definitely Disagree" to "Definitely Agree". The results of estimating regressions that relate being in favor of smoking bans in public places to a variety of socioeconomic determinants like being a smoker are presented in Table 6. State and year fixed effects completely control for any fixed differences between states and between years. Determinants of supporting or not smoking in public places include sex, age, marital status, household income, education, dwelling, attending church or other place of worship, children, working status and being a smoker.

Column 1 first corroborates the finding of Boyes and Marlow (1996) that daily smokers are more resistant to the implementation of smoking bans. Being educated, living in a trailer, being a man, being married, attending church or other place of worship and working full-time increase significantly the probability to agree that smoking should not be allowed in public places (not shown). The latter determinant could be explained by the fact that smoke-free workplaces are not included in the question. The coefficients on age-squared show a clear U-shaped relationship

between age and being in favor of smoking bans in public places. Additionally, it seems that there is not a monotonic relationship between the dependent variable and household income or having children.

The first column pointed out that smokers are not in favor of smoking bans. Column 2 looks at a different issue by investigating whether smokers who have been exposed to a smoking ban are in favor of these policies *ex post*. A dummy ("Smoking Ban") indicating if the respondent's county of residence has a smoking ban either in bars or in restaurants is included. Then, an interaction between "Smoking Ban" and "Smoker" is added to capture the effect for smokers of being in a county with a smoking ban. The OLS shows a positive and large coefficient for the interaction, suggesting that daily smokers who are exposed to a smoking ban are less-opposed to these smoking policies (using an ordered probit yields the same findings). Column 3 does the same exercise but replaces the variable "Smoker" by "Predicted Smoking". The interaction between "Predicted Smoking" and "Smoking Ban" is once again positive but this time insignificant. Remember that smoking bans implemented after 1995 are not taken into account in this specification since the dependent variable is asked over the period 1985-1995.

These results are somewhat consistent with the model of Gruber and Koszegi (2001). Many surveys pointed out that smokers want to quit. However, smokers do not want to cease smoking in the present because they are impatient. Their long term objective is unreachable unless they are pushed to stop. Our results show that smokers do not recognize, *ex ante*, that smoking bans could help them to improve their utility[21]. The positive impact of quitting on life satisfaction and the change in perception regarding smoking bans *ex post* could be interpreted as evidence that agents are not rational when it comes to addictive goods.

[21] O'Donoghue and Rabin (1999) propose an alternative model in which individuals do not recognize their self-control problems. Our findings do not corroborate their model since smokers want to quit but want to do it in a painless way.

VI. Conclusion

This paper has attempted to provide an analysis of the consequences of smoking bans on the well-being of smokers. Our analysis of the LSS and the BRFSS data allows us to evaluate empirically the implications of different addiction models. Under the rational addiction model of Becker and Murphy (1988), smoking policies make time-consistent smokers worse off. On the other hand, Gruber and Koszegi (2001) explain that smoking policies provide a self-control device for smokers. Since most of the smokers wish to quit, smoking bans do increase their well-being.

The empirical results show that life satisfaction increases for predicted smokers once a smoking ban, either for bars or restaurants, is implemented in their county. These findings are consistent with the model of Gruber and Koszegi (2001) in which smokers are time-inconsistent. By forcing 100 percent smoke-free provision of smoking in restaurants or bars, the government allows individuals to do what they were unable to do, stop smoking. Another finding of this research is that smokers do not, *ex ante*, favor the implementation of smoking bans. It is only when they are affected by these policies that they do start to agree that smoking should not be allowed in public places.

The effects of smoking bans are not confined to daily smokers. Occasional smokers benefit as well from these bans. Due to a lack of information on the exact moment where respondents stopped smoking, it was not possible to address the short and long term consequences of stopping to smoke. Even though empirical evidence suggests that smoking bans increase life satisfaction of predicted smokers, it is of general interest to know the evolution of their well-being. Unfortunately, finding a US panel that includes self-reported well-being and smoking behavior over a long period may not be the easiest task.

Finally, the impacts of smoking bans are explained by within-family externalities. Positive effects of smoking bans are found for parents and married couples where the spouse is predicted to smoke. Time-inconsistent family-utility maximization gives a plausible explanation of these findings. If relatives are better off with less smoking, then smokers should stop smoking. Once again, a time-inconsistency model explains

the fact that current smokers do not support smoking bans in the present even if their family would benefit from it.

