

UC Berkeley

UC Berkeley Electronic Theses and Dissertations

Title

Death or Tobacco Taxes: The United States cigarette tax policy and some International Evidence

Permalink

<https://escholarship.org/uc/item/7rt8q3pn>

Author

Avendano Garcia, Natasha

Publication Date

2011

Peer reviewed|Thesis/dissertation

Death or Tobacco Taxes:

The United States cigarette tax policy and some International Evidence

By

Natasha Avendano Garcia

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in

Public Policy

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor John M. Quigley, Chair

Professor Alan Auerbach

Professor John Ellwood

Professor Frederico Finan

Fall 2011

Abstract

Death or Tobacco Taxes:

The United States cigarette tax policy and some International Evidence

by

Natasha Avendaño Garcia
Doctor of Philosophy in Public Policy

University of California, Berkeley

Professor John M. Quigley, Chair

There are many reasons why a government would like to tax differentially commodities known as "bads." One is to discourage its consumption; these are goods that generate negative externalities, addiction and health problems. Another reason is that since these consumption goods have a relatively inelastic demand, taxing them heavily will bring a big deal of revenue for the government. Finally, there is a moral element in having the consumer of these so called sinful goods to face higher prices through taxes.

Cigarette and other tobacco products are categorized in this group, traditionally in the United States the cigarette tax has been applied as an excise tax. The interesting design feature of this tax is that it is a single stage tax and it is already included in the product's price at the time of purchase, making it almost invisible and in theory less politically sensitive.

This paper answers two sets of questions that are equally relevant for the study of excise taxation, and in particular, of cigarette taxation. The first set is: What is the influence of the tax in consumer behavior? How do consumers respond to any increase in taxes, while controlling for all other variables such as smoking restrictions, publicity and factors like income, race, and other demographic characteristics? And the second is: what is the influence of political decisions and other types of political and social variables in the determination of cigarette taxes?

These questions are answered by using a two equation model, and a data set for the USA fifty states and D.C, from 1970 to 2010. The impact of different social, economic and political variables is studied, and the results are discussed under the optic of an integrated analysis of public finance and political economics.

To Gregorio, with all my love and dedication
Tu mami

Acknowledgment

The author wishes to thank several people. I would like to thank my husband, Juan Pablo, for his love, support and encouragement during this adventure. I would like to thank my parents for their unending love and support. I would also like to thank John Quigley for his help and great guidance in this project and for all his advice, friendship and generosity during the past five years. I would like to thank Alan Auerbach, John Ellwood and Fred Finan for their comments, both as part of my Qualifying Exam Committee and Dissertation Committee. Last but not least, I would like to thank the Ministry of Finance of Colombia and my former boss Juan Pablo Zarate for the financial support and permission to do my Ph.D.

Introduction

Tobacco taxes, as part of the commonly known “sin” taxes, have captured the attention of several fields of study. This policy area has increasingly become an important economic and political phenomenon, involving public participation in the policy-making process and thus having an impact on consumers’ behavior. In turn, this impact suggests that the results analyzed in this paper go beyond the revenue effects of any other excise tax.

Sin taxes are sometimes viewed as natural candidates for revenue raising purposes, since the demand for these products is relatively inelastic. In addition, the fact that these taxes punish the consumption of a “bad” does not generate too much voter discontent, given the moral considerations of the issue. Some studies have shown, as noted below, that it is not even clear that tobacco producers and manufacturers will experience considerable lost profit from a hike in tobacco taxes because of the possibility of transferring the entirety of the tax onto consumer prices.

This paper examines the policies concerning tobacco taxes in the U.S. largely by compiling the available literature on the matter and analyzing the political economy implications of these taxes. The federal structure of the United States grants the possibility of focusing on the particular policy of each state and allows analyzing the impact of those policies on federal and state revenues. It also lends itself to an analysis of the politics of policy-making and consumers’ response to tobacco restrictions, independently of what those policies originally intended to address.

