The Effects of Excise Tax on Cigarette Consumption: A Divergence in the Behavior of Youth and Adults

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Abstract

There has been a lot of research done to better understand the effects of taxation on cigarette consumption. Since cigarettes are addictive, it could be expected that taxation would have little or no effect on the number of cigarette smoked per day or the percentage of smokers within a given population. This paper aims to investigate these effects and, more specifically, differentiate between adult smokers and underage smokers. It will be shown that the percentage of adult smokers does not change with taxation whereas the percentage of underage smokers decreases significantly when excise taxes on cigarettes increase. In addition, it will also be shown that the average number of cigarettes smoked per day decreases as well.

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I. Introduction

The effects of cigarette excise taxes on the behavior of smokers have been long debated. State governments, in an effort to reduce cigarette consumption (number of smokers and number of cigarettes smoked) and deter at-risk populations from beginning to smoke, have introduced many increases in taxes on cigarettes. The dire effects of cigarette use on health are well-established facts. According to the 2004 Surgeon General's Report, smoking causes ninety percent of lung cancer cases among men, eighty percent of cases among women, and makes someone twenty times more likely to develop lung cancer than a non-smoker. Smoking causes a plethora of other types of cancers and diseases as well[2]. Thus from a health care perspective, cigarette use should be reduced.

Whether cigarette taxes effectively achieve state governments' goal of reducing cigarette consumption is a key question that needs to be answered to better determine the direction of future policies. Indeed, if the consumption of cigarettes is fairly inelastic, then it cannot be argued that taxation directly reduces consumption. On the other hand, it would imply that cigarette taxation is a good way of raising revenue which can then be used in more effective means of reducing cigarette consumption while deterring potential future smokers from starting to smoke. Conversely, if excise taxes on cigarettes do improve smokers' behavior, then more taxation should take place. It may also be the case that the taxation causes distortionary behaviors among smokers. Since tobacco is addictive, taxation could force smokers to reduce consumption of other goods to maintain the same level of cigarette consumption. It could also be that smokers are rational in their decision to smoke. Reducing the number of cigarettes smoked would only hurt such a smoker. An additional plausible argument is that smokers are not fully rational in their decision because they are not fully aware of all the side-affects of smoking. All of these divergent opinions show that the issue at hand is a complicated one. Nonetheless, knowing the consequences of taxation is the first step towards addressing all of these questions. An analysis of the effects of excise taxes on cigarette consumption is needed to measure how successfully they reduce smoking (if at all).

The population of smokers is not homogenous. When investigating the effects of taxation, one needs to consider different population subgroups separately. One important partition to take into account is that of the adult smokers (those of eighteen years of age or older) and the underage smokers. In this paper, the hypothesis is that underage smokers decrease their consumption

[2] CDC.<http://www.cdc.gov/tobacco/data_statistics/sgr/sgr_2004/00_pdfs/SGR2004_Whatitmeanstoyou.pdf > 15 October 2007.

of cigarettes when faced with an increase in cigarette taxes, while adult smokers do not. Underage smokers have less buying power on average than their adult counterparts so the cigarette taxes affect them more. In addition, adult smokers are more likely to be experienced smokers with many more years of smoking than underage smokers. Thus, smoking is probably a more integral part of the lives of adult smokers than it is for younger smokers. This would imply that cigarette consumption has relatively large tax elasticity for youth smokers but not for adult smokers. The research and analysis that follow will investigate this claim while controlling for key factors such as state tobacco regulations, inflation, the level of spending on anti-tobacco campaigns, and state population characteristics (percentage of different ethnicities, average age, population density, religious makeup, etc.).

II. Literature Review

There exists an extensive amount of literature that has investigated the factors affecting cigarette consumption. Jonathan Gruber and Sendhil Mullainathan (2002) have studied the amount of happiness gained or lost because of cigarette taxation. They use General Social Surveys from the United States and Canada to obtain self-reported data on happiness. They conclude that taxation makes smokers happier because it serves as a self-control device, forcing individuals to smoke less or more likely to quit smoking. This paper, however, omits measuring the direct effect on consumption; in other words, it does not measure how much less people smoke. Philip DeCicca, Donald Kenkel and Alan Mathios (2002) have investigated the effects of cigarette taxation on cigarette consumption from eighth grade to twelfth grade. They use data from the US National Education Longitudinal Survey and find that small increases in taxes do not significantly affect the rates of youth smoking. However, they admit not knowing the effects of larger tax increases. Conversely, Jonathan Gruber (2000) has found that cigarette prices in the 1990's affected consumption among older teens considerably. More recently, Rosemary Avery, Donald Kenkel, Dean R. Lillard, and Alan Mathios (2007) have revealed that smoking cessation advertising significantly affects cigarette consumption by making smokers more likely to attempt to quit. In an experimental paper modeling the cigarette industry as an oligopoly, Wei Tan (2006) has shown that taxation directly decreases cigarette consumption in both the short run and the long run, while restrictions on cigarette marketing can only affect consumption indirectly through their impact on the concentration of the market. Christopher Carpenter and Philip J Cook (2007) have shown that the intensity of youth smoking tends to decrease when taxes are introduced. Their paper focuses mainly on measuring the subsequent changes in the probability of being a

youth smoker and uses solely the Centers for Disease Control and Prevention (CDC) YRBS data.[3]

However, from the above-mentioned research, no definite conjecture can be made about the effects of taxation on the number of smokers or the amount of cigarettes smoked daily. They do not investigate the possible differences in the impact of cigarette taxes on adults and youths either. Indeed, research that focuses on the differential effects of taxation on adult and youth cigarette consumption is scarce. This paper aims to provide such a focused analysis. In addition, the large cigarette tax increases that have taken place in the past fives years provide a great setting to directly study the effects of taxation. Consequently, by using reliable data (from many sources) for up to 2006, the following analysis will further previous research on cigarette taxation by providing updated results on the effects of taxation on cigarette consumption.

This study uses a panel data set that mitigates endogeneity issues that could otherwise arise with taxation and permits us to determine causal relations. It will be shown that increases in excise taxes on cigarettes do not affect the percentage of adult smokers. However, they do cause a decrease in the average number of cigarettes smoked daily by adult smokers and do cause a decrease in the percentage of youth smokers as well. The paper is structured as follows. The next section provides a description of the data set with an emphasis on key variables and the sources used to obtain the data. The penultimate section elaborates on the models used and the results of the analysis. The paper concludes with a discussion of the policy implications of the results and suggested areas for future research.

III. Data

To perform the analysis, a panel data set is used. The data set contains information on forty-nine states plus the District of Columbia (Hawaii and Puerto-Rico are omitted) from 1986 to 2006 for a maximum of 1050 observations. The data on cigarette consumption (percentage of population who smokes, average number of cigarettes smoked per day, tobacco legislation, expenditures on anti-smoking campaigns) come from the CDC[4]. For the panel data regressions, the dependent variables are either ***Smokers_Total*** (annual percentage of total smokers among adults and high school students), ***Smokers_A*** (annual percentage of adult smokers), ***Smokers_Y*** (annual percentage of high

[3] Carpenter, Christopher, and Phillip Cook. "Cigarette Taxes and Youth Smoking: New Evidence from National, State & Local Youth Risk Behavior Surveys." NBER Working Paper No. 13046 (2007).