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Table 1 - Summary Statistics, Behavioral Risk Factor Surveillance System

	All	Daily Smoker?		
		Yes	No	Difference
Reported Life Satisfaction [1] Very Dissatisfied [4] Very Satisfied	3.388 (0.622)	3.163 (0.693)	3.387 (0.620)	-0.223 (0.002)
Very Satisfied	0.453 (0.498)	0.308 (0.462)	0.451 (0.498)	-0.142 (0.001)
Very Dissatisfied	0.010 (0.101)	0.026 (0.160)	0.010 (0.098)	0.017 (0.000)
Male	0.498 (0.500)	0.536 (0.499)	0.564 (0.496)	-0.028 (0.001)
Age	45.93 (16.86)	42.80 (14.47)	51.09 (16.98)	-8.30 (0.039)
Elementary School	0.037 (0.188)	0.035 (0.183)	0.035 (0.184)	0.000 (0.000)
Att. High School	0.065 (0.246)	0.127 (0.333)	0.066 (0.248)	0.061 (0.001)
Grad. High School	0.270 (0.444)	0.390 (0.488)	0.285 (0.451)	0.105 (0.001)
Att. Colleg	0.267 (0.442)	0.289 (0.453)	0.282 (0.450)	0.008 (0.001)
Grad. College	0.362 (0.481)	0.159 (0.365)	0.332 (0.471)	-0.173 (0.001)
Married	0.616 (0.486)	0.484 (0.500)	0.646 (0.478)	-0.162 (0.001)
Divorced	0.091 (0.288)	0.155 (0.362)	0.105 (0.307)	0.050 (0.001)
Single	0.216 (0.411)	0.277 (0.448)	0.158 (0.364)	0.120 (0.001)
Separated	0.021 (0.143)	0.038 (0.192)	0.019 (0.136)	0.019 (0.003)
Widowed	0.056 (0.230)	0.046 (0.209)	0.072 (0.259)	-0.027 (0.001)
No child	0.556 (0.497)	0.555 (0.497)	0.634 (0.500)	-0.078 (0.001)
One Child	0.174 (0.379)	0.188 (0.390)	0.152 (0.359)	0.035 (0.001)
Two Children	0.168 (0.374)	0.154 (0.361)	0.137 (0.343)	0.017 (0.001)
Three Children or More	0.103 (0.303)	0.103 (0.304)	0.078 (0.268)	0.025 (0.001)
Employed	0.539 (0.498)	0.532 (0.499)	0.487 (0.500)	0.045 (0.001)
Unemployed	0.025 (0.156)	0.047 (0.211)	0.023 (0.151)	0.023 (0.000)
Self-Employment	0.088 (0.284)	0.087 (0.282)	0.093 (0.291)	-0.007 (0.001)
Retired	0.148 (0.355)	0.086 (0.281)	0.229 (0.420)	-0.142 (0.001)
Disabled or Student	0.125 (0.331)	0.189 (0.391)	0.111 (0.314)	0.078 (0.001)
Full-Time Homemaker	0.075 (0.263)	0.060 (0.264)	0.057 (0.231)	0.003 (0.001)
Unemployment Rate	6.59 (2.57)	6.58 (2.55)	6.44 (2.47)	-0.135 (0.006)
N	796,910	222,634	574,276	

Note: Sample means are weighted using the variable _finalwt and the personal sampling weights from each wave are re-scaled to sum up to one for each year. Standard errors are in parentheses. The period covered is 1985-1998, except the year 1990. Column 1 is full sample means while 2 and 3 restrict the sample to daily and non-daily smokers respectively.

Table 2 - Linear Probability Models of Cessation

	BRFSS							
Marginal Effects	**Smoking Prevalence (1)**	**Smoking Prevalence (2)**	**Smoking Prevalence (3)**	**Smoking Prevalence (4)**	**% Former Smoker (5)**	**Attempted Quits (6)**	**Smoking Prevalence (7)**	**Attempted Quits (8)**
Smoking Ban (Bars and Restaurants)	-0.0131 (0.0028)	-0.0067 (0.0030)	-0.0130 (0.0028)	-0.0153 (0.0034)	0.0062 (0.0045)	-0.0068 (0.0062)	-0.0154 (0.0033)	0.0213 (0.0073)
Smoking Ban (Workplaces)	-0.0003 (0.0035)	0.0011 (0.0030)	-0.0003 (0.0035)	0.0021 (0.0027)	-0.0015 (0.0047)	0.0116 (0.0074)	0.0020 (0.0027)	-0.0064 (0.0075)
State-Level Changes in Taxes			0.0004 (0.0008)	-0.0004 (0.0006)	0.0010 (0.0012)	0.0030 (0.0015)	-0.0004 (0.0006)	0.0015 (0.0017)
State-Level Changes in Tobacco Control Programs/Funding				0.0000 (0.0002)				
Control Variables (see App. Table 5)								
Socioeconomic Controls	✓	✓	✓	✓	✓	✓	✓	✓
State Dummies	✓	✓	✓	✓	✓	✓	✓	✓
Year Dummies	✓	✓	✓	✓	✓	✓	✓	✓
County-Level Variables		✓			✓	✓		
Years	1988-2010	1988-2010	1988-2010	2000-2010	1988-2010	1990-2010	2005-2010	2005-2010
N	3,751,651	3,671,674	3,691,813	1,945,282	1,721,620	671,498	1,959,507	342,750

