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STATE REGULATIONS OF SMOKING IN PUBLIC PLACES: DETERMINANTS AND IMPLICATIONS ON THE DEMAND FOR SMOKING AND CONSUMERS' BEHAVIOR

by

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Ioana Raluca Mazare

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CHAPTER I

INTRODUCTION

Over the past 40 years, policy makers have been concerned with the health consequences of cigarette smoking, and research at public and private institutions has increased the public's awareness about the health hazards of tobacco use. Today there is a consensus among health experts that cigarette smoking is associated with deadly diseases, such as various cancers, cardiovascular and heart diseases.[1] Moreover, Chalupka and Warner (1999) estimate that tobacco products are responsible for over one-fifth of the annual deaths in the U.S. during middle age.[2]

Since 1964, when the Surgeon General made the first clear statement with regard to the health hazard of cigarette smoking, continuous efforts by state and federal governments have been taken in order to combat smoking and prevent tobacco use.[3] Public policy actions have intensified in the past decades and have focused on specific issues, such as preventing teenagers from starting to smoke and decreasing cigarette consumption among smokers. Research at public and private institutions has shown that smokers are not the only ones at risk because of cigarette smoking. By-standers who inhale the smoke of cigarette may become ill as well, and secondhand smoke represents an additional cause of concern. The Surgeon General pointed out in its 1978 Report the potential dangers to which non-smokers may be exposed

because of cigarette smoke.[4] In 1986, the Surgeon General' Report concentrated entirely on the health consequences of environmental tobacco smoke (ETS) on non-smokers and acknowledged that involuntary smoking causes serious diseases, including cancer, in non-smokers.[5]

The growing awareness of the danger of secondhand smoke, together with the change in the public's attitude toward smoking after 1964, has created pressure for the governments to control the negative externality created by tobacco use and to protect non-smokers. Regulations that restrict smoking in public places represent the tool used by policy makers to protect non-smokers from the health hazard of secondhand smoking. Although the federal government restricted smoking in federal workplaces and major transportation facilities,[6] state governments were granted considerable freedom in regulation of smoking in public places. This has resulted in a wide variation across states regarding the date when smoking was regulated, the severity of regulation, and the categories of public locations subject to regulation.

From an economic point a view, these regulations represent an opportunity to study the mechanisms behind states' decision to pass social regulation and the implications of such legislation in society. The present research focuses on these issues and analyzes regulations of smoking in public places, the factors that affect states' regulatory behavior and the economic implications of no-smoking legislation.

While the majority of economic analysis has focused on the use of taxation as a way to discourage consumption of cigarettes, very few studies have examined the effectiveness of no-smoking restrictions in public places as an instrument used by

the government to correct for a market failure and the negative effect of ETS on nonsmokers' health. The interesting feature of these regulations is that these laws are the product of state legislatures, and each state has had considerable freedom in choosing whether and when to regulate smoking, which specific places were to be regulated, and how restrictive these regulations were. Chapter II of this research presents a picture of states' regulations that restrict smoking in public places, as of 1995. Information on state regulations of smoking in public places is available through the State Tobacco Activities Tracking And Evaluation (STATE) System. The STATE System summarizes regulation of smoking in public places for all 50 states and Washington, D.C., and locations are grouped in six categories : (1) government sites; (2) private-sector work sites; (3) restaurants; (4) commercial child day care; (5) home-based child day care, and (6) other places (including bars, shopping malls, grocery stores, enclosed arenas, public transportation, hospitals, prisons, and hotels and motels).

The regulatory package regarding smoking in public places differs largely from one state to another. Regulations regarding smoking in public places have been passed in more than three decades, and there were still five states with no regulation at the end of 1995. Only a handful of states regulate smoking in all public places, and ban smoking completely in some public places.

In Chapter III of my dissertation, I plan to examine empirically, using the economic theories of regulation, how specific economic and political factors interacted to explain the variation in the states' smoking legislation. This is important

for several reasons. First, given the public concern and awareness of the adverse health effects that smoking has on both smokers and nonsmokers, the fact that there are such wide differences in smoking legislation across states constitutes a concern for public policy. If such legislation is aimed at controlling a negative externality (that of secondhand smoking), we should observe all states banning smoking completely in all public places to ensure the best protection of all non-smokers. The very different reality raises the question about how states decide in fact when they regulate smoking, what places they regulate, and what restrictions they impose by law. Looking at the state-specific factors of economic, political and social nature may help explain why each state takes a different approach to this matter and what else, besides public's interest, interferes with the decision to regulate. Second, if the behavior at state level is understood and if it is known what forces determine when and whether restrictions on smoking are imposed, this could be a good resource for policy makers to find the most effective tools to induce changes in smokers' behavior and minimize the externality problem associated with secondhand smoke.

The strategy is to use the richness of the data in order to empirically test the two competing theories of regulation. The traditional view on regulation is the public interest theory, according to which the public demands some form of regulation from the government to correct for a real or perceived market failure. The basis of my approach is the economic theory of regulation (ET). The ET predicts that regulation is the result of competing interest groups that offer political support in exchange for legislation favorable to them. ET implies that regulation provides benefits to the

group that is better organized and demands regulation that favors it.

There are several research questions that are addressed in Chapter III. First, what economic, political and social factors determine when a particular state restricts smoking in public places? Second, which factors determine the specific places that are subject to regulation? And, third, what factors determine how restrictive the regulation will be?

The results of the analysis reveal that the economic theory of regulation is indeed helpful in explaining states' regulatory behavior. There are specific factors that, within each state, represent forces that policy makers take into consideration regarding no-smoking regulation. Specifically, tobacco companies and restaurant owners represent two powerful interest groups that delay regulation. States with higher divorce and unemployment rates (which proxy for the level of stress in a state's population) regulate later, as well. Political factors are important also for state policy makers. States where Democrats have more control regulate later. Although the result seems surprising, it captures the fact that Democrats control Southern states where tobacco is produced and employment in tobacco industry is significant. Since Democrats promote a worker-oriented agenda, they are also careful about the state legislation that affects tobacco sales. Another explanation is the high state income that results from tobacco industry and influences state legislators in their decision to regulate smoking in public places. While the economic theory explains the timing of regulation, the public interest theory explains the severity of regulation. Once the decision to regulate smoking is made, factors like income, the proportion of children

in states' population, and cigarette consumption determine how restrictive regulations of smoking in public places are.

Although the primary intent of smoking regulation in public places was to protect nonsmokers' health, the economic literature suggests that there might be unintended effects of this legislation.[7] In this case, by restricting smoking in a number of public places, smokers need to change their behavior. For example, smokers may be forced to smoke in restricted areas and only during break time. Consequently, the time for smoking is reduced and discomfort due to the necessity to comply with legislation is caused, which increases the cost of smoking. Therefore, smokers may perceive cigarettes as becoming more expensive and may change their cigarette consumption.

Chapter IV of this research explores this question about the relationship between cigarette consumption and regulations of smoking in public places. A new methodology to investigate this relationship is proposed. Previous work on this topic concludes that regulations of smoking in public places decrease the demand for cigarettes. However, the results are likely to be unreliable because an important issue has been ignored, which will be discussed next.

Consumption of cigarettes and the regulatory package regarding smoking in public places vary widely across states. It may be the case that states where smoking is less prevalent are the states more likely to pass regulation against smoking. In this scenario, legislation proxies the anti-smoking sentiment that exists in state's population and favors regulation of smoking. In those states, smoking consumption

would decrease any way, no matter whether legislation is passed or not. Heckman (1978) develops a model with endogenous dummy variables in a simultaneous equation system, which addresses this problem. The dummy variable indicates the existence of legislation, and the endogeneity arises from the fact that the dummy variable is generated by a latent variable that crosses a certain threshold. The latent variable represents the sentiment toward smoking, which when is strong enough leads to regulation in public places to be enacted.

In Chapter IV, I extend Heckman's (1978) model to allow for multiple endogenous variables in a panel data set. I study the demand for cigarettes for the fifty U.S. states from 1975 to 1995. I attempt to construct a sentiment variable in order to estimate the attitude toward smoking of states' population. I study whether the change in the demand equation is due to regulation of smoking in public places, which is passed in a state or to a strong anti-smoking sentiment.

The results show that regulations of smoking in public places have no effect on the demand for cigarettes. Instead, the anti-smoking sentiment is a significant factor that causes the cigarette consumption to decrease. The sentiment toward smoking is changing and growing in time because of continuous information that the public receives regarding the danger of cigarette smoking. Therefore, smoking is reduced because of the attitude toward smoking that is changing, which makes people to smoke less. This is an important result and constitutes a contribution to the literature because it provides greater insight into the extent to which the no-smoking regulations in public places are effective. The conclusion is that these regulations are

effective in the protection of non-smokers, but they do not have a significant impact on smokers.

The 1988 Surgeon General's report provided evidence of the strong correlation between the use of cigarettes and use of other licit and illicit drugs. Based on the data from the 1985 National Household Survey on Drug Abuse, the report showed that a higher percentage of current cigarette users were also using alcohol compared with nonsmokers in all age groups.[8] This evidence raises questions about the economic relationship between alcohol and cigarettes. The literature has examined the cross-price effect in the demand for alcohol and the demand for cigarettes. However, the results are mixed and the nature of the relationship remains unclear. In this part of my research I focus on estimating the impact that the cigarette price and the no-smoking regulation have on the demand for alcohol. If the no-smoking regulation is omitted, the effect of cigarette price is over-estimated. No-smoking restrictions represent an additional cost for non-smokers who change their smoking habits to comply with legislation. Therefore, by considering the no-smoking regulation into the demand for alcohol equation I estimate more accurately the cross-price effect. Moreover, I am able to study whether imposing restrictions on smoking in public places has any effect on the alcohol consumption.

I use the model developed in Chapter IV, based on Heckman (1978), and I investigate the impact that no-smoking regulations have on the demand for alcohol. A sentiment variable and probabilities that states regulate smoking in public places are first estimated, and then introduced in the demand for alcohol. Similar to the analysis

conducted in Chapter IV, I investigate whether the no-smoking legislation affects in any way the alcohol consumption, or the public's sentiment against smoking is a more general sentiment and expresses an attitude against any drug use, affecting the demand for alcohol as well.

Based on the cross-price effect cigarettes and alcohol are substitutes in consumption. The results also reveal that the no-smoking regulation in other public places have a negative and significant effect on the demand for alcohol. Restricting or banning smoking in other public places, such as bars, leads to a decline in the alcohol consumption. I find that the anti-smoking sentiment has no impact on the demand for alcohol. The estimated sentiment is characteristic to cigarette smoking, and does not capture a more general attitude against drug use.

Chapter VI concludes my dissertation and summarizes the findings of this research.

CHAPTER II

HISTORY OF SMOKING REGULATION AND STATE REGULATION OF SMOKING IN PUBLIC PLACES

The Evolution of Smoking Regulation

Legislation regulating smoking has had at least three functions over the years: to inform consumers about the risk of smoking; to protect nonsmokers from the adverse health effects of environmental tobacco smoke (ETS); and to prevent young people from smoking. The first Surgeon General's report linking smoking to various diseases was published in 1964, and stated that cigarette smoking was "a health hazard of sufficient importance in the United States to warrant appropriate remedial action."[9] In the same year, the American Medical Association (AMA) officially declared smoking "a serious health hazard."

Federal, state, and local governments, as well as private organizations, concentrated their efforts and initiated a campaign against smoking. In the early years, the federal government played the most active role, and the immediate measures were imposed on tobacco manufacturers.[10] The Federal Cigarette Labeling and Advertising Act of 1965 required package-warning labels, saying that cigarette smoking may be hazardous to health. The Public Health Cigarette Smoking Act of 1969 restricted the warning labels to only information that the Surgeon General

had determined that cigarette smoking is dangerous to health, and to the ban of cigarette advertising on television and radio. The Comprehensive Smoking Education Act of 1984 institutes four rotating health-warning labels, all listed as Surgeon General's Warnings, on cigarette packages and advertisements.[11] By contrast, state governments had limited their actions to taxing cigarette purchases.[12]

The Federal government charted a new course in its efforts to address the health concerns associated with cigarette smoking when it unveiled its "anti-smoking campaign" in the Surgeon General's 1972 Report on Smoking and Health.[13] Among other things, this was the first report to address the potential negative-health effects of cigarette smoking on nonsmokers. As a result of intense research in this area, the Surgeon General's report in 1986 expressed concern that "involuntary smoking is a cause of disease, including lung cancer, in healthy nonsmokers."[14] The 1986 report presented a detailed description of the health consequences of exposure to environmental tobacco smoke (ETS) and proposed restricting smoking in public places. The growing awareness of the danger of secondhand smoking, together with the change in the public's attitude toward smoking after 1964, allegedly created pressure for the government to restrict smoking in public places. Public health advocates like the American Lung Association have urged adoption of laws and regulations making public places, workplaces, and schools smoke free.

Regulations that restricted smoking in public places had been passed by state governments before the 1960s.[15] These regulations were, however, largely aimed at "preventing fire and preventing the contamination of food being prepared or

packaged for public consumption," and the second-hand smoke health hazard was not a major concern.[16] This changed in the 1970s when policy makers declared that the primary intent of these laws was to insure "the safety and comfort of nonsmokers," because potential health hazards associated with second-hand smoke were better understood.[17] In 1986, the federal government began to restrict smoking in public places. These regulations covered transportation facilities (see the ban on smoking on commercial airline flights in 1988) and government worksites.[18] Nonetheless, as the 1989 Surgeon General's report emphasized, restrictions on smoking in public places at the state level were "expected to be the norm by the end of the century."[19]

In 1973 Arizona became the first state to restrict smoking in a number of public places and the first to do so explicitly because environmental tobacco (secondhand) smoke exposure was considered a public hazard. In 1974 Minnesota enacted the first comprehensive clean indoor air act, which restricted smoking in most buildings open to the public. Between 1975 and 1984, twelve states passed no-smoking regulations in some public places, with different degrees of enforcement. Surgeon General's reports focused more with every year on smoking health effects and in 1984 it announced the goal of a smoke free society by the year 2000.

State Regulations Regarding Smoking in Public Places

This study is generated by the wide variation of the legislation regarding smoking in public places across states. The detailed information on state regulations

is provided by the State Tobacco Activities Tracking and Evaluation (STATE) System, which was developed by the Center for Disease Control and Prevention (CDC) in the Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion. The STATE System summarizes the legislation in all 50 states and Washington, DC, and identifies four primary aspects of tobacco control laws in each state: (i) smoke-free indoor air, (ii) youth access to tobacco products, (iii) advertising of tobacco products, and (iv) excise taxes on tobacco products. For the purpose of this paper, the discussion will regard only smoke-free indoor air laws, which for the ease of exposition will be referred to as no-smoking regulations. The report includes all state no-smoking regulations effective as of June 30, 1995.

States define public places differently and impose different restrictions on smoking in these locations. Because the comparison across laws based on public places, broadly defined, is difficult, locations were grouped in six categories: (1) government sites; (2) private-sector work sites; (3) restaurants; (4) commercial child day care; (5) home-based child day care, and (6) other places (including bars, shopping malls, grocery stores, enclosed arenas, public transportation, hospitals, prisons, and hotels and motels). Seventeen states have laws that preempt, in some situations, more stringent policies at the local level.[20]

As of June 30, 1995, forty-six states required smoke-free indoor air to some degree or in some public places (see Tables 1, 2A and 2B). [21] There are five states

Table 1

State Clean Indoor Air Laws – Dates When the Laws Were Enacted, as of June 30, 1995

State	Govern-ment Work Sites	Private Work Sites	Restau-rant Law	Com-mercial Child Day Care	Home-Based Child Day Care	Other Places
Alabama	-	-	-	-	-	-
Alaska	1984	-	1984	1990	1990	1984
Arizona	1991	-	-	-	-	1973
Arkansas	-	-	-	1985	-	1977
California	1995	1995	1977	1987	1995	1995
Colorado	1991	-	-	-	-	1977
Connecticut	1977	1983	1979	-	-	1979
Delaware	1994	1994	1994	1994	-	1994
D.C.	1979	1991	1979	1979	-	1979
Florida	1985	1985	1985	1992	-	1985
Georgia	-	-	-	1994	-	-
Hawaii	1988	-	1988	1993	1993	1988
Idaho	1992	-	1986	-	-	1986
Illinois	1990	1990	1990	1993	1994	1990
Indiana	1987	-	-	-	-	1987
Iowa	1987	1987	1990	-	-	1987
Kansas	1987	-	1987	1994	-	1987
Kentucky	-	-	-	-	-	-
Louisiana	1992	1992	-	1993	-	1993
Maine	1986	1986	1987	1994	1994	1994
Maryland	1992	-	1995	-	-	1975

Table 1 – Continued

State	Govern-ment Work Sites	Private Work Sites	Restau-rant Law	Com-mercial Child Day Care	Home-Based Child Day Care	Other Places
Massachusetts	1997	-	1988	1988	-	1988
Michigan	1992	-	1978	1993	1993	1977
Minnesota	1975	1975	1975	1990	1990	1975
Mississippi	-	-	-	-	-	-
Missouri	1992	1992	1992	1992	-	1992
Montana	1985	1979	1979	-	-	1979
Nebraska	1980	1980	1980	-	-	1980
Nevada	1977	-	1987	1989	-	1975
New Hampshire	1991	1991	1991	1991	-	1991
New Jersey	1986	1986	-	1998	-	1982
New Mexico	1986	-	-	-	-	-
New York	1990	1990	1990	1990	-	1990
North Carolina	-	-	-	-	-	-
North Dakota	1977	-	1977	1993	-	1977
Ohio	1993	-	-	-	-	1976
Oklahoma	1987	-	1987	1994	-	1987
Oregon	1977	-	1983	-	-	1977
Pennsylvania	1989	1989	1989	-	-	1989
Rhode Island	1986	1986	1980	-	-	1977
South Carolina	1990	-	-	1990	-	1990
South Dakota	1992	-	-	1990	1994	1974

Table 1 – Continued

State	Govern-ment Work Sites	Private Work Sites	Restau-rant Law	Com-mercial Child Day Care	Home-Based Child Day Care	Other Places
Tennessee	-	-	-	-	-	-
Texas	-	-	-	-	-	1975
Utah	1976	1995	1995	1989	1989	-
Vermont	1993	1988	1993	-	-	1993
Virginia	1991	-	1991	1991	-	1991
Washington	1989	-	1985	-	-	1985
West Virginia	-	-	-	-	-	1985
Wisconsin	1984	1984	1984	1994	-	1984
Wyoming	1990	-	-	-	-	-

Source: The STATE System.

(Alabama, Kentucky, Mississippi, North Carolina, and Tennessee) with no legislation or legislation that preempts localities from enacting any law to restrict smoking in public places.

State Regulations Regarding Smoking in Public Places - Categories

Government Work Sites

Forty-one states have laws restricting smoking in state government sites (Table 2A). Thirty-two states limit smoking to designated areas, while two states require either no smoking or designated smoking areas with separate ventilation, and

Table 2A

State Regulations of Smoking in Public Places, as of June, 1995 - Restrictiveness

State	Govern-ment Work Sites	Private Work Sites	Restau-rant Law	Com-Mercial Child Day Care	Home-based Child Day Care
Alabama	-	-	-	-	-
Alaska	2	-	2	4	4
Arizona	2	-	-	-	-
Arkansas	-	-	-	4	-
California	3	3	3	4	2
Colorado	4	-	-	-	-
Connecticut	2	2	2	-	-
Delaware	2	2	2	4	-
D.C.	2	2	2	-	2
Florida	2	2	2	4	-
Georgia	-	-	-	4	-
Hawaii	2	-	2	4	4
Idaho	4	-	2	-	-
Illinois	2	2	2	4	4
Indiana	2	-	-	-	-
Iowa	2	2	2	-	-
Kansas	4	-	2	4	-
Kentucky	-	-	-	-	-
Louisiana	2	2	-	4	-
Maine	2	2	2	2	2
Maryland	-	-	2	-	-
Massachusetts	2	-	2	2	-

Table 2A - Continued

State	Govern-ment Work Sites	Private Work Sites	Restau-rant Law	Com-Mercial Child Day Care	Home-based Child Day Care
Michigan	4	-	2	4	4
Minnesota	2	2	2	4	4
Mississippi	-	-	-	-	-
Missouri	2	2	2	4	-
Montana	2	2	2	-	-
Nebraska	2	2	2	-	-
Nevada	2	-	2	2	-
New Hampshire	2	2	2	4	-
New Jersey	2	2	-	-	-
New Mexico	2	-	-	-	-
New York	2	2	2	4	-
North Carolina	-	-	-	-	-
North Dakota	2	-	2	4	-
Ohio	4	-	-	-	-
Oklahoma	2	-	2	4	-
Oregon	2	-	2	-	-
Pennsylvania	2	2	2	-	-
Rhode Island	2	2	2	-	-
South Carolina	2	-	-	4	-
South Dakota	4	-	-	2	2

Table 2A – Continued

State	Govern-ment Work Sites	Private Work Sites	Restau-rant Law	Com-Mercial Child Day Care	Home-based Child Day Care
Tennessee	-	-	-	-	-
Texas	-	-	-	-	-
Utah	4	2	4	4	4
Vermont	2	2	2	-	-
Virginia	2	-	2	2	-
Washington	4	-	-	-	-
West Virginia	-	-	-	-	-
Wisconsin	2	2	2	4	-
Wyoming	3	-	-	-	-

Note: 2=designated smoking areas required or allowed; 3=no smoking allowed or designated smoking areas allowed if separately ventilated; 4=no smoking allowed (100% smoke free). Source: STATE System.

seven states prohibit smoking completely. There are different specifications regarding the minimum number of employees for restriction to be implemented, regarding the penalties, and enforcement authority. In Kentucky and North Carolina, state government work sites are permitted, but not required, to develop policies on smoking.

Private Work Sites

In most of the states, workers in private worksites are unprotected against ETS. Only twenty-one state laws restrict smoking in private work sites (see Table

Table 2B

State Regulations of Smoking in Public Places, Category-Other Places, as of June, 1995 - Restrictiveness

State	Bars	Shopping malls	Grocery stores	Enclosed arenas	Public transportation	Hospitals	Prisons	Hotels and motels
Alabama	-	-	-	-	-	-	-	-
Alaska	-	-	2	-	2	4	2	-
Arizona	-	-	-	-	2	2	-	-
Arkansas	-	-	-	-	-	2	-	-
California	3	3	3	3	3	3	-	2
Colorado	-	-	-	2	2	2	-	-
Connecticut	-	-	2	-	2	2	-	-
Delaware	-	-	2	-	4	4	-	-
D.C.	-	-	2	-	4	2	-	-
Florida	-	-	2	2	4	2	-	-
Georgia	-	-	-	-	4	-	-	-
Hawaii	-	-	2	-	2	2	-	-
Idaho	-	-	2	2	2	2	-	-
Illinois	-	-	2	2	2	2	-	-
Indiana	-	-	-	-	-	2	-	-
Iowa	-	2	2	2	2	2	-	-
Kansas	-	-	2	2	4	2	-	-
Kentucky	-	-	-	-	-	-	-	-
Louisiana	-	-	-	-	4	2	-	-
Maine	-	2	2	2	2	2	-	-
Maryland	-	-	2	-	4	4	-	2
Massachusetts	-	-	4	-	2	2	-	-

Table 2B – Continued

State	Bars	Shopping malls	Grocery stores	Enclosed arenas	Public transportation	Hospitals	Prisons	Hotels and motels
Michigan	-	-	2	2	2	3	-	-
Minnesota	-	-	2	2	2	4	4	2
Mississippi	-	-	-	-	-	-	-	-
Missouri	2	2	2	2	2	2	-	-
Montana	-	-	2	2	2	2	-	-
Nebraska	2	-	2	2	2	2	-	-
Nevada	-	-	2	-	2	2	-	-
New Hampshire	-	2	2	2	4	4	2	2
New Jersey	-	-	4	-	4	2	-	-
New Mexico	-	-	-	-	-	-	-	-
New York	-	-	2	2	4	2	-	-
North Carolina	-	-	-	-	-	-	-	-
North Dakota	-	-	-	-	2	2	-	-
Ohio	-	-	-	-	2	2	-	-
Oklahoma	-	-	-	2	2	2	-	-
Oregon	-	-	2	2	-	2	-	-
Pennsylvania	-	-	-	2	2	2	-	-
Rhode Island	-	-	2	-	4	2	-	-
South Carolina	-	-	-	2	4	2	-	-
South Dakota	-	-	-	-	2	2	-	-
Tennessee	-	-	-	-	-	-	-	-

Table 2B – Continued

State	Bars	Shopping malls	Grocery stores	Enclosed arenas	Public transportation	Hospitals	Prisons	Hotels and motels
Texas	-	-	-	-	2	2	-	-
Utah	-	4	4	4	4	2	-	2
Vermont	2	2	2	2	2	2	-	2
Virginia	-	-	2	2	4	2	-	-
Washington	-	2	2	2	2	2	-	-
West Virginia	-	-	-	-	4	-	4	-
Wisconsin	-	-	2	-	2	4	-	-
Wyoming	-	-	-	-	-	-	-	-

Note: 2=designated smoking areas or allowed; 3=no smoking allowed or designated smoking areas allowed if separately ventilated; 4=no smoking allowed (100% smoke free). Source: STATE System.

3.A). Seven states mandate designated smoking areas only in work sites that have a minimum number of employees, but none of them provides a smoke-free environment. Only one state requires a designated smoking area if separately ventilated, and the rest of them are less restrictive and do not impose ventilation requirements.

Restaurants

Thirty-one states have laws that regulate smoking in restaurants (Table 2A). Only Utah's law completely prohibits smoking in restaurant, and only California's law requires either no smoking or separate ventilation for smoking areas. Many state laws exempt small restaurants, generally those with a seating capacity of fewer that 50 persons, from smoking regulation.

Commercial Child Day Care

Twenty-six states regulate smoking in commercial child day care centers, and twenty of them are smoke-free (Table 2A). Six states allow only designated smoking areas.

Home-Based Child Day Care

Children are even less protected by law in home-base child day care centers (Table 2A). Ten states regulate smoking in home-based child day care centers. Six of these states prohibit smoking, and four states allow designated smoking areas.

Enforcement authority and penalties vary across states.

Other Sites

Some states have laws that regulate smoking in other locations (Table 2B). Forty-two states restrict smoking in hospitals, 42 on selected forms of public transportation, 30 in grocery stores, and 23 in enclosed arenas. Few states have laws that restrict smoking in bars, shopping malls, prisons, and hotels and motels.

Facts on Cigarette Smoking in the United States

Adult Smoking Prevalence – United States Population

In this section, I present some historical trends and facts related to cigarette

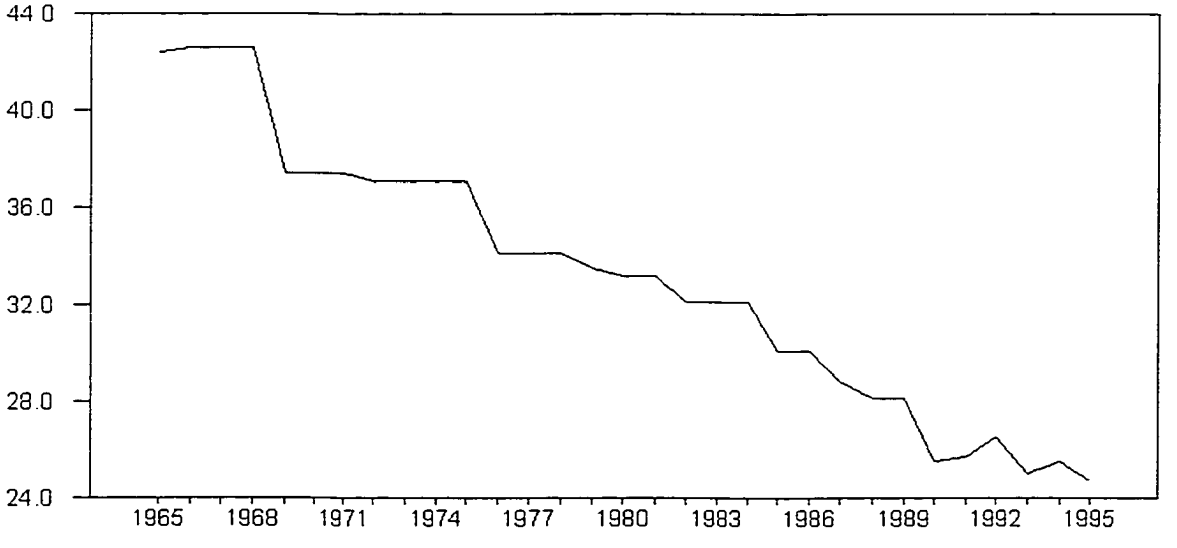
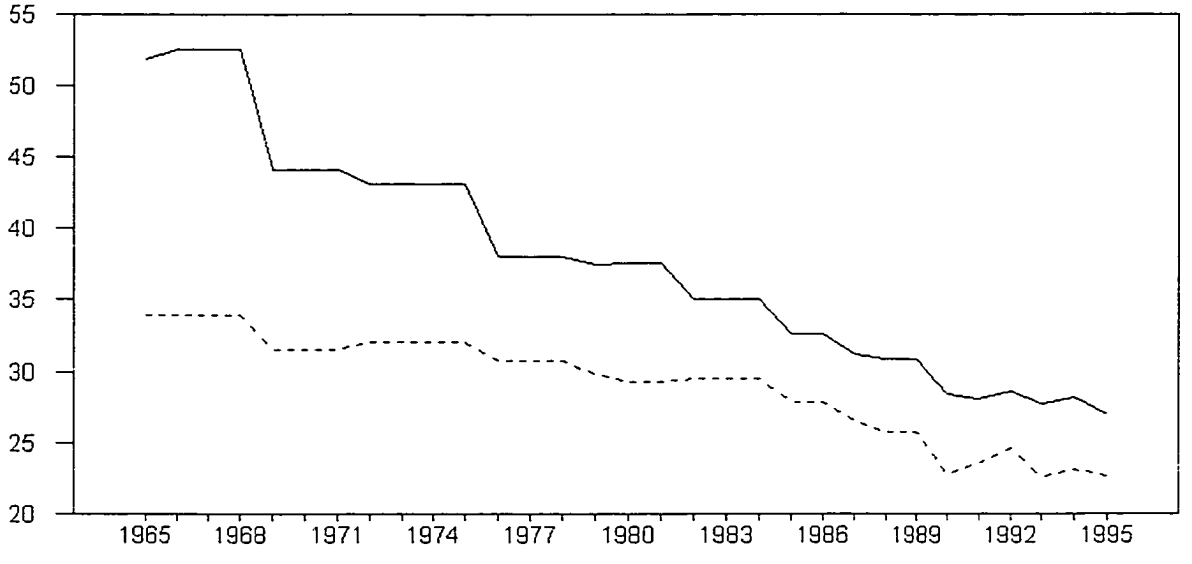


Figure 1. Percent of Current Smokers in the U.S. - Total Population

Source: National Health Interview Surveys, 1965-1995

smoking in the U.S. The data for this analysis is taken from the National Health Interview Surveys, as presented in various CDC Reports.[22] Figure 1 shows the time series trend in cigarette smoking in total U.S. population, which includes persons of ages 18 and older. There has been a precipitous decline in the percentage of current smokers from 42.4% in 1965 to 24.7% in 1995. Since 1990 however the trend has leveled off at about 22.9% in 1998.

The downward historical trend in smoking prevalence has changed in the 1990s, and the percentage of current smokers maintains at almost the same level until 1995. The only exception is the spike on the graph for 1992, when there has been an



Legend. — = men, --- = women.

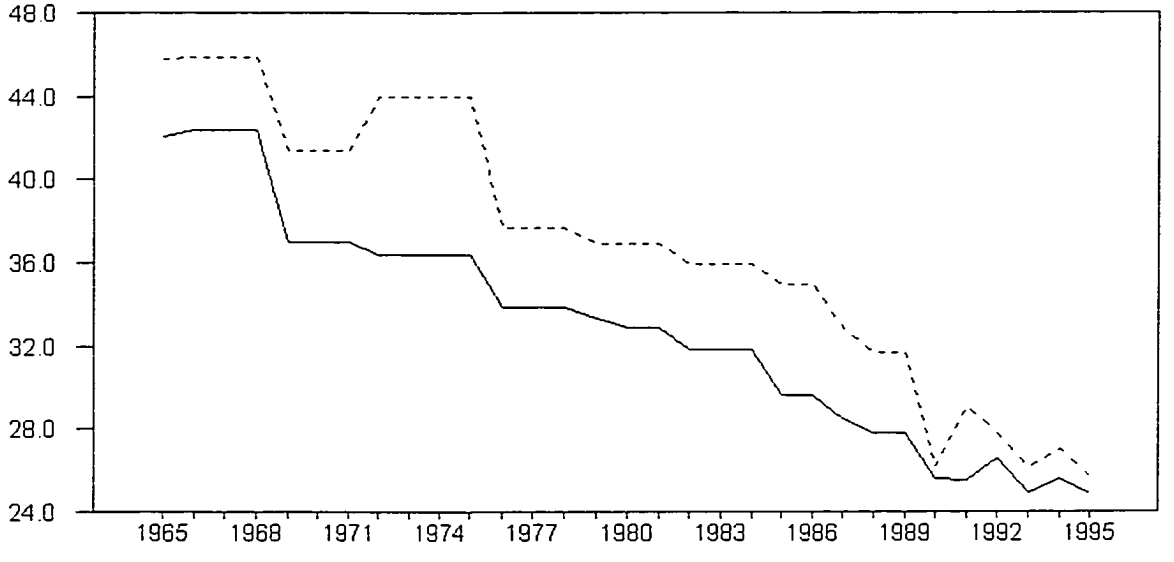
Figure 2. Percent of Current Smokers by Gender

Source: National Health Interview Surveys, 1965-1995

increase in smoking prevalence to 26.5%, up 7.2% compared with the 1990 level.

More recent data continue to reveal a sluggish decline in smoking prevalence in U.S. population, to 23.2% in 1997 and 22.9% in 1998.[23]

Figure 2 compares the percentage of men and women who are current smokers, and two trends appear in these data. The trend of smoking prevalence is declining for both genders, although the gap is closing in the past years. There has been a larger drop of 47% in the percentage of men who are smokers, from 51.9% in 1965 to 27.0% in 1995. The reduction in smoking prevalence among women has been smaller, only 33.3%, from 33.9% in 1965 to 22.6% in 1995. In 1995, almost the same proportions of men and women are current smokers. The narrowing gap is explained by the much smaller decrease in women's smoking. These data are consistent with the



Legend. --- = black, — = white.

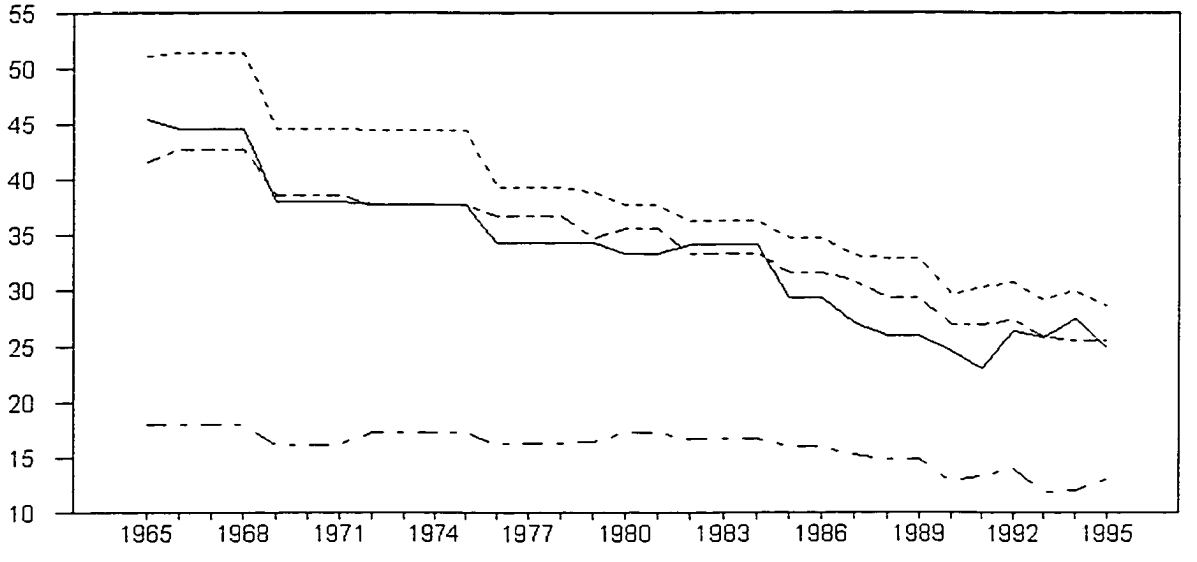
Figure 3. Percent of Current Smokers by Race

Source: National Health Interview Surveys, 1965-1995

findings in the literature, that women are less responsive to changes in policies aimed at discouraging smoking.[24]

Comparison of smoking prevalence by race is shown in Figure 3. Slightly more black people smoke cigarettes compared with white people, but the gap almost closed in the 1990s. The proportion of white persons who are smokers has gone down by 41 %, from 42.1 in 1965 to 24.8 in 1995. The decline in the proportion of smokers among black persons has been larger, 43.8%, from 45.8% in 1965 to 25.7% in 1995. The decline stopped in the 1990s for both whites and blacks.