[4] CDC. <www.cdc.gov > 17 October 2007.

school students who smoke), or ***Cigs*** (average number of cigarettes smoked by an adult smoker daily). Tables 1 and 2 provide a detailed description of all the variables used and their summary statistics.

The data on ***Smokers_A*** comes from the CDC's Behavioral Risk Factor Surveillance System (BRFSS), where they define an adult smoker as anyone of at least eighteen years of age who has smoked at least one hundred cigarettes in the past and currently smokes everyday or on some days. Data is provided for 1986 through 2006. For the first seven years, about twelve states were not included in the BRFSS program. This explains why the number of observations is shy of 1050. The data on ***Smokers_Y*** comes from the CDC Youth Risk Behavior Survey (YRBS). This survey took place every two years from 1993 to 2005 and contains data for about half of the states. It measures the percentage of high school students (grades 9 through 12) who smoke. It may be that the states which chose to participate in this survey are those where underage smoking is more prevalent. It may also be that the high school students who participated in the survey were those who felt more comfortable revealing their smoking habits and also those who smoked the most. These two reasons would explain why there are only one-hundred-and-seventy-six observations. An additional consequence is that if any taxation effect (on ***Smokers_Y***) is measured, then it would likely underestimate the true effect. This would be the case because high school students who smoke the most are the ones who have a stronger habit of smoking and would be expected to have the lowest taxation elasticity in their demand for cigarettes. The ***Smokers_Total*** variable is obtained by calculating the weighted average percentage of smokers (both adult and underage) using ***Smokers_A*** and ***Smokers_Y***. The data on ***Cigs*** comes from the BRFSS as well. The BRFSS reports the average daily consumption of cigarettes by adult smokers in 1992 and from 1994 through 2000. The ***Tax*** variable as well as the one-year and two-year lagged tax variables (***Lag1_Tax***, ***Lag2_Tax***) are obtained from the CDC as well.

The CDC provides the total annual funding (federal, state and outside funding) for anti-tobacco campaigning for 2001 and 2002 only. For 2003 through 2006, the CDC provides information on federal funding and outside funding but excludes state funding. To complete the data for 2003 through 2006 the state funding for anti-smoking expenditures is obtained from Campaign for Tobacco-Free Kids[5] and added to the data acquired from the CDC[6]. For the years preceding 2001, no data is available on these expenditures. The U.S. Department of Commerce Bureau of Economic Analysis provides data on state real GDPs (used to calculate ***Log_GDP***) and the Bureau of Labor and

[5] Campaign for Tobacco-Free Kids. <www.tobaccofreekids.org> 17 October 2007.
[6] Campaign for Tobacco-Free Kids, Ibid.

Statistics provides the data on state CPIs (***CPI***). Interaction variables between ***Log_GDP*** and ***CPI*** and the ethnicity variables (***Black***, ***Hispanic***, and ***White***) are used to measure how combined changes in average state income (or prices) and the percentage of people of each respective ethnicity could together affect cigarette consumption.

The United States Census Bureau provides annual data on state demographics (population, area, education levels, ethnicities, etc.) which may influence cigarette consumption. States' characteristics are included in the data set. Due to a law passed in 1976, the US Census Bureau is prohibited from asking questions about religious affiliation in its surveys[7]. To obtain data on the religious affiliation in each state, the American Religious Identification Survey (ARIS 2001)[8] is used. ARIS 2001 was a study conducted by Egon Mayer, Barry A. Kosmin, and Ariela Keysar at the City University of New York in 2001. More than fifty thousand households in the continental United States were telephoned randomly and asked about their religious affiliation. The results of that survey give a good approximation of the religious classifications in each state. ARIS 2001 provides the percentage of the population that belongs to each of twenty-two religions for each respective state. Since the goal of using data on religion in the data set is to control for possible effects of religion membership on cigarette consumption, two dummy variables for the most popular religions are introduced. The ***Catholic*** dummy equals one if more than thirty-five percent of the population in a given state is Catholic. The ***Baptist*** dummy plays a similar role[9].

In addition to the anti-smoking campaigning and religious prevalence, cigarette legislation may affect cigarette consumption as well. Indeed, in many states it is no longer legal to smoke in bars, inside restaurant, on public property, etc. This warrants the use of a control variable. The variable ***Regulations*** measures the level of restrictions on cigarette use in each state. This variable is built using eleven different measures of restrictions on cigarette use provided by the CDC. These are: the maximum penalties for violating laws against smoking on government worksites, on private worksites, and inside restaurants, and the type of restrictions on smoking (complete or partial ban of cigarette smoking) in bars, enclosed arenas, grocery stores, hospitals, hotels, malls, prisons, and public transportation. Since the maximum penalty for violation is a fine of $2000, a value of 2000 is assigned to any maximum fine of

[7] US Census Bureau. <http://www.census.gov/prod/www/religion.htm> 17 October 2007.

[8] Central University of New York. <http://www.gc.cuny.edu/faculty/research_briefs/aris/aris_index.htm> 17 October 2007.

[9] Table 1 lists and describes all the variables contained in the data set

that amount for any given year in any given state. All other instances where a state sets a maximum penalty below $2000 are assigned a value equal to the maximum penalty itself. The cases where cigarette use is completely banned are given a value of 2000 as well. A value of 500 is assigned to the cases where smoking is allowed in designated areas of the workplace, and a value of 800 is assigned to the cases where smoking is only allowed in separate ventilated areas. The cases where there are no bans on cigarette use are given the value zero. The variable ***Regulations*** is then calculated for any given state and any given year as the sum of the values of the eleven corresponding measures of cigarette use restrictions divided by 11 x 2000 (since there are eleven measures, and the maximum value for each is 2000). Thus, this variable provides a good measure of the severity of the cigarette regulations in any state in any year from 1995 to 2006. The more stringent these regulations are, the higher the value of ***Regulations*** is.

It could be argued that as legislation regulating cigarette use intensifies, the number of cigarettes purchased through the black market increases. Indeed, Patrick Fleenor (2003), former senior economist with the Joint Economic Committee of the United States Congress, argues that increases in taxes on cigarettes (now up to three dollars per pack) in New York have caused a great increase in black market activities. If this is true, then the effects on cigarette consumption that would be measured through the model would not be accurate because part of the reduction in consumption from any increase in taxes would be mitigated by an increase in the consumption of cigarettes from the black market. Possible factors that may contribute to the rise in black market activities include state size and population, which are controlled for here in this paper. An additional set of dummies is included in the data set to help control for the black market supply of cigarettes. These variables equal one if a given state shares a border with Canada, Mexico, the Pacific Ocean, or the Atlantic Ocean respectively. Since part of the black market supply of cigarettes comes from neighboring countries and other contrabands, these variables at least partly control for these black market activities.