This paper answers two sets of questions that are equally relevant for the study of excise taxation, and in particular, of cigarette taxation. Those first set of questions is: What is the influence of the tax in consumer behavior? How do consumers respond to any increase in taxes, while controlling for all other variables such as smoking restrictions, publicity and factors like income, race, and other demographic characteristics? Most of the literature has focused on answering this question. There are several papers written under different areas of study: focusing on calculating the elasticity of cigarette consumption with respect to taxes, the impact on decreasing cigarette consumption through increasing cigarette taxes, the measurement of all the health consequences of smoking, and finally the impact of cigarette taxation on cigarette prices.

The second set of questions in my particular case motivated me to study this topic and is equally relevant: what is the influence of political decisions and other types of political and social variables in the determination of cigarette taxes? The influence of political lobbies and other economic and social variables in the determination of the tax is neither obvious nor clear and very little work has been done to answer this question.

Ultimately, the answer to this question is an additional step in the analysis of the influence of cigarette taxation in the consumption of cigarettes. The question becomes then, what is the influence of political decisions in cigarette consumption? This is why this effort is an innovative way of studying cigarette taxes and the effect of political decisions in consumer behavior.

The effect of cigarette taxes on consumption is well documented and the conclusion of researchers in this field is that there are two main economic conditions by which any tax should be determined. Those economic conditions are the principles of equity and efficiency. When discussing sin taxes, however, there are other variables that should be considered, given that this type of taxes is very sensitive politically and concerns the interests of various sectors of the society, even though they are not as visible as other taxes.

Since cigarette taxes have large revenue potential and the elasticity of the product is relatively small its responsiveness to change in prices is very little. However, the determination of the tax is never done considering only the economic principles of equity and efficiency; instead, myriad other factors exert their influence. Those other factors are mainly political variables, like lobbying efforts and contributions to state legislatures, the demographics of the states, the religious composition of the states, etc. In fact, those factors have persistently shaped state cigarette taxes over the past forty years. South Carolina and Virginia are clear examples of states where taxes have been subject to intense political and industry pressure to keep them low.

Finally, this effort is an invitation to other countries different types of political systems to consider fundamental cigarette taxation reform given cigarettes' great revenue potential and the opportunity presented with this paper, to measure the influence of other variables as determinants of those taxes.

This paper is organized as follows. The first section describes some technical considerations on tobacco taxes and some historical background on the U.S tobacco tax system. The second analyzes the politics behind policy decisions of this kind. The third section discusses other forms of tobacco regulation. The fourth section presents economic considerations; the fifth section gives a brief description of the state of the art in cigarette taxation in Colombia; the sixth describes the data and the seventh presents a statistical and econometric analysis of the economic, social and political factors that may influence the current and future state tax structure. Finally, the paper ends with a note of caution regarding the interpretation of the coefficients and some concluding remarks.