Figure 4 shows the smoking prevalence for different age groups and it



Legend. —— = age 18 to 24, – – – = age 25 to 44, — – – = age 45 to 64, — – = above age of 65.

Figure 4. Percent of Current Smokers by Age

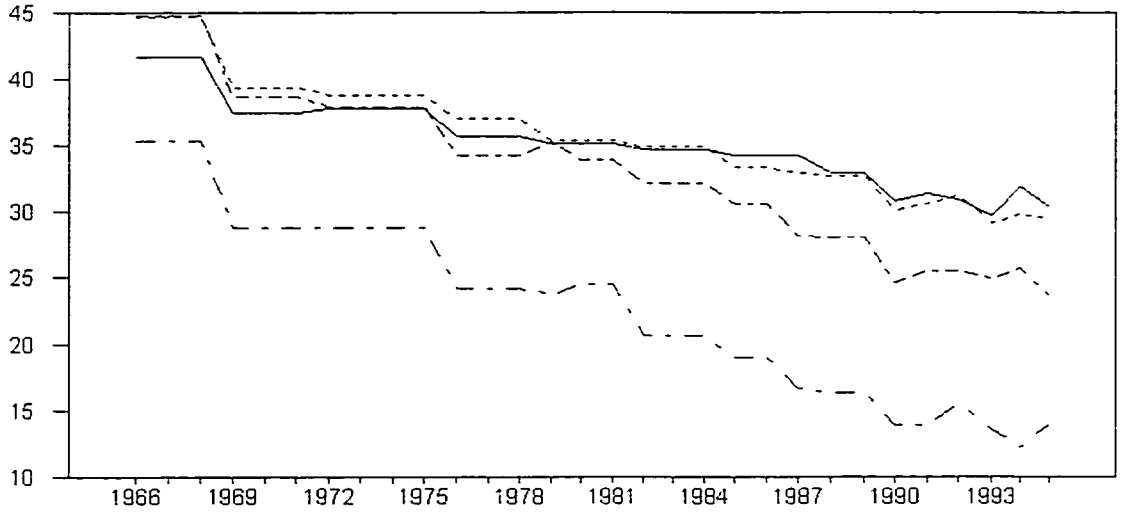
Source: National Health Interview Surveys, 1965-1995

illustrates a general downward trend. The highest proportion of smokers is adults between the ages 25 and 44 throughout the whole sample period; 51.2% in 1965 and 28.6% in 1995.

Almost the same proportions of youths of ages between 18 and 24 and adults of ages between 45 and 65 smoke cigarettes. For the age group 65 and over there has been the smallest proportion of smokers. The biggest decline in smoking prevalence occurred among young adults of ages 18 to 24, from 45.5% in 1965 to 24.8 in 1995, and adults of ages 25 to 44, from 51.2% in 1965 to 28.6% in 1995. It is interesting to observe that smoking prevalence has increased in the 1990s among the group age 18 to 24. The lowest level of smoking among young adults has been registered in 1991, 22.9%, and after that is has increased with a peek of 27.5 in 1994. This new trend in youth smoking, which is true for even younger age groups, represents the concern of policy makers today and it the topic for the economic literature in this area. Although anti-smoking policies have been implemented at federal and state level to discourage and prevent youth smoking, there is yet much to be done.

From Figure 5 we can infer that education is inversely correlated with cigarette smoking. People with 12 years or less of education are more likely to smoke than people with higher education. Until late 1970s there was no difference in smoking trends among people with up to 15 years of schooling. After 1979, the smoking prevalence for people with 13 to 15 years of schooling was more abrupt, while the proportions of smokers among people with high school or less education continue to have similar, less abrupt declining trends. Fewer people among those with

16 years or more of education are cigarette smokers over the entire sample period. This group also registered the largest decline in smoking prevalence of 60%, from



Legend. —— =less than 12 years of education, – – – = 12 years of education, — – – = between 13 and 15 years of education, — – = 16 or more years of education.

Figure 5. Percent of Current Smokers by Education

Source: National Health Interview Surveys, 1965-1995

35.3% in 1966 to 14.0% in 1995. The smallest decrease in smoking prevalence is among less educated people, with less than 12 years of education. The decline for this group has been 27%, from 41.7% in 1966 to 30.4% in 1995.

Among the smokers, it is interesting to determine the level of cigarette consumption and whether it varies through time. Figure 6 shows that there is a decline in the average number of cigarettes smoked daily. There was no real decline until 1988, when the daily number of cigarettes smoked fell from 20.2 cigarettes per

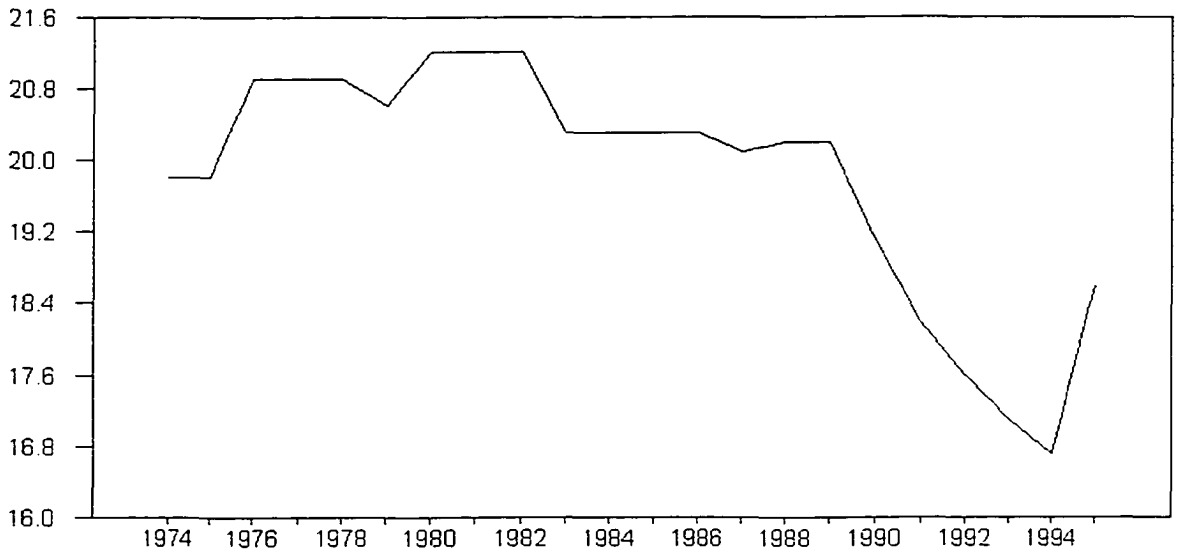
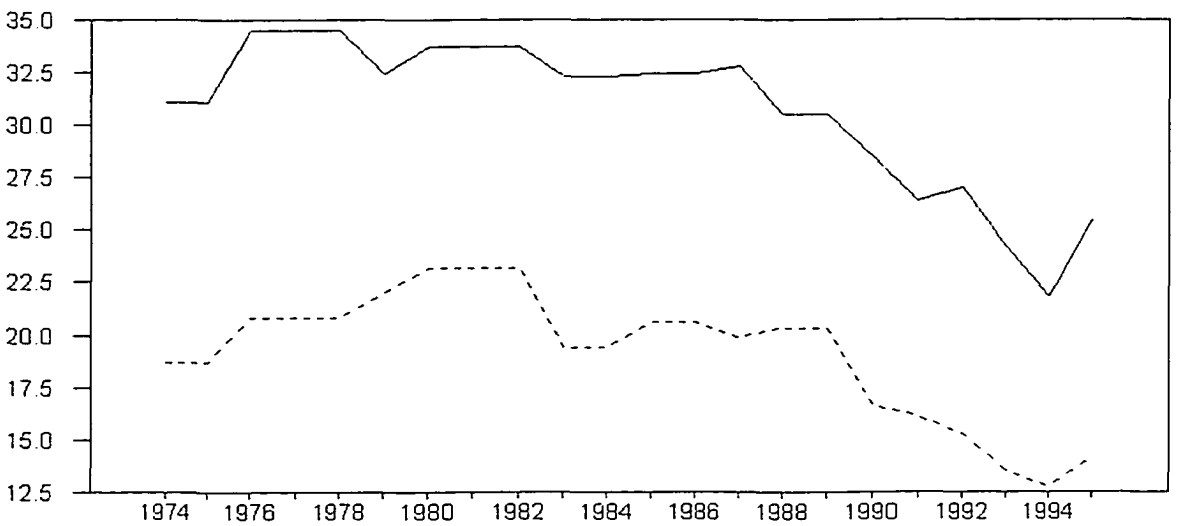


Figure 6. Average Number of Cigarettes Smoked by the Current Adult Smokers

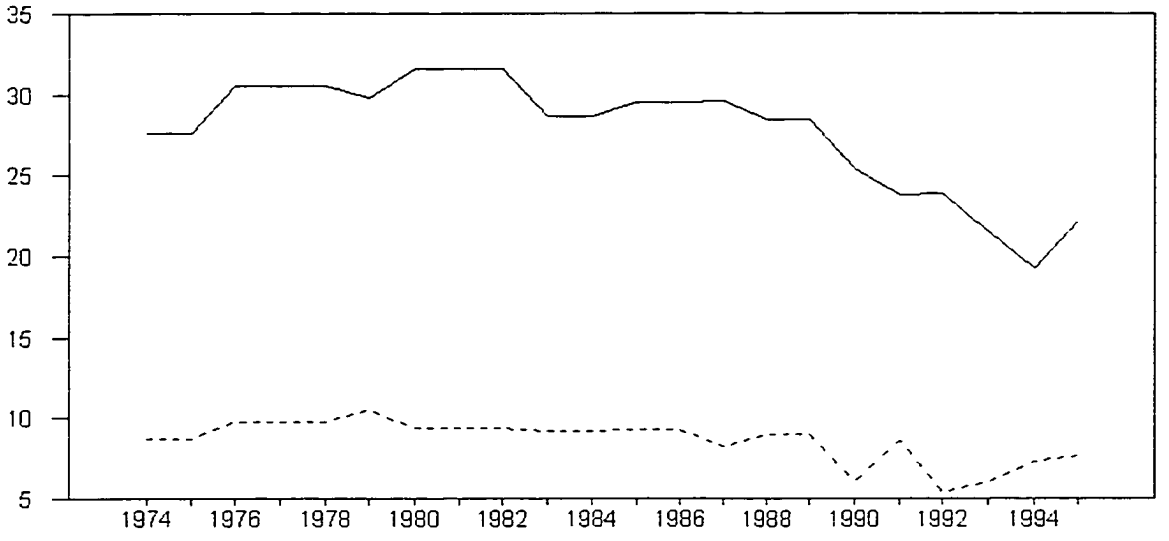
Source: National Health Interview Surveys, 1974-1995



Legend. —— = men, – – – = women.

Figure 7. Percent of Current Smokers Who Smoke 25 or More Cigarettes Per Day – By Gender

Source: National Health Interview Surveys, 1974-1995



Legend. —— = white, – – – = black.

Figure 8. Percent of Current Smokers Who Smoke 25 or More Cigarettes per Day – By Race

Source: National Health Interview Surveys, 1974-1995

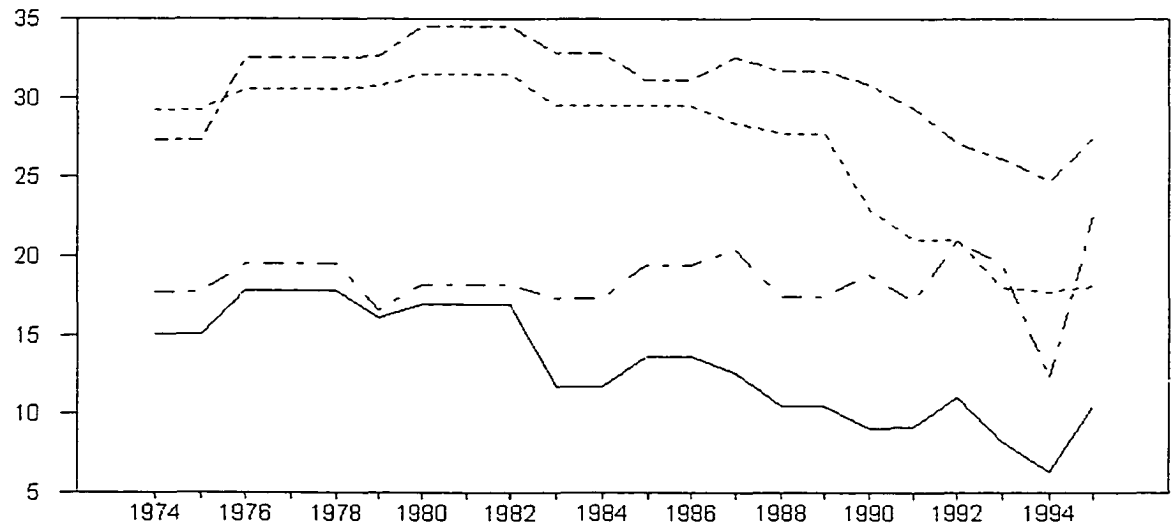
day to 16.7 cigarettes per day in 1994. But data for 1995 shows a 11.3% increase to 18.6 cigarettes per day in 1994.

The health consequences are more serious for those who smoke high quantities of cigarettes. Therefore Figures 7 to 10 illustrate the proportion of current smokers who consume 25 or more cigarettes per day among different demographic groups. Men are more likely to consume large quantities of cigarettes than women, and there is a larger decline in cigarette consumption among women in recent years.

More white smokers consume 25 or more cigarettes per day than black smokers. People of ages between 25 and 64 are more likely to smoke large quantities

of cigarettes, and only a small proportion of young smokers 18 to 25 years old use 25 or more cigarettes per day. Only among smokers 25 to 44 years old the proportion of those smoking 25 or more cigarettes per day is declining.

There is no clear distinction among the proportion of heavy smokers by education in the first part of the sample. It is only after 1990 that fewer people with higher education tend to smoke 25 or more cigarettes per day. For smokers with less than a high school education the proportion of heavy smokers increased.

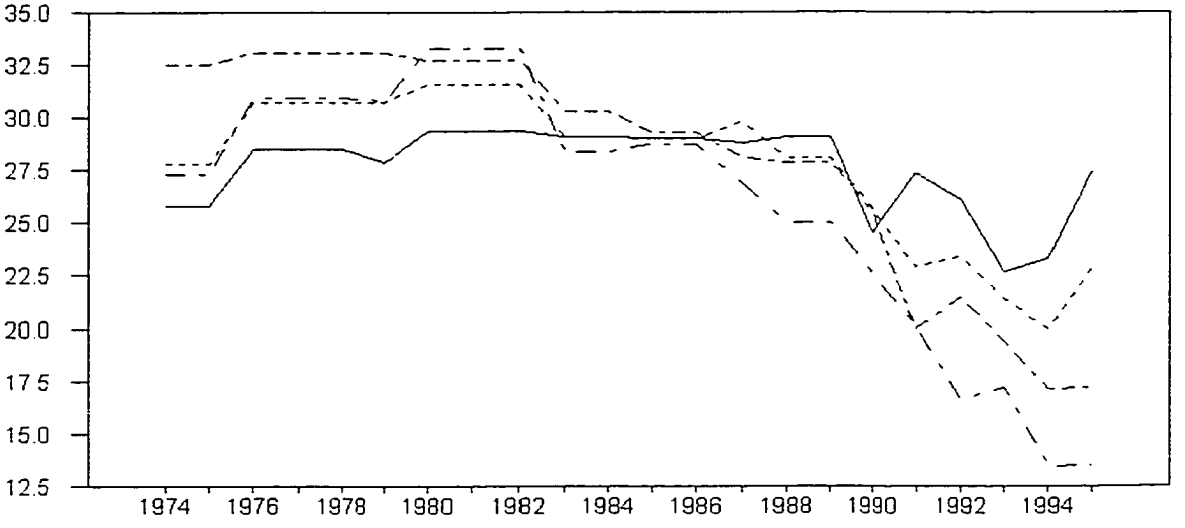


Legend. —— = age 18 to 24, – – – = age 25 to 44, — – – = age 45 to 64, — – = above age of 65.

Figure 9. Percent of Current Smokers Who Smoke 25 or More Cigarettes per Day – By Age

Source: National Health Interview Surveys, 1974-1995

Figure 11 summarizes in a way the information contained in Figures 6 to 10,



Legend. ——— =less than 12 years of education, – – – = 12 years of education, — – – = between 13 and 15 years of education, — – = 16 or more years of education.

Figure 10. Percent of Current Smokers Who Smoke 25 or More Cigarettes per Day – By Education

Source: National Health Interview Surveys, 1974-1995

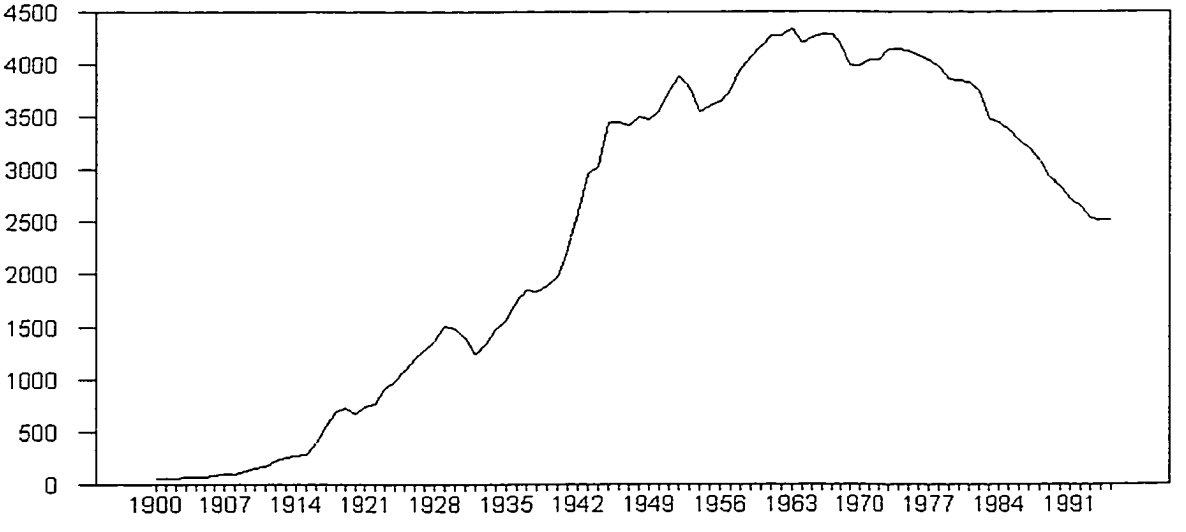


Figure 11. Annual Per Capita Consumption of Cigarettes in the United States, 1900 – 1995

Source: National Health Interview Surveys, 1974-1995

and it displays yearly per capita consumption from 1900 to 1995. There has been a marked increase in cigarette consumption until late 1960s, from 54 cigarettes per year in 1900 to 4287 in 1966. After 1966, per capita consumption declines and the level in 1995 is 2515 cigarettes per year.

State Level Cigarette Smoking Data

State level cigarette smoking data are available through the Behavioral Risk Factor Surveillance System (BRFSS), coordinated by the CDC. The BRFSS is a state-based surveillance system that collects information about risk factors causing chronic diseases and death.[25] Data are collected through random-digit-dialed telephone interviews and provide information on several risk behaviors for adults of ages 18 and older. The report starts in 1984, when 15 states have participated in the survey, and continues until present. More states participated every year and beginning with 1994 all 50 states provided survey data as part of the BRFSS. Sample sizes vary from 476 in 1984 for Indiana, to 3988 in 1992 for California. Beginning with 1991, the sample in each state included at least 1178 persons. Information about smoking consumption, among other risk behaviors is provided by sex, age groups, and education, and race.[26]

Table 3 displays information about state level cigarette smoking. The median cigarette consumption among the 15 states participating in the survey was 27.4% in 1984 and decreased to 22.2% in 1992, when 47 states were participating in the BRFSS. Smoking prevalence was stable throughout the 1990s at about 22% to 23%.[27] Smoking prevalence declined in some states and remained fairly high in others. In

Table 3

Percentage of Adults Aged 18 and Older Who Reported Cigarette Smoking, By State – Selected Years

State	1984	1992	1994	1995
Alabama	-	21.8	21.6	24.6
Alaska	-	28.0	28.9	25.2
Arizona	27.7	19.2	22.8	22.9
Arkansas	-	-	26.6	25.2
California	25.6	19.4	18.2	15.5
Colorado	-	23.1	24.2	21.9
Connecticut	-	22.1	19.6	20.9
Delaware	-	26.5	25.7	25.5
District of Columbia	-	18.7	15.0	-
Florida	-	22.1	23.8	23.3
Georgia	-	19.1	22.8	20.5
Hawaii	-	19.5	20.5	17.9
Idaho	24.5	18.7	19.5	19.8
Illinois	33.6	23.6	24.6	23.1
Indiana	25.7	27.0	25.2	27.2
Iowa	-	19.3	21.0	23.2
Kansas	-	22.3	21.8	22.1
Kentucky	-	27.9	28.9	27.9
Louisiana	-	24.2	25.6	25.3
Maine	-	23.2	23.6	25.0
Maryland	-	19.9	20.2	21.3

Table 3 – Continued

State	1984	1992	1994	1995
Massachusetts	-	22.9	21.2	21.8
Michigan	-	25.1	25.1	25.8
Minnesota	26.5	21.4	21.6	20.5
Mississippi	-	23.5	22.2	24.1
Missouri	-	23.3	24.9	24.5
Montana	28.9	18.0	21.6	21.2
Nebraska	-	17.4	19.4	22.1
Nevada	-	30.5	29.2	26.4
New Hampshire	-	22.8	22.5	21.5
New Jersey	-	20.1	22.8	19.3
New Mexico	-	19.6	21.8	21.3
New York	-	22.1	21.2	21.6
North Carolina	28.6	26.4	27.8	26.0
North Dakota	-	21.9	20.2	22.7
Ohio	28.7	23.4	26.3	26.1
Oklahoma	-	25.6	23.9	21.7
Oregon	-	20.8	21.2	21.9
Pennsylvania	-	24.4	24.1	24.2
Rhode Island	31.3	22.2	-	24.7
South Carolina	26.2	26.7	23.9	24.0
South Dakota	-	21.9	20.9	21.8
Tennessee	25.1	26.6	26.6	26.5
Texas	-	22.0	21.4	23.7
Utah	16.1	15.6	15.7	13.2

Table 3 - Continued

State	1984	1992	1994	1995
Vermont	-	21.7	22.5	22.2
Virginia	-	22.8	25.3	22.0
Washington	-	21.2	21.9	20.3
West Virginia	32.8	24.5	27.0	25.9
Wisconsin	27.4	22.5	22.8	21.9
Wyoming	-	-	21.3	22.0
States participating	15	49	50	50

Note: Current cigarette smokers were persons who reported ever smoking ≥100 cigarettes and currently smokes and did not volunteer that they are occasional smokers when asked to report the average number of cigarettes they smoke daily.

1984, cigarette smoking at state level varied from 16.1% in Utah, the only state in the sample of 15 states with under 20% level of smoking, to 33.6% in Illinois, 32.8% in West Virginia, and 31.3% in Rhode Island. In 1990, there were 45 states included in the BRFSS. Utah presented the lowest smoking prevalence with 16.7%, followed by Montana and Washington D.C. with 19.4%. The states with the highest smoking prevalence were Kentucky and Michigan with 29.1%, North Carolina with 28.0%, Tennessee with 26.7%, Oklahoma and West Virginia, each with 26.6%, and North Dakota with 26.1%. In 1994 and 1995, Utah maintained the lowest level of smoking prevalence among all U.S. states, with 14.5% and 13.2%, respectively. In 1994, more states reduced state level cigarette smoking below 20%, including Washington, D.C. (16.7%), California (18.2%), Nebraska (19.4%) and Idaho (19.5%). In 1995, other

states with low level of smoking included California (15.5%), Hawaii (17.9%), New Jersey (19.3%) and Idaho (19.8%). States with the highest smoking prevalence in 1994 were Kentucky with 30.1%, Nevada with 30.0%, Alaska and Missouri, each with 26.7%. In 1995, the highest smoking prevalence declined and it has been recorded in Kentucky (27.9%), Indiana (27.2%), and Tennessee (26.5%).

Smoking-Attributable Diseases, Mortality, and Years of Potential Life Lost

Cigarette smoking is considered "...the single most preventable cause of premature death in the United States."[28] The data regarding various diseases and deaths caused by cigarette smoking, available at state level and for the overall U.S. population, support the statement and represent a source of public concern. Cigarette smoking has caused more than 10 million deaths since the 1964 Surgeon General's Report on Smoking and Health, from which 2 million deaths were caused by lung cancer.[29] On average, smokers die seven years earlier than nonsmokers.[30] One in every five deaths in the United States is smoking related.[31] Moreover, exposure to secondhand smoke (or ETS) causes an estimated 3000 deaths from lung cancer among American adults. [32]

Table 4 shows annual deaths related to smoking between 1990 and 1994. Each year during this period, an average of 358 persons in 100,000 die from cigarette smoking. The lowest number of deaths is recorded in Utah (188 deaths per 100,000 population), followed at a considerable distance by Hawaii (237 deaths). The highest numbers of deaths related to smoking are twice as large as in Utah and are registered

Table 4

Deaths Related to Smoking – 1990-1994

Rank	State	Deaths per 100,000 Population
1	Utah	188
2	Hawaii	237
3	North Dakota	280
4	Minnesota	287
5	New Mexico	289
6	Idaho	296
7	Nebraska	308
8	Iowa	308
9	South Dakota	309
10	Connecticut	310
11	Wisconsin	313
12	Kansas	319
13	Arizona	325
14	New Jersey	327
15	D.C.	327
16	Colorado	331
17	Massachusetts	331
18	Rhode Island	340
19	California	343
20	New York	343
21	Pennsylvania	346
22	Illinois	347
23	Oregon	348
24	Montana	348
25	Florida	350
26	Maryland	351
27	Vermont	351
28	Washington	351
29	Alabama	353
30	Wyoming	357
31	Texas	358
32	Virginia	360
33	New Hampshire	361
34	Ohio	364
35	Georgia	364
36	Alaska	367

Table 4 – Continued

Rank	State	Deaths per 100,000 Population
37	Missouri	367
38	North Carolina	368
39	Michigan	368
40	Maine	371
41	South Carolina	378
42	Indiana	387
43	Oklahoma	387
44	Louisiana	388
45	Tennessee	390
46	Mississippi	392
47	Delaware	400
48	Arkansas	405
498	West Virginia	424
50	Kentucky	444
51	Nevada	439
	United States	358

Source: Smoking Attributable Mortality, Morbidity, and Economic Costs (SAMMEC). CDC, 1996

in Kentucky (444 deaths for each 100,000 persons) and Nevada (469 deaths per 100,000 persons). It is worth noting that the highest number of deaths happen in the two states with the highest number of smoking prevalence, listed in Table 3.

To offer an idea of how big these numbers are, Figure 12 compares the causes of deaths among Americans every year. The difference between the number of deaths caused by smoking and all other causes is striking. Smoking kills 25 times more people than AIDS or drug induced deaths, 5 times more people than alcohol, 10 times more people than motor vehicle accidents, 22 times more people than homicide, 14 times more people than suicide. Among deaths caused by smoking, Figure 13

illustrates the major smoking-related diseases that lead to death in 1990. Lung cancer, ischemic heart disease, and chronic lung disease represent the most import illnesses that resulted in death.

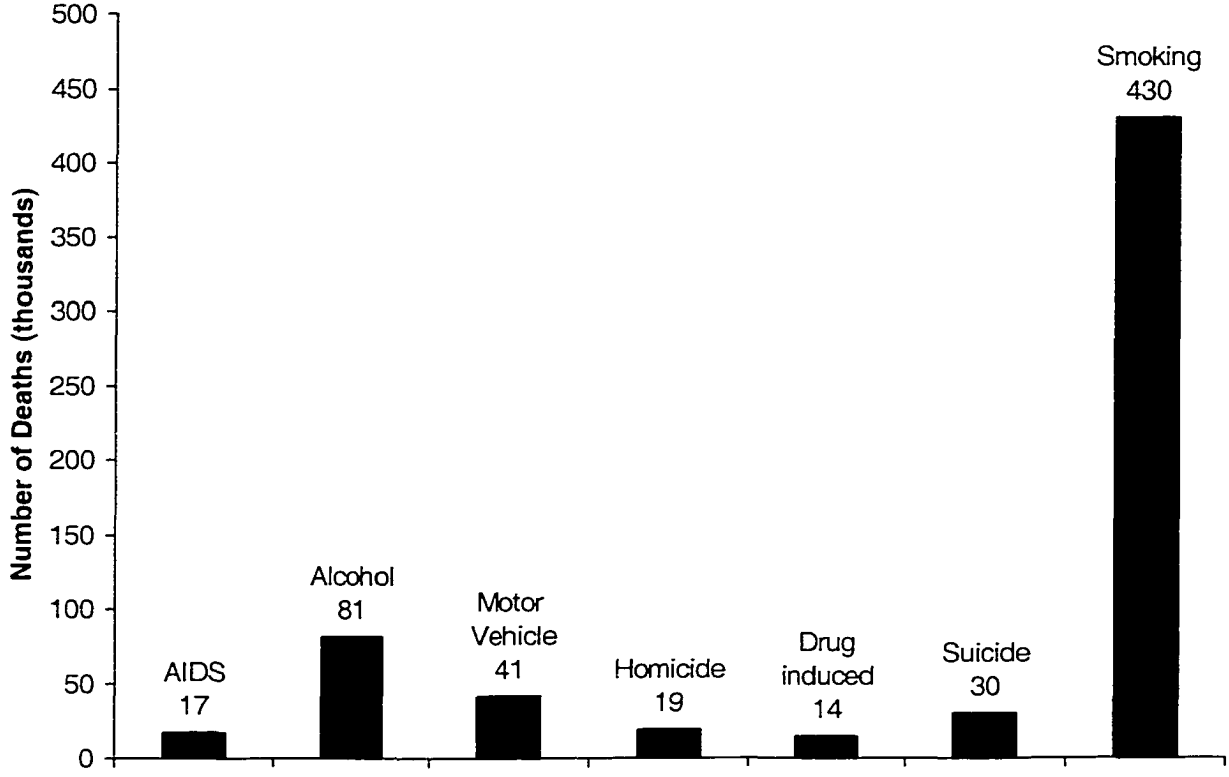


Figure 12. Comparative Causes of Annual Deaths in the United States, 1990

Smoking-related diseases impose very high costs that have an important economic impact. In 1993, direct medical costs associated with smoking are estimated to more than 50 billion dollars.[33] Smoking-related illnesses are responsible for more than 7% of total US health care costs. Federal and state funds pay more than 43% of all smoking-attributable medical care expenditure. In 1993, around 54% of all

smoking-related medical costs represent hospital expenditures (27 billion dollars). Between 1990 and 1994, there were almost 6 million years of potential life lost on average each year, an average of 13.4 years for each death, due to smoking.

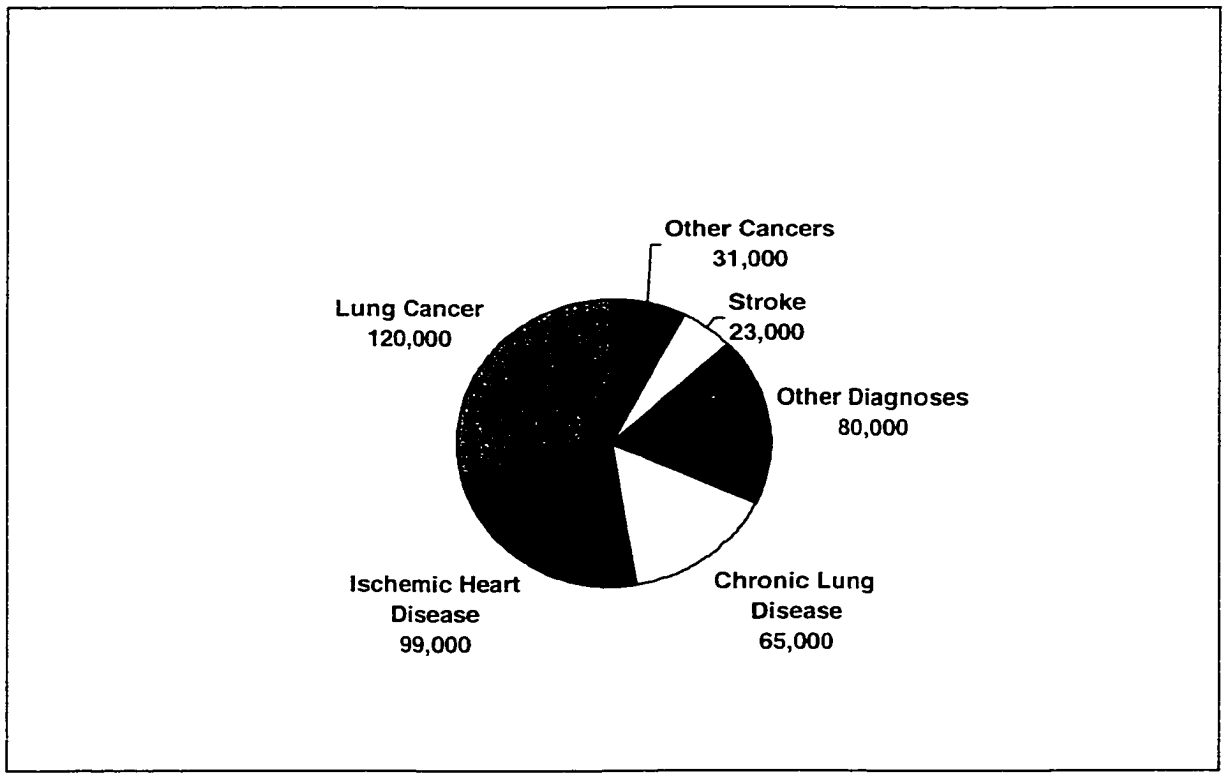


Figure 13. Deaths Attributable to Cigarette Smoking in the United States, 1990

All these data represent important sources of concern and show that there is still much to do to reduce the health burden and economic costs caused by cigarette smoking. On the other hand, in an article by Levy and Marimont (1998), the accuracy of the data is challenged. The authors argue that the numbers regarding the numbers of deaths related to cigarette use and second hand smoke are over-inflated. Cigarettes remain a dangerous drug and represent an important cause of disease for individuals

of all ages. However, the article poses an important question regarding the true intentions of policy makers. What is the real motivation behind regulation? Why is there so much variation in the regulatory activity across states? This research examines no-smoking regulations and the factors that determine their passage. I will take into consideration economic, social and political factors that characterize states and study their impact on state legislators. I will further examine the economic impact of these regulations, and look at their impact on cigarette consumption. Besides the obvious protection that non-smokers receive, do no-smoking regulations affect the demand for cigarettes? Moreover, do these regulations have any impact on the consumption of other drugs, in particular, of alcohol? It is important to assert the true social value of these regulations, considering the fact that smoking is restricted so unevenly across states.

CHAPTER III

STATE REGULATIONS OF SMOKING IN PUBLIC PLACES: DECISIONS ON TIMING AND RESTRICTIONS

In a time when deregulation is taking place in many areas as a major public policy reversal, tobacco control has become one of the most aggressive areas of risk regulation. The deregulation process has proven successful in many industries because free pricing and entry have increased the overall economic and social welfare.[34] The less encouraging results of regulation have been caused by the high costs due to partisan policy decisions.[35] The social cost of regulation has been amplified in some cases because some of the implications of regulatory decisions have not been anticipated, which led to increasing risks.

Since economic deregulation has proven to have positive results, the regulatory process shifted its focus on social areas (which include environmental, health and safety standards). Despite a few successes recorded in the 1980s, not much progress has been made. Some new, inflexible regulations amplified the general sense of a slowdown in the regulatory process.[36] The criticism was that in many cases the economic analysis was not a deciding factor for the elected officials in designing regulatory policies. Moreover, states gained more independence in policy design and implementation, which altered the role of regulation by becoming more sensitive to state politics. These facts come in contradiction with the general belief that the

purpose of regulation is to correct a market failure and suggest that there are more aspects of the regulatory activity that have to be considered. This paper intends to present an alternative view on regulation, and I use the case of tobacco regulation to illustrate this point.