Controlling for black market activities is difficult since black markets are not easily observed. This causes a flaw in the data set. Indeed, part of the black market supply of cigarettes comes from the internet. Cigarettes can be purchased from parties all over the world without paying taxes, while bypassing the laws on minimum age for cigarette smoking. There exists no reliable measure of the volume of cigarettes purchased via the internet and the data set does not have any variable that attempts to control for it.

One additional flaw in the data set lies in fact that the religion data in ARIS 2001 are provided for 2001 only. In the data set, however, the same

figures from ARIS 2001 are used for all the years from 1986 through 2006. Thus, the assumption is that the religious composition of state populations has not changed much during these twenty-one years. Though this assumption may hold, there is still a possibility that it is not fully justified. These flaws are minimal, however, and the data set still provides a good foundation for an accurate analysis. Since the number of observations are fairly large (Table 2), some causal relationships will be determined in the following sections.

IV. Methods and Results

In order to determine how taxation affects cigarette consumption for both adult smokers and underage smokers, we need to observe how changes in tax rates affect the percentage of adult and underage smokers as well as the number of cigarettes smoked over time. Using the panel data set described above, four appropriate sets of regressions can be run; these regressions have ***Smokers_Total***, ***Smokers_A***, ***Smokers_Y***, and ***Cigs*** as the respective endogenous variables. The following specifications are used:

$$Smokers_{i,t} = \beta_1 Tax_{i,t} + \beta_2 Log(GDP)_{i,t} + \beta_3 CPI_{i,t} + \Theta Z + \mu_i + \epsilon_{i,t}$$
$$Cigs_{i,t} = \gamma_1 Tax_{i,t} + \Gamma Z + \eta_i + \nu_{i,t}$$

Table 3 and Table 4 use the first model where the left-hand side variable is respectively ***Smokers_A*** or ***Smokers_Y***. Table 5 uses the second model. It is important to notice that in each regression only one tax variable is used (***Tax***, ***Lag1_Tax***, or ***Lag2_Tax***). This helps to better isolate any possible tax effects. In both models, state fixed effects are used. This is done to control for unobserved heterogeneity between the states. Fixed effect models are used rather than between or random effects models because it is unlikely that the states (which are governed by the same federal government) have policies that are the same across states but evolve differently with time. The model warrants year dummies as well. In all the regressions a dummy for each year (***Yr_t***) is included to help avoid associating general time trends in cigarette consumption with the effect of taxes or other explanatory variables. Indeed, more is known about the health side-effects of cigarettes today than ever before. Furthermore, more awareness programs and anti-smoking campaigns take place than ever before, so it is likely that the general trend in cigarette smoking in the United States of America (and also the rest of the world) is a downward one. To avoid associating this trend effect with the effects of increases in taxes, twenty-one year dummies (***Yr_1986*** to ***Yr_2006***) are used; one is used for each of the twenty-one years of data in the panel data set. ***Z*** is a vector of explanatory variables which contains ***Yr_t*** as well many other key control variables.

The results for the regressions of ***Smokers_Total*** (not shown in this

paper) have a lot of spurious results. One of the reasons why this occurs is that in building such a variable, the underlying assumption is that the percentage of adults and the percentage of people of high school age (14 to 17 years old) within any state do not vary with time. This assumption may not hold and is most likely one of the main sources of the spurious results. However, using separate regressions for adult smokers and underage smokers yield the correct results. Table 3 shows the results for the regressions of ***Smokers_A***. The first three regressions in this table contain all of the explanatory variables with the exception of ***Population***, ***Density***, ***Regulations***, ***Educ***, ***Log_Funding***, ***Black***, ***White***, ***Hispanic***, and the respective interactions between ***CPI*** and ***Log_GDP*** with the ethnicity variables. For the regressions in columns four through six, ***Black***, ***White***, and ***Hispanic*** variables are added, as well as the respective interactions with ***CPI*** and ***Log_GDP***. The regressions in columns seven through nine contain all of the explanatory variables. Table 3 contains similar regressions for ***Smokers_Y*** but a few year dummies were dropped in these regressions because of insufficient observations. Table 4 contains the regression results for ***Cigs***. ***Educ*** is not included in any of the ***Smokers_Y*** (and ***Smokers_Total***) regressions because of insufficient observations, just as ***Log_Funding*** and ***Educ*** are not included in any of the ***Cigs*** regressions.

The regressions for ***Smokers_A*** (Table 3) reveal that taxes do not significantly affect the percentage of adult smokers within a state's population. Indeed, the coefficient on ***Tax*** (-.038) in Column 1 decreases in magnitude and loses its significance as more explanatory variables are included. The same effect can be noticed for the two-year and the one-year lagged tax variables. In columns one through six, the signs of the coefficients on ***Tax***, ***Lag1_Tax***, and ***Lag2_Tax*** are negative as should be expected since an increase in taxation on cigarettes is aimed at decreasing cigarette consumption and encouraging smokers to quit smoking. However, in the regressions with a full set of explanatory variables (Column 7 to Column 9), these coefficients lose their sign and become completely insignificant. This indicates that adult smokers were on average unaffected by excise tax increases. This may be due to the fact that cigarette costs (even with the tax increases) are relatively low when compared to adult smokers' incomes. Indeed, this would explain this hesitance towards quitting smoking despite increases in taxation. The more important reason, however, may just be the fact that smoking cigarettes is addictive. Adult smokers are most likely experienced smokers who have developed a strong habit of smoking. The increases in the cost of cigarettes due to the taxation are not enough to warrant abandoning a habit which has taken many years to develop.

It is also interesting to notice that ***Density*** and ***GDP_Hispanic*** become

significant when we include all the explanatory variables (Column 7 to Column 9). The positive coefficient on ***GDP_Hispanic*** has a 10% p-value. This may reflect the fact that smoking is more prevalent or socially acceptable among Hispanic adults. Increases in average state income (as reflected through an increase in GDP) augment the amount of disposable income available and may encourage those who were already thinking about smoking to do so. However, to fully measure the effect of ***Hispanic*** on cigarette consumption, the coefficient of ***Hispanic*** as well as the coefficients of all interaction variables that include ***Hispanic*** should be added. Since most of these variables are insignificant, the net effect of ***Hispanic*** is most likely insignificant as well. The negative coefficient on ***Density*** suggests that when population density within a state increases by one unit, the average number of adult smokers becomes .03% less of the total state population. Such a strong effect may just reflect the fact that in dense populations, second hand smoke is more of a problem. Therefore, the government, the non-smokers, and even the smokers themselves would most likely put some strict restrictions on the freedom to smoke. It may also result from the fact that in states with high population densities, information about the side-effects of smoking and any reduction in the popularity of cigarette smoking propagate more quickly. In Columns 1 through 3, ***CPI*** is negatively related to ***Smokers_A*** and is significant with a one percent p-value. However, including the variables for ethnicities (Column 4 to Column 6) causes the coefficient on ***CPI*** to lose its significance. Including ***Regulations***, ***Log_Funding***, and ***Educ*** (in the regressions in columns seven through nine) causes the ***White***, and ***Log_GDP*** variables to lose their significance. The positive coefficient on ***Yr_1991*** (Column 4 to Column 6) is significant with at 10% p-value. This variable is dropped when we include all of the explanatory variables in columns seven through nine because of insufficient data. However it most likely would have lost its significance since it was barely significant at a 10% level.