Note: All estimates are weighted using the variable _finalwt and the personal sampling weights from each wave are re-scaled to sum up to one for each year. Robust standard errors are in parentheses, clustered by county. The dependent variable is smoking prevalence for columns 1-4 and 7 (current smokers). Column five uses the percentage of former smokers (smoked a least 100 cigarettes in their lifetime). The dependent variable is attempted quits (within the last year) for columns 6 and 8.

Table 3 - Relationship Between Smoking Bans and Subjective Well-Being

OLS (z-score)	**Life Satisfaction BRFSS (1)**	**Life Satisfaction LSS (2)**	**Life Satisfaction BRFSS (3)**	**Life Satisfaction LSS (4)**	**Something Diff. LSS (5)**	**Life Satisfaction BRFSS (6)**	**Life Satisfaction LSS (7)**
Smoking Ban Bars and Restaurants (SB)	-0.021	0.008	-0.044	-0.079	-0.144	-0.039	-0.068
	(0.006)	(0.030)	(0.013)	(0.062)	(0.053)	(0.012)	(0.065)
Predicted Smoking			-0.840	-0.299	-0.359	-0.840	-0.297
			(0.042)	(0.066)	(0.073)	(0.042)	(0.065)
SB*Predicted Smoking			0.078	0.496	0.807	0.077	0.653
			(0.038)	(0.266)	(0.195)	(0.036)	(0.315)
Smoking Ban Workplace (SBW)						-0.009	-0.048
						(0.010)	(0.047)
SBW*Predicted Smoking						0.003	-0.254
						(0.035)	(0.159)
Control Variables (see App. Table 5)							
Socioeconomic Controls	✓	✓	✓	✓	✓	✓	✓
State Dummies	✓	✓	✓	✓	✓	✓	✓
Year Dummies	✓	✓	✓	✓	✓	✓	✓
F Stat: (SB-(SB*PS)=0)			5.98	3.19	16.68	6.27	3.69
N.	1,683,004	44,635	1,683,003	44,635	44,749	1,683,003	44,635

Note: All estimates are weighted using the variables _finalwt and WEIGHT. The personal sampling weights from each wave are re-scaled to sum up to one for each year. Robust standard errors are in parentheses, clustered by county. The period covered is 1985-1998 (except 1990) for the LSS and 2005-2010 for the BRFSS. The first two columns present basic estimates of the impact of smoking bans. Column 3 and 4 present our basic estimates from equation (1) by adding "Predicted Smoking", and an interaction with "Smoking Ban". Column 5 shows the same specification but using the question 'Do Something Different'. The last two columns do the same exercises but also analyze the effects of workplace smoking bans.

Table 4 - Robustness Checks

Behavioral Risk Factor Surveillance System					
Life Satisfaction OLS (z-score)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Smoking Ban Bars and Restaurants (SB)	-0.051 (0.014)	-0.055 (0.014)	-0.048 (0.015)	-0.047 (0.010)	-0.046 (0.013)
Predicted Smoking (Occasional Smokers Included)	-0.877 (0.047)	-0.877 (0.049)	-0.864 (0.047)	-0.782 (0.062)	-0.848 (0.081)
SB*Predicted Smoking (Occasional Smokers Included)	0.070 (0.030)	0.072 (0.031)	0.065 (0.032)	0.060 (0.022)	0.087 (0.027)
Control Variables (see App. Table 5)					
Socioeconomic Controls	✓	✓	✓	✓	✓
State Dummies	✓	✓	✓	✓	✓
Year Dummies	✓	✓	✓	✓	✓
Predicted Smoking*Unemployment Rate	✓				
State Dummies*Trend		✓			
Predicted Smoking*Trend			✓		
State Dummies*Predicted Smoking				✓	
County-Level Variables					✓
F Stat: (SB-(SB*PS)=0)	7.70	8.47	6.00	12.44	11.46
N	1,653,720	1,683,003	1,683,003	1,683,003	1,653,667

Note: All estimates are weighted using the variable _finalwt and the personal sampling weights from each wave are re-scaled to sum up to one for each year. Robust standard errors are in parentheses, clustered by county. The period covered is 2005-2010. "Predicted Smoking*Unemployment Rate" means that the effect of predicted smoking was allowed to depend on the unemployment rate in the county. "State Dummies*Trend" means that each State was allowed to have its own linear time trend. "Predicted Smoking*Trend" is an interaction between the propensity to smoke and a linear time trend. "State Dummies*Predicted Smoking" means that predicted smoking was allowed to have a different effect in each State.