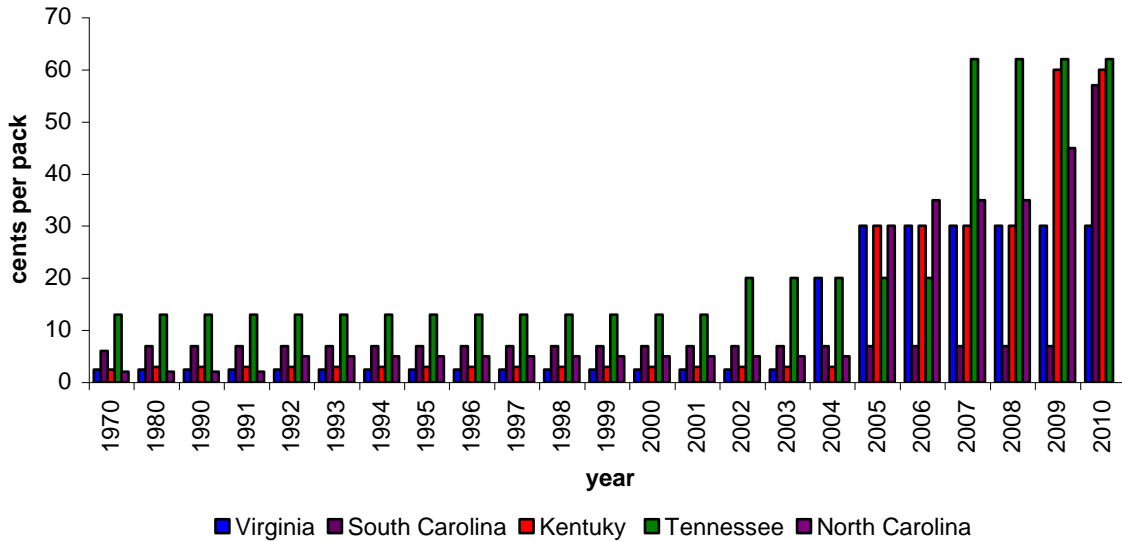
1. Historical Background

Historically, all states enacted cigarette taxes in the 1920s, except for Virginia in 1960 and North Carolina in 1969. In 1995, tobacco-producing states still had very low rates. Between 1995 and 1998, 11 states raised the cigarette state tax, some to \$0.50 per pack and others to \$0.75. Alaska and Hawaii raised the tax to a level of \$1 per pack. By the end of 1998, 16 states had a tax over \$0.50. After the Master Settlement Agreement, California's tax increased to \$0.87 per pack, and the following year New York's went up to \$1.11.

Since 2000, 46 states have passed more than 95 separate state tax increases. Currently, Connecticut and Rhode Island have cigarette tax rates above \$3.00; 15 states have cigarette tax rates of \$2.00 per pack or more; and 28 states have tax rates over \$1.00 per pack (Graph 1 & 2).

Graph 1

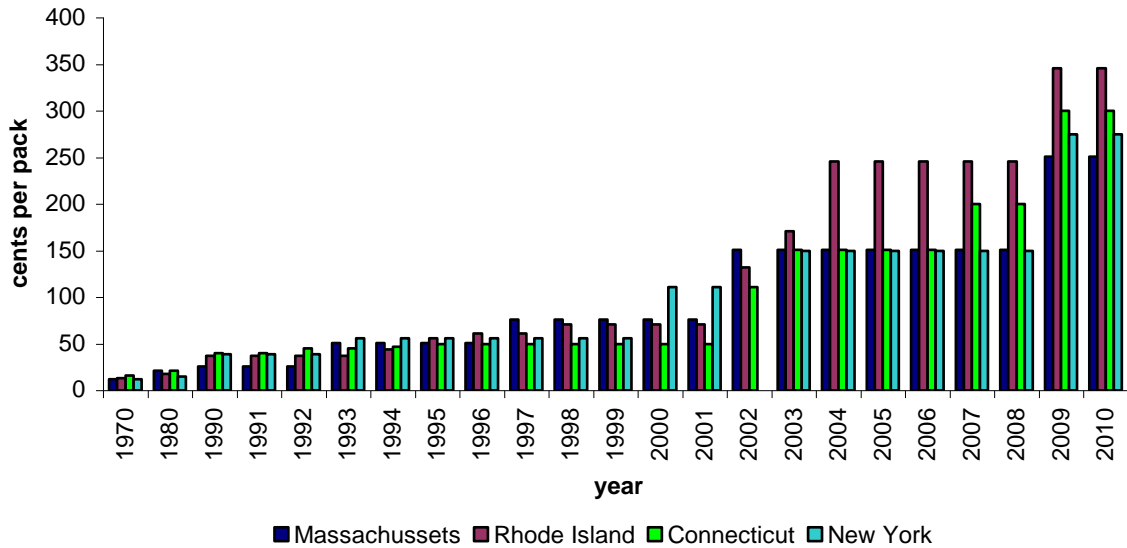
**Cigarette taxes in lower tax states
1970-2010**



Source: <http://www.tobaccofreekids.org/research/factsheets>

Graph 2

**Cigarette taxes in higher tax states
1970-2010**



Source: <http://www.tobaccofreekids.org/research/factsheets>

Different forces have affected the course of tobacco taxes in the states throughout the last decades. These forces relate to social determinants, political affiliations and economic incentives; all of the above have interacted in different ways to generate the current tax systems.

This paper provides an in-depth analysis of the tobacco tax legislation since 1970 in each state; it also presents a quantitative analysis of those various social, economic and political determinants of tobacco taxes in the states.

The existing literature suggests that there is evidence to believe that tobacco taxes are influenced by more than just the economic incentives behind any excise tax.