The behavior of underage smokers, however, is much different. First, Column 1 to Column 3 of Table 4 shows that ***Tax***, ***Lag1_Tax***, and ***Lag2_Tax*** have no significance. However, in the regressions of ***Smokers_Y*** on a full set of explanatory variables, ***Lag1_Tax*** becomes significant. Indeed, in the regression in Column 6, ***Lag1_Tax*** has a coefficient of -.264 and it is significant with a p-value of 10%. Thus, when taxes are one more percent of the cost of a pack of cigarettes, the average percentage of underage smokers in a state's popula-

tion decreases by .264 percentage points[10]. This negative relation between the one-year-lagged tax and the percentage of young smokers suggests that taxes on cigarettes push underage smokers to quit. This effect, which was absent in the regressions for adult smokers, is most likely a result of the lower buying power of the youth. This renders the average underage smoker more price sensitive than an adult smoker is. It may also be an indication of the fact that underage smokers have less years of experience as smokers than their adult counterparts do. As a result, they are much more likely to abandon their smoking habit when they face an increase in price due to taxation.

In addition, as previously seen in the regressions of ***Smokers_A***, ***GDP_Hispanic*** (Column 4 to Column 9) is significant at a 10% level. However, here the coefficient is negative. Furthermore, ***Hispanic*** becomes significant and has a positive coefficient (3.1 with a p-value between 5% and 10%). The fact that ***GDP_Hispanic*** and ***Hispanic*** have opposite signs is more evidence of the price sensitivity and the relatively low level of addiction to cigarettes among youths. A combined increase in state income and Hispanic population leads to a decrease in the percentage of underage smokers. Increased income may, therefore, lead to less smoking prevalence as the youth (more particularly among Hispanic populations) substitute other more attractive goods for cigarettes. Conversely, a one unit increase in the percentage of Hispanics in a state leads to a 3.1 increase in the percentage of underage smokers. This may be due to a prevalence of cigarette consumption among Hispanics, but that alone does not explain why the corresponding increase in the underage smoker percentage is greater than one. It may also be that an increase in the percentage of Hispanics leads to an atmosphere where smoking is encouraged, perhaps due to ease of access to cigarettes, social acceptance, or peer pressure. However, to fully capture the effect of the ***Hispanic*** variable, the coefficient on ***Hispanic***, ***CPI_Hispanic***, ***GDP_Hispanic*** should be added. Since all of these coefficients do not have the same sign and are not all significant, the net effect may be ambiguous. Nonetheless, a separate investigation would be needed to better understand the possible effects of different ethnic populations

[10] The number of observations for the ***Smokers_Y*** variable may be a source of concern (see Table 2). However, increasing the number of observations by using the average of the previous year's value and the following year's value of ***Smokers_Y*** for every year (from 1995 to 2005) where the YRBS annual survey was not done (which increases the number of observations for ***Smokers_Y*** to 361), then running the regressions while controlling for random effects and including the ***Educ*** and ***Log_Funding*** variables yields a coefficient of -.2305 on the ***Lag1_Tax*** variable. This value is close to the -.264 value obtained in the results included in this paper.

on smoking prevalence.

On the other hand, the ***Yr_1995*** dummy remains significant at a 5% level (Column 1 through Column 6). Its positive coefficient indicates an upward trend in cigarette consumption among youths. This is most likely a direct result of the record spending of tobacco companies on advertising. According to the Federal Trade Commission, tobacco industry spending on advertising accelerated more than ever before in 1995. In addition, in 1995, the spending on promotional allowances (e.g. payments made to retailers to facilitate sales of tobacco products), which represents close to forty percent of advertising expenses, was close to twice its previous level.[11] However, the ***Yr_1997***, ***Yr_1999***, ***Yr_2003*** and ***Yr_2005*** dummies are highly significant as well but have negative coefficients. This may be reflecting a general downward trend in the percentage of underage smokers for these respective years. This is perhaps due to the fact that more youth smokers were quitting in light of all the information about the health effects of cigarettes that were made available with the advent of widely publicized court cases involving tobacco companies. It may also be due to the large increase in anti-tobacco advertising (especially the television advertisements such as those by TRUTH)[12].

A similar effect can be seen for the average number of cigarettes consumed daily by adult smokers (Table 5). The regressions for ***Cigs*** indicate that there was a downward trend in the consumption of cigarettes from 1994 to 2001. This is most likely due to the aforementioned increase in information about the negative effects of tobacco. It is also important to notice that the Master Settlement Agreement,[13] which banned and greatly restricted many forms of advertisements,[14] was put into place in November 1998. Although some of the clauses concerning tobacco advertisements did not go into effect until 1999,[15] the ensuing decrease or ban of many types of advertisement further explains the drop in consumption of cigarettes. Furthermore, the coefficient on ***GDP_White*** is positive (Column 7 to Column 9) and remains significant at a

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[11] Federal Trade Commission. <http://www.ftc.gov/os/2002/05/2002cigrpt.pdf> 20 October 2007.

[12] TRUTH. <http://www.whudafxup.com/?ref=http://www.google.com/search?sourceid=navclient&aq=t&ie=UTF-8&rls=HPIC,HPIC:2006-35,HPIC:en&q=TRUTH> 20 October 2007.

[13] Northeastern University. <http://tobacco.neu.edu/tobacco_control/resources/msa/index.html#Chapter%20Six> 21 October 2007.

[14] University of Dayton, Ohio. <http://academic.udayton.edu/health/syllabi/tobacco/summary.htm#Marketing> 21 October 2007.

[15] Northeastern University. <http://tobacco.neu.edu/tobacco_control/resources/msa/index.html> 22 October 2007.

10% p-value. This could indicate that White smokers tend to smoke a bit more when the average state income increases. The coefficient on ***White,*** however, is negative and equals -.901 on average (p-value is 10%). A one unit increase in the percentage of Whites in a state population would therefore lead to a .901 decrease in the average number of cigarettes smoked per day. This may be due to a decrease in the prevalence of cigarette consumption among White populations. The net marginal effect of ***White*** is approximately -.830[16] which is still fairly close to -.901. Again, a separate investigation would be needed to fully understand the differential effects of ethinicities on cigarette consumption.