Table 5 - Relationship Between Smoking Bans and Subjective Well-Being by Demographic Group

	Life Style Survey					
OLS (z-scores)	**Unmarried (1)**	**Married (2)**	**Parents (3)**	**No Child (4)**	**Married (5)**	**Married (6)**
Smoking Ban Bars and Restaurants (SB)	-0.083 (0.105)	-0.110 (0.057)	-0.240 (0.074)	0.015 (0.065)	-0.116 (0.058)	-0.108 (0.058)
Predicted Smoking (Occasional Smokers Included)	-0.260 (0.102)	-0.287 (0.072)	-0.109 (0.081)	-0.388 (0.084)		-0.398 (0.077)
SB*Predicted Smoking (Occasional Smokers Included)	0.285 (0.363)	0.469 (0.232)	0.815 (0.319)	0.036 (0.223)		-0.153 (0.423)
Spouse's Predicted Smoking (Occasional Smokers Included)					-0.536 (0.054)	-0.332 (0.072)
SB*Spouse's Predicted Smoking (Occasional Smokers Included)					0.596 (0.260)	0.715 (0.441)
Control Variables (see App.Table 5)						
Age, Age-Squared and Sex	✓	✓	✓	✓	✓	✓
Socioeconomic Controls	✓	✓	✓	✓	✓	✓
State Dummies	✓	✓	✓	✓	✓	✓
Year Dummies	✓	✓	✓	✓	✓	✓
F Stat: (SB-(SB*PS)=0)	0.63	4.25	7.47	0.01	5.28	3.13
N	14,053	34,630	24,263	24,062	28,560	28,568

Note: All estimates are weighted using the variable WEIGHT and the personal sampling weights from each wave are re-scaled to sum up to one for each year. Robust standard errors are in parentheses, clustered by county. The period covered is 1986-1998 (except 1990). The first column restricts the sample to divorced, single, separated and widowed. Columns 2, 3 and 4 restrict the sample respectively to married, parents, and non-parents. Columns 5 and 6 augment equation (1) by adding spouse's propensity to smoke, and an interaction with "Smoking Ban".

Table 6 - Smoking Bans in Public Places, LSS

Dep. Variable: "Smoking should not be allowed in public places: [1] Definitely Disagree to [6] Definitely Agree?"			
Regression Coefficients (z-scores)	**OLS (z-scores) (1)**	**OLS (z-scores) (2)**	**OLS (z-scores) (2)**
Smoker	-1.514 (0.015)	-1.517 (0.015)	
Smoking Ban Bars and Restaurants (SB)		0.015 (0.071)	-0.038 (0.079)
Smoking Ban*Smoker		0.210 (0.091)	
Predicted Smoking (Occasional Smokers Included)			-1.906 (0.089)
SB*Predicted Smoking (Occasional Smokers Included)		0.166 (0.096)	0.290 (0.352)
Control Variables (see App. Table 5)			
Socioeconomic Controls	✓	✓	✓
State Dummies	✓	✓	✓
Year Dummies	✓	✓	✓
F Stat: (SB-(SB*PS)=0)		2.41	0.67
N.	34,922	34,922	35,158

Note: All estimates are weighted using the variable WEIGHT and the personal sampling weights from each wave are re-scaled to sum up to one for each year. Robust standard errors are in parentheses. The period covered is 1985-1995, except the year 1990.