Regulation of tobacco industry and consumption of cigarettes is one of the most discussed topics today not only by regulatory agencies and governments, but also by health organizations and the public opinion, due to so many implications of cigarette smoking. Today there is a consensus among health experts that cigarette smoking is associated with deadly diseases, such as various cancers, cardiovascular and heart diseases.[37] Moreover, Chalupka and Warner (1999) estimate that tobacco products are responsible for over one-fifth of annual deaths in the U.S. during middle age.

1964 marked the beginning of a corroborated campaign against smoking, initiated by the federal, state and local governments, as well as by private organizations, when the Surgeon General stated that cigarette smoking is "a health hazard..." which requires "...appropriate remedial action"[38]. In the early years, the federal government played the most active role, while state governments limited their actions to taxing cigarettes.

The Surgeon General's 1972 Report on Smoking and Health was the first official document to address the potential negative health effects of cigarette smoking on non-smokers.[39] Passive smoking as a result of the exposure to environmental tobacco smoke (ETS) has been proven to cause illness in healthy non-smokers,

including cancer, heart disease, and respiratory ailments.[40] Nationally, approximately 3,000 deaths a year are attributed to secondhand smoke, as well as 150,000 to 300,000 respiratory tract infections in children younger than 18 months of age.[41] This series of reports, together with research by other public and private organizations, created pressure for the governments to restrict smoking in public places. An article by Levy and Marimont (1998) point out the fact that the numbers regarding the deaths related to cigarette use and secondhand smoke are exaggerated. Without dismissing the real health hazard that cigarette use represents for individuals of all ages, this fact raises the question about the true motivation of legislated actions against tobacco initiated by the government.

Although the federal government passed legislation aimed at restricting smoking in public places,[42] the main role in passing legislation controlling cigarette smoking was assigned to state governments. As the 1989 Surgeon General's Report stated, regulation of smoking on public places at the state level was "expected to be the norm by the end of the century."[43]

The health effects of smoking and the public's concern and awareness of the negative externalities of tobacco smoke on nonsmokers explain in part why economists have shown an interest in analyzing these issues. The economic analysis has changed over the years in response to the research in the area and in response to the need for effective public policies to decrease smoking and change consumers' behavior.[44] The early studies concentrated on the general market analysis, market concentration, and price elasticity of demand issues. Studies after 1964 focused on

examining how economic factors affect cigarette consumption, and how economic tools may be used to decrease the demand for smoking.[45]

The majority of economic analysis focused on the use of taxation as a way to discourage consumption of cigarettes. Few studies examined the effectiveness of no-smoking restrictions in public places as an instrument used by the government to correct for a market failure and the negative effect of ETS on nonsmokers' health. The interesting feature of these regulations is that these laws are the products of state legislatures, and each state had considerable freedom in choosing whether and when to enact regulations on smoking, which specific places were to be regulated, and how restrictive these regulations were to be.

Tables 1, and 2A and B, in the preceding Chapter, show the great diversity among different states with regard to no-smoking regulation in public places. Some states do not have any regulation at all, some states regulate smoking in all public places, while some states choose to regulate only some public places. The same variation appears in the timing of regulation and the restrictiveness imposed by the legislation. As Table 5 shows, the first state that passed legislation restricting smoking in public places was Arizona in 1973, and since then most of the U.S. states passed smoking regulations. Between 1973 and 1984, twenty-one states and Washington, D.C. have passed regulations restricting smoking in some public places, and between 1985 and 1995 twenty-four additional have passed regulations against smoking. However, as of June 1995, there were still five states with no regulation.[46] Moreover, the regulation of smoking in each of the six locations can take one of many

Table 5

The Enacting Dates for the First State Regulation of Smoking in Public Places

State	Enacting Date	State	Date
Alabama	No law	Nevada	05/05/1977
Alaska	07/17/1984	New Hampshire	01/01/1991
Arizona	09/20/1973	New Jersey	09/01/1986
Arkansas	01/01/1977	New Mexico	01/01/1986
California	07/01/1977	New York	02/22/1990
Colorado	01/01/1991	North Carolina	No law
Connecticut	10/01/1977	North Dakota	08/01/1977
Delaware	06/28/1994	Ohio	06/11/1993
Florida	10/01/1985	Oklahoma	11/01/1987
Georgia	01/01/1994	Oregon	10/04/1977
Hawaii	06/24/1987	Pennsylvania	02/18/1989
Idaho	01/07/1992	Rhode Island	06/27/1986
Illinois	07/01/1990	South Carolina	08/01/1990
Indiana	09/01/1987	South Dakota	11/19/1992
Iowa	07/01/1987	Tennessee	No law
Kansas	07/01/1987	Texas	01/01/1975
Kentucky	No law	Utah	04/01/1976
Louisiana	08/15/1992	Vermont	07/01/1993
Maine	01/01/1986	Virginia	07/01/1991
Maryland	10/01/1992	Washington	01/01/1989
Massachusetts	01/14/1988	Washington D.C.	09/28/1979
Michigan	06/15/1992	West Virginia	01/01/1985
Minnesota	06/02/1974	Wisconsin	04/26/1984
Mississippi	No law	Wyoming	03/07/1990
Missouri	08/28/1992		
Montana	10/01/1977		
Nebraska	01/01/1980		

forms, which indicates how restrictive the law is. The restriction may specify that smoking is allowed in designated areas only, with ventilation recommended or required, or may ban smoking completely. The restrictiveness of smoking regulations varies also across states.

The wide variation in states' smoking regulation provides an opportunity to empirically test competing theories of regulation. The traditional approach is that the public demands some form of regulation from the government to correct some real or perceived market failure. This theory is called the public interest theory. The basis of my approach is the economic theory of regulation (ET), known also as the private interest theory, which predicts that regulation is the result of competing interest groups that offer political support in exchange for legislation favorable to them. ET implies that regulation provides benefits to the group that is better organized and demands regulation that favors it.

In the case of no-smoking regulations, the market failure is the health hazard of second hand smoking by nonsmokers. According to the public interest theory, states should promptly act and regulate smoking in all public places, in the same period of time, enforcing the same restrictions. The reality is more complicated and tells a different story. Each state has a different package of smoking regulations, passed at a different date, over a period of almost thirty years, and there are states with no smoking regulation yet. This variation in states' no-smoking regulation suggests that the public interest theory provides only a partial explanation for states' regulatory activity. There are specific forces that characterize each state, which determine whether no-smoking regulation will be implemented, when the regulation will be passed and what form the regulation will take. The complete description of the regulatory behavior will be provided by looking at the state level and identifying the possible economic, political and social factors that may put pressure on state

legislators and influence their decision regarding smoking regulation. The rest of the paper will be built on this approach, and will use the economic theories of regulation to test this hypothesis.

In this chapter, I plan to critically examine the claim that regulation of smoking in public places is a response to a perceived market failure. In this sense, I will empirically examine how specific economic, social and political factors interact to explain the variation in state no-smoking legislation. The richness of the data on states' regulations allows us to answer several research questions. First, which factors determine when a particular state takes action and restricts smoking in public places? This question is motivated by the fact that states passed regulation against smoking beginning with 1973, during a period of over thirty years, and there are still states without any smoking regulation. Second, which factors determine the specific places that are subject to regulation? The answer to this question will provide an explanation for the fact that states usually regulate smoking only in some public places, and there are only five states that restrict smoking, to some extent, in all public places. And, third, which factors determine how restrictive the state regulation will be in restricting smoking in public places? This is another concern for policy makers, since even when smoking is regulated, states choose to impose different restrictions on smokers.

The results of this study are important for several reasons. First, given the public concern and awareness of the adverse health effects that smoking has on both smokers and nonsmokers, the fact that there are such wide differences in smoking legislation across states constitutes a concern for public policy. If smoking is such a

danger, for both smokers and nonsmokers, the situation should be corrected for all people in the same measure. Policy makers have to make sure that in all states nonsmokers are protected as much as possible against ETS, therefore they have to find the right incentives for states to enforce the strictest regulations on smoking. Second, if the behavior at state level is understood and if it is known what forces determine when and whether restrictions on smoking are imposed, this could provide policy makers with an effective tool to guarantee non-smokers a smoke-free environment. At the same time, these policies may induce changes in smokers' behavior and decrease the number of smokers nationwide.

The next section provides a historical review of the regulatory efforts designed to increase awareness of health hazards of smoking and to fight the negative consequences of tobacco use. Then the various state regulations regarding smoking in public places as provided by State Tobacco Activities Tracking and Evaluation (STATE) are described. Next, the two major research ideas that will be explored in this paper, the timing and restrictiveness of regulation, are presented. In the following section, I use the economic theory of regulation to develop hypotheses and predictions about the potential determinants of smoking regulations at the state level. I further propose a set of various interest groups likely to affect states' regulatory decision regarding smoking in public places, and then I provide the econometric models that we will use to develop the empirical analysis, the data, and the results of this analysis. Finally, the last section presents the conclusions of this chapter.

Timing and Restrictiveness Regarding Regulation of Smoking in Public Places

Timing

Information regarding the dates when the various state laws were passed is also available through the STATE System. Table 1 in Chapter II presents the dates when no-smoking regulations in public places were enacted in each state. Twenty-two states and Washington, D.C. passed laws regarding smoking in public places by the end of 1984, while twenty-three regulated smoking in public places between 1985 and 1995. Five states still did not have any law at the end of the sample period (June 30, 1995).

This detailed information regarding the timing of regulation at the state level forms a very valuable data set with cross section and time-series variation. The sample covers a period of twenty-three years and includes the fifty states and Washington, D.C.. The information on timing in this panel data represents an opportunity to take a new approach with respect to smoking restrictions in public places. I investigate states' regulatory behavior by studying the factors that explain the timing of smoking regulation in public places. I critically examine the traditional view that regulation is the way governments correct some perceived or real market failures signaled by the public. The variation in the timing of regulation of smoking in public places suggests that regulatory activities must be explained by state-specific factors that pressure state legislators. Therefore, I will develop a model that includes economic, political, and social factors to test the two alternative theories of

regulation. Kroszner and Strahan (1998) have been the innovators of this technique and they have used it to study the forces that drive branch banking deregulation. They construct a hazard model and examine how the two theories of regulation, private and public interest theories, explain the timing of branch-banking deregulation in the U.S. states. They find some results consistent with both theories, but conclude that the recent bank branching deregulation is explained better by the private interest theory. The evidence suggests that both economic, and ideological factors play an important role in the timing of deregulation. Kroszner and Strahan (1998), however, recognize that the difficulty of such a study stands in the lack of cross-sectional variation in the regulatory activity present in other industries.

I take advantage of the wide variation in the regulatory activity of no-smoking regulation to conduct similar research in this paper. There are a few important questions that I can address and study using the data on timing of smoking regulation. First, what are the forces that determine a state's decision to regulate smoking in public places? In answering this question, I am not concerned with how many locations are subject to regulation, but only with the date when state legislators consider for the first time to restrict smoking in public places. This question is interesting because it represents the starting point in a state's regulatory activity and it reveals what are the forces behind such a decision. Table 5 shows the dates when each state first enacted a restriction on smoking in a public place, without considering how many locations were regulated at that date. A second question that I address regards what factors determine the timing of regulation for each of the six public

place categories. There are only a few states that regulate smoking in all public places, while most of them have laws restricting smoking in some of the six locations considered. Moreover, in many cases, when the states first enacted smoking restrictions, the regulations only covered some locations.[47] To extend the restrictions to other locations they enacted smoking regulations later on. Table 1 shows the dates of smoking regulation for each state and for each public place category. Therefore we will study the factors that affect the timing of regulation in each public location separately. In this approach, we can determine which regulatory theory is supported by evidence.

Restrictiveness

The report of the CDC Surveillance Summaries also provides information regarding the restrictions imposed on smoking by law in each state. Before considering the restrictiveness, an interesting question is why some states regulate smoking in public places, while some states choose not to regulate at all. Therefore, I first examine what factors determine whether a state regulates smoking in any public place. I consider in this case that a state regulates smoking in public places if smoking is restricted in at least one public place category. Another question that one can study regards the overall restrictiveness of state legislation against smoking in public places. The STATE System provides a rating for how strict the law for each public place category is according to the restrictions imposed on smokers in that public place. A regulation may specify one of three possible restrictions. The first possibility

is that designated smoking areas are required or allowed. The second possibility is more restrictive and requires that no smoking is allowed or designated smoking areas are allowed if separately ventilated. The most restrictive requirement by law is a 100 percent smoke-free area; for example when a law declares a building a no-smoking environment. Some states prescribe penalties for violations, require employers to establish a written smoking policy or post signs indicating the smoking policy. In order to evaluate a state's overall smoking regulation of public places I aggregate the information for each location. A rating system of states' legislation on smoking in public places is provided in State Legislated Actions on Tobacco Use.[48] Without strictly following their criteria, I use the rating system in this publication to decide on the restrictiveness of each state's legislation. I designate a state with minimal regulation if smoking is restricted in only a few places, or if up to six places are covered by smoking regulation but only a designated area may be required. States with moderate regulation restrict smoking in more than seven public places (including coverage in other places, like public transportation, bars, retail stores etc.), or more than five places among which some are smoke-free by law. States with extensive regulation ban smoking more widely in public places (in more than 8 locations, including other places), and some places are smoke-free areas by law. Table 6 presents the categories of states' regulations according to this rating system. Besides the five states that do not regulate smoking at all, nineteen states have a minimal smoking legislation, and twenty-one states have a moderate smoking legislation. Only six states are considered to have an extensive legislation regarding smoking. There is

Table 6

Categories of State Legislation by Degrees of Restriction Enforcement

No Law	With Law		
	Minimal	Moderate	Very strict
Alabama	Arizona	Alaska	California
Kentucky	Arkansas	Delaware	Florida
Mississippi	Colorado	Hawaii	Minnesota
North Carolina	Connecticut	Illinois	New Hampshire
Tennessee	Georgia	Iowa	New York
	Idaho	Kansas	Utah
	Indiana	Louisiana	
	Maryland	Maine	
	New Mexico	Massachusetts	
	North Dakota	Michigan	
	Ohio	Missouri	
	Oklahoma	Montana	
	Oregon	Nebraska	
	Pennsylvania	Nevada	
	South Dakota	New Jersey	
	Texas	Rhode Island	
	Washington	South Carolina	

Table 6 – Continued

No Law	With Law		
	Minimal	Moderate	Very strict
	West Virginia Wyoming	Vermont Virginia Washington D.C. Wisconsin	
5	19	21	6

no state with a comprehensive legislation, which is to ban smoking in all public places. Using this grouping we can examine what economic, social, and political factors determine how strict a state is in designing the general regulatory policy regarding smoking in public places. The next step is to identify the factors that have an impact on the degree of enforcement imposed by the law.

Theories of Regulation

The purpose of this chapter is to identify the factors explaining the variation and timing of state regulatory policies with regard to smoking in public places. The ultimate goal is to explain the wide variation in states' smoking legislation. In order to do that I develop my hypotheses starting from the economic theories of regulation.

During the post-war era, economists have been preoccupied with explaining the necessity of regulation and the pattern of regulatory behavior in different industries. The public interest theory was the first attempt to interpret regulation and provide some economic insights about what causes policy change. According to this theory, regulation represents the way governments intervene in industries where the "invisible hand" of the market economy fails. The public interest theory views regulation as social efficiency enhancing, and assumes that regulation is demanded by the public to correct for a market failure. Therefore, the social welfare is increased, and profits of the companies operating in that industry are decreased. According to this theory, producers are harmed and oppose to regulation.[49]

The public interest theory has been criticized on two fronts. First, it fails to explain the pattern of government intervention in certain industries. The public interest theory only assumes that regulation is the response to a market failure. Second, regulation of industries that are not natural monopolies or where externalities are not present contradicts this theory. Moreover, some regulatory episodes have had the support or have been required by the producers and firms in the industry.[50] Third, it is silent of the forces during deregulation.[51]

The capture theory represents the next step in the evolution of regulation theories and it supports the idea that regulation is "pro-producer" or that regulation becomes controlled by the industry. According to this view, regulation is demanded by firms in the industry, which are well organized as a lobby group and seek to improve their profits. The criticisms of this theory are that it is not satisfactory in

explaining how the industry captures the regulation and why producers and not other interest groups capture the regulators.[52]

The economic theory of regulation (ET), also known as the interest group theory, was first formulated by Stigler (1971). It was considered a major step towards a better understanding of the regulatory process, because the theory was built on a fundamental question, why is there regulation? The contribution was that ET was designed to predict and explain which industry will be regulated and what form the regulation will take. The basic idea is that regulators are utility maximizing arbiters between various competing groups, such as producers and consumers. The work of Stigler (1971) was completed by Peltzman (1976), who formulated the premises of ET. The underlying premise of this theory is that elected state officials desire to maintain and extend their careers in the office and their policy actions take into account constituents' and interest groups' preferences. Regulation redistributes wealth and affects firms' profits and consumers' welfare. Consequently, there are many interest groups likely to lobby the government to pass or not a piece of regulation. In the end, interest groups compete by offering political support in exchange for legislation favorable to them. Small groups are favored because they can organize better and avoid the problem of free riding. This way, ET explains why producers are more likely to gain from regulation. Becker (1983) develops a theory of competing pressure groups that lobby for political support. Political equilibrium is determined by the pressure of all interest groups, the number of individuals in each group, and the deadweight cost of taxes and subsidies[53]. The important feature of this

model are the deadweight costs, which may represent a competitive advantage to taxpayers in their quest for political influence. Therefore, increasing deadweight costs lower the pressure of subsidized groups and give more weight to pressure by taxpayers.

In this chapter, I plan to test how well ET explains regulatory activity regarding smoking in public places. Although smoking restrictions belong to the area of social regulation, applying the theory of economic regulation to explain the factors that determine regulation of smoking seems to be the natural approach. Regulations of smoking have the intention to interfere with the behavior of consumers of a product, and change the economic relations in the market for cigarettes. However, a more direct explanation has its roots in the traditional view of the existence of regulation. The intervention of the government into the markets was justified by the existence of a market failure, which in our case is represented by the second-hand smoke that violates non-smokers rights to a clean environment. Therefore smoking restrictions have direct economic implications and the analysis fits perfectly in the economic theory.

In the next section I propose various economic, social and political factors that represent interest groups likely to accelerate or delay the smoking legislation at state level. In the same time, I specify the predicted influence of each interest group on regulation, as suggested by the two alternative theories, public interest theory and interest group theory. In the following sections, I develop the methodology to test which theory better describes states' regulatory behavior towards smoking in public

places.

Discussion of the Various Interest Groups

Tobacco companies represent the group that is most likely to oppose legislation against smoking, since any restriction on smoking is very likely to limit consumption, which ultimately affects industry's profits. It is well known that tobacco producers are a powerful lobby group, and Glantz and Monardi (1998) find that tobacco campaign contributors can influence state legislators' behavior. The economic theory of regulation predicts that states where tobacco companies are present regulate smoking later or not at all. In the light of this theory, tobacco producers represent money contributions and votes for state legislators, who, in turn, will tailor public policy in their favor. Moreover, states have an economic interest to encourage tobacco production. Taxes on tobacco sales represent an important source of government revenue, and one might think that state policy makers have an incentive to delay the passage of smoking regulations.

Restrictions on smoking in public places are likely to affect other businesses. Restaurant owners represent an important category that might suffer because of these regulations. They may represent a significant interest group that opposes no-smoking regulations. When restaurants are forced to comply with the regulation, they may lose smoking customers who find this policy discriminatory or restrictive. The economic theory of regulation predicts that states with more powerful restaurant owners who organize as an interest group will pass regulation against smoking later. We use as a

proxy for this interest group the annual restaurant sales in the state.

One of the most affected groups by these regulatory activities are smokers themselves. Although regulations of smoking in public places intend to protect non-smokers, cigarette smokers must change their behavior to comply with the legislation. Therefore we predict that they represent another pressure group that will lobby against the passage of smoking regulations, according to the ET. We introduce per capita tax-paid sales of packs of cigarettes to capture the influence of smokers on state legislators. According to the public interest theory, states with high per capita sales bare the highest cost to society and they will be the first where smoking will be restricted.

I also consider the social pressure on the state's decision to regulate smoking in public places. The biggest concern that is addressed against smoking is the health of the children who are exposed to second-hand smoke. Educating and protecting children from hazardous products is not only one of the goals of the public policy, but also every parent's concern. To capture this effect we use the percent of children under eighteen in the state. The public interest theory predicts that regulation against smoking is accelerated by a higher proportion of children in the state, as the social benefit of regulation is increased.

Income is another factor to consider in the decision to regulate. Increasing personal income is usually associated with higher health and environment standards. As people become wealthier, they also become more aware of problems concerning their overall well being. Therefore, they may represent a strong lobby group with

voting power that demands clean-air legislation. The public interest theory would suggest that states with higher per-capita income are more likely to pass smoking regulation earlier.

In the same line of thinking, education is generally associated with greater concern about health issues, and in particular with negative health effects of cigarette smoking. We use in our analysis the percentage of state population with a bachelor degree as the proxy for the level of education. The public interest theory of regulation predicts that states with more college graduates could represent a factor that can determine state legislators to restrict smoking in public places earlier.

Stress is a big part of every day life and people may use cigarette smoking as a temporary way to relax. To capture this effect, I use the rate of divorces per 1000 persons and the unemployment rate at state level. According to the economic theory of regulation, states with a higher rate of divorces and a higher rate of unemployment are more likely to pass regulation against smoking at a later date.

The fact that states have been given the independence in designing specific smoking regulations gives rise to the possibility that state politicians and regulators may be partisan in policy making. It is generally believed that Republicans are against regulation, more business oriented, and more likely to vote against environmental policies. It is also more likely that a regulation is passed when the same party controls both the legislature and the governorship. I use a few specifications to capture the impact of political pressure on state legislators. First, I consider a dummy variable, which takes value 1 if Democrats dominate both houses of the legislature in

the state and 0 otherwise. I expect that a higher proportion of Democrats lead to a faster regulation of smoking in public places. A second political variable measures the degree to which a party controls the state government, given that there is a better chance for a party to pass a regulation if it controls all three bodies of the state government (the assembly, senate, and governorship). This variable equals one-third if Democrats have the majority in the assembly, and Republicans have the majority in the senate and the governor is Republican as well.[54] Similarly, I expect that states where Democrats have control regulate earlier.

Empirical Models and Results

To investigate the research questions in this chapter, I use two econometric models. In order to determine how different factors affect the timing of state regulation of smoking in different public places I use a duration model. I use the ordered probit model to explore states' choice of the restrictions to be imposed by regulation.

Time of State No-Smoking Regulations

This section describes the empirical procedure used to estimate the relationship between the timing of state regulation in the above mentioned locations and various economic, political and social variables, as suggested by the two theories of regulation. The use of a duration model to test economic theories of regulation is an innovative approach introduced by Kroszner and Strahan (1998). They develop a

duration model and estimate the hazard function to explain the timing of state bank branching deregulation.

Following the notation in Kiefer (1988), the probability distribution of duration data can be written as[55]

(1) $F(t) = Pr(T<t)$,

where F(t) is the distribution function specifying the probability that the random variable T is less than a value t. Then, $f(t) = dF(t)/dt$ is the density function. The survival function is defined as

(2) $S(t) = 1 - F(t) = Pr(T \geq t)$,

and gives the probability that a state regulates at a time greater than or equal to t. Another useful function for the analysis of duration until states regulate is the hazard function, which is defined as

(3) $\lambda(t) = f(t)/S(t) = -d \ln S(t)/dt$.

A hazard function represents the probability that an event occurs, given that it did not occur prior to time t. In the context of this study, the hazard function, $\lambda(t)$, is the likelihood that a state regulates smoking in public places at time t, given that it has not yet regulated smoking. The data set provided by the STATE System contains information on state regulations between 1973 and 1995. Based on this information, we can compute the time spells for each state and for each of the six public place categories that are being regulated. The time spell in each case equals the number of years between 1973, the beginning of the data set, and the year when the regulation is enacted.

We can determine the duration dependence in the data by using the hazard function. That there is positive duration in the data at a point t in time if $d\lambda/dt > 0$. This indicates that the probability that a state regulates in the next period increases the longer a state stays without smoking regulation. Conversely, negative duration dependence is defined by $d\lambda/dt < 0$ and implies the probability that a state regulates in the next period decreases as the duration until regulation increases.

As a first step in analyzing the duration until state smoking regulation is passed, I use the Kaplan-Meier non-parametric estimator to estimate the shape of the hazard function over time. Graphical illustration of duration data is useful for preliminary analysis and helpful in suggesting a functional form for the duration distribution.[56] The non-parametric estimation imposes no a priori structure on the hazard. There are states in our sample that do not regulate smoking in some public places by the end of the sample period, and therefore we need to account for right censored observations. The completed spells in the sample are arranged in an increasing order, $t_1 < t_2 < \ldots < t_K$. The number of completed spells K is smaller than the number of states in our sample, fifty-one, because there are states with still incomplete spells by 1995, the end of the sample period.[57] Moreover, ties may occur when two or more states regulate in the same year a certain location. I denote h_j the number of completed spells of duration t_j, $j = 1,\ldots, K$. For example, if two states have the duration equal to three years ($t_j = 3$ for two states), then $h_j = 2$. I further denote m_j as the number of observations censored between t_j and t_{j+1}. Then m_K represents the number of states that did not regulate by the end of our sample. Let n_j be the number

of spells neither completed or censored before t_j.

(4) $$n_j = \sum_{i \geq j}^{K} (m_i + h_i).$$

Then the estimated hazard function will be a step function. The estimator of the hazard function is

(5) $$\hat{\lambda}(t_j) = h_j/n_j,$$

where $\hat{\lambda}(t_j)$ estimates the probability that the spell is completed at t_j, conditional on the spell's reaching duration t_j.[58] The Kaplan-Meier estimator of the survival function is

(6) $$\hat{S}(t_j) = \prod_{i=1}^{j} (n_i - h_i)/n_i = \prod_{i=1}^{j} (1 - \hat{\lambda}_i),$$

which is obtained setting the estimated hazard equal to the relative frequency of completion at t_j. The Kaplan-Meier estimator provides an estimator for the unconditional hazard, using only information on the duration spells. The purpose of this analysis is to determine what are the factors that affect the date when smoking regulations are passed. Therefore, an estimator of the conditional hazard is better suited. I use the Weibull parametric model to estimate the hazard function conditional upon a set of regressors that proxy state-specific interest group-factors that are likely to influence the passage of state smoking regulations.

Under the Weibull distribution, the hazard function has the following form:

(7) $$\lambda(t) = \lambda_0(t)\exp\{x'\beta\}$$

where the baseline hazard rate, $\lambda_0(t)$, is pt^{p-1}, and p is the shape parameter that will be

estimated from the data. The parameter p indicates whether the hazard is increasing or decreasing over time. If $p > 1$, then the data exhibits positive duration, and if $p < 1$, the data hazard function shows a negative duration.

Duration models allow for censored observations, when the completed spell is not observed. In our case, we consider only right censoring, since our data set begins in 1973, when the first state, Arizona, passed regulation in a public place. The data set for this study ends in 1995, with five states not yet regulating smoking in public places. We include these states in our sample, because omitting censored observations leads to biased estimates of the hazard function. For the censored observations we know only that the duration is at least t_j (if censoring occurs at t_j).

The log-likelihood with right censoring for the Weibull distribution is

$$(8) \qquad L(p,\beta) = \sum_{i=1}^{n} d_i \ln p + (p-1) \sum_{i=1}^{n} d_i \ln t_i + \sum_{i=1}^{n} d_i x_i'\beta - \sum_{i=1}^{n} t_i^{\,p} \exp\{x_i'\beta\}$$

where d_i indicate whether the spell is censored ($d_i = 1$) or uncensored ($d_i = 0$).

Some of the factors that influence states' decision to regulate vary over time and we need to capture this aspect in our analysis. Thus, the hazard function will be modeled as a step function, with different values for some covariates for every year between 1973 and the year when the state passes smoking regulation. The hazard function for time-varying covariates x(t), can be written as $\lambda(t,x(t),p,\beta)$. Using the integrated hazard function $\Lambda(t_i,\theta) = \int_0^t \lambda[u,x(u),x,\beta]du$ and the log-likelihood function for the Weibull distribution takes the following form:

$$(9) \qquad L(p,\beta) = \sum_{i=1}^{n} d_i \ln p + (p-1) \sum_{i=1}^{n} d_i \ln t_i + \sum_{i=1}^{n} d_i x_i(t_i)'\beta - \sum_{i=1}^{n} t_i^{\,p} \exp\{x_i(t_i)'\beta\},$$

I will use the likelihood function in expression (9) based on this multiplicative hazard to obtain estimates for p, the shape parameter, and the vector β.

The data set that will be used is an unbalanced panel, with a different number of years for each state, depending on the time when regulation against smoking has been passed in each location and each state. Consequently, the number of observations for each state changes when the analysis is done for each public place, as each state regulates smoking in different locations in different years. The dependent variable is the log of duration until regulation, and it is computed as the difference between the year of regulation for each state and 1973, which marks the beginning of the sample.

When assumptions about the baseline hazard cannot be made, the coefficients, β_i's, can be estimated by partial likelihood. This is a semi-parametric procedure and Cox proportional duration model is employed. In Cox proportional model β_i's are estimated based on a vector of explanatory variables, x, without imposing any structure on the baseline hazard. I choose the Weibull parametric model to estimate the effect of various factors on the duration until a state regulates smoking in public places because of its relative advantages over Cox estimator in the case that I study. Weibull model is a log-linear model and it is estimated by maximum likelihood. A maximum likelihood estimator presents increased efficiency, which is desirable for my sample of 51 states (therefore, the model is estimated based on 51 durations).

Another advantage of Weibull parametric model is that the estimated coefficients are easier to interpret. In the Weibull model, time is rescaled and the model can be written $\ln t = x'b + e$, where e does not depend on the x's.[59] The interpretation of the estimated coefficients is similar to any semi-logarithmic linear model:

(10) $\partial \ln t / \partial x = b$.[60]

The b_i coefficients represent the percentage change in the time to regulation for a one-unit change in the corresponding x_i.

The purpose of this study is to test the two theories of regulation and see which one better explains the timing and restrictiveness of a state's regulatory behavior. Based on the economic theory I made predictions about how different factors that are considered likely to affect regulatory decisions at state levels. Empirically, I test the two theories by comparing the predicted signs of the coefficients with the estimated coefficients. The predicted signs of coefficients in the hazard model that result from the two economic theories of regulation are presented in Table 7. As discussed earlier, we investigate the effect of various economic, political and social factors on the timing of state regulation for each of the six different categories of public places. I also investigate what state-specific factors determine the time when a state first decides to regulate smoking in any of the six public places (therefore, we consider the earliest date when regulation against smoking has been passed in each state).

I also take into consideration the possible interdependence among the six

regulations a state could pass. When a state decides to regulate smoking in one public place, this event may affect the probability that that state will regulate smoking in other locations as well. To control for this, I develop hypotheses about the direction of the effect of each regulation on the other regulations.[61]

Table 7

Expectations About Coefficient Signs as Predicted by the Two Theories of Regulation for the Duration Model

Variable	Economic Theory of Regulation	Public Interest Theory of Regulation
RESTAUR	+	No prediction
TOBPROD	+	No prediction
TOBCASH	+	No prediction
INCOME	No prediction	-
YOUNG18	No prediction	-
EDUCATION	No prediction	-
CIGCONS	+	-
UNEMPL	+	-
DIVORCE	+	-
DEMCTRL	No prediction	-
DEMPROP	No prediction	-

Forty-three states regulate smoking in other public places and forty-one states

regulate smoking in government worksites[62] (see Table 1, Chapter II). Usually regulation that restricts smoking in other public places is passed simultaneously with or earlier than regulation in government worksites. Four states (West Virginia, Texas, Massachusetts, and Arkansas) regulate smoking in other public places and do not regulate smoking in government worksites at all. Only twenty-one states regulate smoking in private worksites, and all of them regulate smoking in government worksites. States regulate smoking in private worksites at the same time with or later than they regulate smoking in government worksites. The only exception is Vermont, which regulated smoking in private worksites earlier (1988) than in government worksites (1993). Most of the states that regulate smoking in restaurants pass this regulation at the same time with regulations in government worksites and other public places (eight states), at the same time with regulation restricting smoking in other public places only (five states), or later than both types of regulation (four states). Most of the states restricting smoking in commercial child day care pass this form of regulation in the same time or later than the most recently passed regulations. Smoking in home child day care is regulated in nine states only and this type of regulation is the most recent one in all states.

Based on the information on states regulations provided above I decided to include in the regression equations for the duration until regulation a dummy variable indicating whether a state has already passed regulation of smoking in other places. This type of regulation has been passed by the highest number of states, compared with other regulations of smoking in public places, and it is interesting to see if its

presence affects in any way states' decision to regulate in other locations as well. An alternative to consider is the number of locations that have been regulated prior to the passage of each regulation. An interesting question is whether the presence of some form of regulation determines which states more quickly regulate the remaining places or delay the passage of additional smoking restrictions. As a result, we estimate the duration models for each of the six regulations with an indicator of how many places are subject to some form of smoking restrictions.

Data

The sample contains data on the 50 states, and Washington, D.C.. The variables for each state are collected between 1973 and 1995.

The regressors are the same for all models, and are as follows.

Tobacco production (TOBPROD). This variable represents the annual production of tobacco leaves (in 1000 lbs.) in a state and it intends to capture the effect of the presence of the tobacco companies in a state.

Tobacco cash revenue (TOBCASH). We consider another alternative to measure the pressure of tobacco companies on state legislators. This variable represents the cash receipts from tobacco sales, in millions of dollars. The variable is deflated by the 1982-1984 Consumer Price Index (CPI).

State annual restaurant sales (RESTAUR). This variable is a proxy for the number of restaurants in a state and for the potential power of lobby of restaurant owners. The variable used in the analysis is the annual retail sales in eating and drinking places

(SIC 58), in millions of dollars. The variable is deflated by the 1982-1984 CPI.

Percentage of population under the age of 18 in a state (YOUNG18). A greater proportion of children should indicate a greater concern of the state for children's health and a greater concern about the danger of the negative effect of the secondhand smoking. The variable used in the regression equations is the number of children under eighteen in the state divided by the total state population.

Annual personal income (INCOME). This variable is an indicator of the well being of the people in each state. The variable that we use is personal income in current prices deflated by the 1982-1984 CPI.

Percentage of state population with a bachelor degree (EDUCATION). We introduce a proxy for the level of education of states' population as another factor likely to affect state's decision to regulate smoking in public places.

Rate of divorces per 1000 population (DIVORCE). This variable is a proxy for the stress level in a state and represents the proportion of divorces in state's population.

Rate of unemployment (UNEMPL). The state rate of unemployment represents another proxy for the stress level in a state.

Democrat Party Control (DEMCTRL). This is a dummy variable, which takes value 1 if Democrats dominate in both houses of the legislature in one state and 0 otherwise.

Democrat Party Proportion (DEMPROP). This variable measures to what degree the Democrats control all three bodies of the state government (the assembly, senate, and governorship). This variable equals one-third if Democrats have the majority in the assembly, and Republicans have the majority in the senate and the governor is

Table 8

Correlations Between the Regression Variables

	Restaurant	Income	Young18	Tobcash	Unemployment	Divorce	Demctrl	Demprop	Cigcons
Restaurant	1.00								
Income	0.92	1.00							
Young18	-0.04	-0.03	1.00						
Tobcash	-0.02	-0.01	-0.009	1.00					
Unemployment	0.02	0.05	0.03	-0.006	1.00				
Divorce	-0.13	-0.18	0.04	-0.04	0.11	1.00			
Demctrl	0.09	0.09	0.03	0.21	0.20	0.03	1.00		
Demprop	0.13	0.15	-0.01	0.12	0.13	-0.01	0.31	1.00	
Cigcons	-0.17	-0.13	-0.02	0.43	0.08	0.20	0.059	-0.01	1.00

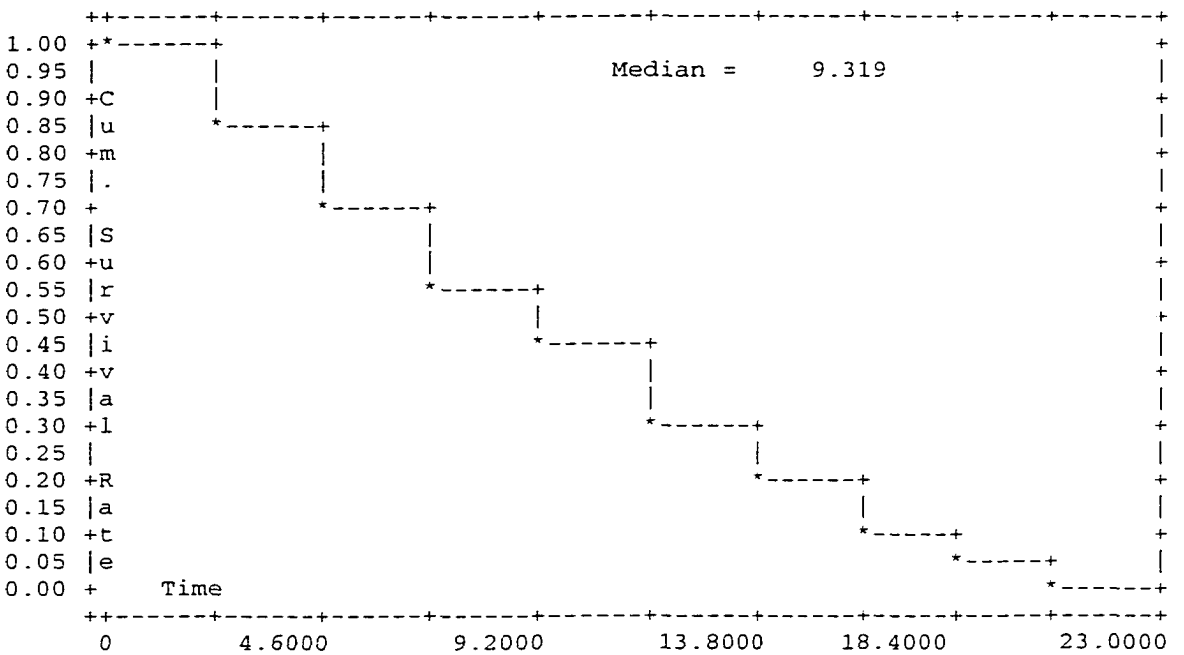
Republican as well.