The most important result to underline is in columns two, five, and eight. In these three regressions, the average number of cigarettes smoked by adult smokers decreases with taxes. The coefficient on ***Lag1_Tax*** remains significant (5% p-value) in these three regressions for ***Cigs***. This indicates that an increase in the taxes does cause a decrease in the average number of cigarettes consumed daily by adult smokers; however, it does take some time before the smokers adjust their consumption. From the results discussed above, it is shown that the percentage of adult smokers is unaffected by the taxation. Thus, cigarette taxation has an effect on the intensiveness of consumption rather than its extensiveness. More precisely, if the total state and federal taxes on cigarettes is one more percent of the retail cost of a pack of cigarettes, adult smokers adjust their consumption by smoking .06 cigarettes less per day on average. In other words, if taxes increase by fifteen percentage points, adult smokers consume one less cigarette per day on average.

At the beginning of the paper, the hypothesis was that taxation had no effect on the percentage of adult smokers. This is confirmed by the results (Table 3) which show that ***Smokers_A*** does not vary with current or past taxes. It was also posited that underage smokers are more sensitive to taxation and that the percentage of underage smokers decreases with taxation. This claim is confirmed by the results as well (Table 4). The final claim made at the beginning of the paper was that although the percentage of adult smokers did not vary with taxes, the average number of cigarettes they consumed did. The results in Table 5 support this claim. Indeed adult smokers seem to decrease their consumption on average within a year after an increase in excise taxes. The severe restrictions imposed on tobacco advertising as well as the increase in dissemination of anti-tobacco information from 1997 to 2000 are reflected in the models as well. Indeed, there seems to be a negative trend in the percentage of underage smokers as well as the number of cigarettes smoked from 1997 through 2000. This is most likely a result of the ban on youth-targeted

[16] This value is obtained by adding the coefficients on ***White***, ***CPI_White***, and ***GDP_White***.

tobacco advertising (e.g. the use of cartoon characters like Joe Camel[17]) and widespread and readily available information about the severe side-effects of cigarette smoking. Using random effects models (not shown in this paper) instead of fixed effects models does not affect the results much.

V. Discussion and Conclusions

Identifying the effects of increases in excise taxes on cigarette consumption is essential for determining future governmental policies on tobacco use. As already discussed, the severe health side-effects of cigarettes and their addiction may justify taxation. On the other hand, low taxation elasticity could justify increases in taxes to raise revenues. In this paper, separate longitudinal regressions are used for adult smokers, underage smokers and the average number of cigarettes consumed by adult smokers daily. In addition, the models used control for many key variables such as each state's average real GDP per capita and average CPI for each year from 1986 to 2006, as well as fixed effects to measure time-invariant differences within states. With these models, the aforementioned effect of taxation on cigarette consumption was determined.

The first set of regressions (Table 3) show that taxes have no significant effect on the percentage of adult smokers in a state population. This occurs because adult smokers are most likely experienced smokers who have smoked for many years and who consequently have low price elasticity in their demand for cigarettes. This is reinforced by the fact the cigarette taxes most likely represent a relatively small portion of the adult smokers' wealth. For underage smokers, however (Table 4), cigarette taxes do curb behavior. In particular, the one-year lagged tax is shown to be a significant determinant of the percentage of underage smokers. When taxes represent one more percent of the retail price of a pack of cigarettes, the average percentage of underage smokers within a state decreases by .264 percentage points. Though this value may seem small, it becomes more important when one thinks about the total number of underage smokers in the US. This number is approximately four million,[18] and it decreases by fifty-two-thousand-and-eight-hundred when cigarette taxes in every state increase by one percent. When we consider the dire effects smoking would have on an individual who began to smoke at a young age, this reduction in the number of youth smokers becomes even more important. This decrease in the percentage of underage smokers is due to the

[17] Jim's Burnt Offerings. <http://www.wclynx.com/burntofferings/adsjoecamel.html> 1 November 2007.

[18] This value is obtained by using 20% as the average percentage of smokers among individuals of high school age (14 -17 years of age)

low buying power of the youth, their relatively low level of addiction compared to adult smokers and their large price elasticity of demand for cigarettes. Furthermore, the results show that an adult smoker consumes one less cigarette per day when taxes on the retail cost of a pack of cigarettes increases by sixteen to seventeen percentage points (Table 5). This is not negligible. In fact, According to the British Medical Journal smoking, one cigarette decreases one's expected life by eleven minutes[19]. This reduction in the number of cigarettes consumed would be observed for underage smokers as well (although it is not investigated in this paper). In fact, with the underage smoker's high sensitivity to taxation, it is likely that the reduction in cigarettes consumed would be larger. From these results, important knowledge can be gained for future policies on tobacco.

The state taxation policies on tobacco may have two purposes. The first is to raise funds (for campaigning against tobacco use, and many other state expenses). According to the results discussed above, in the short run, the percentage of adult smokers does not decrease when taxes increase, ceteris paribus. The amount of tax revenue collected from adult smokers, therefore, increases. Although adult smokers reduce the number of cigarettes consumed slightly, this is not significant enough to offset the increase in tax revenues. Similarly, the drop in underage smokers (high school students who smoke) is not large enough to offset the gains in tax revenues because the total number of high school student in any given state is much smaller than the total number of adults[20]. In the long run, however, the total number of smokers could decrease substantially if taxes are increased because fewer youths would begin to smoke in high school, which in turn would lead to a much larger decrease in the number of adult smokers. So, in the long run, an increase in the tax rate could lead to a decrease in the total tax revenue collected.

On the other hand, state government could use cigarette taxation to protect the people's welfare. As Gruber and Mullainathan (2002) have shown, taxation serves as a valuable self-control device for adult smokers, the majority of which would like to quit. At the same time, they have provided evidence showing that individuals consuming addictive substances such as cigarettes may not be fully rational in their decision to smoke and that taxation conse-

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[19] American Cancer Society. <http://www.cancer.org/downloads/COM/OH2006GASTipSheet.pdf> 2 November 2007.

[20] There are approximately 226 million adults (18 years old and older) in the US and approximately 18 million individual of high school age (14 to 17 years old) according to a US Census Bureau 2007 report: US Census Bureau**. <**http://www.census.gov/popest/states/asrh/tables/SC-EST2006-01.xls> cited 3 November 2007.

quently improves welfare. Thus, it is more likely that younger smokers are not fully taking into account the future side-effects of smoking. In this case, raising taxes would help achieve the goal of raising welfare both in the short run and long run. Indeed, adults and youths would decrease the number of cigarettes they smoke, which prolongs their lives. Furthermore, the number of underage smokers would decrease, and consequently further increase total welfare. Though there may be some distortions in consumption because of taxation, the net increase in future welfare (when we include the future health benefits from not smoking) would surpass these effects. Thus from a welfare perspective, increases in excise taxes on cigarettes should occur.

Nonetheless, to fully understand the effects of taxation of cigarettes, further research is needed. More specifically, future research is highly recommended to uncover the distortions in consumption resulting from cigarette taxation. In addition, further research should be done to investigate how adult smokers with different income ranges respond to increases in excise taxes on cigarettes. More focused research should also take place to formally measure the taxation elasticity of underage smokers. Lastly, to complete the investigation on cigarette consumption, it is necessary to study the ensuing health benefits from increases in taxes on cigarettes as well as the marginal rate of substitution of health for cigarettes.