Appendix Table 1 - Summary Statistics, Life Style Survey

	All	Daily Smoker?		
		Yes	No	Difference
Life Satisfaction: [1] to [6]	4.019 (1.469)	3.790 (1.518)	4.084 (1.446)	-0.300 (0.017)
Satisfied: Def. Agree	0.160 (0.367)	0.134 (0.340)	0.167 (0.373)	-0.037 (0.004)
Satisfied: Def. Disagree	0.081 (0.273)	0.108 (0.310)	0.073 (0.260)	0.033 (0.003)
Male	0.452 (0.498)	0.482 (0.500)	0.441 (0.497)	0.039 (0.006)
Age	46.18 (15.89)	43.53 (14.07)	46.76 (16.28)	-3.33 (0.180)
Elementary School	0.027 (0.163)	0.034 (0.181)	0.027 (0.161)	0.006 (0.002)
Att. High School	0.070 (0.255)	0.115 (0.319)	0.059 (0.235)	0.055 (0.003)
Grad. High School	0.353 (0.478)	0.425 (0.494)	0.336 (0.471)	0.088 (0.005)
Att. Colleg	0.287 (0.453)	0.283 (0.450)	0.286 (0.452)	0.000 (0.005)
Grad. College	0.133 (0.339)	0.079 (0.270)	0.147 (0.354)	-0.067 (0.004)
Post-Grad. Educ.	0.129 (0.335)	0.064 (0.245)	0.146 (0.353)	-0.082 (0.004)
Mobile HM	0.071 (0.257)	0.102 (0.303)	0.063 (0.242)	0.041 (0.003)
1-Family Detached	0.724 (0.447)	0.673 (0.469)	0.738 (0.440)	-0.068 (0.005)
1-Family Attached	0.046 (0.209)	0.048 (0.213)	0.045 (0.206)	0.004 (0.002)
Building for 2 Families	0.043 (0.203)	0.055 (0.228)	0.040 (0.197)	0.015 (0.002)
Building for 3+ Families	0.113 (0.317)	0.119 (0.323)	0.112 (0.315)	0.008 (0.004)
Never Att. Church	0.255 (0.436)	0.373 (0.484)	0.220 (0.414)	0.147 (0.005)
Att. Church 1-4 a Year	0.156 (0.363)	0.207 (0.405)	0.143 (0.350)	0.060 (0.004)
Att. Church 5-8 a Year	0.067 (0.251)	0.080 (0.271)	0.064 (0.244)	0.017 (0.003)
Att. Church 9-11 a Year	0.047 (0.213)	0.050 (0.218)	0.046 (0.209)	0.005 (0.002)
Att. Church 12-24 a Year	0.073 (0.260)	0.070 (0.255)	0.074 (0.261)	-0.003 (0.003)
Att. Church 25-51 a Year	0.144 (0.352)	0.103 (0.304)	0.157 (0.364)	-0.052 (0.004)
Att. Church 52+ a Year	0.257 (0.437)	0.118 (0.322)	0.296 (0.457)	-0.175 (0.005)
Married	0.723 (0.447)	0.699 (0.459)	0.734 (0.442)	-0.033 (0.005)
Divorced	0.083 (0.276)	0.116 (0.321)	0.072 (0.258)	0.043 (0.003)
Single	0.106 (0.308)	0.103 (0.304)	0.108 (0.310)	-0.004 (0.003)
Separated	0.015 (0.121)	0.022 (0.148)	0.010 (0.101)	0.011 (0.001)
Widowed	0.073 (0.260)	0.059 (0.236)	0.076 (0.265)	-0.016 (0.003)
No child	0.488 (0.500)	0.438 (0.496)	0.497 (0.500)	-0.058 (0.006)
One Child	0.201 (0.401)	0.217 (0.412)	0.199 (0.399)	0.020 (0.004)
Two Children	0.196 (0.397)	0.215 (0.411)	0.191 (0.393)	0.021 (0.004)
Three Children or More	0.115 (0.319)	0.131 (0.337)	0.113 (0.316)	0.018 (0.004)
Full-Time Worker	0.489 (0.500)	0.523 (0.500)	0.478 (0.500)	0.040 (0.006)
Unemployed	0.027 (0.162)	0.042 (0.200)	0.023 (0.151)	0.020 (0.002)
Self-Employment	0.087 (0.281)	0.087 (0.282)	0.087 (0.282)	0.001 (0.003)
Part-Time Worker	0.090 (0.286)	0.080 (0.271)	0.092 (0.290)	-0.012 (0.003)
Retired	0.154 (0.361)	0.108 (0.311)	0.166 (0.372)	-0.059 (0.004)

Disabled or Student	0.032 (0.176)	0.043 (0.202)	0.028 (0.166)	0.016 (0.002)
Full-Time Homemaker	0.122 (0.327)	0.118 (0.322)	0.126 (0.331)	-0.007 (0.004)
Unemp. Rate (County)	6.09 (2.33)	6.18 (2.30)	6.34 (2.27)	0.146 (0.026)
N	44,793	9,055	32,396	

Note: Sample means are weighted using the variable WEIGHT and the personal sampling weights from each wave are re-scaled to sum up to one for each year. Standard errors are in parentheses. The period covered is 1985-1998, except the year 1990. Column 1 is full sample means while 2 and 3 restrict the sample to daily and non-daily smokers respectively.