2. Political forces behind the tax policy decision.

Legislators, as public elected officials, have constituencies to which they are accountable. Political pressure may come from several fronts: religious groups, producers and manufacturers of tobacco-related products; the entertainment and tourism industry and citizens in general (Johnson and Meier 1990).

Religious preference is probably among the most important factors that affect individuals' attitudes towards cigarette taxes; certain churches in the United States have major concerns regarding smoking, drinking of alcoholic beverages and gambling.¹ Particularly, Protestant fundamentalists have historically had a significant national and state level role in the political debate about the taxation and restriction of those activities (Hertzke 1988; Miller 1958; Meyer 1960; Hutcheson and Taylor 1973, *in* Johnson and Meier 1990).

On the contrary, Catholic-predominant states have a more tolerant view of individual actions that do not directly affect others (Monroe 1975 *in* Johnson and Meier 1990), a fact that makes these states less likely to have high sin taxes and restrictions on those activities.

Production and manufacturing considerations are also likely to be important with regards to taxes of the tobacco industry. Producers have low organization costs, and as a result they should be able to organize themselves and be able to exercise political pressure and lobby to attain lower taxes. The conventional wisdom suggests that because taxes add to the price of cigarettes and would have a direct effect in reducing demand, the tobacco industry would push for lower taxes (Johnson and Meier 1990). Here, industry is not only understood as states² that produce tobacco as an agricultural crop, but also as those that have cigarette manufacturers in their states.

The entertainment and tourism industry relies heavily on the consumption of these goods; states like New Jersey and Nevada have built their own tourism industry around gambling. Since gambling is an activity that generally is accompanied by the consumption of alcohol and tobacco products, this could be a determinant on state tax policy (Johnson and Meier 1990).

On average, individual citizens are unaware of most of the tobacco and alcohol taxes since they are already included in the price of the commodity. Individuals tend to appear informed about commodity taxes when their attention is directed to it, suggesting that salience is an

¹ According to the Pew Forum on Religion & Public Life / U.S. Religious Landscape Survey in 2007, 51.3% of the adult population in the United States belonged to Protestant churches, and 23.9% to the Catholic Church, being the most important religious affiliations in the country.

² According to the National Agricultural Statistics Service Report historically the tobacco producers states have been: North Carolina, Kentucky, Tennessee, Virginia, South Carolina, Ohio, Missouri, Pennsylvania, Connecticut, Rhode Island and Massachusetts.

important determinant of individual behavioral responses to taxes (Chetty, Looney and Kroft, 2008).

As with any other tax, sentiment on tobacco taxes is also influenced by general views of political affiliation. Even though conservatives are in general against taxes, taxes on tobacco are seen as “good taxes” because they are thought of as user fees (Johnson and Meier 1990). Hence, one may think that conservative states are more likely to have higher sin taxes.

Finally, elected officials’ individual interests are, at the end, the decisive element in public policy debates. Funding of government programs and maintaining a certain level of benefits within the states may define how different legislators’ respond to the different interest groups described above. Sin taxes may not raise as much revenue as more conventional sales, income or property taxes, but political competition may increase the use of them as the need for increased budgets prevails.

Johnson and Meier (1990) estimated a model including specific measures for the political forces influencing the policy-making process on the state revenues from sin taxes in 1987. The authors analyzed three different sin taxes, cigarette, alcohol and gambling. The results pertaining cigarette taxes are presented below.

The authors found that the determinants of cigarette tax are mainly three: the existence of tobacco industry is associated with a 75% reduction in the cigarette tax rate, a 1% increase in catholic population will result in a 0.166% increase in cigarette taxes and a 1% increase in consumerism generates a 0.451% increase in taxes (Johnson and Meier 1990).

Regarding a state decision on the use of sin taxes, Johnson and Meier (1990) found that a 1% increase in cigarette taxes produced a 0.214% increase in sin tax revenues and can be associated with a 0.231% increase in revenue dependence on sin taxes. The presence of tobacco production in the state, however, reduces sin tax revenues by about 21%, mostly because these states have lower cigarette taxes.