Table 1: Definition of Variables

Variable	Index Varies Over	Definition
Smokers_Total	i,t	Percentage of smokers (both adult and underage)
Smokers_Y	i,t	Percentage of smokers under the age of 18
Smokers_A	i,t	Percentage of adult smokers
Cigs	i,t	Average number of cigarettes smoked by an adult smoker per day
Tax	i,t	Federal and State tax as percentage of retail price
Lag1_tax	i,t	One-year lagged Federal and State tax as percentage of retail price
Lag2_tax	i,t	Two-year lagged Federal and State tax as percentage of retail price
Black	i,t	Percentage of population that is Black
White	i,t	Percentage of population that is White
Hispanic	i,t	Percentage of population that is Hispanic
Region	i	Federal region (Region 1 through Region 10) to which each state belongs
Catholic	i	Dummy equaling one if the percentage Catholics is greater than or equal to 35
Baptist	i	Dummy equaling one if the percentage Baptists is greater than or equal to 35
Regulations	i,t	Variable reflecting the level of regulations on cigarette use
Canada	i	Dummy equaling one if the state shares a border with Canada
Mexico	i	Dummy equaling one if the state shares a border with Mexico
Pacific	i	Dummy equaling one if the state shares a border with the Pacific Ocean
Atlantic	i	Dummy equaling one if the state shares a border with the Atlantic Ocean
Population	i,t	State population
Area	i	State area
Density	i,t	State population density
CPI	i,t	CPI - Urban Wage Earners and Clerical Workers (Current Series) seasonally adjusted
CPI_Black	i,t	Interaction variable (CPI x Black)
CPI_White	i,t	Interaction variable (CPI x White)
CPI_Hispanic	i,t	Interaction variable (CPI x Hispanic)
Log_Funding	i,t	Natural logarithm of total funding per capita spent on anti-smoking campaigns
Educ	i,t	Percentage of population 25 years or older who have completed high school
Age	i,t	Average age of population in each state
Yr_t	t	Dummy for each year (e.g. Yr_1986=1 if Year=1986; otherwise Yr_1986=0)
Log_GDP	i,t	Natural logarithm of state real GDP per capita
GDP_Black	i,t	Interaction variable (Log_GDP x Black)
GDP_White	i,t	Interaction variable (Log_GDP x White)
GDP_Hispanic	i,t	Interaction variable (Log_GDP x Hispanic)

Notes: i is the state indicator; t is the year indicator.

Table 2: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max
Smokers_Total	176	23.397	3.631	11.018	32.706
Smokers_Y	176	27.88	8.27	7.3	47
Smokers_A	968	23.24	3.27	9.8	34.7
Cigs	347	19.18	1.50	12	23.9
Tax	1050	27.31	6.88	10.48	52.27
Lag1_tax	1000	27.13	6.72	10.48	52.27
Lag2_tax	950	26.92	6.52	10.48	52.27
Black	722	24.59	5.16	11	43.9
White	915	23.19	3.40	10.1	33.6
Hispanic	815	23.11	5.87	9.8	50.2
Region	50	5.26	2.71	1	10
Catholic	50	0.16	0.37	0	1
Baptist	50	0.18	0.38	0	1
Regulations	600	0.16	0.14	0	0.75
Canada	50	0.22	0.41	0	1
Mexico	50	0.08	0.27	0	1
Pacific	50	0.06	0.24	0	1
Atlantic	50	0.34	0.47	0	1
Population	850	5444.51	6000.40	453.4	36457.55
Area	50	75663.04	96297.08	68.34	663267.30
Density	850	311.63	1145.13	0.83	8835.44
CPI	950	157.623	22.149	118.193	195.653
CPI_Black	463	3746.723	1140.693	1323.090	8336.840
CPI_White	512	3482.868	733.393	1467.690	5943.695
CPI_Hispanic	815	23.112	5.871	9.800	50.200
Log_Funding	300	15.838	1.131	13.278	19.281
Educ	250	85.02	3.86	75	91.4
Age	1050	34.47	2.40	25.70	41.10
Yr_t	1050	1996	6.06	1986	2006
Log_GDP	850	10.304	0.497	6.537	13.767
GDP_Black	625	247.827	51.536	109.853	453.262
GDP_White	783	234.747	33.746	104.505	333.761
GDP_Hispanic	726	237.761	60.530	101.226	515.006

Notes: the unit of observation is a state-year combination. 1050 observations correspond to the maximum number of observations for fifty states over twenty-one years. The observations less that 1050 occur because of unavailable data for certain years or states.