Appendix Table 2 - Distribution of Well-Being and Smoking Variables

BRFSS										
Life Satisfaction		Very Dissatisfied	Dissatisfied	Satisfied	Very Satisfied				Total	Period
	Freq.	17,288	73,924	829,960	761,832				1,683,004	2005-2010
	%	1,03	4,39	49,31	45,27					
Smoking Cigarettes	# Times last year	NonSmoker	1 to 4	5 to 8	9 to 11	12 to 24	25 to 51	Daily	Total	Period
	Freq.	33,826	408	249	207	486	599	9,953	45,728	2005-2010
	%	73,97	0,89	0,54	0,45	1,06	1,31	21,78		
PSMOKE		[0,0.2]	]0.2,0.4]	]0.4,0.6]	]0.6,0.8]	]0.8,1]			Total	Period
	Freq.	571,839	661,940	402,545	55,339	18,50			1,721,681	2005-2010
	%	33,21	40,19	23,38	3,21	0,00				

Note: Weighted using the variable _finalwt (BRFSS). The personal sampling weights from each wave are re-scaled to sum up to one for each year.

Appendix Table 3 - Distribution of Well-Being and Smoking Variables

LSS

Life Satisfaction		Definitely Disagree	2	3	4	5	Definitely Agree		Total	Period
	Freq.	4,022	4,388	7,432	11,785	13,488	7,973		49,088	1985-1989, 1991-1998
	%	8,19	8,94	15,14	24,01	27,48	16,24			
Smoking Cigarettes	# Times last year	NonSmoker	1 to 4	5 to 8	9 to 11	12 to 24	25 to 51	Daily	Total	Period
	Freq.	33,826	408	249	207	486	599	9,953	45,728	1985-1989, 1991-1997
	%	73,97	0,89	0,54	0,45	1,06	1,31	21,77		
Smoking in Public Places Should not be Allowed		Definitely Disagree	2	3	4	5	Definitely Agree		Total	Period
	Freq.	6,221	2,845	3,349	4,308	4,847	17,164		38,734	1985-1989, 1991-1995
	%	16,06	7,34	8,65	11,12	12,51	44,31			
PSMOKE		[0,0.2]	]0.2,0.4]	]0.4,0.6]	]0.6,0.8]	]0.8,1]			Total	Period
	Freq.	26,127	17,354	5,250	612	15			49,355	1985-1989, 1991-1998
	%	52,94	35,16	10,64	1,23	0,03				

Note: Weighted using the variable WEIGHT and the personal sampling weights from each wave are re-scaled to sum up to one for each year.

Appendix Table 4 - Linear Probability Models of Cessation, BRFSS

Smoking Prevalence						
Marginal Effects	**Parents (1)**	**No Child (2)**	**Unmarried (3)**	**Married (4)**	**Less 50 Years Old (5)**	**More 50 Years Old (6)**
Smoking Ban (Bars and Restaurants)	-0.0216	-0.0109	-0.0257	-0.0097	-0.0204	-0.0069
	(0.0056)	(0.0031)	(0.0055)	(0.0030)	(0.0047)	(0.0024)
Smoking Ban (Workplaces)	0.0028	0.0021	0.0050	0.0001	0.0034	0.0011
	(0.0043)	(0.0030)	(0.0047)	(0.0027)	(0.0039)	(0.0022)
State-Level Changes in Taxes	0.0001	-0.0006	-0.0017	0.0004	-0.0007	0.0004
	(0.0010)	(0.0007)	(0.0010)	(0.0006)	(0.0007)	(0.0007)
Control Variables (see App. Table 5)						
Socioeconomic Controls	✓	✓	✓	✓	✓	✓
State Dummies	✓	✓	✓	✓	✓	✓
Year Dummies	✓	✓	✓	✓	✓	✓
Years	2005-2010	2005-2010	2005-2010	2005-2010	2005-2010	2005-2010
N	599,552	1,359,955	865,998	1,093,509	830,708	1,142,154

Note: All estimates are weighted using the variable _finalwt and the personal sampling weights from each wave are re-scaled to sum up to one for each year. Robust standard errors are in parentheses, clustered by county. The dependent variable is smoking prevalence (current smokers).