Per capita sales of cigarettes (CIGCONS). This variable represents the number of cigarette packs (in thousand units) per capita and is included to control for the influence that smokers have on state legislators.

The variables measuring the tobacco production, tobacco cash revenue, and restaurant sales are divided by the total state population. Sample statistics for the explanatory variables are provided in Appendix A and correlations between the variables are shown in Table 8. The sources of the data described above are provided in Appendix B.

Results

Figures 14 to 20 present the Kaplan-Meier estimators of survival functions and hazard functions of regulations of smoking in each of the six public place categories and of the first state regulation of smoking. In estimating hazard function and survival function of the overall regulatory activity in a state, we consider the first date when a no-smoking regulation was passed in that state. For all regulations, the survival function is decreasing over time, suggesting that as the time passes by, it becomes less likely for a state to survive to the next period without regulating smoking. For all regulations, the hazard functions are increasing over time. The slopes of all hazard functions become very steep in the most recent years. These hazard functions show that the longer a state survives without no-smoking regulations, the likelihood that the state will regulate in the next period increases.



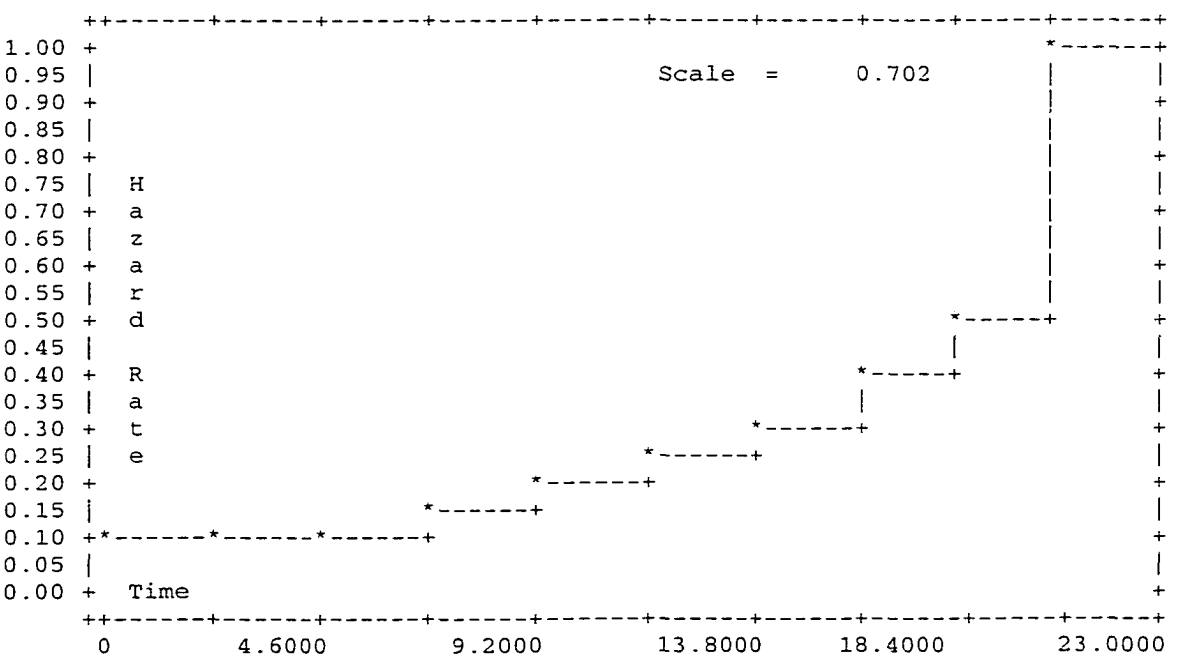


Figure 14. Kaplan-Meier Estimators of Survival Function and Hazard Function for the Overall Regulation of Smoking in Public Places (any location), 1973-1995

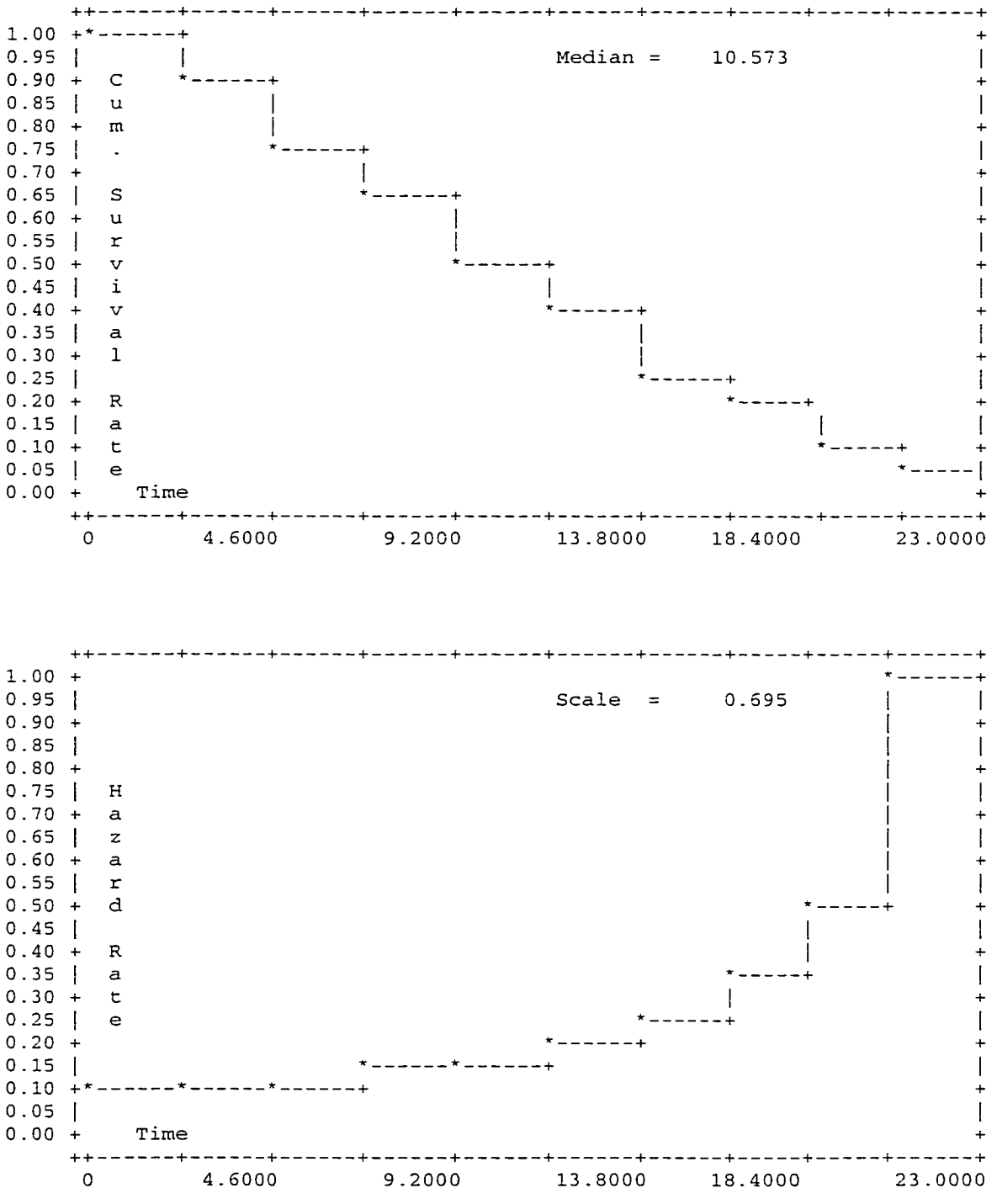


Figure 15. Kaplan-Meier Estimators of Survival Function and Hazard Function for Regulation of Smoking in Government Worksites, 1973 - 1995

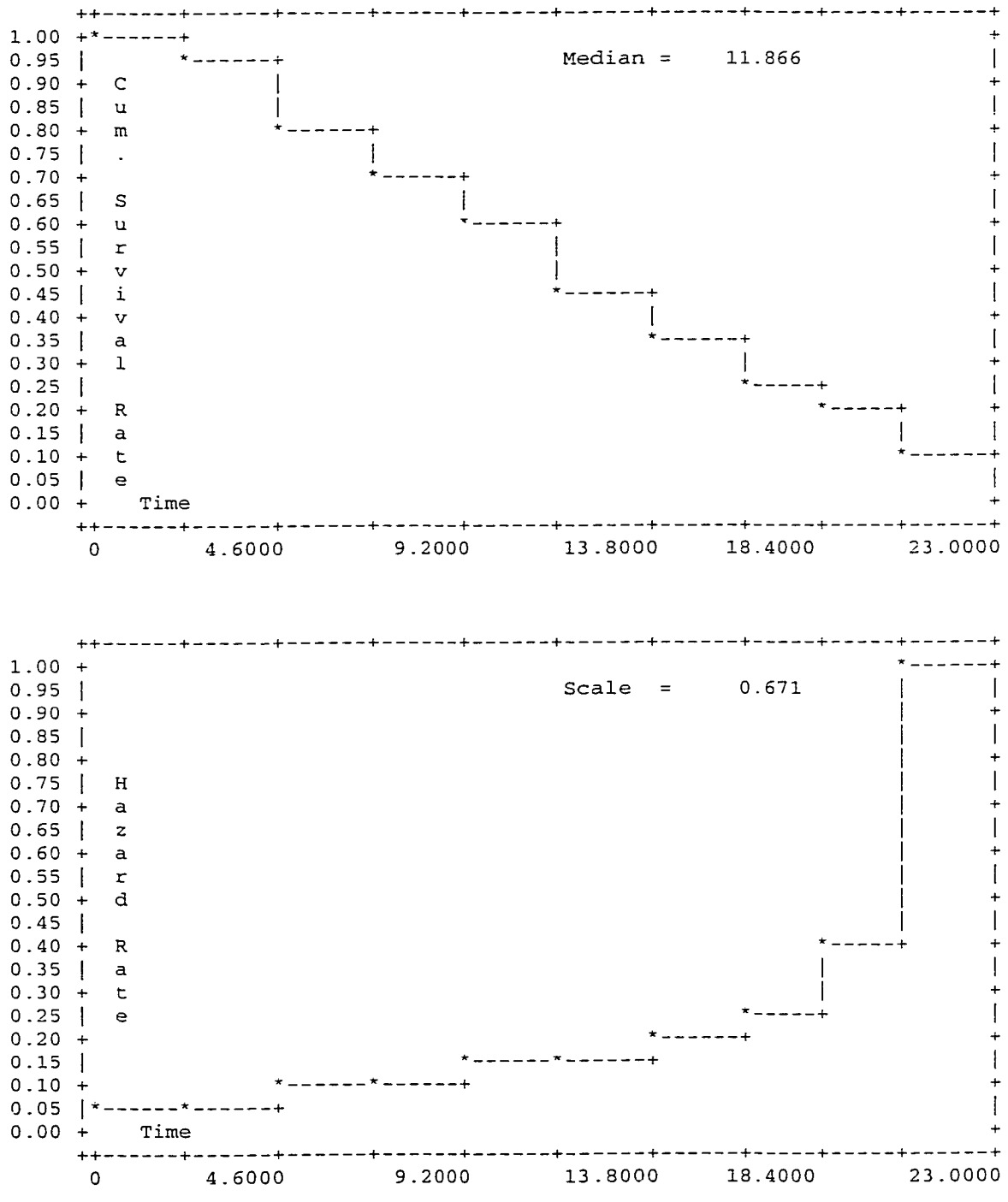


Figure 16. Kaplan-Meier Estimators of Survival Function and Hazard Function for Regulation of Smoking in Private Worksites, 1973 - 1995

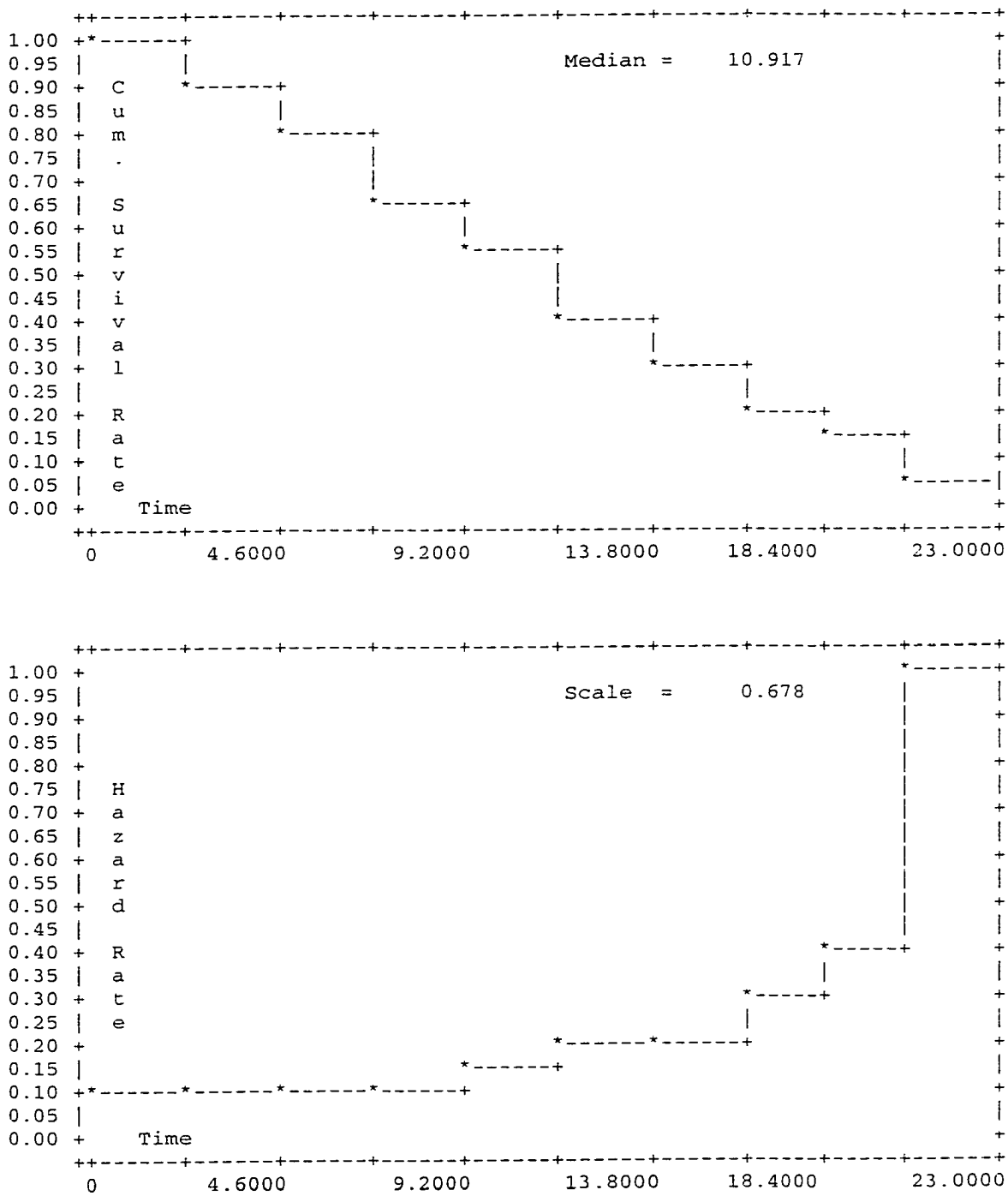
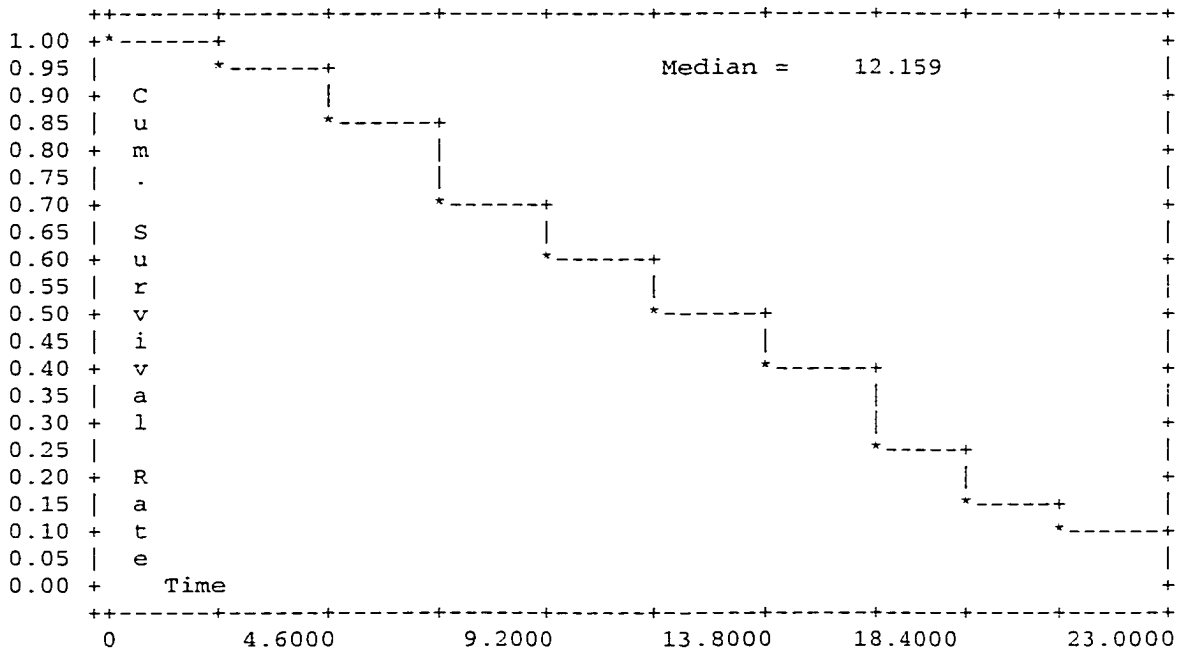


Figure 17. Kaplan-Meier Estimators of Survival Function and Hazard Function for Regulation of Smoking in Restaurants, 1973 - 1995



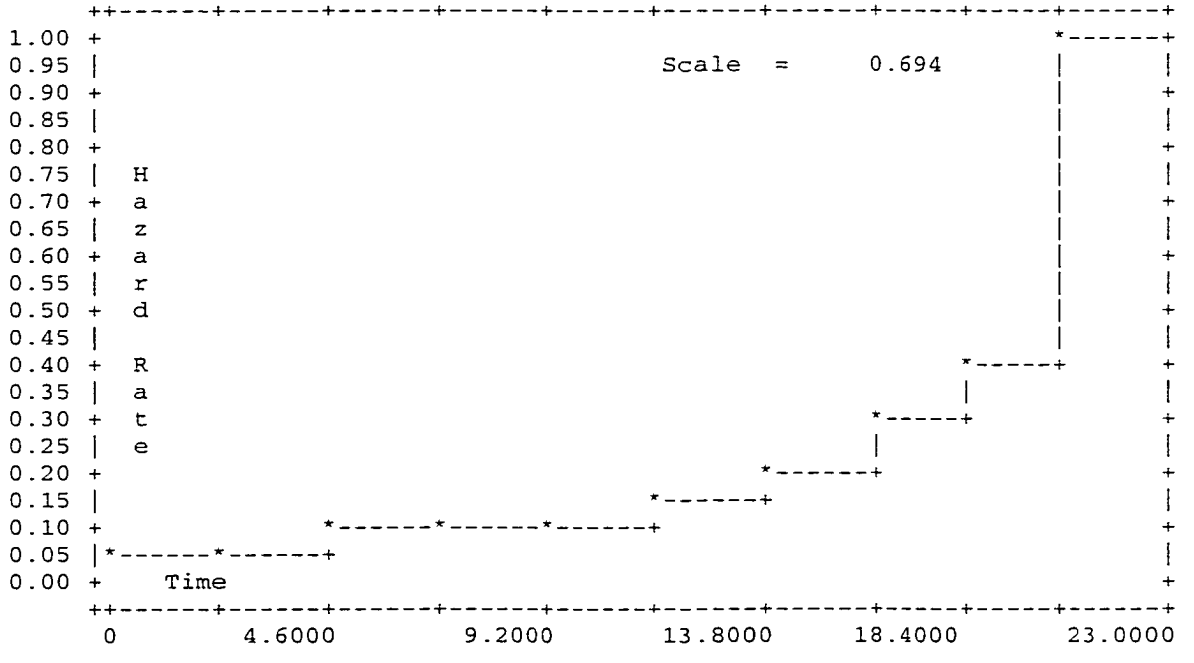
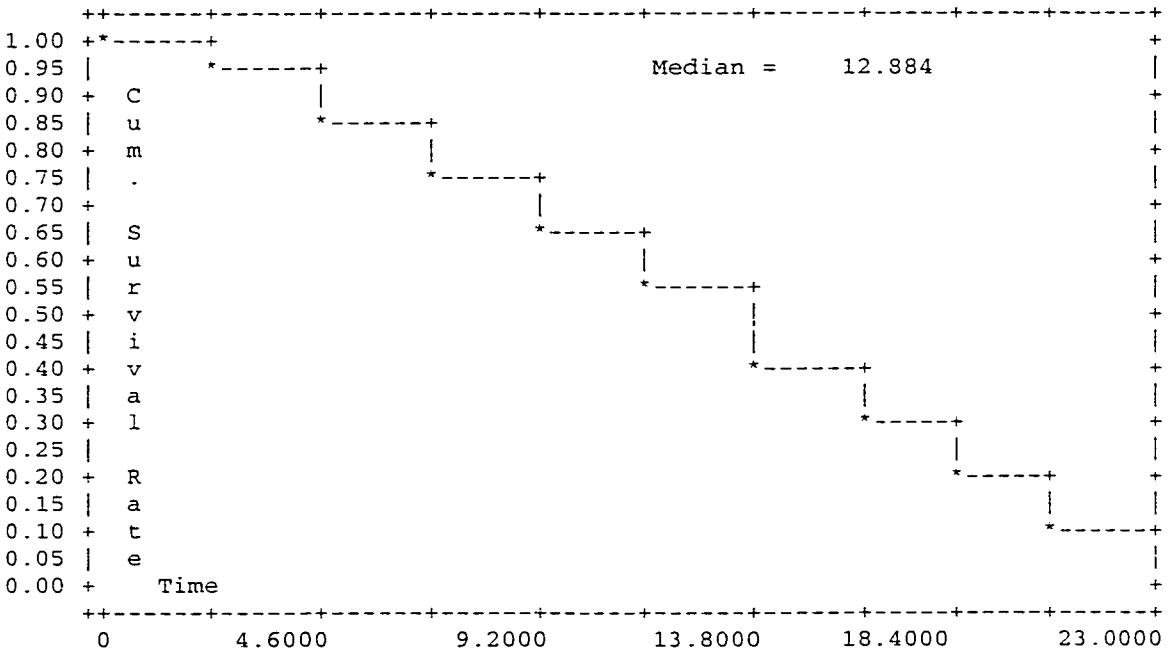


Figure 18. Kaplan-Meier Estimators of Survival Function and Hazard Function for Regulation of Smoking in Commercial Child Day Care, 1973 - 1995



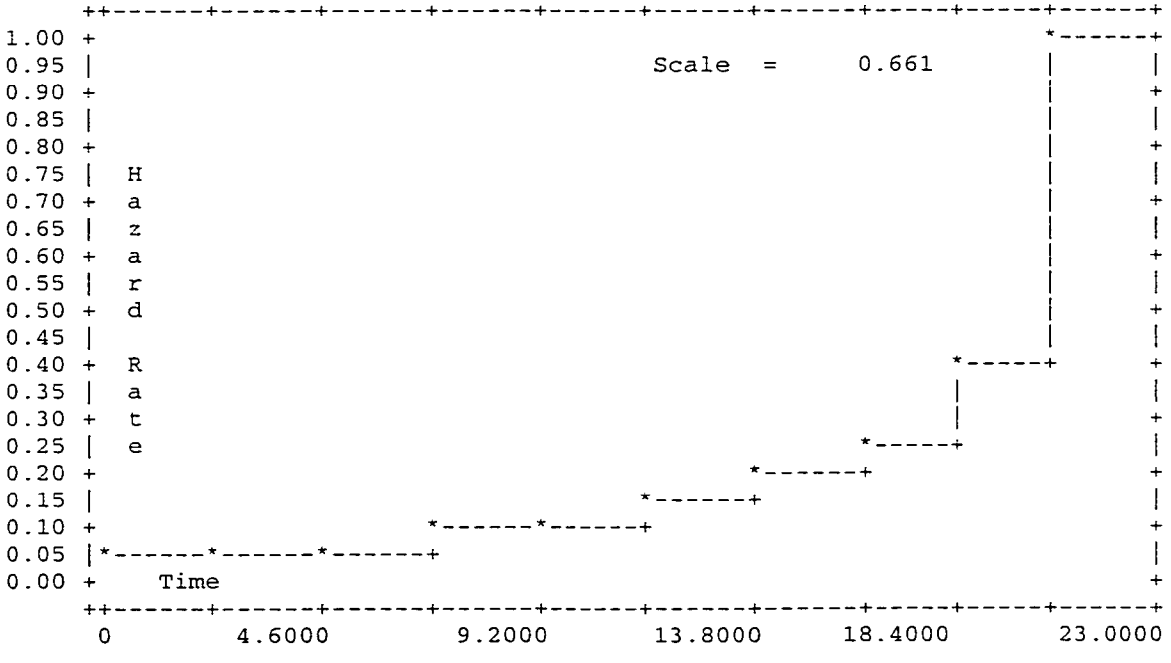


Figure 19. Kaplan-Meier Estimators of Survival Function and Hazard Function for Regulation of Smoking in Home Child Day Care, 1973 - 1995

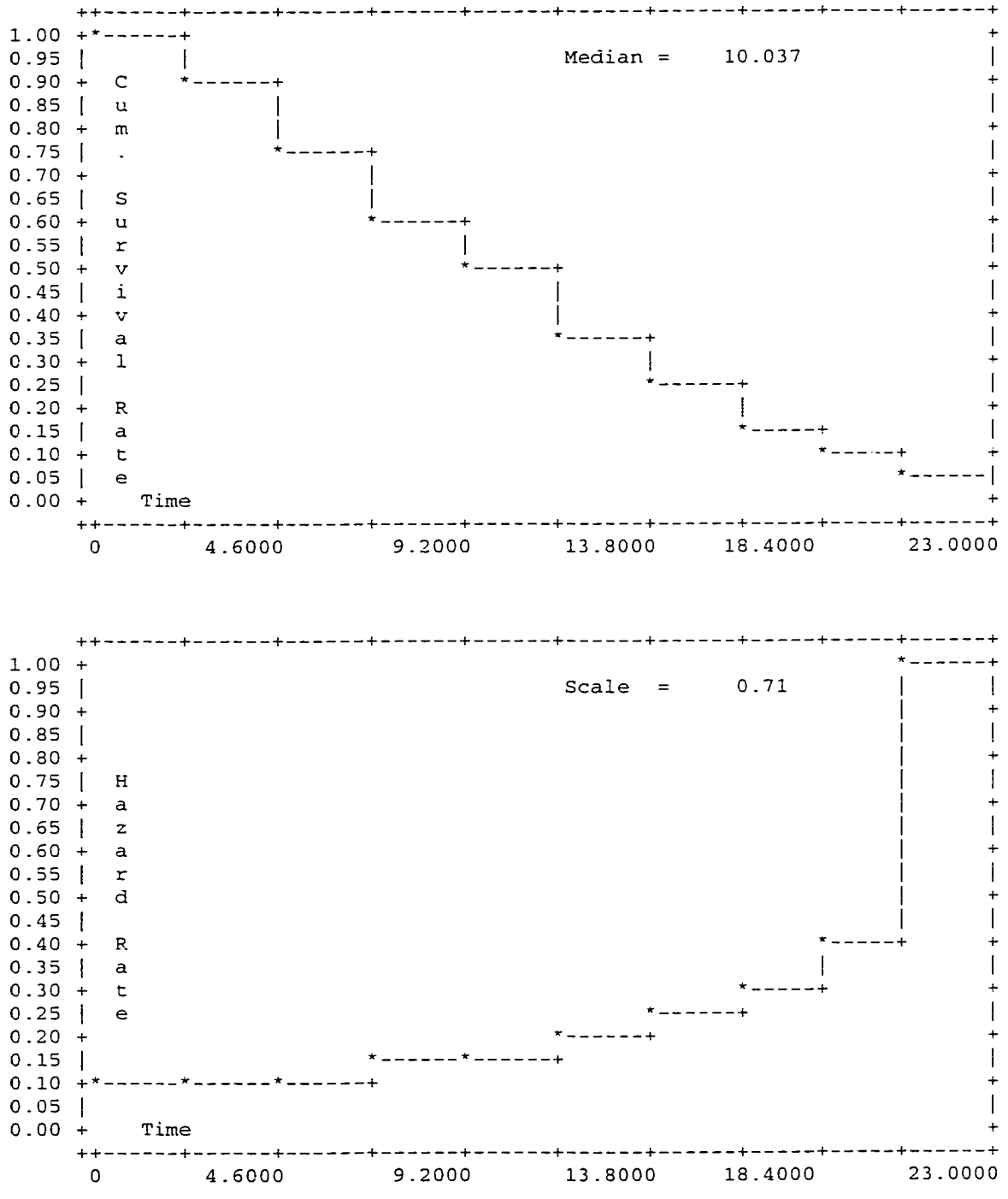


Figure 20. Kaplan-Meier Estimators of Survival Function and Hazard Function for Regulation of Smoking in Other Places, 1973 - 1995

Kaplan-Meier estimators suggest that there is positive duration in the data.

The unconditional estimates present a description of the duration data when no other factors of influence are taken into account. I use the Weibull model to study the factors that determine at the state level the time when smoking is regulated in each of the six public place categories. I also use this model to estimate the effect of the same variables on the decision to regulate smoking in the first place, for the first time. I started by determining the factors that have potentially an impact on time. I started in determining the factors that have potentially an impact on state regulators from the two competing theories of regulation, the public interest theory of regulation and the economic theory of regulation. The predicted signs of the variables included in the regressions in accordance with the two theories are shown in Table 7.

In Table 9, I present the estimates of the coefficients of the factors that determine when a state first decides to regulate smoking in a public place. This analysis is based on Table 5, which presents the dates when each state first passed a regulation of smoking in any of the six public places considered for our study.

Unfortunately, none of the regressors in our duration model is significant. This result may be due to the aggregation that I proposed, which led to the inclusion of any type and number of regulations as a dependent variable. Therefore I will continue my analysis with the study of the factors that affect the passage of each of the six regulations, by disaggregating the dependent variable.

Table 10A presents the results from the duration models for each of the six regulations, and we can compare the impact of each factor on the timing of

Table 9

Weibull Duration Model for the First TimeWhen States Regulate Smoking in a Public Place (1973-1995) – Maximum Likelihood Estimates

Variable	(1)
CONSTANT	2.17*
	(0.56)
INCOME	-0.0001
	(0.002)
RESTSALE	-0.005
	(0.008)
TOBPROD	0.0003
	(0.0002)
TOBCASH	-
YOUNG18	-0.0006
	(0.008)
UNEMPLOYMENT	0.05
	(0.06)
DIVORCE	0.0001
	(0.0006)
DEMCTRL	0.0004
	(0.0003)
DEMPROP	-0.19
	(0.49)
Value of shape parameter p	1.28***

Note: ***-significant at 1% level; **-significant at 5% level; *-significant at 10% level. Standard errors are shown in parentheses. The restaurant sales and tobacco variables are divided by the state population. Number of observations : 744

regulation.[63] In the first column, I present the factors that affect states' decision to regulate smoking in other places. There are only nine states that restrict smoking in home day care centers and the reduced number of observations on the duration variable causes any statistical inference to be invalid. Therefore, I include the information on the regulation of smoking in home day care centers in the study of factors that affect the states' decision to regulate smoking in other places. Restaurant sales and cash receipts from tobacco are positive and significant. This means that owners of eating places and tobacco companies oppose regulation and they succeed in delaying the passage of regulation in other places. The estimated intercept represents the expected duration until regulation when all other variables are zero, which is around 14.1 years for the regulation in other public places. When restaurant sales increase by 10 percent, the expected duration increases by 1 percent, or one month and a half. A 10 percent increase in the production of tobacco leads to a delay in the passage of regulation by 7 percent, or 11 months. YOUNG18 has a negative and significant sign, which indicates that a larger proportion of children in a state decreases the duration to regulation of smoking in other places. Specifically, when the proportion of children in a state's population goes up by 10 percent, the duration until regulation declines by 6 percent, or 10 months.

In the second column of Table 10A, the presence of tobacco companies has a significant impact on the duration to regulation of smoking in government workplaces. Together with the two stress variables, unemployment and divorce, they constitute the pressure groups that delay the passage of regulation of smoking in

Table 10A

Weibull Duration Model for Regulation of Smoking in Public Places (1973-1995) – Maximum Likelihood Estimates

Variable	Other places	Government worksites	Private worksites	Restaurants	Commercial child care
CONSTANT	2.65*** (0.34)	2.44*** (0.46)	2.71*** (0.54)	2.82*** (0.43)	2.96*** (0.42)
INCOME	0.00007 (0.001)	-0.0006 (0.001)	-0.001 (0.001)	-0.0008 (0.001)	-0.0006** (0.0002)
RESTSALE	0.001* (0.0009)	-	-	0.001** (0.0005)	-
TOBCASH	0.007** (0.004)	0.002*** (0.0008)	0.003*** (0.0007)	0.006*** (0.002)	0.002 (0.01)
YOUNG18	-0.006* (0.004)	-	-	-0.005** (0.002)	-0.0003 (0.005)
UNEMPL	0.05 (0.06)	0.03* (0.04)	0.14* (0.10)	0.06 (0.06)	0.03* (0.02)
DIVORCE	0.0004 (0.0005)	0.0004* (0.0003)	0.0003 (0.0004)	-0.008 (0.05)	-0.000008 (0.0001)
DEMCTRL	0.0008 (0.0009)	0.0008* (0.0005)	0.001*** (0.0005)	0.001** (0.0006)	-0.0008 (0.06)
DEMPROP	-0.28 (0.44)	0.15 (0.29)	0.02 (0.38)	-	0.01 (0.09)
EDUCATION	-	-0.0001 (0.0004)	-0.0001 (0.0002)	-	0.00003 (0.0001)
CIGCONS	-	-0.0001 (0.0005)	-0.0001 (0.0003)	0.00005 (0.0003)	-0.0006 (0.001)
Value of shape parameter p	1.31	2.52	2.59	2.06	7.81

Table 10A – Continued

Variable	Other places	Government worksites	Private worksites	Restaurants	Commercial child care
Number of observations	592	736	897	781	958

Note: ***-significant at 1% level; **-significant at 5% level; *-significant at 10% level. Standard errors are shown in parentheses. The restaurant sales and tobacco variables are divided by the state population.

government worksites. When tobacco production increases by 10 percent, the expected duration until regulation increases by 2 percent, or 3 months. Unemployment rate has a more significant impact on the timing of regulation. Just 1 percent increase in the unemployment rate causes a delay equal to 3 percent in the expected duration to regulation, or 5 months. A 10 percent increase in the divorce rate causes a delay of almost half percentage point in the time until regulation, or 20 days. DEMCTRL has also a positive and significant sign, which is contrary to our prediction. The positive sign of DEMCTRL may suggest that this variable captures the effect of other interest groups that lobby for political support. In passing regulation against smoking, political parties take into consideration more the interest of lobby groups than the public interest. This scenario supports the theory of economic regulation.