Table 3: Regressions of the percentage of adult smokers

	Smokers_A								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tax	-0.038***	--	--	-0.020*	--	--	0.002	--	--
	(0.015)	--	--	(0.013)	--	--	(0.037)	--	--
Lag1_Tax	--	-0.017	--	--	-0.002*	--	--	0.007	--
	--	(0.016)	--	--	(0.013)	--	--	(0.036)	--
Lag2_Tax	--	--	-0.033**	--	--	-0.013	--	--	-0.020
	--	--	(0.016)	--	--	(0.014)	--	--	(0.035)
Black	--	--	--	-0.047	-0.038	-0.035	-0.678	-0.695	-0.724
	--	--	--	(0.183)	(0.183)	(0.183)	(1.926)	(1.925)	(1.919)
White	--	--	--	0.263	0.203	0.248	4.653	4.671	5.044
	--	--	--	(0.402)	(0.403)	(0.404)	(5.689)	(5.679)	(5.706)
Hispanic	--	--	--	-0.288	-0.303	-0.298	-2.660	-2.682	-2.734
	--	--	--	(0.222)	(0.223)	(0.222)	(1.798)	(1.746)	1.745
Regulations	--	--	--	--	--	--	0.682	0.723	0.739
	--	--	--	--	--	--	(1.682)	(1.697)	(1.680)
Population	--	--	--	0.000	0.000	0.000	0.000	0.000	0.000
	--	--	--	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Density	--	--	--	0.003**	0.003**	0.003**	-0.030**	-0.030**	-0.030**
	--	--	--	(0.001)	(0.001)	(0.001)	(0.015)	(0.014)	(0.014)
CPI	-0.038***	-0.036***	-0.037***	-0.020	-0.020	-0.019	0.005	0.007	-0.003
	(0.011)	(0.011)	(0.011)	(0.020)	(0.020)	(0.020)	(0.090)	(0.088)	(0.088)
CPI_Black	--	--	--	0.000	0.000	0.000	0.000	0.000	0.000
	--	--	--	(0.000)	(0.000)	(0.000)	(0.002)	(0.002)	(0.002)
CPI_White	--	--	--	0.001	0.001	0.001	0.004	0.004	0.005
	--	--	--	(0.001)	(0.001)	(0.001)	(0.004)	(0.004)	(0.004)
CPI_Hispanic	--	--	--	0.000	0.000	0.000	-0.002	-0.002	-0.002
	--	--	--	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Log_GDP	-0.003	0.001	0.000	-1.758**	-1.875**	-1.786*	-1.980	-2.252	-1.412
	(0.142)	(0.143)	(0.143)	(0.964)	(0.969)	(0.970)	(11.390)	(11.444)	(11.394)
GDP_Black	--	--	--	0.011	0.010	0.010	0.063	0.066	0.069
	--	--	--	(0.018)	(0.018)	(0.018)	(0.202)	(0.202)	(0.201)
GDP_White	--	--	--	0.037	0.042	0.038	-0.439	-0.439	-0.481
	--	--	--	(0.038)	(0.038)	(0.038)	(0.538)	(0.537)	(0.541)
GDP_Hispanic	--	--	--	0.027	0.029	0.028	0.287	0.289*	0.294*
	--	--	--	(0.021)	(0.021)	(0.021)	(0.178)	(0.173)	(0.173)
Log_Funding	--	--	--	--	--	--	-0.196	-0.204	-0.185
	--	--	--	--	--	--	(0.174)	(0.179)	(0.175)
Educ	--	--	--	--	--	--	0.099	0.091	0.107
	--	--	--	--	--	--	(0.193)	(0.195)	(0.192)
Age	0.043	0.007	0.031	-0.172	-0.180	-0.162	1.168	1.114	1.407
	(0.126)	(0.127)	(0.126)	(0.144)	(0.145)	(0.145)	(2.114)	(2.083)	(2.071)
Yr_1991	0.040	0.038	0.035	0.084*	0.082*	0.081*	--	--	--
	(0.056)	(0.056)	(0.056)	(0.049)	(0.049)	(0.049)	--	--	--
Yr_2005	-0.053	-0.062*	-0.063*	0.053	0.041	0.043	-0.101	-0.101	-0.100
	(0.039)	(0.039)	(0.039)	(0.045)	(0.045)	(0.045)	(0.091)	(0.091)	(0.090)
Yr_2006	-0.0784**	-0.084**	-0.086**	--	--	--	--	--	--
	(0.039)	(0.040)	(0.039)	--	--	--	--	--	--
Observations	473	473	473	384	384	384	112	112	112
R^2	0.5386	0.5327	0.5360	0.7227	0.7206	0.7213	0.7386	0.7387	0.7399

The time trend variables that are not shown are not significant or lose their significance as more explanatory variables are used. Those that were not included in some regressions are those for which there is no observation for the corresponding year. All other variables from Table 1 and Table 2 which are not included in Table 3 were absorbed by the fixed effect variable. Standard deviations are in parenthesis. Coefficients significantly different from zero in a two-tailed t-test at the *ten percent level; **five percent level; ***one percent level are reported.

Table 4: Regressions of the percentage of underage smokers

	Smokers_Y								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tax	-0.042	--	--	-0.061	--	--	-0.142	--	--
	(0.083)	--	--	(0.124)	--	--	(0.139)	--	--
Lag1_Tax	--	-0.146	--	--	-0.167	--	--	-0.264*	--
	--	(0.092)	--	--	(0.126)	--	--	(0.138)	--
Lag2_Tax	--	--	-0.028	--	--	0.154	--	--	0.107
	--	--	(0.094)	--	--	(0.153)	--	--	(0.196)
Black	--	--	--	-1.633	-2.084	-1.326	-2.171	-2.692	-1.502
	--	--	--	(2.513)	(2.467)	(2.477)	(2.726)	(2.598)	(2.894)
White	--	--	--	-4.278	-3.867	-5.594	-6.594	-7.753*	-7.106
	--	--	--	(3.193)	(3.091)	(3.453)	(3.958)	(3.811)	(4.312)
Hispanic	--	--	--	2.458*	2.403*	2.409*	3.158**	3.446**	2.823*
	--	--	--	(1.384)	(1.330)	(1.349)	(1.509)	(1.438)	(1.550)
Regulations	--	--	--	--	--	--	7.318	8.891	4.813
	--	--	--	--	--	--	(5.598)	(5.380)	(16.533)
Population	--	--	--	0.001	0.001	0.002	0.000	-0.001	0.001
	--	--	--	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)	(6.838)
Density	--	--	--	0.010	0.009	0.011	0.021	0.018	0.019
	--	--	--	(0.019)	(0.019)	(0.019)	(0.022)	(0.020)	(0.022)
CPI	0.082	0.081	0.088	0.147	0.140	0.210	0.041	0.005	0.138
	(0.076)	(0.073)	(0.075)	(0.164)	(0.155)	(0.163)	(0.178)	(0.168)	(0.199)
CPI_Black	--	--	--	-0.002	-0.002	-0.001	0.000	0.001	0.001
	--	--	--	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
CPI_White	--	--	--	0.004	0.006	0.000	0.010	0.019	0.005
	--	--	--	(0.010)	(0.010)	(0.010)	(0.012)	(0.012)	(0.013)
CPI_Hispanic	--	--	--	0.001	0.000	0.003	0.001	0.000	0.003
	--	--	--	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
Log_GDP	0.775*	0.838*	0.802*	-7.049	-6.454	-10.343	-8.988	-8.613	-10.901
	(0.458)	(0.445)	(0.456)	(6.635)	(6.461)	(7.290)	(6.812)	(6.440)	(7.895)
GDP_Black	--	--	--	0.189	0.237	0.147	0.220	0.246	0.138
	--	--	--	(0.277)	(0.272)	(0.272)	(0.301)	(0.284)	(0.316)
GDP_White	--	--	--	0.335	0.259	0.523	0.440	0.408	0.581
	--	--	--	(0.316)	(0.313)	(0.358)	(0.346)	(0.328)	(0.427)
GDP_Hispanic	--	--	--	-0.256*	-0.237*	-0.276**	-0.330**	-0.342**	-0.319**
	--	--	--	(0.135)	(0.130)	(0.134)	(0.147)	(0.139)	(0.149)
Log_Funding	--	--	--	--	--	--	0.574	0.188	-0.166
	--	--	--	--	--	--	(1.315)	(1.888)	(1.817)
Educ	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--
Age	-2.091***	-1.939***	-2.188***	-0.667	-0.370	-1.378	0.921	0.811	-0.371
	(0.645)	(0.608)	(0.606)	(2.263)	(2.143)	(2.148)	(2.598)	(2.275)	(2.387)
Yr_1995	0.707***	0.806***	0.735***	0.531**	0.667**	0.365	--	--	--
	(0.135)	(0.143)	(0.148)	(0.236)	(0.250)	(0.287)	--	--	--
Yr_1997	0.665***	0.745***	0.691***	0.058	0.159	-0.057	-0.571*	-0.698**	-0.5114
	(0.152)	(0.153)	(0.157)	(0.371)	(0.363)	(0.387)	(0.324)	(0.317)	(0.326)
Yr_1999	0.404**	0.453***	0.453***	-0.094	-0.041	-0.136	-0.763*	-0.895**	-0.5805
	(0.162)	(0.140)	(0.148)	(0.397)	(0.358)	(0.380)	(0.395)	(0.371)	(0.356)
Yr_2001	-0.133	-0.136	-0.114	-0.672	-0.694***	-0.645	-1.342***	-1.679***	-1.150**
	(0.169)	(0.160)	(0.164)	(0.434)	(0.410)	(0.413)	(0.477)	(0.499)	(0.470)
Yr_2003	-0.342**	-0.334**	-0.337**	-0.916*	-0.933**	-0.915**	-1.577***	-1.930***	-1.432***
	(0.163)	(0.159)	(0.163)	(0.458)	(0.440)	(0.446)	(0.516)	(0.535)	(0.520)
Yr_2005	-0.420**	-0.402**	-0.416**	-1.06**	-1.065**	-1.123**	-1.718***	-2.087***	-1.632***
	(0.179)	(0.175)	(0.180)	(0.489)	(0.471)	(0.486)	(0.570)	(0.584)	(0.573)
Observations	80	80	80	68	68	68	64	64	64
R^2	0.9414	0.9441	0.9412	0.9486	0.9515	0.9501	0.9549	0.9597	0.9533