Appendix Table 5 - Smoking Prediction Equation (Daily Smoker)

Logit	LSS (1993)	BRFSS (2005)
Male	-0.160 (0.307)	-0.253 (0.094)
Age	0.112 (0.024)	0.070 (0.008)
Age-Squared/100	-0.140 (0.026)	-0.109 (0.008)
Age*Male	0.005 (0.006)	0.004 (0.002)
Less than 10,000	0.221 (0.246)	
[10000, 15000]	0.254 (0.252)	
[15000, 20000]	0.107 (0.234)	
[20000, 25000]	0.467 (0.216)	
[25000, 30000]	-0.232 (0.226)	
[30000, 35000]	0.163 (0.209)	
[35000, 40000]	Omitted	
[40000, 45000]	-0.267 (0.256)	
[45000, 50000]	0.263 (0.231)	
[50000, 60000]	-0.276 (0.215)	
[60000, 70000]	-0.194 (0.255)	
More than 70,000	-0.283 (0.216)	
Less than 10,000		0.555 (0.089)
[10000, 15000]		0.421 (0.097)
[15000, 20000]		0.434 (0.059)
[20000, 25000]		0.429 (0.056)
[25000, 35000]		0.432 (0.046)
[35000, 50000]		0.371 (0.041)
[50000, 75000]		0.201 (0.041)
More than 75,000		Omitted
Elementary School	-0.380 (0.313)	-0.137 (0.126)
Att. High School	0.698 (0.175)	0.212 (0.049)
Grad. High School	Omitted	Omitted
Att. Colleg	-0.387 (0.112)	-0.281 (0.036)
Grad. College	-1.078 (0.163)	-0.798 (0.042)
Post-Grad. Educ.	-0.906 (0.180)	
Mobile HM	0.587 (0.270)	
1-Family Detached	0.104 (0.223)	
1-Family Attached to House	Omitted	
Building for 2 Families	0.099 (0.287)	
Building for 3+ Families	0.275 (0.248)	
Never Att. Church	1.412 (0.147)	
Att. Church 1-4 a Year	1.398 (0.169)	
Att. Church 5-8 a Year	1.239 (0.186)	
Att. Church 9-11 a Year	1.253 (0.245)	
Att. Church 12-24 a Year	0.763 (0.220)	

Att. Church 25-51 a Year	0.599 (0.166)	
Att. Church 52+ a Year	Omitted	
Married	0.123 (0.179)	-0.393 (0.048)
Divorced	0.590 (0.207)	0.086 (0.048)
Single	Omitted	Omitted
Separated	0.479 (0.365)	0.172 (0.117)
Widowed	0.294 (0.275)	0.127 (0.065)
No child	Omitted	Omitted
One Child	0.078 (0.125)	-0.143 (0.044)
Two Children	-0.018 (0.138)	-0.186 (0.044)
Three Children or More	0.360 (0.158)	-0.106 (0.052)
Full-Time Worker	-0.060 (0.170)	-0.099 (0.103)
Unemployed	0.349 (0.265)	Omitted
Self-Employment	0.008 (0.226)	-0.145 (0.129)
Part-Time Worker	Omitted	
Retired	0.350 (0.247)	-0.226 (0.105)
Disabled or Student	-0.012 (0.304)	0.036 (0.116)
Full-Time Homemaker	-0.189 (0.214)	-0.121 (0.101)
Smoking Prevalence Rate (County)		✓
Unemployment Rate (County)	✓	✓
% Owner Occupied Housing (County)	✓	✓
Population Density (County)	✓	✓
Urbanization (County)	✓	✓
Median Household Income (County)	✓	✓
% High School Graduates (County)	✓	✓
State Dummies	✓	✓
N.	3,374	125,561
Pseudo R^2	0.1407	0.1029
Log Pseudolikelihood	-0.4305	-0.2643

Note: All estimates are weighted using the variables WEIGHT and _finalwt and the personal sampling weights from each wave are re-scaled to sum up to one for each year. Robust standard errors are in parentheses, clustered by county.

Appendix Table 6 - Robustness Checks

Behavioral Risk Factor Surveillance System			
Life Satisfaction	**OLS (z-scores) (1)**	**Ordered Probit (2)**	**OLS (z-scores) (3)**
Predicted Smoking (Occasional Smokers Included)	-0.842 (0.046)	-0.900 (0.057)	-0.839 (0.047)
Smoking Ban Bars and Restaurants (SB)	-0.052 (0.014)	-0.070 (0.018)	-0.052 (0.014)
SB*Predicted Smoking (Occasional Smokers Included)	0.075 (0.030)	0.100 (0.037)	0.073 (0.029)
1 Year Before the Smoking Ban (1B_SB)			0.002 (0.012)
1B_SB*Predicted Smoking			-0.021 (0.031)
Control Variables (see App. Table 5)			
Socioeconomic Controls	✓	✓	✓
State Dummies	✓	✓	✓
Year Dummies	✓	✓	✓
F Stat: (1B_SB-(1B_SB*PS)=0)			0.30
F Stat: (SB-(SB*PS)=0)	8.51	9.89	8.60
N	1,683,003	1,683,003	1,683,003

Note: All estimates are weighted using the variable _finalwt and the personal sampling weights from each wave are re-scaled to sum up to one for each year. Robust standard errors are in parentheses, clustered by county. The period covered is 2005-2010.