In the third column of Table 10A, the same variables, with the exception of DIVORCE, are significant for the timing to regulation of smoking in private

worksites, and for the government worksites. When tobacco production increases by 10 percent, the duration until regulation increases by 3 percent, or 5 months. Again, the impact of unemployment rate is notable. One percent increase in the unemployment rate causes an increase in the duration until regulation of 14 percent, or 2 years. The political variable, DEMCTRL, has a higher significance (at 5% level) on the regulation of smoking in private worksites, which suggests that the opposition is stronger with regard to this type of regulation. The result is a possible explanation for the fact that fewer states regulate smoking in private worksites compared with government worksites.

In the fourth column of Table 10A, the results from the duration model in the case of regulation of smoking in restaurants are presented. Tobacco companies and restaurant owners oppose to regulation in restaurants, while children represent a strong reason for passing the regulation earlier. When production of tobacco increases by 10 percent, the expected duration increases by 6 percent, or almost 1 year. 10 percent increase in the proportion of children causes a delay of 5 percent in the passage of regulation, or 11 months. Again, DEMCTRL is significant and the positive sign suggests that states where Democrats dominate pass regulation later.

In the fifth column of Table 10A, the duration to regulation of smoking in commercial child day care is affected by per capita income and unemployment. INCOME has a negative and significant sign, which suggests that in states where per capita income increases by 10 percent, regulation is passed one month and a half earlier, and the duration until regulation is decreased by .6 percent. This result

suggests that as per capita income increases the concern about clean environment child day care centers increases as well. UNMPLOYMENT is significant and positive, which suggests that stress is a factor that determines workers to oppose smoking regulation in day care. An increase by 1 percent in the unemployment rate causes a delay of 3 percent in the expected duration until regulation, or 7 months.

To summarize the findings in Table 10A, economic, social and political factors explain the variation of no-smoking regulations across states. The presence of tobacco companies, restaurant owners, divorce, unemployment, and the proportion of domination of Democrats are important factors that delay regulation of smoking in public places. They are significant in most of the models, and their signs suggest that the economic theory of regulation explains the variation in states' legislated action on smoking. Income is significant only in one model, and the proportion of children is significant in two models. The negative signs of these two variables give some support for the public interest theory. It is interesting to note that education and cigarette consumption are not significant at all in these models.

The duration models provide additional information, which is the shape parameter, p. The estimated values of p are all positive, indicating that the hazard is increasing and data exhibit positive duration. This means that states that wait longer until they regulate are more likely to pass regulation in the next period. Moreover, the value of p is the largest for the regulation in commercial child day care, which means that the hazard is higher for this type of regulation. The result confirms the observed pattern of states' regulatory behavior, which indicates that many states did not

regulate smoking in commercial child day care yet, or they passed this type of regulation later than no-smoking regulations in other places, government work sites, private work sites, or restaurants.

In Table 10A, I looked at the determinants of the timing of smoking regulations in these six locations, ignoring the fact that states have already some legislation restricting smoking. As I mentioned earlier in the chapter, it is useful to capture the fact that the passage of regulation of smoking in one location may affect states' decision to regulate smoking in another location. I propose two alternative variables two control for the presence of smoking regulation that were passed before the place under study was regulated.

In Table 10B, I introduce in the duration model for each location a dummy variable that indicates whether the state has passed regulation of smoking in other places. The results show that OTHERLAW is significant and the coefficient is negative for all other regulations. This suggests that if a state has already regulated smoking in other places, the duration to the regulation of the other locations is decreased. This finding is interesting, and supports the public interest theory. Peltzman's argument is that when a regulation is passed the marginal costs and marginal benefits are equated, and therefore further regulation is less likely to occur.[64] According to the public interest theory, the social cost of smoking is decreased if one regulatory episode is followed at a short time by others, until smoking is restricted in all public places. This way, the best protection of non-smokers is guaranteed.

In Table 10C, OTHERLAW is replaced by another variable (LAWS) that

Table 10B

Weibull Duration Model for Regulation of Smoking in Public Places (1973-1995) – Maximum Likelihood Estimates

Variable	Government worksites	Private worksites	Restaurants	Commercial child care
CONSTANT	3.01*** (0.58)	3.05*** (0.48)	3.83*** (0.82)	3.23*** (0.43)
INCOME	0.0006 (0.001)	-0.002* (0.001)	-0.0004 (0.001)	-0.0005** (0.0003)
RESTSALE	-	-	0.001 (0.002)	-
TOBCASH	0.0026* (0.002)	0.003** (0.001)	0.007 (0.01)	0.002 (0.001)
YOUNG18	-	-	-0.006 (0.01)	-0.0007 (0.007)
UNEMPL	0.09* (0.06)	0.18* (0.13)	0.07 (0.08)	0.03*** (0.02)
DIVORCE	0.0009* (0.0005)	0.0003 (0.0006)	-0.003 (0.06)	-0.00005 (0.0001)
DEMCTRL	0.0008 (0.002)	0.002* (0.001)	0.001 (0.003)	-0.001 (0.07)
DEMPROP	0.27 (0.39)	0.19 (0.49)	0.12 (0.51)	-0.005 (0.10)
EDUCATION	-0.0001 (0.0004)	-0.0001 (0.0002)	-	0.00008 (0.0001)
CIGCONS	-0.0003 (0.0008)	-0.0002 (0.0004)	-0.00002 (0.0004)	-0.002*** (0.001)
OTHERLAW	-1.15*** (0.34)	-0.70* (0.42)	-1.68* (0.70)	-0.19** (0.12)
Value of shape parameter p	2.08	2.15	1.67	7.63

Table 10B - Continued

Variable	Government worksites	Private worksites	Restaurants	Commercial child care
Number of observations	736	897	781	958

Note: ***-significant at 1% level; **-significant at 5% level; *-significant at 10% level. Standard errors are shown in parentheses. The restaurant sales and tobacco variables are divided by the state population.

Table 10C

Weibull Duration Model for Regulation of Smoking in Public Places (1973-1995) – Maximum Likelihood Estimates

Variable	Other places	Government worksites	Private worksites	Restaurants	Commercial child care
CONSTANT	4.65*** (1.70)	2.40*** (0.57)	3.50*** (1.14)	5.70*** (2.21)	3.36*** (0.26)
INCOME	0.004 (0.005)	0.0009 (0.001)	-0.002 (0.003)	-0.00001 (0.004)	-0.0006** (0.0003)
RESTSALE	0.001 (0.002)	-	-	0.002 (0.002)	-
TOBCASH	0.003 (0.03)	0.006* (0.004)	0.003 (0.004)	0.007 (0.05)	0.001 (0.03)
YOUNG18	-0.005 (0.03)	-	-	-0.007 (0.05)	0.0004 (0.005)
UNEMPL	-0.03 (0.11)	0.07* (0.05)	0.26 (0.28)	-0.07 (0.13)	0.03*** (0.02)

Table 10C – Continued

Variable	Other places	Government worksites	Private worksites	Restaurants	Commercial child care
DIVORCE	-0.00008 (0.002)	0.0004* (0.0003)	0.0005 (0.001)	-0.01 (0.10)	-0.000004 (0.0001)
DEMCTRL	0.0003 (0.005)	0.0008* (0.0005)	0.001 (0.002)	0.001 (0.008)	-0.02 (0.08)
DEMPROP	-1.48* (0.92)	0.19 (0.31)	0.20 (0.78)	-	-0.09 (0.11)
EDUCATION	-	0.0001 (0.0004)	-0.0002 (0.0007)	-	-
CIGCONS	-	-0.0001 (0.0005)	-0.0006 (0.0008)	0.0005 (0.0007)	-0.002*** (0.001)
LAWS	-1.34** (0.64)	-0.003 (0.004)	-0.53 (0.47)	-1.24* (0.88)	-0.07** (0.03)
Value of shape parameter p	1.05	2.52	2.59	2.06	7.50
Number of observations	592	736	897	781	958

Note: ***-significant at 1% level; **-significant at 5% level; *-significant at 10% level. Standard errors are shown in parentheses. The restaurant sales and tobacco variables are divided by the state population.

indicates in each model, for each type of regulation, how many places has been already regulated before. This variable is significant and again has a negative sign in the no-smoking regulations in other places, restaurants and commercial child day care equations. The result supports again the public interest theory. While most of the variables remain significant and with the same sign, except for the DEMCTRL, in

Tables 10B and 10C, CIGCONS becomes significant, with a negative sign in the equation for regulation of commercial child day care. While this may seem a bit counter-intuitive, the result captures the public pressure to protect children, which increases in states with high levels of smoking. Therefore, the public interest theory explains better the regulatory activity in child-care centers.

Again, the shape parameter p is larger than 1, which suggests that there is a positive duration in the data. This means that the longer a state waits until it regulates, the higher is the likelihood that it will regulate in the next period.

The results obtained from the hazard models show mixed evidence. We find support for both theories, which is consistent with the results of Kroszner and Strahan (1998). The classical view on regulation that government intervention in market is justified by the existence of a market failure does not provide a satisfactory explanation for the regulatory pattern at state level. If that was the only reason, states would all regulate smoking at the same time, in all public places, and they would impose the most severe restrictions. The wide variation must be the result of the action of some pressure groups specific to each state, and this explanation is supported by our findings. The economic theory of regulation helps us in providing a more compelling story about why states regulate and, more importantly, why states regulate at different times.

Restrictiveness of State No- Smoking Regulations

In this section we examine how different economic, social and political factors

affect how severe the regulation of smoking in public places will be. When passing regulation in a public place category, states can choose how restrictive the regulation is. The three possibilities are listed in Tables 2A and 2B, in Chapter II. This is a discrete choice for which there is an ordering of the outcomes. I employ an ordered probit model to analyze the states' decision regarding the degree of restriction imposed on smoking by regulation in each of the six categories of public places. I

Table 11

Expectations About Coefficient Signs as Predicted by the Two Theories of Regulation for the Ordered Probit Model

Variable	Economic Theory of Regulation	Public Interest Theory of Regulation
RESTAUR	-	No prediction
TOBPROD	-	No prediction
TOBCASH	-	No prediction
INCOME	No prediction	+
YOUNG18	No prediction	+
EDUCATION	No prediction	+
CIGCONS	-	+
UNEMPLOYMENT	-	+
DIVORCE	-	+
DEMCTRL	No prediction	+
DEMPROP	No prediction	+

also investigate what factors play a role in determining whether a state regulates smoking or not. In this case, the dependent variable is a dichotomous variable that takes value 1 if a state chooses to regulate and value zero if a state does not regulate. The predicted sign for the coefficients of each variable are presented in Table 11.

To formulate the model we start with[65]

(11) $Y_i^* = x_i'\beta' + \varepsilon_i,$

where y_i^* is unobserved and represents the state sentiment towards smoking, which determines how restrictive the no-smoking regulation will be. If the sentiment towards smoking is not strong enough to pass a certain threshold, then the state does not pass any regulation. As the sentiment against smoking becomes stronger regulation is more likely to be passed in a more severe form. I observe

(12) $y_i = 0$ if $y_i^* \leq 0$,

$= 1$ if $0 < y_i^* \leq \mu_1$,

$= 2$ if $\mu_1 < y_i^* \leq \mu_2$,

.

.

.

$= J$ if $\mu_{J-1} \leq y_i^*$.

We assume that ε_i 's are normally distributed across observations. The probability of each choice of regulation severity is

(13) $\text{Prob}(y=0) = \Phi(-\beta'x)$,

$\text{Prob}(y=1) = \Phi(\mu_1-\beta'x) + \Phi(-\beta'x)$,

$\text{Prob}(y=2) = \Phi(\mu_2-\beta'x) + \Phi(\mu_1-\beta'x)$

$$\text{Prob } (y=3) = \Phi(\mu_3-\beta'x) + \Phi(\mu_2-\beta'x)$$

In order to insure positive probabilities, I impose

(14) $0 < \mu_1 < \mu_2 < \ldots < \mu_J$,

where μ_i's represent thresholds that determine what form the regulation takes.

When I test the factors that are likely to determine the degree of restrictiveness of the overall legislation regarding smoking in public places based on Table 6, J= 3, and y_i=0, if the state i chooses not to regulate; 1, if the state i chooses a minimal law; 2, if the state i chooses a moderate law; 3, if the state i chooses an extensive law. Based on Tables 2A and 2B, I can use the above mentioned model to test the factors that are likely to influence the form in which the law will restrict smoking in each of the six locations. Then, J =3, and y_i =0, if there is no law for a certain location in state i, or if there is only a preemptive law; 1, if the law requires or allows a designated smoking area in a certain location; 2, if the law specifies that no smoking is allowed, or designated smoking area is allowed if separately ventilated; 3, if no smoking is allowed (100 percent smoke free). Because these are all cases of multiple choices, the ordered probit is the appropriate model to use.

Results

In Table 12, we present the results from the ordered probit model for the overall severity of smoking regulation in a state. Income is a significant factor that leads to a more severe regulation of smoking in a state, while the presence of tobacco

Table 12

Ordered Probit Model Estimation for the Overall Severity of Regulation of Smoking in Public Places (1973-1995) – Maximum Likelihood Estimates

Variable	(1)	(2)
CONSTANT	3.73***	0.79***
	(2.23)	(0.82)
INCOME	0.006***	0.0006***
	(0.003)	(0.0003)
RESTSALE	0.0008	-0.0006
	(0.006)	(0.006)
TOBPROD	-0.0004***	-
	(0.0002)	
TOBCASH	-	-0.34***
		(0.20)
YOUNG18	-0.06	-0.60
	(0.05)	(0.56)
UNEMPLOYMENT	-0.03	-0.04
	(0.14)	(0.14)
DIVORCE	-0.0002	0.0002
	(0.0007)	(0.0007)
DEMCTRL	-0.0007	-0.0007
	(0.42)	(0.41)
DEMPROP	-1.22***	-1.21***
	(0.83)	(0.72)
EDUC	0.0001	0.0001
	(0.0007)	(0.0007)

Note: ***-significant at 1% level; **-significant at 5% level; *-significant at 10% level. Standard errors are shown in parentheses. The restaurant sales and tobacco variables are divided by the state population. Number of observations : 51

Table 13

Ordered Probit Model Estimation for the Severity of Regulation of Smoking in Public Places (1973-1995) – Maximum Likelihood Estimates

Variable	Other places	Government worksites	Private worksites	Restaurants	Commercial child care	Home child care
CONSTANT	1.72	1.70	1.94	1.95	-3.21	-10.21**
	(3.18)	(2.39)	(4.87)	(4.79)	(46.00)	(6.15)
INCOME	0.007***	0.005***	0.02***	0.0005	0.005	-0.009
	(0.002)	(0.002)	(0.01)	(0.01)	(0.01)	(0.005)
RESTSALE	-0.0003	-	-	0.0002	-	-
	(0.005)			(0.01)		
TOBCASH	-0.0003	0.001	-0.001	0.0005	0.13	42.08
	(0.002)	(0.12)	(0.47)	(0.13)	(0.62)	(186.01)
YOUNG18	-0.05	-	-	-0.006	0.16	0.26**
	(0.06)			(0.12)	(0.19)	(0.15)
UNEMPL	-0.14	-0.02	-0.10	-0.13	0.19	0.26
	(0.58)	(0.18)	(1.03)	(0.59)	(0.43)	(0.29)
DIVORCE	0.03	-0.0004	-0.001***	0.003	-0.001	0.0001
	(0.10)	(0.0009)	(0.001)	(0.42)	(0.06)	(0.0008)
DEMCTRL	-	0.0006	-0.0005	0.0002	0.01	0.002
	(0.15)	(1.16)	(0.75)	(1.97)	(0.41)	
DEMPROP	-0.92	0.19	-1.17	-0.17	-0.31	1.83*
	(0.66)	(0.97)	(4.72)	(2.62)	(2.65)	(1.16)
CIGCONS	0.002***	0.003***	0.003**	0.002***	0.006	-
	(0.0008)	(0.001)	(0.001)	(0.001)	(0.02)	
EDUC	0.002	-0.0002	-0.0001	0.0003	0.0007	0.0005
	(0.001)	(0.001)	(0.001)	(0.004)	(0.002)	(0.002)

Note: ***-significant at 1% level; **-significant at 5% level; *-significant at 10% level. Standard errors are shown in parentheses. The restaurant sales and tobacco variables are divided by the state population. Number of observations : 51

companies and a higher proportion of Democrats in a state government bodies tend to decrease the degree of restrictiveness of smoking regulation. The results suggest that when tobacco companies cannot avoid the regulation, they can at least try to reduce the severity of restrictions imposed on smoking in public places.

The next step in my analysis is to investigate how different forces determine the shape of each smoking regulation. The results from the ordered probit estimation of the severity of each of the six regulations of smoking are presented in Table 13.

The form of smoking regulation in other places is determined by the per capita income and cigarette consumption. A higher per capita income causes states to impose more restrictions on smoking in other places. Higher per capita cigarette sales cause legislators to pass a more restrictive regulation. In the second column of Table 13, the same variables, INCOME and CIGCONS, are significant and have a positive sign in the ordered probit model for regulation in government worksites. Per capita income and cigarette consumption are factors that determine state legislators to pass a more severe regulation in private worksites. A higher rate of divorces decreases the probability that the smoking regulation in private work places will be too restrictive. Again cigarette consumption is significant in the model for restaurant smoking restrictions, where heavier cigarette smoking leads to a more severe regulation of smoking.

While in the equation for regulation of smoking in commercial child day care centers there is no significance in any of the variables, children constitute a factor that determine the shape of regulation in home child day care centers. A higher proportion

of children determines states to pass a more severe regulation in home child day care centers.

A possible interpretation of the positive coefficient for INCOME may be that in states with higher per capita income, it is more likely to find strong pressure groups that have more money to lobby for regulation favorable to them. An alternative explanation may come from Becker's (1983) theory. Higher income gives the large public more influence through their voting power. It is not the pressure from a specific group, but the pressure that comes from the large mass of voters who are eager to pay higher taxes for a healthier environment. According to the later interpretation, the positive coefficient for INCOME supports the public interest theory.

Another possibly unexpected result is the positive coefficient for CIGCONS. One would expect the presence to heavy smokers to be a factor that opposes regulations and severe restrictions. While smokers' opposition to no-smoking regulations may be captured through some other variables, the coefficient of CIGCONS reflects a general attitude against smoking and a concern about the health hazard of second hand smoke. That attitude determines people to demand more severe regulation, once state legislators have decided to regulate smoking in public places. Therefore, the result provides support to the public interest theory.

The results support heavily the public interest theory of regulation. While the time when states regulate smoking in public places may be determined by some interest groups, the severity of each individual regulation seems to be the result of the

public's concern of the negative health effects of smoking.

Conclusion

In this Chapter I study the factors that are likely to affect the regulatory state behavior. Two different sets of research questions are addressed. First, what factors determine when states regulate smoking in public places? To study this question, I use a duration model to estimate the hazard function and the factors that affect the duration until regulation. Second, what are the determinants of the form that the regulation takes in each state? More precisely, I use an ordered probit model in order to study the factors that affect the severity of no-smoking regulations.

The results from the duration models suggest that hazard function is increasing over time, and that there is positive duration in the data. States that wait longer until regulation of smoking in public places present a higher likelihood that they regulate in the next period. Weibull estimators show that economic, social and political factors affect the decision to regulate smoking in public places at state level. The results illustrate that the public interest theory alone cannot explain the regulatory package regarding smoking in public places that varies across states. Instead, state-specific factors affect policy makers' decisions to pass no-smoking regulations. I conclude that the economic theory of regulation provides a more accurate view on states' regulatory behavior.

While it seems that private interests play an important role in states' decision regarding the date when smoking is regulated in public places, public interest seems

to explain the severity of no-smoking regulations. Once the decision to regulate is made, children are an important factor in the decision to impose more severe restrictions. When income increases, people become more concerned about the environment and stricter restriction are imposed by regulation, in order to ensure a better protection against the health hazard of second hand smoke.

CHAPTER IV

DEMAND FOR CIGARETTES AND STATE REGULATIONS OF SMOKING IN PUBLIC PLACES

Over the past 30 years, policy makers have been concerned with the health consequences of cigarette smoking, and research at public and private institutions has increased the public's awareness about the health hazards of tobacco use. Today there is a consensus among health experts that cigarette smoking is associated with deadly diseases, including various cancers, cardiovascular and heart diseases.[66] Moreover, Chalupka and Warner (1999) estimate that tobacco products are responsible for over one-fifth of the annual deaths in the U.S. during middle age.

The federal government initially acknowledged the negative health effects of cigarette smoking by imposing legislation aimed at protecting non-smokers. However the state governments have increasingly assumed the main role of controlling cigarette smoking. As a consequence, smoking legislation today is widely uneven across states.

The primary intention of smoking regulation in public places is to protect non-smokers from the dangers of second-hand smoking. Because these regulations restrict smoking in some form in most public places, smokers will be affected as well. To comply with the rules imposed by smoking regulations, smokers have to adjust their smoking habits and may perceive this as an additional cost to the price of cigarettes.

Fines imposed on those who do not respect the regulations and the time cost from the inconvenience to smoke outdoors or in restricted locations make cigarettes more expensive for smokers. Consequently, these factors are likely to change smokers' behavior and change the number of cigarettes that they smoke.

The literature on cigarette smoking investigates the effect of various anti-smoking laws (e.g. cigarette taxes, regulation of smoking in public places, laws prohibiting teenagers from buying cigarettes) on the demand for cigarettes.[67] The general finding is a negative relationship between anti-smoking legislation and cigarette consumption. Most studies that examine restrictions of smoking in public places focus on teenage smoking, and conclude that teenagers and young adults are more sensitive to changes in the price of cigarettes than to smoking restrictions. Only two studies analyze the impact of no-smoking regulations on the aggregate demand for cigarettes and they find a negative relationship.[68]

In this chapter, I study how restrictions on smoking in public places (i.e. government worksites, private worksites, restaurants, commercial child day care, home-based child day care, and other places) affect the state demand for cigarettes. This additional effect of regulations of smoking in public places on smokers has important public policy implications. It could represent an effective way to reduce smoking and discourage smokers to consume ciigarettes, which have a negative effect on their health. Knowing which of these smoking restrictions reduce cigarette consumption the most will aid policy makers in choosing the strongest restrictions in those particular locations and be most effective in the fight against smoking.

In this chapter a widely ignored issue is approached, which is next discussed. Consumption of cigarettes and the regulatory package regarding smoking in public places vary widely across states. It may be the case that states where smoking is less prevalent are the states more likely to pass regulation against smoking. In this scenario, legislation proxies the anti-smoking sentiment that exists in state's population, which favors regulation of smoking. In those states, smoking consumption would decrease any way, no matter whether legislation is passed or not. Heckman (1978) develops a model with dummy endogenous variables in a simultaneous equation system, which addresses this problem. The dummy variable indicates the existence of legislation, and the endogeneity arises from the fact that the dummy variable is generated by a latent variable that crosses a certain threshold. The latent variable represents the sentiment toward smoking, which when it is strong enough leads to regulation in public places to be enacted.

In this essay, I extend Heckman's (1978) model to allow for multiple endogenous variables in a panel data set. I study the demand for cigarettes for the fifty U.S. states from 1975 to 1995. I attempt to construct a sentiment variable in order to estimate the attitude toward smoking of states' population. I study whether the change in the demand equation is due to regulation of smoking in public places, which is passed in a state or to a strong anti-smoking sentiment.

In the following section of this essay the results about the relationship between the demand for cigarettes and anti-smoking legislation is reviewed. Section III presents the methodology used to estimate the demand for cigarettes. Heckman's

model is extended for six endogenous variables and I present the strategy used to estimate the sentiment variable. Section IV presents the data and the method used to calculate the smuggling variables. Section V presents the results and, finally, Section VI concludes this chapter.

The Impact of Price and Anti-Smoking Policies on the Demand for Cigarettes

The early studies of cigarette demand regarded smoking as an irrational behavior that was inconsistent with the conventional law of demand.[69] More recent studies have shown that cigarette consumption responds to changes in prices and other factors, including income, advertising, and tastes.[70]

In the 1980s the work in this area focused on the estimation of price elasticity of demand for cigarettes. The evidence showed that young men are the most responsive to changes in the price of cigarettes, while women are generally price insensitive. Chaloupka (1990) estimates the demand for cigarettes in the framework of the Becker-Murphy model of rational addictive behavior, for men and women separately.[71] The Becker-Murphy model assumes that the individual is fully rational and tastes are constant. This model accounts for the reinforcement, tolerance, and withdrawal factors characterizing addictive consumption. The hypothesis is that cigarette smoking is an addictive behavior. The model also captures the fact that men and women respond differently to the smoking policies and have different smoking behaviors. Although the rates of smoking are historically higher for men than for women, in recent years the rates have reversed. Smoking rates have declined for men,

while for women remained unchanged. Differences between men and women are accentuated by the additional health complications of women, such as the high risk of smoking during pregnancy. Using data from the Second National Health and Nutrition Examination Survey, conducted between 1976-1980, Chaloupka (1990) finds that men are responsive to changes in the price of cigarettes. Women do not respond to price changes, and men behave more myopically than women do.

A large majority of the recent studies use individual-level data and concentrate on the behavior of young smokers. This age group is particularly interesting because smoking practices are generally established when people are young. An important factor in fighting against smoking is to know what anti-smoking policies may be effective in discouraging smoking for young people before the smoking behavior becomes permanent.[72]

Wasserman et al. (1991), whose results contradict earlier findings by Lewit et al. (1981), Lewit and Coate (1982), and Grosman et al. (1983), obtain a low estimate for the price elasticity of demand for teenage smokers. Their explanation is that earlier studies fail to take into consideration the potential impact of anti-smoking legislation on cigarette demand.[73] These regulations are highly correlated with cigarette prices and failing to consider them as explanatory variables may overestimate the price effect on the demand for smoking. Their results suggest that anti-smoking regulations have a statistically significant effect on teenage smoking, and that they represent an effective means to prevent smoking among youths. Later studies by Chaloupka (1992), Chaloupka and Saffer (1992), and Chaloupka and

Wechsler (1995), show that the price elasticity of demand is not affected by the inclusion of anti-smoking regulations in the equation.

Chaloupka and Wechsler (1995) and Chaloupka and Grossman (1996) use different data to study the effects of cigarette prices and tobacco control policies (including restrictions on smoking in public places and limits on youth access to tobacco products) on cigarette smoking among youths and young adults. They use nationally representative surveys of students in the US and their results show that increases in price have a significant effect on reducing cigarette smoking and smoking participation among college students. While less stringent policies have little impact on youth smoking participation, the more restrictive regulations decrease the probability that a youth will smoke. Strong restrictions on smoking in public places and private workplaces have a smaller impact on daily consumption by young smokers. Restrictions on smoking in schools have a significant effect on cigarette consumption and are an important tool in reducing smoking among students.

Chaloupka and Pacula (1998) are concerned with the gender and racial differences in smoking rates among young people. They use data from the 1992-1994 Monitoring the Future surveys to study these differences and they consider four different tobacco control policies (e.g. taxes, smoker protection laws, restriction on smoking in public places, and limits on youth access to cigarettes). They argue that tobacco-control policies are correlated with each other, and therefore they include one policy at a time in the demand equation. They find that young men are much more responsive to changes in the price of cigarettes than young women, and that smoking

rates of young black men are significantly more responsive to changes in price than rates of young white men. There are significant differences in responsiveness to particular tobacco control policies. For example, smoking rates among white youths are responsive to anti-tobacco activities and clean indoor air restrictions, while smoking rates among black youths are significantly influenced by smoker protection laws and restrictions on youth access.

A recent study by Tauras and Chaloupka (1999a) estimates smoking participation and conditional demand equations including individual fixed effects. They analyze the effects that cigarette price and restrictions on smoking in public places have on cigarette consumption on young adults. They employ two alternative strategies in order to avoid the problem of multicollinearity among the six dummy-variables for the smoking regulations (e.g. private worksites, restaurants, health care facilities, government worksites, grocery stores, and other public places). First, they construct an index to capture the presence of anti-smoking regulation that replaces the six dichotomous variables. The second strategy is to estimate the demand equation including only one dichotomous variable representing a clean indoor air restriction. Both strategies provide significant results, showing that restrictions on smoking in public places have a strong impact on reducing the probability of smoking and cigarette consumption among teenagers. In a follow-up paper, Tauras and Chaloupka (1999b) estimate smoking cessation equations for young males and females separately. They find that higher cigarette prices influence many young adults to quit smoking. Policies restricting smoking in private worksites are effective in leading

young adult females to stop smoking.

Gruber (2000) conducts a comprehensive analysis of the impact of cigarette prices and other public policies (e.g. smoking restrictions in public places and limits on youth purchase of cigarettes) on youth smoking in the 1990s. He finds that the most important policy in reducing youth smoking, particularly among older teens, is the price of cigarettes. There is little evidence that other public policies are significant in reducing smoking among teens. There is some evidence that restrictions on youth purchase of cigarettes reduce the quantity of cigarettes smoked. Smoking restrictions in public places prove to have no impact on teen smoking.

Smoking regulations in work places are considered important because they restrict smoking behavior of smokers for eight hours a day. Evans et. al (1996) tested whether workplace restrictions led to self-selection, with nonsmokers attracted to worksites where smoking was not permitted and smokers looking for worksites permitting smoking. Using household data, they estimated the impact of the restrictions on cigarette demand in a simultaneous equations model that allows for individuals to self-select worksites based on their smoking status and smoking policies. After accounting for workers' potential self-selection, smoking bans diminished the probability of adult smoking by 5%, while reducing average daily cigarette consumption among smokers by 10%. The conclusion is that recent declines in smoking among workers relative to nonsmokers in the U.S. can be attributed to the growing number of workplace bans on smoking.

Only a few studies use aggregate data to explore the relationship between

cigarette price, tobacco control regulations and the demand for cigarettes. The reason is that several potential complications are encountered when aggregate data are used. First, multicollinearity can result because of high correlation between price and other key independent variables. Second, interstate differences in cigarette prices, resulting from the variation in state cigarette taxes, give rise to the problem of casual and organized smuggling from low-tax to high-tax states. Failing to control for this problem leads to distorted estimates of price effect on the demand for cigarettes.

Using annual state-level data from 1975 to 1985, Chalupka and Saffer (1992) examine the possibility that smoking restrictions are endogenous. They notice that states with the strongest restrictions, those with limits on smoking in private workplaces, are also the states in which anti-smoking sentiment is relatively high and smoking is relatively low. To correct for the potential bias caused by endogeneity, they use a simultaneous equation model. Chaloupka and Saffer (1992) consider two categories of smoking regulations, public place regulations and private place regulations, without taking into account the public's attitude toward smoking. Public place regulations restrict smoking in four or more public places, including restaurants, government work sites, but not in private work places. Private place regulations restrict cigarette smoking in private work places, in addition to restrictions in public places. They conclude that the strongest restrictions have no impact on cigarette demand. But they find that relatively comprehensive restrictions on smoking in public places (those including restaurants in addition to a number of other public places) significantly reduce smoking even after accounting for their potential endogeneity.

Ohsfeldt and al. (1998) find the opposite result, concluding that the strongest restrictions on smoking lead to significant reductions in smoking prevalence, after accounting for their potential endogeneity.

In a more recent paper, Yurekli and Zhang (2000) estimate the effect of smoking restrictions in public places and smuggling activities on states' per capita cigarette consumption. They use an updated data set for 50 states and Washington, D.C., which includes observations from 1970 through 1995. They construct an index to avoid the problem of multicollinearity among smoking restrictions in different public places. This index accounts for the restrictiveness of the laws and the time people spend in different public places subject to anti-smoking regulation. Their results show that no-smoking regulation reduces significantly per capita cigarette consumption. They calculate that, in 1995, consumption has been reduced by 4.7 packs of cigarettes per capita, or by a total of 1.1 billion packs of cigarettes.

In conclusion, the existing literature on the impact of no-smoking regulations on the demand for cigarettes has yielded mixed and sometimes inconclusive results. Most of the studies have used individual level data containing information about young adults only, and little is known about the effect of smoking regulations on the other age groups. Some studies use data for all age groups, but they are either cross section data or time series data, with observations on different individuals each year. The complications are that the effect of anti-smoking policies over the time cannot be captured for the same individuals to see the real impact of smoking restrictions. In studies using aggregate level data, the impact of regulations on the cigarette

consumption is not entirely described. Their limitation is that regulations of smoking in public places are included either as an index variable or grouped in two categories, which does not allow the examination of the economic impact of no-smoking regulation in each location.

In addition, this chapter intends to address an issue ignored by all other studies to date. The economic impact of legislation has been discussed and modeled by Heckman (1978). In his paper, he made the distinction between the impact of the legislation per se and the sentiment that the population of a certain state might have in favor of or against that legislation. In other words, when the impact of smoking legislation on cigarette demand is analyzed, one has to examine the question whether the change in cigarette consumption is due to the anti-smoking regulation that is passed or because of an underlying anti-smoking sentiment that exists in a state.

In this chapter I extend Heckman's (1978) model allowing for multiple endogenous dummy variables and construct a variable that captures the states' sentiment in favor of or against smoking. I will analyze the impact of six different regulations of smoking in various public places, including government work sites, private work sites, restaurants, commercial child day care, home child day care, and other places, including the public's sentiment toward smoking in the demand for cigarettes. Using state level data over the period 1975 to 1995, I will analyze whether policies restricting smoking in public places have an impact on state per capita cigarette consumption.

The answer to this question has important policy implications. The general

impact of anti-smoking regulations is considered to be the first step in the fight for a smoke-free society, and it is as important as specific programs for different age and other demographic categories. The major contribution of this paper is the use of Heckman's (1976) model, which helps to give a more precise quantification of the effect the anti-smoking policies have on the demand for cigarettes.

Analytical Framework

In this section I develop the empirical model that will be used to estimate the impact of state smoking restrictions on the consumption of cigarettes. The strategy is to estimate the demand for cigarettes as a function of the price of cigarettes, income, and other relevant control variables.

It has been argued in the literature that the impact of price is overestimated if smoking restrictions are not included in the regression equation.[74] Regulations that restrict smoking in public places represent an increase in the cost of cigarettes incurred by smokers, as they have to adjust their smoking habits to comply with these rules and pay additional fines if they do not respect them. Therefore, regulation indicators are introduced in the demand equation to capture the impact that such restrictions have on cigarette smoking. Six dummy variables are added to cigarette demand equation to control for whether a state regulates smoking in each of the six locations considered (government work sites, private work sites, restaurants, commercial child day care, home-based child day care, and other locations).

In analyzing the impact that regulations have on the demand for cigarettes,

one needs to consider one more factor that has been largely ignored in the literature. Smoking levels vary widely across states, and that may happen because there are different attitudes toward smoking in states' population. In states with low consumption levels, the sentiment toward smoking is stronger, and that may favor the passage of no-smoking regulation in one or more public places. Therefore, it is both the sentiment toward smoking and the presence of regulation that can affect the level of consumption of cigarettes. I include in the demand equation six dummy variables, each representing a regulation of smoking in a public place. The dummies take the value one when the corresponding regulation is passed. The relevant policy question that has to be answered is whether the changes in the demand for cigarettes is due to the presence of regulation of smoking in public places or to the sentiment toward smoking that would lead to a decrease in cigarette consumption.

The model developed by Heckman (1978) applies to cross-section data and allows for the presence of only one dummy endogenous variable. In his model, the discrete endogenous variables (d_i) are generated by continuous latent variables crossing thresholds (s_i^*). I extend Heckman's (1978) model and introduce six dummy variables, each corresponding to one of the six regulations of smoking in public places. Heckman (1978) also mentions the possibility of extending his model for the case of multiple dummy endogenous variables. However, his scenario, in which each dummy variable is generated by a different latent variable, does not apply to our case. It is the same sentiment toward smoking that determines states to pass smoking restrictions in different public places. Only the thresholds are different for each

regulation, and they determine which place is being regulated.