The time trend variables that are not shown are not significant or lose their significance as more explanatory variables are used. Those that were not included in some regressions are those for which there is no observation for the corresponding year. All other variables from Table 1 and Table 2 which are not included in Table 3 were absorbed by the fixed effect variable. Standard deviations are in parenthesis. Coefficients significantly different from zero in a two-tailed t-test at the *ten percent level; **five percent level; ***one percent level are reported.

Table 5: Regressions of average number of cigarettes smoked

	Cigs								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tax	0.001	--	--	-0.003	--	--	0.009	--	--
	(0.015)	--	--	(0.018)	--	--	(0.025)	--	--
Lag1_Tax	--	-0.026*	--	--	-0.042**	--	--	-0.057**	--
	--	(0.015)	--	--	(0.017)	--	--	(0.024)	--
Lag2_Tax	--	--	-0.001	--	--	-0.013	--	--	0.008
	--	--	(0.015)	--	--	(0.016)	--	--	(0.024)
Black	--	--	--	-0.016	-0.017	-0.016	0.026	0.010	0.030
	--	--	--	(0.014)	(0.013)	(0.014)	(0.221)	(0.217)	(0.222)
White	--	--	--	0.030	0.028	0.028	-0.895*	-0.705	-0.907*
	--	--	--	(0.047)	(0.047)	(0.047)	(0.473)	(0.465)	(0.479)
Hispanic	--	--	--	0.013	0.013	0.013	0.133	0.169	0.139
	--	--	--	(0.010)	(0.010)	(0.010)	(0.239)	(0.233)	(0.238)
Regulations	--	--	--	--	--	--	5.079	5.528	5.188
	--	--	--	--	--	--	(4.494)	(4.392)	(4.484)
Population	--	--	--	0.000	0.000	0.000	0.000	0.000	0.000
	--	--	--	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Density	--	--	--	-0.001	-0.001	-0.001	0.000	-0.001	-0.001
	--	--	--	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
CPI	--	--	--	--	--	--	-0.032	-0.021	-0.034
	--	--	--	--	--	--	(0.051)	(0.050)	(0.051)
CPI_Black	--	--	--	--	--	--	0.000	0.001	0.000
	--	--	--	--	--	--	(0.001)	(0.001)	(0.001)
CPI_White	--	--	--	--	--	--	0.002	0.001	0.002
	--	--	--	--	--	--	(0.002)	(0.002)	(0.002)
CPI_Hispanic	--	--	--	--	--	--	-0.001	-0.001	-0.001
	--	--	--	--	--	--	(0.001)	(0.001)	(0.001)
Log_GDP	--	--	--	--	--	--	-1.389	-1.166	-1.380
	--	--	--	--	--	--	(0.969)	(0.943)	(0.967)
GDP_Black	--	--	--	--	--	--	-0.012	-0.012	-0.011
	--	--	--	--	--	--	(0.017)	(0.017)	(0.017)
GDP_White	--	--	--	--	--	--	0.070*	0.063*	0.069*
	--	--	--	--	--	--	(0.038)	(0.037)	(0.038)
GDP_Hispanic	--	--	--	--	--	--	-0.001	-0.005	-0.001
	--	--	--	--	--	--	(0.022)	(0.021)	(0.022)
Log_Funding	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--
Educ	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--
Age	0.218*	0.223*	0.219*	0.199	0.194	0.208	0.189	0.192	0.164
	(0.115)	(0.114)	(0.115)	(0.187)	(0.185)	(0.187)	(0.250)	(0.244)	(0.255)
Yr_1994	-0.153***	-0.136***	-0.152***	-0.144***	-0.119***	-0.147***	--	--	--
	(0.022)	(0.021)	(0.019)	(0.028)	(0.027)	(0.025)	--	--	--
Yr_1995	-0.102***	-0.088***	-0.101***	-0.096***	-0.074***	-0.091***	--	--	--
	(0.021)	(0.020)	(0.020)	(0.028)	(0.027)	(0.027)	--	--	--
Yr_1998	-0.101***	-0.095***	-0.100***	-0.095***	-0.085***	-0.092***	-0.039	-0.049*	-0.038
	(0.020)	(0.020)	(0.020)	(0.031)	(0.031)	(0.031)	(0.029)	(0.029)	(0.030)
Yr_1999	-0.122***	-0.119***	-0.122***	-0.113***	-0.107***	-0.110***	-0.041	-0.059*	-0.043
	(0.021)	(0.020)	(0.021)	(0.032)	(0.032)	(0.032)	(0.036)	(0.033)	(0.034)
Yr_2000	-0.126***	-0.134***	-0.126***	-0.109***	-0.120***	-0.108***	-0.050	-0.086**	-0.049
	(0.019)	(0.019)	(0.019)	(0.030)	(0.030)	(0.030)	(0.037)	(0.038)	(0.038)
Yr_2001	-0.178***	-0.182***	-0.179***	-0.166***	-0.171***	-0.170***	-0.115***	-0.141***	-0.112***
	(0.019)	(0.019)	(0.020)	(0.031)	(0.031)	(0.031)	(0.041)	(0.040)	(0.045)
Observations	447	447	447	341	341	341	176	176	176
R^2	0.4254	0.4299	0.4254	0.4240	0.4359	0.4253	0.4421	0.4653	0.4421

The time trend variables that are not shown are not significant or lose their significance as more explanatory variables are used. Those that were not included in some regressions are those for which there is no observation for the corresponding year. All other variables from Table 1 and Table 2 which are not included in Table 3 were absorbed by the fixed effect variable. Standard deviations are in parenthesis. Coefficients significantly different from zero in a two-tailed t-test at the *ten percent level; **five percent level; ***one percent level are reported.

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