Appendix Table 7 - Smoking Bans and Subjective Well-Being

OLS (z-score)	Life Satisfaction BRFSS (1)	Life Satisfaction LSS (2)
Smoking Ban (Bars and Restaurants)	-0.002	-0.001
	(0.008)	(0.040)
Smoker	-0.184	-0.057
	(0.07)	(0.011)
Smoking Ban*Smoker	0.004	0.177
	(0.011)	(0.067)
Control Variables (see Table 5)		
Socioeconomic Controls	✓	✓
State Dummies	✓	✓
Year Dummies	✓	✓
F Stat: (SB-(SB*PS)=0)	0.18	4.36
N	788,519	41,448

Note: All estimates are weighted using the variables WEIGHT and _finalwt and the personal sampling weights from each wave are re-scaled to sum up to one for each year. Robust standard errors are in parentheses, clustered by county. The period covered is 1985-1997 for the LSS (except 1990), and 2005-2010 for the BRFSS. Robust standard errors are in parentheses, clustered by county. The first column presents estimates of the variable "Smoking Bans", "Being a Smoker", and an interaction between these two variables using the BRFSS. Column 2 does the same using the LSS.

Appendix Table 8 - Robustness Checks

Life Style Survey						
Life Satisfaction OLS (z-score)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Smoking Ban Bars and Restaurants (SB)	-0.091 (0.060)	-0.067 (0.070)	-0.082 (0.061)	-0.082 (0.068)	-0.088 (0.052)	-0.115 (0.059)
Predicted Smoking (Occasional Smokers are Included)	-0.036 (0.104)	-0.313 (0.062)	-0.358 (0.074)	-0.355 (0.145)	-0.267 (0.060)	-0.279 (0.066)
SB*Predicted Smoking (Occasional Smokers are Included)	0.513 (0.214)	0.505 (0.246)	0.422 (0.222)	0.426 (0.249)	0.393 (0.203)	0.442 (0.224)
Control Variables (see App. Table 5)						
Socioeconomic Controls	✓	✓	✓	✓	✓	✓
State Dummies	✓	✓	✓	✓	✓	✓
Year Dummies	✓	✓	✓	✓	✓	✓
Predicted Smoking*Unemployment Rate	✓					
State Dummies*Trend		✓				
Predicted Smoking*Trend			✓			
State Dummies*Predicted Smoking				✓		
County-Level Variables					✓	
County Dummies						✓
F Stat: (SB-(SB*PS)=0)	5.08	3.47	3.29	2.65	3.73	4.08
N	44,626	44,675	44,675	44,675	44,509	44,675

Note: All estimates are weighted using the variable WEIGHT and the personal sampling weights from each wave are re-scaled to sum up to one for each year. Robust standard errors are in parentheses, clustered by county. The period covered is 1985-1998 (except 1990). "Predicted Smoking*Unemployment Rate" means that the effect of predicted smoking was allowed to depend on the unemployment rate in the county. "State Dummies*Trend" means that each State was allowed to have its own linear time trend. "Predicted Smoking*Trend" is an interaction between the propensity to smoke and a linear time trend. "State Dummies*Predicted Smoking" means that predicted smoking was allowed to have a different effect in each State.

Appendix Table 9 - Smoking Bans and Subjective Well-Being by Demographic Group

Behavioral Risk Factor Surveillance System				
OLS (z-scores)	**Unmarried (1)**	**Married (2)**	**Parents (3)**	**No Child (4)**
Smoking Ban (Bars and Restaurants)	-0.032 (0.016)	-0.051 (0.014)	-0.072 (0.020)	-0.024 (0.011)
Predicted Smoking	-1.189 (0.056)	-0.671 (0.061)	-0.618 (0.095)	-0.892 (0.051)
Smoking Ban*Predicted Smoking	0.034 (0.038)	0.123 (0.047)	0.142 (0.055)	0.029 (0.037)
Control Variables (see App. Table 5)				
Socioeconomic Controls	✓	✓	✓	✓
State Dummies	✓	✓	✓	✓
Year Dummies	✓	✓	✓	✓
F Stat: (SB-(SB*PS)=0)	1.62	8.59	8.49	1.32
N	731,420	951,583	536,683	1,146,320

Note: All estimates are weighted using the variable _finalwt and the personal sampling weights from each wave are re-scaled to sum up to one for each year. Robust standard errors are in parentheses, clustered by county. The period covered is 2005-2010. The first column restricts the sample to divorced, single, separated and widowed. Columns 2, 3 and 4 restrict the sample respectively to married, parents, and non-parents.