The next step in our analysis is to develop a model for a panel data that captures the six smoking regulations and to estimate the state sentiment toward smoking:

(15a) $y_{it} = X_{1it}\alpha_1 + \sum_{j=1}^{6} d_{jit}\beta_j + s_{it}^{*}\gamma_1 + \varepsilon_{1it}$

(15b) $s_{it}^{*} = X_{2it}\alpha_2 + \sum_{j=1}^{6} d_{jit}\delta_j + y_{it}\gamma_2 + \varepsilon_{2i\,t}$

(15c) $d_{jit} = 1$ iff $s_{it}^{*} > \mu_j$, $j = 1,\ldots,6$,

$d_{jit} = 0$ otherwise,

where y_{it} represents the cigarette demand in state i at time t, s_{it}^{*} represents the anti-smoking sentiment, which is not observed, X_{1it} and X_{2it} represent row vectors of exogenous variables, ε_{1it} and ε_{2it} represent the errors, d_{jit}'s represent the six regulations of smoking in public places for state i at time t. In our model, $j = 1,\ldots,6$ (j is an index for the six no-smoking regulations in the six places above-mentioned), $i = 1,\ldots, 50$, and $t = 1975,\ldots, 1995$. A state passes legislation to restrict smoking in a specific public location if the sentiment passes a certain threshold, μ_j, specific for that location. The model assumes the following:

(16) $E(\varepsilon_{ij}) = 0$, $E(\varepsilon_{ij}^{2}) = \sigma_{ij}$, $E(\varepsilon_{1i}\,\varepsilon_{2i}) = \sigma_{12}$, $j = 1,\ldots,6$; $i = 1,\ldots,50$.

$E(\varepsilon_{ji}\,\varepsilon_{j'i'}) = 0$, for $j, j' = 1,\ldots,6$; $i \neq i'$.

The system of equations (15a) to (15c) can be written in semi-reduced form, with the

two dependent variables on the left-hand side, and all independent variables on the right-hand side of the equation:

$$(17a)\quad y_{it} = X_{1it}\theta_{11} + X_{2it}\theta_{12} + \sum_{j=1}^{6} d_{jit}\pi_{1j} + \nu_{1it}$$

$$(17b)\quad s_{it}^{*} = X_{1it}\theta_{21} + X_{2it}\theta_{22} + \sum_{j=1}^{6} d_{jit}\pi_{2j} + \nu_{2i\,t}$$

$$(17c)\quad d_{jit} = 1 \text{ iff } s_{it}^{*} - \mu_j > 0,\ j = 1,\ldots,6,$$

$$d_{jit} = 0 \text{ otherwise,}$$

where $\theta_{11} = \alpha_1/(1 - \gamma_1\gamma_2)$, $\theta_{12} = \alpha_2\gamma_1/(1 - \gamma_1\gamma_2)$, $\pi_{1j} = \sum_{j=1}^{6} (\beta_j + \gamma_1\delta_j)/(1 - \gamma_1\gamma_2)$,

$\theta_{21} = \alpha_1\gamma_2/(1 - \gamma_1\gamma_2)$, $\theta_{22} = \alpha_2/(1 - \gamma_1\gamma_2)$, $\pi_{2j} = \sum_{j=1}^{6} (\delta_j + \gamma_2\beta_j)/(1 - \gamma_1\gamma_2)$,

$\nu_{1it} = (\varepsilon_{1it} + \gamma_1\varepsilon_{2it})/(1 - \gamma_1\gamma_2)$, $\nu_{2it} = (\varepsilon_{2it} + \gamma_2\varepsilon_{1it})/(1 - \gamma_1\gamma_2)$.

The joint distribution of ν_{1it} and ν_{2it}, $h(\nu_{1it},\nu_{2it})$, is characterized by the following assumptions:

$$E(\nu_{1it}) = 0,\ E(\nu_{2it}) = 0,\ E(\nu^2_{1it}) = \omega_{11},\ E(\nu^2_{2it}) = \omega_{22},\ E(\nu_{1it}\nu_{2it}) = \omega_{12}.$$

In equation system 17(a)-17(c), the regression dummies are endogenous. Therefore, to write the model in the reduced form, the dummies will be replaced by their expected value, which is $P_{jit}(d_{jit} = 1 \mid X_{1it}\ X_{2it})$, plus an error term. The true reduced forms are obtained by assuming that $P_{jit}(d_{jit} = 1 \mid X_{1it}\ X_{2it})$ exists, where j = 1, ...,6, and may be written as follows:

(18a) $y_{it} = X_{1it}\theta_{11} + X_{2it}\theta_{12} + \sum_{j=1}^{6} P_{jit}\pi_{1j} + \nu_{1it} + \sum_{j=1}^{6} (d_{jit} - P_{jit})\pi_{1j}$

(18b) $s_{it}^{*} = X_{1it}\theta_{21} + X_{2it}\theta_{22} + \sum_{j=1}^{6} P_{jit}\pi_{2j} + \nu_{2i\,t} + \sum_{j=1}^{6} (d_{jit} - P_{jit})\pi_{2j}$

(18c) $d_{jit} = 1$ iff $s_{it}^{*} - \mu_j > 0$, $j = 1,\ldots,6$,

$d_{jit} = 0$ otherwise,

where $\nu_{1it} + \sum_{j=1}^{6} (d_{jit} - P_{jit})\pi_{1j}$ and $\nu_{2i\,t} + \sum_{j=1}^{6} (d_{jit} - P_{jit})\pi_{2j}$ are the true errors of the model.

The condition of existence of the model is that the probability that $d_{jit} = 1$ is not a determinant of the event in the sentiment equation, in order to ensure the existence of P_{jit}.[75] In terms of the model, this condition becomes: $\pi_{2j} = 0$, $j = 1,\ldots,6$.[76] The condition for the identification of the model is that there is at least one variable in X_{1it} not included in X_{2it}, and at least one variable in X_{2it} not included in X_{1it}.[77] The reduced-form model can be written then:

(19a) $y_{it} = X_{1it}\theta_{11} + X_{2it}\theta_{12} + \sum_{j=1}^{6} P_{jit}\pi_{1j}\,\nu_{1it} + \sum_{j=1}^{6} (d_{jit} - P_{jit})\pi_{1j}$

(19b) $s_{it}^{*} = X_{1it}\theta_{21} + X_{2it}\pi\theta_{22} + \nu_{2i\,t}$

(19c) $d_{jit} = 1$ iff $s_{it}^{*} - \mu_j > 0$, $j = 1,\ldots,6$,

$d_{jit} = 0$ otherwise.

The above system may be rewritten as follows:

(19'a) $y_{it} = X_{1it}\theta_{11} + X_{2it}\theta_{12} + \sum_{j=1}^{6} P_{jit}\pi_{1j} + \nu_{1it} + \sum_{j=1}^{6} (d_{jit} - P_{jit})\pi_{1j}$

(19'b) $s_{it}^{*} = \mu_j + X_{1it}\theta_{21} + X_{2it}\pi\theta_{22} + \nu_{2i\,t}$

(19'c) $d_{jit} = 1$ iff $s_{it}^{*} - \mu_j > 0, j = 1,\ldots,6,$

$d_{jit} = 0$ otherwise.

The threshold, μ_j, becomes the intercept in the sentiment equation, and is different for each no-smoking regulation. The level of μ_j indicates which regulation is passed first. The regulation for which μ_j is higher, hence, against which the sentiment is stronger, is passed first.

Equation (19'b) is estimated by probit and used to calculate the sentiment variable:

(20) $\hat{s}^{*}_{it} / \omega^{1/2}_{22} = X_{1it}\hat{\theta}^{*}_{21} + X_{2it}\hat{\theta}^{*}_{22},$

where $\hat{\theta}^{*}_{21} = \theta_{21} / \omega^{1/2}_{22}$, and $\hat{\theta}^{*}_{22} = \theta_{22} / \omega^{1/2}_{22}$. Probabilities $\hat{P}_{jit}$'s are obtained from the pooled estimated probability $\hat{P}_i = \hat{P}(Y_i = 1 \mid X_{1i}, X_{2i}) = (\hat{P}_{1it}, \hat{P}_{2it}, \hat{P}_{3it}, \hat{P}_{4it}, \hat{P}_{5it}, \hat{P}_{6it})'$, where $\hat{P}_{jit} = \hat{P}(d_{jit} = 1 \mid X_{1it}, X_{2it})$. The estimated sentiment represents a combination of factors that characterize each state and determine the overall public attitude toward smoking. I include the variables used in the previous chapter to analyze the factors that affect the time and the form of no-smoking regulation. By controlling for different pressure groups and other state attributes, I am capturing the "net" sentiment, which may be in favor of or against smoking. The net affect of different pressure groups may change over time as a result of new information about

the negative impact of tobacco on health and other events.

We replace s_{it}^* and d_{jit}'s by their estimated expectations in equation (15a), which now becomes:

$$(21) \quad y_{it} = X_{1it}\alpha_1 + \sum_{j=1}^{6} \hat{P}_{jit}\beta_j + \hat{s}^*_{it}/\omega^{1/2}_{22}\gamma^*_1 + \varepsilon_{1it} + \sum_{j=1}^{6} (d_{jit} - \hat{P}_{jit})\beta_j + (s_{it}^*/\omega^{1/2}_{22} - \hat{s}^*_{it}/\omega^{1/2}_{22})\gamma^*_1$$

Among the regressors in y_{ki} the price of cigarettes is included, which is endogenous. Equation (21) represents the demand for cigarettes, and an appropriate estimator is two-stage least squares. Therefore, the cigarette price is instrumented by the cigarette excise tax. Instrumental variables applied to equation (21), yields unique consistent estimators of α_1, β_i's, and $\gamma^*_1 = \gamma_1/\omega^{1/2}_{22}$. Equation (21) represents the model that will be used to estimate the demand for cigarettes and study the impact of the six regulations of smoking in public places.

Equation (31) describes a composite-error model, where the error term is $\varepsilon_{1i} + \sum_{j=1}^{6} (d_{ji} - \hat{P}_{ji})\beta_j + (s_i^*/\omega^{1/2}_{22} - \hat{s}^*_i/\omega^{1/2}_{22})\gamma^*_1$. The errors will be heteroscedastic and serially correlated. To correct for this, consistent standard errors are computed from the Newey and West (1987) robust variance-covariance matrix estimator.

The Data

The data used in this paper consist of a panel of cross-sectional, time-series data for all 50 states in the United States. This section presents a description of the

data and the variables used in the empirical model described above.

The dependent variable is cigarette consumption. The regressors in X_{1it} are price, income, the percent of children under eighteen in state population, education, the rate of divorce, the rate of unemployment, and a political variable. The sentiment and six indicators for the six regulation of smoking in public places will be estimated first by probit and then included in the demand equation.

The cigarette consumption and cigarette price data come from the Tobacco Institute's annual compilation.[78] The cigarette consumption variable (CIGCONS) represents the number of per capita cigarette packs. This variable is computed as the annual tax-paid sales of packs of cigarettes. The cigarette price (CIGPRICE) is a weighted average of the prices of single-pack, carton, and vending machines sales, where the weights are the fractions of each in total sales at the national level. Most of the variation in cigarette prices is due to large differences in excise taxes across states. The prices listed in Tobacco Institute's publication are reported as November 1 of each year. I follow Yurekli and Zhang (2000) and adjust cigarette prices for fiscal year t, which is calculated as five-sixths of the price in November of year t-1 plus one-sixth of the price in November of year t. The adjustment is made on prices from which the taxes are subtracted, and then added back for the respective year. State level cigarette taxes from 1975 to 1995 are available through Tobacco Institute (1996).

I use information on state regulation of smoking in public places, introduced in the model as dummy-variables, which take the value one if the state passed

regulation in that year, and zero otherwise. I have data on the regulatory policies in six public locations (e.g. worksites, private worksites, restaurants, commercial child day care, home-based child day care, and other places).[79] The source of the information and detailed description on state regulation of smoking in public places is provided by the State Tobacco Activities Tracking and Evaluation (STATE) System, developed by the Center for Disease Control and Prevention (CDC) in the Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion.[80] Table 1 in Chapter II shows the public places that are regulated within each, and the time when the regulations have been passed.

Studies using state level data encounter a problem that merits special consideration. The dependent variable is the annual per-capita sales of packs of cigarettes. Sales data may not represent the actual state-level cigarette consumption because of smuggling. Taxes vary widely across states, and that leads to large cigarette price differences. These differences in cigarette prices encourage smuggling activities from lower to higher tax states because of prospects of large profits. Failing to account for smuggling leads to an overestimation of the price effect on the demand of cigarettes. The literature considers two types of smuggling, casual (or short distance) smuggling and organized (or long distance) smuggling. [81]

Casual or short distance smuggling is defined as the activity of buying cigarettes in a nearby state with lower cigarette taxes that are consumed in a state with higher taxes. These activities are incidental, and occur when people take trips in neighboring states. The seriousness of short distance smuggling depends on the

population living near the border between the states. Two variables are included in the model to control for casual cigarette smuggling, short distance imports and short distance exports. Following Chaloupka and Saffer (1992) and Yurekli and Zhang (2000), short distance imports are defined as:

$$(22) \quad SDIMPORT_i = \sum_j K_{ij} (Price_i - Price_j),$$

where $SDIMPORT_i$ represents the short distance cigarette imports from the lower tax neighbor state j to the higher tax state i; $Price_i$ is the cigarette price in the higher tax state i; $Price_j$ is the cigarette price in the lower tax state j; K_{ij} is the fraction of the population of the higher tax state i living within 20 miles of the lower tax state j.

Short distance exports are defined in a similar way:

$$(23) \quad SDEXPORT_i = \sum_j K_{ji} (Price_i - Price_j)(POP_j / POP_i)$$

where represents the short distance cigarette exports from the low tax state i to the high tax state j ; K_{ji} is the fraction of the population in the low tax state i living within 20 miles of the border of the high tax state j; POP_j and POP_i represent the total populations of the high tax and low tax states, respectively. The short distance export equation is weighted by the total population because the size of the population of the high tax state can affect the level of cigarette sales in the low tax state. In the case of the short distance import this is not a concern, since the size of the population of the low tax state cannot have an impact on the cigarette sales in the high tax state.

The proportion of the border population, K_{ij} and K_{ji}, is calculated in as follows. First, in each state the counties within 20 miles of the border with adjacent

states are identified, and the border population is estimated as the sum of the population living in those counties. Second, the fraction of the border population is the ratio of the border population to the total population of the base state.

The long-distance smuggling variable is constructed in a similar manner as in the previous literature and assume that long-distance smuggling happens only from North Carolina, Virginia and Kentucky.[82] Long distance smuggling is defined as the transport of cigarettes from low tax states to high tax states for resale. To construct the long distance smuggling variable, a few more assumptions are necessary. First, North Carolina and Virginia share the long distance smuggling to all states within a 1000-mile radius of them, except Kentucky, and all states in the northeast and southeast. Kentucky exports to the remaining states, except Alaska and Hawaii. States more than a 1000-mile radius from North Carolina, Kentucky and Virginia are assumed not to have long-distance smuggling. As a consequence, the states of California, Oregon, Washington, Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Utah, and Wyoming are considered states without long distance smuggling. Alaska and Hawaii are assumed not to have short distance or long distance smuggling.

For the importing states, following the literature, the long distance smuggling is calculated as:

(25) $LDSMUGGLING_i = (Price_i - Price_{KY})$

if cigarettes are smuggled from Kentucky, and where i is the index for states importing from Kentucky;

(26) $LDSMUGGLING_i = TB_{NC}(Price_i - Price_{NC}) + TB_{VA}(Price_i - Price_{VA})$

if cigarettes are smuggled from Virginia and North Carolina, and where i represents the index for the states importing from North Carolina and Virginia; TB is a weight used for states importing from North Carolina and Virginia, which is the share of the production of cigarettes in these states combined.[83]

For Kentucky, the long distance smuggling is:

(27) $$LDSMUGGLING_{KY} = \sum_j (Price_{KY} - Price_j)(POP_j / POP_{KY})$$

where j is the index for the states importing from Kentucky.

For North Carolina and Virginia, long distance smuggling is:

(28) $$LDSMUGGLING_i = \sum_j TB_i (Price_i - Price_j)(POP_j / POP_i)$$

where i is the index for North Carolina and Virginia, and j is the index for states importing from North Carolina and Virginia.

Additional explanatory variables included in the regression equations include per capita income (INCOME), which is expected to have a negative sign, indicating that cigarette is an inferior good. The higher the income, the lower the demand for cigarettes. The percent of young people under age of 18 in the state (YOUNG18) is expected to have a negative sign, indicating that the more children in a state, the lower the demand of cigarettes. A political variable is included to measure the political pressure towards or against passing clean air laws. The variable (DEMPROP) measures to what degree the state controls all three bodies of the state government (the assembly, senate and governorship). Education (EDUCATION) is a

variable that represents the percentage of state's population with at least a bachelor's degree. Two variables are introduced to capture the stress at state level, unemployment rate (UNEMPL) and the rate of divorces (DIVORCE). Tobacco production (TOBPROD) represents the pressure from the existence of tobacco companies in a state. This variable represents the additional regressor that will be included in X_{2it} and not included in X_{1it} , to meet the identification condition of the model. States with high level of production of tobacco are more likely to have a positive sentiment towards cigarette smoking and less likely to impose no-smoking restrictions.

The cigarette price, per capita income, cash from tobacco, and short and long distance smuggling variables are deflated by Consumer Price Index (1982-1984=100). The source of each of the variables is given in Appendix B. Summary statistics for the data used in this study is presented in Appendix A and correlations between the variables are presented in Table 14. The regression equations also contain state dummy variables.

Results

Estimation of the Probit Equation for States' Decision to Regulate Smoking in Public Places

Table 15 presents the results from the probit estimation of states' decision to pass non-smoking regulations, using the pooled data. The model includes fixed effects for the six regulations to allow for different thresholds for the sentiment toward smoking.

The results illustrate how different state-specific factors influence the probability that regulations are passed in different locations.

Cigarette price has a negative effect on the probability that states will regulate smoking in public places. The results indicate that when price is high, state revenue from cigarette selling is an incentive that determines legislators to postpone the passage of smoking regulations. A high per capita income has a positive impact on the probability that smoking regulation is passed. The positive relationship between per capita income and the concern about health standards is an expected result. The unemployment rate, divorce, the proportion of democrats and tobacco production are negatively correlated with the probability that smoking is regulated. Higher unemployment and divorce rates proxy a higher level of stress in state population and may induce people to smoke more and oppose regulations of smoking in public places. Democrats represent the dominant party in Southern states where tobacco is produced and where smoking is more prevalent. Any measure against smoking may have an effect on the overall economy of those states and, therefore, legislators are more reluctant to pass regulations that restrict smoking. The presence of tobacco companies, proxied by the level of tobacco production, represent a pressure that legislators consider against the passage of smoking restrictions. The results from the probit equation allow the estimation of the "net" sentiment toward smoking at state level, because it is calculated as a combination of the impacts of various pressure groups that lobby pro or against no-smoking regulation.

Table 14

Correlations Between the Regression Variables

	Cigcons	Cigprice	Income	Education	Young18	Divorce	Unemployment	Demprop	Sdsmug	Ldsmug
Cigcons	1.00									
Cigprice	-0.60	1.00								
Income	-0.13	0.16	1.00							
Education	-0.05	0.08	-0.007	1.00						
Young18	-0.006	0.004	-0.09	0.07	1.00					
Divorce	0.20	-0.14	-0.17	-0.28	0.08	1.00				
Unemployment	0.09	-0.18	0.06	-0.11	0.05	0.12	1.00			
Demprop	-0.01	0.001	0.15	-0.09	-0.04	-0.02	0.12	1.00		
Sdsmug	-0.18	-0.02	0.17	-0.17	0.02	0.004	0.06	0.21	1.00	
Ldsmug	-0.35	0.23	0.03	0.07	0.006	-0.01	0.04	-0.03	-0.03	1.00

Table 15

Results from the Probit Estimation of the Pooled Data

Variable	(1)
CIGPRICE	-0.001*** (0.0004)
INCOME	0.77*** (0.06)
YOUNG18	-0.0006 (0.0007)
EDUCATION	-0.77*** (0.06)
UNEMPL	-0.13*** (0.01)
DIVORCE	-0.0002*** (0.00009)
DEMPROP	-0.17*** (0.06)
TOBPROD	-0.0004*** (0.00004)
SDSMUG	0.0003 (0.0004)
LDSMUG	0.00005 (0.0001)
DUMMYGOV	0.24* (0.10)
DUMMYPRIV	-0.38* (0.10)
DUMMYREST	0.11* (0.10)
DUMMYCOM	-0.62* (0.10)

Table 15 – Continued

Variable	(1)
DUMMYHOME	-1.37*
	(0.12)
DUMMYOTHER	0.60*
	(0.10)
Number of observations	6300
Log-likelihood	-2600.79***

Note: ***-significant at 1% level; **-significant at 5% level; *-significant at 10% level. Standard errors are shown in parentheses. The dependent variable is Regulation = (GOVLAW, PRIVLAW, RESTLAW, COMCARELAW, HOMCARELAW, OTHERLAW). The model includes fixed effects for each of the six regulations.

Table 15 also reports the fixed effects for the six no-smoking regulations. The coefficients reported represent the thresholds of the public's sentiment towards smoking above which states pass a certain no-smoking regulation. States pass first the regulation with the higher threshold. According to Table 15, the dummy for regulation in other public places records the coefficient with the highest value. The results in Table 15 above show that the next higher coefficient is obtained for regulation in government worksites. The rest of the fixed effects for the other no-smoking regulations record values in the following descending order: restaurants, private worksites, commercial child day care, home-based child day care.

In Chapter III, when the possible interdependence among the six no-smoking regulations has been discussed, it is stated that no-smoking regulation in other public

places is passed by most states. Forty-three states regulate smoking in other public places, and forty-one states regulate smoking in government worksites (see Table 1, Chapter II). Based on the same statistical evidence, only twenty-one states regulate smoking in private worksites, and a decreasing number of states regulate smoking in restaurants, commercial child day care, and home-based child day care. Therefore, the results from the probit estimation of the pooled data confirm the ordering of no-smoking regulations. The public's sentiment toward smoking in other public places is very strong in most of the states, these locations are the most common places where people meet with each other and the hazard of inhaling cigarette smoke is very high. The thresholds for the other no-smoking regulations indicate that the sentiment decreases in intensity towards smoking in those public places.

Estimation Results for the Cigarette Demand Equation

Table 16 presents the results from the estimation of the demand equation using the six predictions from the probit estimation. To avoid the endogeneity of cigarette price we use the cigarette excise tax to instrument the price. Per capita consumption of cigarettes, cigarette price, the excise tax, and per capita income are introduced in log form. Therefore, the estimated coefficients of price and income represent the price elasticity and income elasticity of demand, respectively. To take advantage of the panel feature of the data, state fixed effects have been included in the regression. The model has a composite error, which causes heteroscedasticity and serial correlation. Therefore, following Newey and West (1987), I estimate the

Table 16

Results from the Estimation of the Demand for Cigarettes Equation By Instrumental Variables

Variable	(1)	(2)	(3)
CIGPRICE	-0.43***	-0.39***	-0.40***
	(0.07)	(0.03)	(0.07)
INCOME	-0.15***	-0.22***	-0.15***
	(0.04)	(0.03)	(0.05)
EDUCATION	0.0000006	-0.00002*	-0.03***
	(0.000004)	(0.00001)	(0.01)
YOUNG18	0.001***	0.001***	0.001***
	(0.0006)	(0.0002)	(0.0007)
UNEMPLOYMENT	-0.001	0.006	-0.001
	(0.002)	(0.006)	(0.005)
DIVORCE	0.04***	0.04***	0.04***
	(0.008)	(0.005)	(0.009)
DEMPROP	0.05***	0.06***	0.05***
	(0.01)	(0.01)	(0.01)
SDSMUG	0.00005	0.00007	0.00008
	(0.00008)	(0.0001)	(0.0001)
LDSMUG	-0.0006*	-0.0007***	-0.0003
	(0.0004)	(0.0001)	(0.0003)
SENTIMENT	-	-	-0.04***
			(0.01)
GOVLAW	-	-1.33	-5.69
		(47.29)	(30.07)
PRIVLAW	-	-0.01	4.31
		(54.66)	(63.79)
RESTLAW	-	0.61	1.04
		(49.42)	(41.36)
COMCARELAW	-	-2.68	-3.75
		(59.01)	(60.19)

Table 16 – Continued

Variable	(1)	(2)	(3)
HOMCARELAW	-	6.56 (21.51)	4.02 (17.76)
OTHERLAW	-	1.15 (6.91)	3.02 (3.79)
R-squared	.90	.90	.90
Number of observations	940	940	940

Note: ***-significant at 1% level; **-significant at 5% level; *-significant at 10% level. Newey and West (1987) robust standard errors are shown in parentheses. The dependent variable is the log of per capita cigarette consumption. Cigarette excise tax has been used to instrument cigarette price. All regressions include state dummy variables.

demand for cigarettes using a robust-errors procedure.

In column (1) of Table 16, the demand equation is estimated without the sentiment variable and the six no-smoking regulations. The coefficient for CIGPRICE is negative and significant, which indicates that the price elasticity of demand is 1.43. This means that when the cigarette price increases by 10 percent, the demand for cigarettes decreases by 4.3 percent.

In column (2) of Table 16, the demand equation is estimated including the six no-smoking regulations, but without the sentiment variable. The coefficient for CIGPRICE is now -.39. This indicates a more inelastic demand and suggests that the cigarette consumption is sensitive to the inclusion of the no-smoking regulations. The result confirms the hypothesis that ignoring no-smoking legislation from the demand

equation leads to an overestimation of the impact of cigarette price. The results also illustrate that the no-smoking regulations are insignificant and have no effect on cigarette consumption.

In column (3) of Table 16, the demand equation is estimated including both the six no-smoking regulations and the sentiment variable. The coefficient for cigarette price is negative and significant, and indicates a price elasticity of demand of –0.40. The result is in the range of other studies that also found that the demand for cigarettes is inelastic.[84] For every 10 percent increase in price, demand for cigarettes goes down by 4 percent. When evaluated at mean values, a 10 percent increase in the price of cigarettes leads to a decrease in cigarette consumption of 4.8 packs of cigarettes per year for a person in the typical state. The estimated coefficient for per capita income is also negative and significant. The result is in accordance with previous studies that found that cigarettes are an inferior good.[85] As income increases the concern about the quality of life and general health increases and people consume less cigarettes. In terms of the impact, for every 10 percent increase in per capita income, consumption of cigarettes goes down by 1.5 percent, or almost 2 packs of cigarettes. Education is another factor that is negatively associated with the demand for cigarettes. The coefficient for education is negative and significant, indicating that a higher proportion of state population with at least a bachelor's degree is associated with a lower per capita consumption of cigarettes. The results indicate that when the proportion of state population with at least a bachelor's degree increases by 1 percent, per capita consumption of cigarettes decreases by 3 percent, or 3.6 packs of

cigarettes.[86] By contrast, higher divorce rates and a higher proportion of Democrats lead to an increase in per capita consumption of cigarettes. A one percent higher divorce rate increases cigarette consumption by 4 percent, or 4.8 packs of cigarettes. In states where Democrats control more bodies of state government, cigarette consumption goes up by 5 percent, or 6 packs of cigarettes. This last result is consistent with earlier findings in Chapter III, that states controlled by Democrats are associated with a lower probability that no-smoking regulations are passed and, now, with a higher cigarette consumption. A possible explanation is the fact that Southern states that are controlled by Democrats, are also the big tobacco producers and a large part of the state income comes from tobacco sales and tobacco industry, in general. The percentage of smokers in those states is very high (see Table 3, in Chapter II), and the coefficient of DEMPROP might capture this fact.

None of the no-smoking regulations are significant, and most of them have the wrong sign. Previous studies have reported a negative sign for these variables, indicating that the presence of smoking restrictions in public places decrease the demand for cigarettes. The variable of interest, SENTIMENT, which represents the innovation of my work in this Chapter, has a negative sign and is significant. To calculate the magnitude of the impact of this variable on the demand for cigarettes I multiply the coefficient of SENTIMENT by its standard deviation and then by 100, which allows me to quantify the impact, in percentage terms, of one standard deviation increase in the sentiment toward smoking on the per capita consumption of cigarettes.[87] I conclude that when a one standard deviation increase in the sentiment toward

smoking increases, per capita cigarette consumption decreases by approximately 10 percent, or 12 packs of cigarettes per year. This result suggests that it is not the effect of regulations per se that causes smoking to decrease, but rather it is the public's sentiment toward smoking that explains why cigarette consumption is affected. Since information related to the danger of smoking is available every day, on all media channels, this likely affects individuals' perception regarding cigarette smoking. Moreover this is likely to be correlated with the general attitude toward smoking specific within each state, and contributes to the formation of an underlying sentiment against smoking. When we account for this sentiment in the demand equation, the results show that cigarette consumption is affected by it, and smoking regulations have no impact on the quantity of cigarettes people are smoking.

In Table 17 we replace the six smoking regulations by an index, to avoid the possible multicollinearity among the six indicators of smoking restrictions in public places. The index is calculated as an average of the six estimated probabilities ($P_{jit}(d_{jit} = 1 \mid X_{1it}, X_{2it})$) obtained from the probit model of the pooled data. The index is not significant, and the results are similar to those reported in Table 16. The coefficient for SENTIMENT is significant and negative, similar to the result in Table 16. According to Table 17, column (2), a one standard deviation increase in the sentiment toward smoking causes a decline of 9 percent, or 10.8 packs of cigarettes per year, in per capita consumption of cigarettes. Again, this confirms the previous finding that the decline in cigarette demand is caused by the public's attitude toward smoking, and not by no-smoking regulations.

Table 17

Results from the Estimation of the Demand for Cigarettes Equation By Instrumental Variables (With One Indicator Variable for Regulations of Smoking in Public Places)

Variable	(1)	(2)
CIGPRICE	-0.41***	-0.42***
	(0.03)	(0.03)
INCOME	-0.18***	-0.12***
	(0.03)	(0.03)
EDUCATION	0.000005	-0.02***
	(0.00001)	(0.007)
YOUNG18	0.001***	0.001**
	(0.0002)	(0.0002)
UNEMPLOYMENT	0.001	-0.005
	(0.003)	(0.003)
DIVORCE	0.04***	0.04***
	(0.005)	(0.005)
DEMPROP	0.06***	0.05***
	(0.01)	(0.01)
SDSMUG	0.00008	0.00009
	(0.0001)	(0.0001)
LDSMUG	-0.0007***	-0.0004***
	(0.0001)	(0.0002)
SENTIMENT	-	-0.03***
		(0.01)
INDEX	0.12	0.03
	(0.10)	(0.10)
Number of observations	940	940
R-squared	.90	.90

Note: ***-significant at 1% level; **-significant at 5% level; *-significant at 10% level. Newey and West (1987) robust standard errors are shown in parentheses. The dependent variable is the log of per capita cigarette consumption. The *INDEX*

variable represents the average of the six estimated probabilities for the six regulations of smoking in public places. Cigarette excise tax has been used to instrument cigarette price. All regressions include state dummy variables.

Conclusion

In this Chapter, I provide an alternative analysis of the impact of smoking regulations on the demand for cigarettes. While the primary intent of these regulations is to protect non-smokers from the adverse health effects of cigarette smoke, they could affect smokers as well. The restrictions imposed on smoking in public places may be perceived as an addition to the total cost of cigarettes. Complying with regulations (i.e. smoking outside or in restricted areas only) causes an alteration of smoking behavior. Therefore, it is interesting to investigate this secondary effect of smoking restriction on the demand for cigarettes. Previous studies concluded that regulation of smoking in public places indeed reduce cigarette consumption.

Using state-level data, over a period of twenty-one years, from 1975 to 1995, I investigate the impact of smoking restrictions on per capita consumption of cigarettes. I extend Heckman's (1978) model, and estimate the sentiment toward smoking that exists in states' population. I make the distinction between the effect of legislation per se and the state's attitude toward smoking, in order to estimate the true impact of smoking regulations in public places on cigarette demand. Using a robust instrumental variable estimation procedure, we conclude that regulations of smoking

in public places have no impact on the demand for cigarettes. My results indicate that the sentiment toward smoking has a significant and negative impact on per capita consumption. One standard deviation increase in the anti-smoking sentiment leads to a 10 percent decrease in cigarette consumption, or approximately 12 packs of cigarettes per year.

CHAPTER V

THE IMPACT OF REGULATIONS OF SMOKING IN PUBLIC PLACES ON ALCOHOL CONSUMPTION

In the previous chapter the focus was on describing how state regulations affect cigarette smoking in public places. Policy makers are concerned with how effective no-smoking policies are in combating cigarette consumption among teenagers and among all smokers, in general. Unfortunately, cigarettes are not the only drug that adversely affects people's health. Alcohol and a number of illicit drugs represent some other health hazards that put at risk people of all ages.[88]

The 1988 Surgeon General's report provides evidence of the strong correlation between the use of cigarettes and the use of other licit and illicit drugs.[89] Based on data from the 1995 National Household Survey on Drug Abuse, the report shows that a higher percentage of current cigarette users are also using alcohol and marijuana compared to nonsmokers in all age groups.[90] This evidence raises an interesting question about the economic relationship among cigarettes and other drugs, and the impact that changes in the price or public policies regarding one drug have on the use of the other drugs.

In particular, this essay focuses on the economic relationship between cigarette and alcohol consumption. The economic literature investigates this question based on the cross-price effect of cigarettes on the demand for alcohol and vice versa.

The results so far present mixed evidence with regard to this relationship.[91] In this chapter I attempt to estimate more accurately the impact of cigarette price on the consumption of alcohol by considering additional variables in the demand for alcohol equation. Similar to the work in Chapter IV of this research, I introduce the no-smoking regulations and the sentiment toward smoking in the demand for alcohol. Failing to account for no-smoking regulations leads to an over-estimation of the cigarette price effect on alcohol consumption. Moreover, I make the distinction between the impact of legislation per se and the public's underlying sentiment toward smoking. Specifically, I investigate whether the estimated sentiment reflects an overall attitude toward drug use in general, not only cigarettes, which would lead to a decrease in the demand for alcohol.

The presence of no-smoking regulations in the demand for alcohol equation allows me to study whether the presence of smoking restrictions in public locations affects the quantity of alcohol that people consume. An interesting question is whether smokers, when forced to smoke less, consume more or less alcohol. It is important to note that not all no-smoking regulations are likely to have an impact on the alcohol consumption. Actually, I argue that the only regulation that may have an impact on the demand for alcohol is the regulation of smoking in other public places, which restricts smoking in bars, among other locations. The theory developed by Craig and Van Natta (1977) explains the relationship between smoking and drinking by the fact that both habits are "learned" and practiced in the same place, that is, in bars. This is the reason why I will include in the demand for alcohol equation only

the no-smoking regulation regarding other public places.

There are a number of alcohol-related regulations regarding alcohol that may affect the alcohol consumption. The major difference between no-smoking regulations and alcohol-control regulations is that the later are more uniform across states, and they were passed at the federal level before the 1990s. The most important alcohol regulation is the minimum legal drinking age, which was passed by the federal government in 1984 and which all states were required to enforce it by 1987.[92] Other alcohol control policies include regulations of driving under the influence, limiting or prohibiting advertising of alcoholic beverages, limiting or reducing the number of sales outlets and limiting the days and hours during which alcoholic beverages can be sold, printing warning signs and warning messages with all advertising.[93] The evidence shows that these policies have no significant impact on alcohol consumption, and some of them lead to greater alcohol abuse.[94] The only policy that proves to be somewhat efficient in reducing the alcohol consumption is imposing alcohol excise taxes, which vary from state to state and over time. However, economists find consistently that alcohol demand is inelastic and negative, which indicates that alcohol consumption declines only slightly when the price of alcohol increases. Since alcohol regulations do not vary too much across states, and they are passed well before the 1990, when the data used for this study starts, they will not be considered and will not be included in the demand for alcohol equation. The results will not be affected by the non-inclusion of alcohol regulations because they. The only policy that is captured is state alcohol excise tax, which is included in the price

of alcohol. The alternative approach is to use the no-smoking regulations to construct a sentiment variable, which I use in the regression analysis. Health concerns with cigarette consumption may reflect broader concerns regarding the consumption of cigarettes, alcohol, and drugs.

The medical literature provides evidence that there is a biological and psychological connection between alcohol use and cigarette smoking.[95] A number of medical studies provide alternative explanations for the fact that smokers are more likely to consume alcohol, and vice versa. One theory indicates a common addictive personality pattern, while another derives from the observation that smoking and drinking may be "learned" in the same time, in bars or other public places.[96] However, these theories do not indicate the nature of the relationship. In other words, they do not specify whether alcohol and cigarettes are substitutes or complements in consumption.

Previous work in this area has concentrated on the effect of a price increase of cigarettes on the alcohol consumption and vice versa. The potential effect that smoking restrictions in public places may have on alcohol consumption has been largely ignored. As discussed in previous chapters, smoking regulations are an additional cost to smokers who need to adjust their behavior while at work, or in restaurants, as well as in a number of other public places. Since some other drugs may be more accessible at a cheaper price, especially in those states imposing severe restrictions on smoking, some smokers may be tempted to substitute alcohol for cigarettes, and only in those situations in which the substitution can be made easily.

Previous results show mixed evidence regarding the nature of the relationship between consumption of cigarettes and alcohol.[97] Goel and Morey (1995) estimate the demand for cigarettes and liquor using a panel data of U.S. states for 1959-1982. They find that cigarettes and liquor are substitutes in consumption. Jones (1989) obtains the opposite result using aggregate quarterly expenditure data for the U.K. for 1964-1983. He estimates the cross price elasticity between tobacco and four categories of alcoholic drinks, and he finds the strongest complementarity between tobacco and spirits.

Farrelly et al. (1999) study the relationship between the use of tobacco, marijuana, and alcohol for a nationally representative sample of youths (ages 12 to 20), and young adults (ages 21 to 30) from the 1990-1996 National Household Surveys on Drug Abuse. They use measures of the real price of beer, the real price of cigarettes, marijuana possession arrests over total arrests and cannabis eradication (used as a proxy for the monetary price of marijuana), and they estimate probit equations to estimate the probability of using each substance. Analyzing cross-price effects, they conclude that tobacco, marijuana and alcohol are economic complements among youth. They find that higher cigarette and beer prices decrease the probability that youths use marijuana.

Decker and Schwartz (2000) investigate the economic and social relationship between cigarette and alcohol consumption. They use individual-level data from the Behavioral Risk Factor Surveillance System and estimate both own and cross-price elasticities. The results show that higher alcohol prices decrease both alcohol

consumption and smoking participation, which suggests that cigarettes and alcohol are complements. Higher cigarette prices tend to decrease smoking participation but increase drinking, indicating that cigarettes and alcohol are substitutes.

I use the model developed by Heckman (1978), and extended in Chapter IV of this research, to investigate the impact that no-smoking regulations have on the demand for alcohol. In addition, I use the sentiment variable and probability that states regulate smoking in other public places estimated in Chapter IV and introduce these measures in the demand for alcohol equation. As in the case of the cigarette demand regression analysis, I investigate whether the inclusion of no-smoking legislation and the sentiment variable improves the cross price effect in the alcohol demand equation. Moreover, the sentiment variable that I construct in the previous Chapter may reveal that the public's concern with the health consequences of cigarette smoking are part of a broader concern with the health consequences of cigarette, alcohol, and drug (licit and illicit) use.

In this analysis, I use an individual-level data from the Behavioral Risk Factor Surveillance System (BRFSS), which spans the period 1990 to 1995 and contains information on 468,781 individuals in 46 states. This data set has the advantage that it reports alcohol and cigarette consumption for each individual participating in the survey. Studies that use aggregate sales data may be biased because of inter-state smuggling unless it can be controlled for in the empirical analysis.[98] The detailed information provided by the BRFSS data allows me to estimate both the demand for cigarettes and alcohol. Moreover, the survey reports the gender of the respondents.

Becker and Murphy (1988) acknowledge the addictive nature of cigarette smoking, and the fact that men and women respond differently to smoking policies and have different smoking behaviors. The same patterns are observed for all other drugs, and the gender differences are accentuated by the additional health risks that women face, such as the high risk of drug use during pregnancy. Consequently, I will estimate the demand for the two drugs for men and women, separately, to determine if there are any differential effects.

In the next section I review the methodology used for my study. In the third section, I present the data used in my analysis, and the last two sections contain the results and the conclusion of this essay, respectively.

Methodology

The methodology used to study the impact of cigarette price and no-smoking regulation on the demand for alcohol is similar to the one developed in Chapter IV. As Heckman (1978) pointed out, in order to study the effect of no-smoking legislation, one needs to consider the underlying sentiment against smoking that a state's population might have. Consequently, to analyze the true impact that no-smoking regulation has on alcohol consumption, we need to distinguish between the effects of legislation per se and the state's sentiment towards smoking, which may be related to alcohol consumption. In states where smoking and drinking prevalence are low, the presence of no-smoking regulations may proxy the anti-smoking sentiment, and possibly a more general attitude of the state toward tobacco, alcohol and drugs.

The low level of cigarette and alcohol demand may be determined just by this anti-drug sentiment that the population has and not by the passage of no-smoking regulation. These regulations may not affect cigarette consumption at all, but rather, the levels of cigarette and alcohol consumption determine the regulations that states pass.

The model used to analyze the relationship between the demand for alcohol and no-smoking regulation is similar to the one developed in Chapter IV. However, the notable difference is the fact that in this chapter I use individual-level data. Most of the variables represent personal characteristics, while the sentiment towards smoking is the same for all individuals in one state, in each year. Therefore, to estimate the anti-smoking sentiment, I use state-level data. In fact, the sentiment equation is the same as in the previous chapter.

The model that is used to estimate the demand for alcohol is:

(29a) $y_{ki} = p_i \xi_1 + X_{1ki}\theta_{11} + P_{ji}\pi_{1j} + s_i^* \gamma^*_1 + \nu_{1i} + (d_{ji} - P_{ji})\pi_{1j}$.

The sentiment variable in equation (29a) is estimated from the following equations:

(29b) $s_i^* = \mu_j + X_{2i}\theta_{22} + \nu_{2i}$

(29c) $d_{ji} = 1$ iff $s_{it}^* - \mu_j > 0$, $j = 1,\ldots,6$,

$d_{ji} = 0$ otherwise.

where y_{ki} represents the demand for alcohol for individual k, $k = 1, \ldots, n_i$, in state i, $j=1,\ldots,6$ is an index for the sin no-smoking regulations, and s_i^* represents the latent state-specific anti-smoking sentiment variable. The cigarette price is represented by p_i and is included in equation (29a) to estimate the cross-price effect. X_{1ki} is a vector of

personal characteristics that vary for each individual in the survey, including individual income, age, education, working status, marital status, race, and gender. The alcohol price is also included in X_{1ki}. X_{2i} is a row vector of state-specific variables, which includes cigarette price, state average per capita income, state production of tobacco, the percent of children under the age 18 in state's population, the percent of state population with at least a bachelor's degree, unemployment rate, divorce rate, the degree of control of state government bodies by the Democratic Party, short distance and long distance smuggling measures, and six no-smoking regulation fixed effects (see Table 15, Chapter IV). $v_{1i} + (d_{ji} - P_{ji})\pi_{1j}$ and v_{2i} represent the errors, and d_{ji} is a dummy variable representing the no-smoking in other public places for state i. P_{ji} represents the probability that the no-smoking regulation dummy is equal to one, $d_{ji} = 1$, which is estimated from equation (29b). The joint distributions of v_{1it} and v_{2it}, $h(v_{1it}, v_{2it})$ are characterized by the following assumptions:

$$E(v_{1it}) = 0,\ E(v_{2it}) = 0,\ E(v^2_{1it}) = \omega_{11},\ E(v^2_{2it}) = \omega_{22},\ E(v_{1it}\, v_{2it}) = \omega_{12}.$$

A state passes legislation in a certain public location if the sentiment passes a certain threshold, μ_j, which is specific for each location. Compared to the model in Chapter IV, there is an additional condition that has to be imposed to ensure that the model exists. The sentiment towards smoking is specific to each state and is determined by factors that characterize that state. Therefore, the vector of personal characteristics should not be among the regressors in the sentiment equation. For this reason, the condition is: $\theta_{21} = 0$.

The sentiment equation (29b) is estimated by probit, using the pooled information on regulation dummies. I use $\hat{\theta}^*_{22}$ to estimate the sentiment variable as follows:

(30) $\hat{s}^*_i / \omega^{1/2}_{22} = X_{2i}\, \hat{\theta}^*_{22}$,

where $\hat{\theta}^*_{22} = \theta_{22} / \omega^{1/2}_{22}$. $\hat{P}_{ji}$'s represent the estimated probabilities that the regulation dummies take the value one and are obtained from the probit estimation of equation (29b).

Equations (29b) and (29c) are used to estimate the sentiment variable and the probabilities that regulation dummies are equal to one. As I explained earlier, I will include only the no-smoking regulation in other public places in the demand for alcohol equation. This is the only regulation that may affect the alcohol consumption. Therefore, s_i^* and d_{ji} are replaced by their estimated expectations in the initial demand for alcohol equation that has to be estimated[99]:

(31) $y_{ki} = p_i \xi_1 + X_{1ki}\alpha_1 + \hat{P}_{ji}\beta_j + (\hat{s}^*_i / \omega^{1/2}_{22})\gamma^*_1 + \varepsilon_{1i} + (d_{ji} - \hat{P}_{ji})\beta_j + (s_i^* / \omega^{1/2}_{22} - \hat{s}^*_i / \omega^{1/2}_{22})\gamma^*_1$.

In the above equation, p_i represents the cigarette price and $\hat{P}_{ji}$ is the probability that no-smoking regulation in other public places is equal to one. The only variable included in X_{2ki} that appears in the initial demand equation is p_i, which is necessary to estimate the cross price effect of cigarettes on the demand for alcohol.

Among the regressors in X_{1ki} the price of alcohol is included, which is endogenous. The above equation represents the demand for alcohol, and an

appropriate estimator is two-stage least squares. Therefore, the alcohol price is instrumented by the alcohol excise tax. Instrumental variables applied to equation (31) yields unique consistent estimators of α_1, β_i's, and $\gamma^*_1 = \gamma_1 / \omega^{1/2}_{22}$. Equation (31) represents the model that will be used to estimate the demand for alcohol.

Equation (31) describes a composite-error model, where the error term is $\varepsilon_{1i} + (d_{ji} - \hat{P}_{ji})\beta_j + (s_i^* / \omega^{1/2}_{22} - \hat{s}^*_i / \omega^{1/2}_{22})\gamma^*_1$. The errors will be heteroskedastic and serially correlated. To correct for this, consistent standard errors are computed from the Newey and West (1987) robust variance-covariance matrix estimator.

The same model and the same procedure will be used to estimate the cigarette demand equation, using the BRFSS data. The survey includes data on cigarette consumption for individuals who reported that they smoked in the past thirty days, which will be the dependent variable, y_{ki}, in equation (32).

$$(32) \quad y_{ki} = p_i \xi_1 + X_{1ki}\alpha_1 + \sum_{j=1}^{6} \hat{P}_{ji}\beta_j + (\hat{s}^*_i / \omega^{1/2}_{22})\gamma^*_1 + \varepsilon_{1i} + \sum_{j=1}^{6} (d_{ji} - \hat{P}_{ji})\beta_j + (s_i^* / \omega^{1/2}_{22} - \hat{s}^*_i / \omega^{1/2}_{22})\gamma^*_1.$$

Therefore, the relationship between cigarette consumption and all six no-smoking regulations is estimated, in order to check the results obtained in the previous chapter.

The Data

The analysis uses a repeated cross-section of individual-level data available through the Behavioral Risk Factor Surveillance System (BRFSS), which is coordinated by the Centers for Disease Control and Prevention. The sample includes

data on 468,781 individuals from 46 U.S. states, over a period of 6 years, from 1990 to 1995.

Although the BRFSS survey includes individuals from all 50 states, information in only 46 states is used in this study. For the purpose of the analysis in this essay, I merge the BRFSS data with a number of other state-specific variables, including the price of alcohol, the price of cigarettes, and state no-smoking regulations. Data for the price of alcohol are not available for the sample period for Hawaii, Maine, New Jersey, and Rhode Island. Therefore, these states have been excluded from the study.

The BRFSS is a state-based surveillance system that collects information about risk factors causing chronic diseases and death.[100] Data are collected through random telephone interviews and provide information on several risk behaviors for adults of ages 18 and older. The report starts in 1984, when 15 states participated in the survey, and continues until present. More states participate each year and beginning with 1994 all 50 states provided survey data as part of the BRFSS. Sample sizes vary from 476 in 1984 for Indiana to 3988 in 1992 for California. Beginning with 1991, the sample in each state included at least 1178 persons. Information about smoking and alcohol consumption, among other risk behaviors[101], is reported by sex, age groups, education, and race.

Annual surveys between 1990 and 1995 are combined in a pool of cross sections to estimate demand equations for tobacco and alcohol. The survey is a repeated cross-section rather than longitudinal because the respondents are

interviewed only once. Therefore, the information on tobacco and alcohol use behavior is collected at one point in time and does not report evidence on changes in behavior over time for the same group of individuals. The disadvantage of this data set is that it is not a panel and that I do not have information on the individual's cigarette and alcohol consumption on the years prior to or after the survey year. Therefore, I am able to estimate the short-term own and cross-price elasticities; the economic theory suggests that the long-term elasticities would be larger.[102]

The BRFSS data set includes information on smoking and drinking behavior for each individual. Specifically, each person in the survey is asked whether he or she has consumed cigarettes and alcohol in the past thirty days. If the answer is positive, that person is considered a current smoker or drinker. For each drinker and for each smoker, the survey indicates the number of drinks in the past month and the number of cigarettes per day in the past month, respectively, that the individual has consumed. These two indicators will be the dependent variables in the following analysis, the number of alcohol drinks per day (ALCCONS) and the number of cigarettes smoked per day (CIGCONS). The survey provides demographic information on each individual participating in the survey, including sex, age, working status, marital status, and level of education.

The survey also provides information on the state of residence for each individual, which allows the addition of other state-specific variables. Specifically, I match the BRFSS data to the average price of a pack of cigarettes in each state and year, which is reported by the Tobacco Institute.[103] The cigarette price (CIGPRICE) is

a weighted average of the prices of single-pack, carton, and vending machines sales, where the weights are the fractions of each in total sales at the national level. Most of the variation in cigarette prices is due to large differences in excise taxes across states.[104] The prices listed in Tobacco Institute's publication are reported as November 1 of each year. I follow Yurekli and Zhang (2000) and adjust cigarette prices for fiscal year t, which is calculated as five-sixths of the price in November of year t-1 plus one-sixth of the price in November of year t. The adjustment is made on prices from which the taxes are subtracted, and then added back for the respective year. State level cigarette taxes from 1990 to 1995 are available through Tobacco Institute (1995).

I also add to the initial data set a measure of the price of alcoholic beverages (ALCPRICE), which is based on the American Chamber of Commerce Researchers Association (ACCRA) Inter-City Cost of Living Index.[105] The ACCRA index is based on prices for many products sold by retailers in 240-280 "middle management" cities per quarter. Following Grossman, Chaloupka and Sirtalan (1998), Decker and Schwartz (2000) and others, I use the price of beer in the third quarter of every year as a proxy for the "average" price of alcoholic beverages.[106] For many of the six years included in this sample, ACCRA does not provide information on beer prices for any area in Hawaii, Maine, New Jersey, and Rhode Island. Therefore, these states are excluded in the following analysis. The beer price in the ACCRA data is based on the price of a six-pack of Budweiser or Miller Lite. The state price of beer is estimated by weighting the prices in each city within a state by that city's estimated 1990

population. Both the price of beer and the price of cigarettes are deflated by the Consumer Price Index (CPI, base year: 1982-1984=100). In order to determine the price elasticities and cross-price elasticities of demand for alcohol and cigarettes, the price and consumption variables are entered in logarithmic form.

I also match information on state regulation of smoking in public places with the BRFSS data by state and by year. No-smoking regulations are introduced in the model as dummy-variables, which take the value one if the state passed regulation in that year, and zero otherwise. The data on regulatory policies cover six public locations (e.g. worksites, private worksites, restaurants, commercial child day care, home-based child day care, and other places).[107] The source of this information and detailed description on state regulation of smoking in public places is provided by the State Tobacco Activities Tracking and Evaluation (STATE) System, developed by the Center for Disease Control and Prevention (CDC) in the Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion.[108] Table 1 in Chapter II shows the public places that are regulated within each state, and the date when the regulations have been passed.

Additional explanatory variables included in the regression equations to control for factors that are likely to affect the demand for alcohol and cigarette demands are per capita income (INCOME)[109], age of each individual in the survey (AGE), a dummy variable for the women in the survey (FEMALE), a dummy variable for black (BLACK) people, and people of other races (OTHRACE). To control for the education of individuals in the survey, I introduce dummy variables for

people with high school education (HIGHSCHOOL), for people with some years of college education (SOMECOLLEGE), and for those with a bachelor's degree (COLLEGE). The BRFSS data also contains information on employment status. Therefore, I introduce in the demand equations controls for unemployed individuals, making distinction between people who have been out of work for less than a year (UNEMPLONE) and people who have been unemployed for more than one year (UNEMPLMORE). This way, I am able to study the difference in cigarette and alcohol consumption behavior between people who are temporary unemployed and people who could not find a job for a longer period of time. The distinction is important because it illustrates whether being unemployed for a long period of time increases the stress level and leads to a higher level of cigarette and alcohol consumption. Besides the unemployment dummies, I control for the employment status of individuals who stay home (HOMEMAKER), students (STUDENT), and retired individuals (RETIRED). Finally, the regression equations also include dummies for marital status, including divorced individuals (DIVORCE), people who are widowed (WIDOWED) or separated (SEPARATED), and those with other status. I expect that the employment status and marital status will influence the demand for alcohol and cigarettes. For example, individuals who are unemployed or divorced may experience a higher level a stress than persons who have a job or a stable relationship or marriage. Therefore, I expect that UNEMPLOYMENT, DIVORCED, and SEPARATED variables have positive coefficients in the demand equations. Year and region dummies are also included in all regression equations.[110]

Descriptive Statistics of Dependent and Independent Variables

Table 18 presents the descriptive statistics on alcohol and cigarette consumption, which are the dependent variables in the two demand equations.[111] In the first panel, the first column reports that almost 50 percent of the sample has consumed alcoholic beverages in the past month. Among those who reported drinking, the average consumption is 19.05 drinks per month. The last two columns of the top panel show that more men reported drinking than women. Almost 60 percent of the men in the sample have had a drink in the past month, compared to only 41 percent of women. Male drinkers have had an average of 26 drinks in the past month, while female drinkers average almost 12 drinks per month.

The second panel of Table 18 describes smoking consumption in the sample. The data show that approximately 26 percent of the adult population smokes, and the average cigarette consumption among smokers is around 19 cigarettes per day. In addition, 27.5 percent of men have reported that they smoked, compared with 24.6 percent of the women in the sample. Male smokers consume a pack of cigarettes per day (20.8 cigarettes), while women consume an average of 17 cigarettes per day.

Descriptive statistics for the independent variables from the BRFSS data are presented in Appendix C. On average, a six-pack of beer costs $2.76 over the sample period, while a pack of cigarettes costs approximately $1.16 (both reported in 1984 dollars). Average income for the individuals in the sample is $19,137 and the average age is 45. Approximately 57 percent of the sample is female, 85 percent is white, 16

Table 18

Alcohol and Cigarette Consumption - Descriptive Statistics

	Entire Sample	Women	Men
Drinking			
Drinker (percentage)	48.81	41.37	58.59
Drinks Per Month	19.05	11.96	26.00
Smoking			
Smoker (percentage)	25.99	24.65	27.58
Cigarettes Per Day	18.86	17.24	20.81

Note: The means are computed based on BRFSS data 1990-1995, excluding Washington, D.C., Hawaii, Maine, New Jersey and Rhode Island. 468,781 observations have been used in computations.

percent do not have high school education, 58 percent are currently married, 68 percent are working, and 27 percent live in West.

As mentioned earlier, in every year more states have started to participate in the BRFSS, and the sample size has increased over time. Table 19 captures the change in the smoking and drinking behavior over the years in the BRFSS sample. While smoking participation has dropped a little from 1990 to 1995, drinking participation has not shown any notable change over this period. The same trend can be seen in the alcohol and cigarette consumption. Alcohol consumption decreases in

Table 19

Alcohol and Cigarette Consumption Over Time

Year	Number of States	N	Drinking Participation (%)	Alcohol Consumption Among Drinkers	Smoking Participation (%)	Cigarette Consumption Among Smokers
1990	45	75,129	48.6	19.55	24.0	20.71
1991	48	79,793	47.6	19.79	23.9	20.60
1992	49	88,213	47.8	19.56	23.2	20.55
1993	50	94,044	49.6	17.85	22.9	19.99
1994	50	99,446	49.2	18.74	22.8	19.62
1995	50	112,491	49.1	18.87	22.5	19.50

Note: The means are computed based on BRFSS data 1990-1995, excluding Washington, D.C., Hawaii, Maine, New Jersey and Rhode Island.

the first years, but then increases in the most recent years. Cigarette consumption shows a steady decline, although the fall is only one cigarette per day from 1990 to 1995.

Tables 20 and 21 explore the correlation between smoking and drinking. Table 20 focuses on the correlation between smoking and drinking participation. As mentioned before, 48.8 percent of the sample has reported drinking in the past month. Among those 48.8 percent, 27.7 percent smoke, compared with 20.6 percent who have not had a drink. Moreover, 57 percent of smokers have also reported drinking in

the past month, compared to 54 percent of non-smokers. In Table 21, I investigate the correlation between alcohol and cigarette consumption. The average alcohol average

Table 20

Smoking and Drinking Participation

Drinking Prevalence (in percentage)

	Entire Sample	Smokers	Non-smokers
Entire sample	48.8	57.2	54.4
Women	41.3	51.2	49.6
Men	58.5	64.4	58.9

Smoking Prevalence (in percentage)

	Entire Sample	Drinkers	Non-drinkers
Entire Sample	25.9	27.7	20.6
Women	24.6	29.0	15.9
Men	27.5	26.5	25.1

Note: The means are computed based on BRFSS data 1990-1995, excluding Washington, D.C., Hawaii, Maine, New Jersey and Rhode Island. 468,781 observations have been used in computations.

Table 21

Alcohol and Cigarette Consumption

Among Drinkers

		Alcohol Consumption	Cigarette Consumption
Sample	Drinkers	19.05	19.00
	Non-drinkers	0.00	18.54
Women	Drinkers	11.96	17.60
	Non-drinkers	0.00	16.60
Men	Drinkers	26.00	21.32
	Non-drinkers	0.00	20.37

Among Smokers

		Alcohol Consumption	Cigarette Consumption
Sample	Smokers	21.75	18.86
	Non-Smokers	17.46	0.00
Women	Smokers	13.66	17.24
	Non-smokers	9.73	0.00
Men	Smokers	30.17	20.81
	Non-smokers	22.49	0.00

Note: The means are computed based on BRFSS data 1990-1995, excluding Washington, D.C., Hawaii, Maine, New Jersey and Rhode Island. 468,781 observations have been used in computations.

consumption in the sample is 19.05 drinks per month, while smokers consume on average, 21.75 drinks per month. Also, drinkers consume 19 cigarettes per day, slightly more than the sample average of 18.86 cigarettes per day. These results show a strong correlation between cigarettes and alcohol.

Results

In order to study the impact of cigarette price and no-smoking regulations on alcohol and cigarette consumption, I use the model developed in Chapter IV, based on Heckman (1978). In the alcohol demand equation, I include only the no-smoking regulation in other public places. The locations regulated by no-smoking legislation in other public places include, among other places, bars where usually people gather and consume both alcohol and cigarettes. Restricting smoking in bars represents the best opportunity to study how no-smoking regulation affects alcohol consumption, and to examine the relationship in consumption between alcohol and cigarettes.[112]

The probabilities that no-smoking regulation are passed are estimated based on equation (29b), where X_{2i} includes state variables such as, cigarette price, state average per capita income, percentage of children under the age of eighteen in state population, unemployment rate, divorce rate, state production of tobacco leaves, proportion of Democratic Party in state government, short distance and long distance smuggling. Fixed effects for state no-smoking regulations are included in the regression in order to estimate the thresholds for the sentiment against smoking. Each regulation is passed in one state if the sentiment is above the threshold that is

different for each regulation. The results are shown in Table 15, in Chapter IV. The sentiment and the probability for the no-smoking regulation in other public places estimated in Chapter IV and presented in Table 15 are used in this analysis. I match the information with the data in the BRFSS, by year and by state.

The Impact of No-Smoking Regulation on Alcohol Consumption

The alcohol demand equation is estimated using the instrumental variables procedure. The dependent variable is the number of alcoholic drinks consumed by each individual in the past month. The alcohol price (ALCPRICE) is endogenous and therefore two-stage least squares is used to estimate the equation. The price is instrumented by the alcohol excise tax, which comes from Brewers Almanac. The price of cigarettes (CIGPRICE) is also included in the demand for alcohol equation, in order to estimate the cross-price effect. The estimated probability for the no-smoking regulation in other public places and the sentiment variable are also introduced in the alcohol demand equation. By controlling for the no-smoking regulation in the alcohol demand equation, I will be able to estimate a more accurate cross-price effect. Prices and income are entered in log form. Because the model has composite errors, I use the Newey and West(1987) robust procedure to consistently estimate standard errors in the presence of heteroscedasticity and serial correlation.

Table 22 presents the results from the instrumental variables (IV) estimation of the demand for alcohol. In column (1), I estimate the own-price effect and the cross-price effect of cigarettes on the alcohol demand. The no-smoking regulation and

the sentiment variable are not included. By including the results of this estimation I am able to examine how the estimated cross-price effect differs when the two additional variables are included in the demand equation. The coefficient for the ALCPRICE is negative and significant, which indicates that a 10 percent increase in the price of alcohol leads to a 2.1 percent decrease in the alcohol consumption. The result is consistent with the literature. For example, Decker and Schwartz (2000) estimate the demand for alcohol by ordinary least squares and obtain an inelastic demand for alcohol of -.23. The estimated coefficient for the CIGPRICE is positive and significant. The result illustrates a substitution effect. When the price of cigarettes increases by 10 percent, the demand for alcohol increases by 3.4 percent.

In column (2), the demand for alcohol for the whole sample is estimated including the price of cigarettes, the no-smoking regulation and the anti-smoking sentiment in the regression equation. The estimated coefficient for the ALCPRICE is negative, indicating that the demand is inelastic. At a 10 percent increase in the price of alcohol, the demand for alcohol decreases by .5 percent, which shows a smaller own-price effect compared to the results in column (1). Apparently, alcohol consumption is less sensitive to the alcohol price when cigarette price, no-smoking regulation and the sentiment variable are included in the regression equation. Income is positive and significant, which means that when income goes up by 10 percent, the demand for alcohol increases by .4 percent. The coefficient for the CIGPRICE is positive and significant, indicating that cigarettes represent a substitute for alcohol. When the price of cigarettes goes up by 10 percent, the demand for alcohol increases

by 2.8 percent. The coefficient for OTHERLAW is negative and significant. Following Halvorsen and Palmquist (1980), this result indicates that when smoking is restricted in other places, including bars, alcohol consumption declines by 10 percent, or almost 2 cigarettes per day.[113] Although this finding seems to contradict the result based on the cross price effect, a more careful examination reveals that this is not the case. The estimated effect of no-smoking regulation suggests that when smoking is restricted in other places, people go less often to bars or spend less time in these places. As a result, they smoke and drink less. The cross-price effect is sensitive to the inclusion of no-smoking regulation in other places, and the estimated coefficient is smaller. Omitting the no-smoking regulation leads indeed to an over-estimation of the cross-price effect.

The sentiment variable is insignificant. This result suggests that the estimated sentiment represents the public's attitude toward smoking and toward broader health concerns has no impact on drinking. One explanation may be that people receive more information about the negative health consequences related to smoking, while the concern with drinking is usually associated with the danger of driving while intoxicated or with young individuals consuming alcohol. Therefore there may be a more relaxed attitude in the society regarding drinking, compared to the general perception about smoking.

Other results from the regression analysis show that older individuals, more educated people, women and blacks drink less, while unemployed, divorced and separated individuals consume more alcohol.

Table 22

Instrumental Variables Estimation of Demand for Alcohol

Variable	Sample -no regulation- (1)	Sample (2)	Female (3)	Male (4)
CONSTANT	1.05*** (0.15)	1.40*** (0.19)	0.86*** (0.26)	1.26*** (0.28)
ALCPRICE	-0.21*** (0.03)	-0.05** (0.03)	-0.08** (0.006)	-0.02*** (0.006)
INCOME	0.04*** (0.004)	0.04*** (0.004)	0.04*** (0.006)	0.02*** (0.006)
CIGPRICE	0.34*** (0.04)	0.28*** (0.11)	0.16*** (0.15)	0.19 (0.18)
AGE	-0.003*** (0.0002)	-0.003*** (0.0003)	-0.001*** (0.0004)	-0.004*** (0.0004)
HIGHSCHOOL	-0.04*** (0.01)	-0.04*** (0.01)	-0.06*** (0.01)	-0.01 (0.01)
SOMECOLLEGE	-0.09*** (0.01)	-0.08*** (0.01)	-0.08*** (0.01)	-0.08*** (0.01)
COLLEGE	-0.14*** (0.01)	-0.14*** (0.01)	-0.07*** (0.01)	-0.18*** (0.01)
UNEMPLONE	0.09*** (0.02)	0.09*** (0.02)	0.12*** (0.03)	0.06 (0.04)
UNEMPLMORE	0.13*** (0.01)	0.14*** (0.01)	0.11*** (0.02)	0.16*** (0.02)
HOMEMAKER	-0.01 (0.01)	-0.009 (0.02)	-0.01 (0.01)	-0.09 (0.13)

Table 22 – Continued

Variable	Sample -no regulation- (1)	Sample (2)	Female (3)	Male (4)
STUDENT	-0.009	-0.01	-0.12**	0.07*
	(0.007)	(0.03)	(0.04)	(0.04)
RETIRED	0.06***	0.07***	0.07***	0.06***
	(0.01)	(0.01)	(0.02)	(0.01)
WIDOWED	0.08***	0.07***	-0.01	0.21***
	(0.01)	(0.01)	(0.01)	(0.03)
SEPARATED	0.24***	0.23***	0.20***	0.28***
	(0.01)	(0.01)	(0.02)	(0.03)
OTHSTATUS	0.32***	0.32***	0.32***	0.31***
	(0.007)	(0.008)	(0.01)	(0.01)
DIVORCED	0.26***	0.26***	0.18***	0.35***
	(0.008)	(0.009)	(0.01)	(0.01)
BLACK	-0.22***	-0.23***	-0.29***	0.16***
	(0.01)	(0.01)	(0.02)	(0.02)
OTHRACE	-0.15***	-0.13***	-0.17***	-0.09***
	(0.01)	(0.01)	(0.01)	(0.01)
FEMALE	-0.74***	-0.73***	-	-
	(0.006)			
OTHERLAW	-	-0.11***	-0.32***	0.08*
		(0.04)	(0.09)	(0.06)
SENTIMENT	-	0.01	0.02	-0.03
		(0.01)	(0.02)	(0.02)

Table 22 – Continued

Variable	Sample -no regulation- (1)	Sample (2)	Female (3)	Male (4)
Number of observations	195510	195510	95260	99693
R-squared	0.10	0.10	0.12	0.10

Note: The estimation is based on BRFSS data 1990-1995, excluding Washington, D.C., Hawaii, Maine, New Jersey and Rhode Island. The omitted categories are "less than high school" for education, "employed" for working status, "married" for marital status, "white" for race, "male" for sex. The beer price is instrumented by the beer excise tax. The models include controls for year effects (1990 omitted) and region effects ("West" omitted).
Note: ***-significant at 1% level; **-significant at 5% level; *-significant at 10% level. Newey and West (1987) standard errors are shown in parentheses. The dependent variable is the number of drinks in the past thirty days.

In columns (3) and (4) of Table 22, the demand for alcohol is estimated for women and men separately. It is worth noting that women are more price-sensitive. When the price of alcohol increases by 10 percent the demand for alcohol decreases by .8 percent for women, compared with a .2 percent decrease for men. The result is consistent with the literature. For example, Decker and Schwartz (2000) find also that women are more price-sensitive than men. For women alcohol is an inferior good, which means that women with higher income consume less alcohol. The substitution effect with respect to cigarette price is stronger for women than for men. For both men and women, the no-smoking regulation in other public places is significant. However, the effect of the no-smoking regulation is stronger for women. The anti-

smoking sentiment is insignificant in both columns (3) and (4). The results indicate that for the BRFSS data, over the period 1990 to 1995, there is a difference in women's behavior versus men's behavior regarding alcohol consumption. Men respond less to price changes, while women respond more to no-smoking policies. Alcohol is an inferior good for women, while for men it is a normal good.

The Impact of No-Smoking Regulations on Cigarette Consumption

Table 23 presents the results from the IV estimation of the demand for cigarettes. The price of cigarettes is endogenous and correlated with the errors, therefore it is instrumented by the state cigarette excise tax. Again, I use a Newey and West (1987) robust estimation procedure, to correct for the heteroscedastic and serially correlated errors.

In column (1) of Table 23, the demand for cigarettes for the whole sample is estimated without the no-smoking regulations and the sentiment variable included in the equation. This way I am able to compare how the own-price effect if affected by the inclusion of these variables. The coefficient for CIGPRICE is negative and significant. The result suggests that at 10 percent increase in the price of cigarettes the demand goes down by 5.4 percent. The ALCPRICE coefficient is positive and significant. When the price of alcohol increases by 10 percent, the demand for cigarettes increases as well, by 1.4 percent, confirming the substitution effect found from the alcohol demand equation estimation.

In column (2) of Table 23, the cigarette demand equation is estimated including in the regression analysis the price of alcohol, the no-smoking regulations, and the anti-smoking variable. There are only four regulation variables included in the equation. When all six regulations have been included, the results are likely to be imprecise because of the presence of multicollinearity. Therefore, to avoid this complication, the demand equation includes only four regulation indicators: no-smoking regulation in government worksites, in private worksites, in home child daycare, and in other public places, which includes regulations of smoking in restaurants and commercial child day care. The coefficient of cigarette price is negative and significant. The result shows an inelastic demand. At a 10 percent increase in the price of cigarettes, the demand declines by 3.9 percent, result that confirms the findings in the previous Chapter (see Table 16, Chapter IV). In contrast with the case of alcohol, cigarettes are an inferior good. The estimated coefficient of income is negative, which means that at a 10 percent increase in income the demand for cigarettes goes down by almost 1 percent. The coefficient for alcohol price is positive and significant. When the price for alcohol goes up by 10 percent, the demand for cigarettes increases by 1.3 percent. The result verifies the fact that cigarettes and alcohol are substitutes in consumption, as seen in Table 22. Older, unemployed, separated or divorced individuals consume more cigarettes. More educated individuals, blacks and women smoke less.

While all four no-smoking regulations are insignificant, the anti-smoking sentiment is negative and significant. To calculate the percent impact of the anti-

Table 23

Instrumental Variables Estimation of Demand for Cigarettes

Variable	Sample -no regulation- (1)	Sample (2)	Female (3)	Male (4)
CONSTANT	2.65	3.00***	3.19***	2.61***
	(0.23)	(0.22)	(0.33)	(0.31)
CIGPRICE	-0.51***	-0.39***	-0.19*	-0.55*
	(0.12)	(0.13)	(0.19)	(0.17)
INCOME	-0.009*	-0.009**	-0.007***	-0.02***
	(0.004)	(0.004)	(0.004)	(0.006)
ALCPRICE	0.14***	0.13***	0.17**	0.09
	(0.04)	(0.05)	(0.08)	(0.07)
AGE	0.007***	0.007***	0.006***	0.008***
	(0.0002)	(0.0003)	(0.0005)	(0.0004)
HIGHSCHOOL	-0.05***	-0.05***	-0.06***	-0.05***
	(0.01)	(0.01)	(0.01)	(0.01)
SOMECOLLEGE	-0.14***	-0.13***	-0.14***	-0.13***
	(0.01)	(0.01)	(0.01)	
COLLEGE	-0.26***	-0.26***	-0.26***	-0.26***
	(0.01)	(0.01)	(0.01)	(0.01)
UNEMPLONE	0.07***	0.07***	0.04*	0.09***
	(0.02)	(0.02)	(0.03)	(0.03)
UNEMPLMORE	0.07***	0.08***	0.08**	0.08***
	(0.01)	(0.01)	(0.02)	(0.02)
HOMEMAKE	0.06***	0.05***	0.06***	-0.08
	(0.01)	(0.01)	(0.01)	(0.11)

Table 23 – Continued

Variable	Sample -no regulation- (1)	Sample (2)	Female (3)	Male (4)
STUDENT	0.05*** (0.03)	0.06*** (0.03)	0.005 (0.05)	0.11*** (0.04)
RETIRED	-0.16*** (0.01)	-0.17*** (0.01)	-0.12*** (0.02)	-0.22*** (0.02)
WIDOWED	-0.04** (0.02)	-0.03* (0.01)	-0.02 (0.02)	-0.03 (0.01)
SEPARATED	0.06*** (0.01)	0.05*** (0.01)	0.06*** (0.02)	0.02 (0.02)
OTHSTATUS	-0.08*** (0.009)	-0.08*** (0.009)	-0.07*** (0.01)	-0.08*** (0.01)
DIVORCED	0.08*** (0.009)	0.08*** (0.009)	0.08*** (0.01)	0.07*** (0.01)
BLACK	-0.42*** (0.01)	-0.43*** (0.01)	-0.42*** (0.02)	-0.45*** (0.02)
OTHRACE	-0.32*** (0.01)	-0.31*** (0.01)	-0.31*** (0.02)	-0.31*** (0.02)
FEMALE	-0.23*** (0.006)	-0.22*** (0.007)	-	-
GOVLAW	-	0.61 (3.59)	3.96 (5.21)	-2.07 (4.96)
PRIVLAW	-	-1.71 (4.23)	-4.83 (6.08)	0.57 (5.90)
HOMCARELAW	-	3.19 (5.68)	-5.01 (7.31)	2.22 (7.86)

Table 23 – Continued

Variable	Sample -no regulation- (1)	Sample (2)	Female (3)	Male (4)
OTHERLAW	-	-0.04 (1.58)	-1.62 (7.31)	1.24 (2.17)
SENTIMENT	-	-0.04*** (0.01)	-0.009* (0.005)	-0.08*** (0.04)
Number of observations	195510	195510	95260	99693
R-squared	0.10	0.10	0.09	0.11

Note: The least squares estimation is based on BRFSS data 1990-1995, excluding Washington, D.C., Hawaii, Maine, New Jersey and Rhode Island. The omitted categories are "less than high school" for education, "employed" for working status, "married" for marital status, "white" for race, "male" for sex. The cigarette price is instrumented by the cigarette excise tax. The models include controls for year effects (1990 omitted) and region effects ("West" omitted).
Note: ***-significant at 1% level; **-significant at 5% level; *-significant at 10% level. Newey and West (1987) standard errors are shown in parentheses. The dependent variable is the number of drinks in the past thirty days.

smoking sentiment on the demand for cigarettes, the estimated coefficient of SENTIMENT is multiplied by 100, and then by its standard deviation.[114] This means that a one standard deviation increase in the anti-smoking sentiment leads to a 3.2 percent decrease in daily cigarette consumption, or half a cigarette per day. The yearly impact of one standard deviation in the anti-smoking sentiment is a decrease of 10.1 packs of cigarettes per year. This result confirms the finding from Chapter IV of this research, in terms of both direction of impact and magnitude, where the analysis

of state level data reveals that a one standard deviation in the public's sentiment against smoking determines a decline of 12 packs of cigarettes per year of per capita cigarette consumption. It is indeed the state-specific sentiment against smoking that decreases the consumption of cigarettes, while no-smoking regulations have no impact on the demand for smoking.

Columns (2) and (3) of Table 23 present the results from the IV estimation of the demand for cigarettes for women and men, separately. Women are less price-sensitive than men, and the demand for cigarettes is more elastic for men than for women. This confirms the results of Becker and Murphy (1988), that there are differences in behavior between men and women with regard to cigarette smoking. The price of alcohol is insignificant for men, while it is significant for women. It seems that women substitute cigarettes for alcohol in the event of an increase in the alcohol price. While no-smoking regulations are insignificant in both last columns, the anti-smoking sentiment is negative and significant for both men and women, although it is stronger for men than for women.

Conclusion

In this essay, I investigate the economic relationship between alcohol and cigarettes and the possible impact of no-smoking regulations on the demand for alcohol. Previous economic and medical studies establish a relationship in consumption between alcohol and complements. The economic literature has been concerned with the possible connection in consumption between alcohol and

cigarettes based only on the cross-price effects estimated from the demand for these two goods. The evidence about the nature of this relationship is mixed. The cross price effect of cigarettes on the alcohol demand is over-estimated if no-smoking regulations are not included in the regression analysis. Therefore I estimate more accurately the impact of cigarette price on the alcohol consumption, including the no-smoking regulation in other public places in the regression equation. In addition, considering the fact that cigarettes and alcohol are often consumed together, it is possible that imposing restrictions on cigarette smoking in public places (e.g. in bars) will also cause a change in the consumption for alcohol. This side effect of no-smoking regulations has been largely ignored in the literature before, and this is the issue addressed in this essay.

The demand for alcohol is estimated, based on a model developed by Heckman (1978), which distinguishes between the effects of no-smoking legislation per se and the anti-smoking sentiment that people may have. I also examine whether the estimated sentiment variable captures a more general attitude of the public toward cigarettes, alcohol and drug use.

Based on the cross-price estimated effects, a change in the price of cigarettes leads to an increase in the demand for alcohol, suggesting that alcohol and cigarettes are economic substitutes. While the sentiment variable is insignificant in the alcohol demand equation, the no-smoking regulation in other public places has negative and significant effect on the alcohol consumption. The results suggest that the presence of no-smoking legislation decreases alcohol consumption, which reveals an important

secondary effect of this regulation. The result is important because it indicates that there are possible cross-effects of policies regarding one drug on the use of another drug. However, the insignificance of the estimated sentiment seems to suggest that the public is more concerned with the health effects of cigarettes, and perhaps less so with the health concerns with regard to alcohol use. The explanation for this result may be the different attitude that the public has with regard to these two drugs. While the perception is that cigarette smoking has very direct negative effects on health, causing cancer and other diseases, drinking is associated more with the incidence of drunk driving and limiting youth alcohol consumption.

There is a similar cross-price effect of alcohol on the demand for cigarettes, which means that increases in the price of alcohol determine the consumption of cigarettes to go up. No-smoking regulations have no impact on the demand for cigarettes. The model applied to the BRFSS data verifies the results obtained in Chapter IV, that the sentiment against smoking is causing the decline in the cigarettes consumption.

To summarize the findings of this analysis, it is important to notice that while no-smoking regulations do not decrease smoking consumption, they have a negative impact on the demand for alcohol. Alcohol consumption declines in the presence of smoking restrictions in other places, which include bars, where cigarettes and alcohol are used together.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Smoking and the health consequences of tobacco use have been the subject of public policy for the past three decades. Research at public and private institutions has linked smoking to deadly diseases, including various cancers, cardiovascular and heart diseases. Moreover, beginning with 1972's report of Surgeon General, the potential adverse health effect of cigarette smoke on non-smokers has been documented. Passive smoking causes illness in health non-smokers, and 3,000 deaths a year are related to environmental tobacco smoke (ETS).

Increasing amount of evidence about the deadly impact of cigarette smoking on smokers, as well as on non-smokers, has led to increasing concern of policy makers over the years. Actions intended to reduce smoking and protect non-smokers have intensified. Federal and state governments have taken action and enacted legislation aimed at preventing teenagers from starting smoking (legislation that restricts the youth access to tobacco), reducing smoking among smokers of all ages (i.e. excise taxes on tobacco products), and protecting non-smokers from the ETS (restrictions on smoking in public places).

With all the active intervention of state governments, tobacco control has become one of the most aggressive areas of regulation. Since economic deregulation proves to be a positive trend, tobacco regulation also marks the shift of the regulatory

process towards social areas. Provided the public concern regarding the second-hand smoke impact on non-smokers, regulation of smoking in public places has become a tool that policy makers use to restrict cigarette use by smokers in public locations. This study focuses on analysis of these regulations, and intends to provide an economic view on their role as an instrument used by state governments in the battle against smoking and their implications in consumption.

The research provides first detailed information on state regulations of smoking in public places, or shortly, no-smoking regulations. There are six public locations that are regulated: government worksites, private worksites, restaurants, commercial child day care, home-based child day care, and other public places (including bars, shopping malls, grocery stores, enclosed arenas, public transportation, hospitals, prisons, hotels and motels). Dates and specific locations that are being regulated are provided for each state. Arizona is the first state that has passed regulation in 1973, in other public places. Forty-six states have passed no-smoking regulations in one or more public places, between 1973 and 1995. There are still five states with no smoking restrictions, as of 1995. From these data, it can be observed the wide variation in no-smoking regulation across states. This variation is the starting point of this research, which investigates the source of states' regulatory diversity and its economic implications.

The discretion in legislative initiative with regard to no-smoking regulations that state governments have brought a lot of criticism to the role of regulation in state politics. Although the primary intent of smoking regulation in public places is to

protect non-smokers, the difference in regulatory pattern across states suggests that public policy is not the only reason that determines when and whether smoking is restricted. Chapter III of this research focuses on this issue, and analyses the question of what determines states to regulate smoking in public places.

Starting from the theories of regulation, I provide a critical examination of the claim that states regulate smoking in response to a market failure, the negative externality of second-hand smoke. The public interest theory predicts that states should regulate smoking in public places in order to protect non-smokers against the health hazard caused by cigarette smoke. According to this theory, all states should restrict smoking at the same time, in all locations, to eliminate the potential danger of inhaling smoke and contracting diseases for all non-smokers. Instead, the reality provides a more complicated picture, with each state having a different regulatory package, that certainly cannot be explained by this single theory. The claim that no-smoking regulation is passed in order to correct a market failure is critically evaluated, using the economic theory of regulation (ET). The ET predicts that regulation is the result of competing interest groups that offer political support in exchange for legislation favorable to them. Regulation provides benefits to the group that is better organized. Applying this theory to the case that I study, the variation in state no-smoking regulation may be explained by economic, social and political factors specific to each state that may put pressure on states' legislators and influence their decision regarding when smoking is restricted, what public locations are regulated, and how strict the regulation is.

The results in Chapter III indicate that state-specific factors affect the decision of state policy makers regarding the time when smoking is regulated in public places. Tobacco companies, restaurant owners and political parties lobby against no-smoking regulations and are partly responsible for the discrepancy in state legislation. This result represents the contribution of Chapter III to the understanding of the motivation behind policy making at state level. The result is important because it certifies the fact that the concern about the public's well being is not the only determinant in the design of legislation. There are many other state-specific factors or organized groups with political power that intervene in the decision to regulate and when to regulate.

A similar question is posed regarding the restrictions that are imposed by regulation. The public interest theory provides a better explanation regarding the severity of no-smoking regulations. Income is an important factor that determines legislators to impose a more severe regulation. The result is consistent with the general belief that as people earn a higher income, they tend to become more concerned about the overall life conditions and the quality of environment. When a higher income is available people are willing to spend more money for cleaning the air and living a healthier life. More severe restrictions are imposed on smoking in states with a higher percentage of children, and in states with higher per capita cigarette consumption.

The primary intent of no-smoking regulations is to protect no-smokers from the negative health hazard of cigarette smoke. Over the years, most of the states regulated smoking in one or more locations, and public places became a safer place

for children and non-smokers in general. However, the economic literature, beginning with Peltzman (1975), considers the secondary, unintended effects that regulations usually have. In this sense, Chapter IV of this research considers the potential impact that no-smoking regulations may have on smokers and demand for cigarettes. Smokers are very likely affected by these regulations. Smokers have to comply with the existing regulation and adjust their smoking habits, which may be perceived as an additional cost of smoking. Therefore, cigarettes become more expensive for smokers and the demand for cigarettes may suffer changes. The relationship between cigarette consumption and no-smoking regulations is investigated, using a new methodology. The new approach represents a contribution to the literature, and presents a more reliable method to answer this research question. Although previous studies concluded that no-smoking regulations decrease the demand for cigarettes, an important issue raised by Heckman (1978) has been widely ignored. In order to analyze the true impact of no-smoking regulation on smoking consumption, one has to consider the general attitude toward smoking. Since per-capita consumption of cigarettes varies widely across states, it is possible to have low levels of consumption before legislation is passed. The consumption is low not because regulation is passed, but because there is a general anti-smoking sentiment that the state population might have. And because of this sentiment, legislation is passed. Therefore, no-smoking regulations are endogenous, and they may proxy the anti-smoking sentiment. Therefore, I develop a model based on Heckman (1978) in order to study the real relationship between cigarette demand and no-smoking regulations. The results reveal

that no-smoking regulations have no impact on the demand for cigarettes. Instead, it is the states' sentiment toward smoking that decreases cigarette consumption. This is an important finding that clarifies the impact that regulation that protects non-smokers has on smokers. Smoking regulations in public places do not affect cigarette consumption. It is rather the general attitude, which exists and grows because of continuous information that decreases cigarette consumption. Another contribution is represented by the methodology used to obtain the results, which proves to be more reliable because it accounts for both the endogeneity of no-smoking regulations and the anti-smoking sentiment.

Cigarettes are not the only drug of addictive nature. Studies have shown that individuals that smoke are more likely to consume alcohol and other drugs than non-smokers. These findings raise an interesting question about the economic relationship between cigarettes and alcohol. Previous economic studies analyzed the cross-price effect of cigarettes on alcohol and vice versa, but the results are mixed. Moreover, the economic literature pointed out the fact that the effect of cigarette price is over estimated if the no-smoking regulations are omitted. The next question in my research focuses on this issue.

In Chapter V, I attempt to estimate more accurately the impact that cigarette price has on alcohol consumption by considering additional variables in the demand for alcohol equation. Failing to account for no-smoking regulations may lead to an overestimation of the effect of cigarette price. Moreover, following the work in Chapter IV, I make the distinction between the impact of no-smoking regulation and

the public's attitude toward smoking. I specifically investigate whether the estimated sentiment reflects an overall attitude toward drug use in general, not only cigarettes, which may affect cigarette consumption.

In Chapter V the demand for alcohol is estimated using the same model proposed by Heckman (1978), but a different data set. Individual-level data from the Behavioral Risk Factor Survey System are used, containing information on the number of alcoholic drinks per month. The results show that cigarettes and alcohol are substitutes, according to the cross-price effects. An increase in the price of one good causes the demand of the other good to increase.

No-smoking regulation in other places has a negative and significant impact on the demand for alcohol. This means that in states where smoking is restricted in other places, including bars, alcohol consumption declines. The anti-smoking sentiment is insignificant. The result suggests that the public is more concerned with the health effects of cigarette smoking, and less so with the health effects of alcohol. The public's concern with alcohol is different, and is related to the incidence of drinking and driving and drinking among youth.

I estimate the demand for cigarettes using the BRFSS data in order to estimate the effect of alcohol price on cigarette consumption. The alcohol price is positive and significant, which indicates that alcohol and cigarettes are economic substitutes. No-smoking regulations have no effect on cigarette consumption. Instead, the demand for cigarettes decreases because of the public's sentiment against smoking, which is characteristic to each state. The attitude against smoking changes due to continuous

information regarding the dangerous consequences of cigarette smoking and second-hand smoke on people of all ages.

To summarize, the present research provides a general overview on state regulation of smoking in public places. Questions about the mechanisms behind the decision making of public policy at state level are raised. An article by Levy and Marimont (1998) has revealed that the numbers reported by the World Health Organization regarding the deaths related to smoking and the health effects related to secondhand smoke have been exaggerated. Although tobacco still remains one of the deadliest consumption goods, the report raises another question mark about the real intentions of federal and state legislators. The conclusions of the analysis in this research suggest that it is essential to take into consideration economic, political and social factors within a state in order to explain state regulatory pattern. It seems that even in social area, when the regulation is supposed to come to the help of the large public, interest groups with political power, economic motivation, and the promise of voting support are taken into consideration by state legislators.

The analysis of no-smoking regulations reveals the extent of their economic impact. The declared purpose of these regulations is to protect non-smokers from the ETS. Most of the states regulate in some form public places, which guarantees to some extent protection to by-standers, and the danger of second-hand smoke is reduced. However, there is no impact of these regulations on the demand for cigarettes. Although smokers are constrained to smoke in restricted areas or not at all, the level of consumption is not affected by these requirements. One possible

explanation is the fact that still only a few states ban smoking completely in public places. The usual requirement imposed by law is that people smoke in restricted areas, which still allows smokers to consume cigarettes.

A major contribution of this research is the capture of the public's attitude toward smoking into the analysis. Even in Chapter III, when I examine the factors that determine the wide variation of no-smoking regulations across states, the sentiment toward smoking is taken into consideration. The inclusion of various interest groups and other state-specific variables in the model reveals the overall attitude of that state with regard to tobacco and tobacco related issues. The results show how each interest group and each factor contribute to the decision to regulate at state level. In Chapter IV, the sentiment is estimated as a single variable, and is calculated as a combination of all these factors. The variable that is introduced in the regression analysis represents the "net" effect of all interest groups, which may be pro or against the passage of no-smoking regulations.

Based on the findings in this research, the presence of pressure groups with different economic and political interests cause the variation in state legislated actions on smoking. However, besides the obvious protection that no-smokers get thanks to these regulations, when they are imposed, smokers seem to be unaffected in general. One might expect to observe a decrease in the cigarette consumption following the passage of no-smoking regulations, which is not the case. One possible explanation is the fact that the actions of different interest groups have been successful and smoking is still regulated in too few places. A simple look over Table 1 proves it; there are

only a handful of states that regulate smoking in all public places, while most of them regulate smoking in two or three places. Only in one or two cases public locations are declared smoke-free. Such variations do not prove to be efficient at discouraging smokers to consume fewer cigarettes. Therefore, the results in Chapter III build the foundation for the findings in Chapter IV, that no-smoking regulations do not affect the level of smoking.

An important finding in Chapter IV is the fact that the sentiment toward smoking declines cigarette consumption. The result reveals the fact that people's attitude can change and the awareness about the health effects of tobacco use can be raised by continuous information. Therefore, I conclude that although private interests are more successful in delaying regulation, the sentiment toward smoking is more important in reducing the demand for cigarettes. The attitude and the public's concern with the dangers of cigarette use represents the premise of the decision to regulate, but economic and political interests may delay and oppose efficient legislation. Therefore, the public's attitude represents the key, and the concern about the living and health standards is converted in less cigarette use.

However, it is interesting to note that this general attitude regards smoking only. The same sentiment leaves the demand for alcohol unaffected. While the concern with the health effects of drinking is not so strong, people are more concern with other issues related to drinking and driving, and youth consumption of alcohol. For the future, it will be an interesting research topic to examine the impact of public's attitude toward other drugs, including marijuana and other illicit drugs.

A matter of interest for future research will be the analysis of the efficiency of no-smoking regulations in protecting non-smokers. Considering the number of places that are regulated in each state, is the health of children and by-standers improved by regulation? It would also be interesting to study the loss in efficiency of legislation passed, but covering only a few locations and imposing moderate restrictions, compared with a situation when no-smoking regulations would ban smoking completely and would be comprehensive. Another idea for future research would be comparison of costs and benefits of no-smoking regulations. What are the costs of imposing no-smoking legislation and what are the benefits, measured in reduction in medical costs due to smoking-related diseases, longer life expectancy and so on.

ENDNOTES

1. See U.S. Department of Health, Education, and Welfare (1964) (hereafter, US DHHS)

2. Levy and Marimont (1998) argue that these numbers have been exaggerated and for many of them there is no scientific basis. Nevertheless, tobacco and cigarette use remains a major cause of disease and death for people of all ages. The above-mentioned article is just another question mark about the real intentions of regulatory actions promoted by federal and state legislators. It also represents a motivation for the analysis conducted in this research.

3. See Centers for Disease Control and Prevention (1996b)

4. See US DHHS (1972)

5. US DHHS (1986)

6. See Centers for Disease Control and Prevention (1996b)

7. See Peltzman (1975) and Peltzman (1987), who illustrated the secondary effects of automobile safety, and prescription drugs regulations, respectively. Both these regulations changed consumers' behaviors, but not in the desired direction. The results show that following the imposition of automobile safety standards the decrease of highway deaths was offset by the increase in the number of pedestrian deaths and nonfatal accidents, while the enforcement of prescription-only regulation did not reduce the poisoning mortality from drug consumption.

8. US DHHS (1988)

9. US DHHS (1964)

10. See Centers for Disease Control and Prevention (1996a)

11. See Centers for Disease Control and Prevention (1996a)

12. A question one might ask is what is the most important impact of states' tax increase. With higher taxes, the cigarette price goes up inducing people to buy and consume fewer cigarettes. But depending on the price elasticity of demand for

cigarettes, states could gain higher revenues from selling cigarettes.

13. See US DHHS (1972)

14. See US DHHS (1986)

15. See Centers for Disease Control and Prevention (1996a)

16. See US DHHS (1989)

17. See US DHHS (1989)

18. See Centers for Disease Control and Prevention (1996b)

19. See US DHHS (1989)

20. According to CDC Surveillance Summaries (1995), preemptive legislation is defined as legislation that prevents any local jurisdiction from enacting restrictions that are more stringent than the state law or restrictions that may vary from the state law.

21. The statistical description is summarized from CDC Surveillance Summaries (1995)

22. See www.cdc.gov/tobacco

23. See Centers for Disease Control and Prevention (1998)

24. See, for example, Chaloupka, 1990; Chaloupka and Pacula (1998)

25. For a detailed description of the BRFSS, see Giovino et al. (1994)

26. Other risk factors included in the BRFSS are alcohol use, safety belt use, drinking and driving, awareness of high blood pressure and high blood cholesterol, testing for blood ch9olesterol, colorectal cancer screening, and two kinds of vaccinations.

27. See Centers for Disease Control and Prevention (1998)

28. See Centers for Disease Control and Prevention (1989)

29. See Centers for Disease Control and Prevention (1993a)

30. See Centers for Disease Control and Prevention. Office on Smoking and Health (1996c)

31. See Centers for Disease Control and Prevention (1993a)

32. See Centers for Disease Control and Prevention. Office on Smoking and Health. (1996)

33. See Centers for Disease Control and Prevention (1993b)

34. Among the successful examples, we mention the deregulation of transportation services and hydrocarbon fuels, and partial deregulation of telecommunications and electricity (see Noll, 1999)

35. See Noll (1999)

36. For example, the Clean Air act Amendments and the Americans with Disabilities Act in 1990

37. See US DHHS (1964)

38. See US DHHS (1964)

39. See US DHHS (1972)

40. See US DHHS (1986)

41. See West Virginia Tobacco Control Program (1997)

42. At this stage, federal legislation that restricts smoking in public places covered mostly public transportation and government worksites (see Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention (1996b)

43. See US DHHS (1989)

44. See Chaloupka and Warner (1999)

45. Chaloupka and Warner (1999) provide a detailed review of the economic research in this area

46. As of June 1998, there were still four states with no smoking regulation. In 1998, Tennessee enacted regulation restricting smoking in hospitals.

47. This is true especially for those states that passed smoking regulations in early years.

48. See Coalition on Smoking OR Health (1995)

49. See Viscusi et al. (1995)

50. Viscusi et al. (1995) cite the cases of regulation of railroads in the 1980s and of local and long-distance telephone (pp. 326)

51. The exception is the evidence provided by Kroszner and Strahan (1998). They find that some results are consistent with the public interest theory, the deregulation of bank branching is the result of competition among state –specific interest groups. Ideological factors may affect the timing of deregulation as well.

52. See Viscusi et al. (1995)

53. The deadweight cost of taxes and subsidies are generated by the allocation of time and leisure, investments in human and nonhuman capital, consumption of various goods, and other behavioral variables. Increases in taxes and subsidies lead to a sharp raise in the deadweight costs.(See Becker, 1983)

54. This variable is similar to one of the political proxies used by Kroszner and Strahan (1998)

55. A complete description of the duration models is provided by Kiefer (1988)

56. See Kiefer (1988)

57. For the purpose of our study, we consider Washington D.C. as a state in our sample.

58. See Kiefer (1988)

59. See Kiefer (1988)

60. The estimated vector of coefficients b corresponds to –b/p in Kiefer's (1988) specification.

61. We use this strategy to control for correlation between regulations in different public places because of the complications encountered in using a multivariate duration model. Dealing with multiple integrals and implementing an econometric procedure on the statistical packages available at the time of writing this essay are two of the reasons for which we could not develop a multivariate duration model. The alternative strategy is the next best method that captures the interdependence between regulations of smoking in the six categories of public places.

62. See Table 1, Chapter II.

63. Although I proposed two alternative measures to capture the presence of tobacco companies in a state, TOBPROD and TOBCASH, in Tables 10a to 10c I present only the results from the regression equations including TOBCASH. When TOBPROD is used instead of TOBCASH the results are similar, but the coefficient for TOBPROD is much smaller and in some equation even insignificant.

64. See Peltzman (1976)

65. See Grene (1997)

66. U.S. Department of Health, Education, and Welfare, 1964 (hereafter, US DHHS)

67. See Chalopka and Warner (1999) for an extended summary of the literature in this area.

68. Chaloupka and Saffer (1992) and Yourekli and Zhang (2000) examine the effect of smoking regulations at state level.

69. See, for example, Elster (1979); Winston (1980); Schelling (1984), as mentioned in Chaloupka and Warner (1999)

70. See Chaloupka and Warner (1999)

71. See Becker and Murphy (1988)

72. See Lewit et al. (1981), Lewit and Coate (1982), Grosman et al. (1983).

73. Wasserman et al. (1991) use an index to capture the effect of clean-indoor air regulations, following the guidelines provided by the 1986 Surgeon General' report.

74. See Wasserman et al. (1991)

75. See Heckman (1978).

76. Another explanation suggested by Maddala (1983) is that legislation in one period cannot influence the anti-smoking sentiment in the same period.

77. See Maddala (1983).

78. See Tobacco Institute, 1995

79. Other places include bars, child day care centers, home-based child day care, shopping malls, grocery stores, enclosed arenas, public transportation, hospitals, prisons, and hotels and motels

80. The complete description and explanation of state regulations of smoking in public places can be found in the previous Chapter (essay).

81. Studies that consider the problem of cigarette smuggling include Baltagi and Levin, 1986; Thursby and Thursby, 1994; Chaloupka and Saffer, 1992; Yurekli and Zhang, 2000

82. See Chaloupka and Saffer, 1992; Yurekli and Zhang, 2000.

83. For example, TB_{NC} is the gross state cigarette production in North Carolina divided by the combined gross state
cigarette production in North Carolina and in Virginia.

84. See, for example, Chaloupka (1992), Chaloupka and Grossman (1996), Chaloupka and Pacula (1998), Chaloupka and Saffer (1992), Chaloupoka and Wechsler (1997)

85. See, for example, Chaloupka and Pacula (1998), Chaloupka and Saffer (1992), Chaloupoka and Wechsler (1997)

86. Cigarette consumption, price and income are introduced in log form. The rest of other variables are in absolute value. To calculate the impact of a variable in absolute form on cigarette consumption I multiply the coefficient obtained from the regression by 100. See Halvorsen and Palmquist (1980) for more detail.

87. The mean of the estimated sentiment variable is –9.54, and the standard deviation is 2.70.

88. Cigarettes and alcohol have identified as two major causes of disesase and death in the United States. Reducing the high-risk behaviors, including smoking and drinking, among others, reflect a broader health concern of policy makers and have been among the year 2000 national health objectives (see Public Health Service, 1991).

89. See US DHHS (1988)

90. See US DHHS (1988)

91. See, for example, Decker and Schwartz (2000).

92. The minimum legal drinking age (MLDA) was first introduced after Prohibition, restricting access to alcohol to persons under the age of 21. Between 1970 and 1975, 29 states lowered the MLDA to 18, 19, or 20, following the changes in the minimum age for other activities, such as voting. However, studies pointed out to the effects of the lowered MLDA. Driving under the influence became the leading cause of death among teenagers. The evidence prompted citizen groups to pressure states to restore the MLDA to 21. The federal government enacted the Uniform Drinking Age Act in 1984, which mandated reduced federal transportation funds to those states that did not raise the MLDA to 21. Beginning with 1987, all states were required to enforce the MLDA (See Toomey et al., 1996).

93. Chaloupka and Wechsler (1995) argued that the most important alcohol control policies are imposed by the federal government and must be followed by all states. The policies are passed before 1990, when the sample period for this analysis starts. For example, The Public Law 100-690 passed in 1989 imposes that labels warning of the danger of drinking and driving and drinking while pregnant appear on all alcoholic beverages containers. Alcohol Traffic Safety Act of 1983 encourages states to enact stronger laws related to driving under the influence. However, there is not too

much variation regarding the legal limit of the blood alcohol content across states. The most important policy in reducing drinking, especially among teenagers and college students, is alcohol tax.

94. See, for example, Nelson and Morun (1995) and Makowski et al. (1991) on alcohol advertising policies, Linski et al. (1986) on alcohol availability policies, Mayer et al. (1991) and Mackinnon et al. (1993) on warning labels policies.

95. For example, Decker and Schwartz (2000) mention the work of Bobo et al. (1987), and Craig and Van Natta (1977)

96. See Decker and Schwartz (2000)

97. For example, Farrelly et al. (1999) conclude that alcohol and cigarettes are economic complements, while Decker and Schwartz find evidence that cigarettes and alcohol are economic substitutes.

98. In studies using state-level data, the per-capita cigarette or alcohol consumption may not represent the actual level of consumption. Taxes vary widely across states, which leads to large price differences. These differences in cigarette and alcohol prices encourage smuggling activities from lower to higher tax states because of prospects of large profits. When smuggling is ignored, the price effect in the demand equations is over-estimated. Individual-level data do not present this problem, because they report the true level of consumption.

99. See, for more details, Chapter IV, page 115

100. For a detailed description of the BRFSS, see Giovino and al., 1994

101. Other risk factors included in the BRFSS are alcohol safety belt use, drinking and driving, awareness of high blood pressure and high blood cholesterol, testing for blood cholesterol, colorectal cancer screening, and two kinds of vaccinations.

102. See, for example, Decker and Schwartz (2000).

103. See Tobacco Institute (1996)

104. See Chaloupka and Saffer (1992)

105. The ACCRA index is based on prices for many products among retailers in 240-280 "middle management" cities per quarter. See ACCRA (various years).

106. Since the highest sales for beer and alcoholic beverages are recorded in the third quarter of every year, economists use the information on the beer price in this quarter.

107. Other places include bars, child day care centers, home-based child day care, shopping malls, grocery stores, enclosed arenas, public transportation, hospitals, prisons, and hotels and motels

108. The complete description and explanation of state regulations of smoking in public places can be found in the previous Chapter (essay).

109. The individuals in the BRFSS survey give information about the range of total income in their household. I take the middle range income in the interval, and I divide it by the number of individuals in the household to obtain a continuous variable for per capita income.

110. The omitted categories are "male" for sex, "white" for race, "less than high school" for education, "employed" for employment status, "married" for marital status, "West" for region, and "1990" for year dummies.

111. Due to lack of data on alcohol prices for these regions, the analysis excludes Hawaii, Maine, New Jersey, Rhode Island and Washington, D.C.

112. When the demand for alcohol was estimated including two regulation variables, the no-smoking regulation in restaurants and no-smoking regulation in other public places, the multicollinearity was present. The coefficients for the two no-smoking regulations were insignificant because of large standard errors. The no-smoking regulation in restaurants was dropped from the regression equation. Another explanation for not considering the no-smoking regulation in restaurants is that not all restaurants serve alcohol.

113. The mean of the estimated sentiment variable is –5.01, and the standard deviation is 0.98.

114. Halvorsen and Palmquist (1980) explain how to correctly interpret the magnitude of dummy endogenous variables in semi-logarithmic equations. If c is the estimated coefficient of the dummy variable, the relative effect on cigarette

consumption is $g = \exp(c) - 1$, and the percentage effect is equal to $100 \cdot g = 100 \cdot \{\exp(c) - 1\}$.

Appendix A

Descriptive Statistics for State-Level Variables in Regression Equations

Series	Obs	Mean	Std Error	Minimum	Maximum
RESTAUR	1045	2443.59	3266.50	126.53	36217.94
TOBPROD	1032	32958.18	111964.07	0.00	956995.00
TOBCASH	1050	53.44	187.65	0.00	1768.40
YOUNG18	1043	28.58	14.40	2.55	340.94
REALPRICE	1000	93.39	19.21	24.51	156.60
GOVLAW	1050	0.33	0.47	0.00	1.00
PRIVLAW	1050	0.16	0.37	0.00	1.00
RESTLAW	1050	0.29	0.45	0.00	1.00
COMCARELAW	1050	0.11	0.31	0.00	1.00
HOMCARELAW	1050	0.03	0.17	0.00	1.00
OTHERLAW	1050	0.47	0.49	0.00	1.00
CIGCONS	1000	120.19	30.09	44.20	90.50
UNEMPL	1050	6.64	2.11	2.20	18.00
DIVORCE	1008	5.22	1.87	2.20	17.80
DEMCTRL	1029	0.58	0.49	0.00	1.00
DEMPROP	1050	0.49	0.30	0.00	1.00

Continued

Series	Obs	Mean	Std Error	Minimum	Maximum
INCOME	1044	1247.63	468.01	215.80	10404.63
EDUC	1044	0.61	0.31	0.12	7.09
SDSMUG	1000	-11.54	42.8	-513.59	32.42
LDSMUG	1014	-0.53	67.02	-573.31	48.58

Appendix B

Sources of State-Level Data

Tobacco production (TOBPROD). The state production of tobacco leaves (in 1000 lbs). Source: National Agricultural Statistics, USDA-NASS Agricultural Statistics.

Tobacco cash revenue (TOBCASH). The tobacco receipts from tobacco sales, in millions of dollars. Source: The STATE System.

State annual restaurant sales (RESTAUR). The annual retail sales in eating and drinking places (SIC 58), in millions of dollars. Source: Statistical Abstract of the United States, from 1975 through 1996.

Percentage of young people under the age of 18 in state population (YOUNG18). The number of children under eighteen in the state divided by the total state population. Source: The Statistical Abstract of the United States, 1975-1996.

Annual personal income (INCOME). The personal income in current prices. Source: The Statistical Abstract of the United States, 1975-1996.

Percentage of state population with at least a bachelor degree (EDUC). Source: US Department of Health, Education and Welfare, Office of Education, Earned Degrees Conferred 1975-1995.

Rate of divorces per 1000 population (DIVORCE). Source: The Statistical Abstract of the United States, 1975-1996.

Rate of unemployment (UNEMPL). Source: The Statistical Abstract of the United States, 1975-1996.

Democrat Party Control (DEMCONT). This is a dummy variable, which takes value 1 if Democrats dominate in both houses of the legislature in one state, and 0 otherwise. Source: The Statistical Abstract of the United States, 1975-1996.

Democrat Party Proportion (DEMPROP). This variable equals one-third if Democrats have the majority in the assembly, and Republicans have the majority in the senate and the governor is Republican as well. Source: The Statistical Abstract of the United States, 1975-1996.

Per capita annual sales of cigarettes (CIGCONS). The variable represents the number of cigarette packs (in thousand units) per capita. Source: Tobacco Institute, 1996

Per capita annual sales of cigarettes (CIGCONS). The variable represents the number of cigarette packs (in thousand units) per capita. Source: Tobacco Institute, 1996

Cigarette Price (CIGPRICE). The price of cigarette includes all Federal, state and local excise taxes imposed on cigarettes, as well as any state level taxes applied to cigarettes. The cigarette price is a weighted average of the prices of single-pack, carton, and vending machine sales, where the weights are the fractions of each in total sales at the national level. The variation in cigarette comes from the wide differences in cigarettes excise taxes across states. Source: Tobacco Institute, 1996

Cigarette Excise Tax (CIGTAX). This variable represents the state excise tax. Source: Tobacco Institute, 1996

Appendix C

Descriptive Statistics for Independent Variables From the BRFSS Data

Variable	N	Mean	Std Dev	Minimum	Maximum
ALCPRICE	468781	2.76	0.24	2.26	3.59
CIGPRICE	468781	1.16	0.14	0.88	1.51
INCOME	468780	19137.82	14379.71	416.66	75000.00
AGE	468781	45.04	17.24	18.00	99.00
HIGHSCHOOL	468781	0.33	0.47	0.00	1.00
SOMECOLLEGE	468781	0.25	0.43	0.00	1.00
COLLEGE	468781	0.26	0.44	0.00	1.00
UNEMPLONE	468781	0.01	0.13	0.00	1.00
UNEMPLMORE	468781	0.02	0.15	0.00	1.00
HOMEMAKER	468781	0.08	0.27	0.00	1.00
STUDENT	468781	0.03	0.18	0.00	1.00
RETIRED	468781	0.18	0.38	0.00	1.00
WIDOWED	468781	0.10	0.30	0.00	1.00
SEPARATED	468781	0.02	0.15	0.00	1.00
DIVORCED	468781	0.12	0.32	0.00	1.00
OTHSTATUS	468781	0.18	0.38	0.00	1.00
BLACK	468781	0.08	0.27	0.00	1.00
OTHRACE	468781	0.07	0.26	0.00	1.00

Continued

Variable	N	Mean	Std Dev	Minimum	Maximum
FEMALE	468781	0.57	0.49	0.00	1.00
MIDWEST	468781	0.26	0.44	0.00	1.00
SOUTH	468781	0.36	0.48	0.00	1.00
NORTHEAST	468781	0.11	0.32	0.00	1.00
SDSMUG	468781	-19.42	72.96	-513.59	15.33
LDSMUG	467203	-9.87	76.87	-424.82	24.83
GOVLAW	468781	0.66	0.47	0.00	1.00
PRIVLAW	468781	0.31	0.46	0.00	1.00
RESTLAW	468781	0.57	0.49	0.00	1.00
COMCARELAW	468781	0.37	0.48	0.00	1.00
HOMCARELAW	468781	0.11	0.32	0.00	1.00
OTHERLAW	468781	0.76	0.42	0.00	1.00

The means are computed based on BRFSS data 1990-1995, excluding Washington, D.C., Hawaii, Maine, New Jersey and Rhode Island. The omitted categories are "less than high school" for education, "employed" for working status, "married" for marital status, "white" for race, "male" for sex, "West" for region.

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