In general, state sin tax dependence is positively associated with conservatism, and negatively related with existence of entertainment industry, production industry, and the existence of Protestant churches. Also, states with consumer-oriented legislators and under high pressure from property taxes are more likely to reach to sin taxes as a financing option to provide additional revenues.

3. Other forms of restrictions and regulations on the tobacco market

Different forms of legislation pertaining to tobacco control and regulation have also been part of states’ interests. Excise taxes on cigarettes, although having proved historically to reduce consumption, need to be reinforced with other type of measures. Other regulation-like actions, mainly the Master Settlement Agreement in 1998, and the increasing restriction on indoor and public space smoking have been the other target of state control.

Master Settlement Agreement

In 1998 the United States through the lawsuits of 46 state Attorneys General against the major cigarette manufacturers acquired a novel regime on tobacco control. The main claim of the

lawsuits was to recover state Medicaid costs attributable to cigarette smoking, considered to be the leading preventable cause of death in the United States³.

The settlement requires manufacturers to pay approximately \$246 billion to the state governments and the National Association of Attorneys General over a period of 25 years. Besides the monetary cost, the settlement imposed various restrictions with regards to advertising and marketing practices, as the prohibition of mass-transit posters and billboards (Derthick 2001).

Additionally, the industry will receive in return a settlement of all state suits, immunity for future punitive damages as part of individual suits and immunity from future class-action suits. The agreement was essentially a form of “legal insurance,” where part of the component of the payment was a volume adjustment tying each company’s yearly payments to the volume of cigarettes sales and converting this settlement in a tax, roughly 45 cents per pack (Gruber 2001). The industry could pass this tax onto prices and suffer only a \$1 billion per year reduction in profits, while transferring \$13 billion per year to the states (Bulow and Klemperer 1998, *in* Gruber 2001).

Based on the above discussion, we could conclude that, since every state differs in its social, economic, and political composition the resultant interest and stakes on cigarette taxation are different. States with economies heavily dependent on the tobacco industry such as North Carolina, Kentucky, Virginia, Georgia and Tennessee have light taxes and try to have fewer prohibitions on cigarette use. On the other hand, states with no economic stakes on the industry but with a high anti-smoking movement sentiment such as California, Utah, Oregon and Massachusetts have higher taxes and have ruled against smoking in different places. The variety of political forces, each one pulling in a different direction, has historically kept Congress away from tobacco control at the federal level.

The tobacco litigations were not born at the legislative level of the states, they were part of an initiative of private tort-lawyers and state Attorneys General. As a matter of fact, the legislatures did not have to finance the lawsuits because they were prepared by the private lawyers under a contingency-fee contract part of the agreement. Lawyers representing 46 states received \$1.25 billion initially and \$500 million per year thereafter (Gruber 2001).

Some of the states’ Attorneys General never sued directly, but ended up signing the MSA nonetheless. The free-rider incentives created by the first Attorneys General once an agreement was foreseeable were clear. Prices were going to increase at the national level as a result of the settlement, so it did not make sense to refrain from giving to its own state a portion of that settlement as extra revenue from the tobacco industry.

As a result the MSA generated a considerable increase in the market price of cigarettes, intended by anti-smoking movements to discourage consumption. The agreement also generated the cartelization of the industry with the aim of protecting manufacturers from the entrance of new competitors not included in the agreement.

Instead of signing the MSA, it would have been better to implement an additional 45 cents per-pack tax at the federal level. This would have saved all the reduction in liabilities granted to manufacturers and the huge lawyer fees paid by the states. These costs were the political economy costs that had to be paid in order to increase revenue from the cigarette industry given the current political and budgetary situation at that time. That juncture made any action taken by the federal government to raise the price of cigarettes unlikely to be successful (Gruber 2001).

³ National Conference of States Legislatures, State cigarettes excise taxes 2009 report: <http://www.ncsl.org/Default.aspx?TabId=14349#Facts>

Each state was entitled to use its portion of the MSA revenues as they wished. In 2001 a large portion of the money was committed nationwide to health services and research, and approximately 9% was devoted to smoking prevention programs. In particular, Illinois used 72% of its funds to establish a property-tax relief. North Dakota put 45% of the money in trust funds for water resources and flood control. Michigan planned to use 75% of its money on scholarships for high school graduates (Derthick 2001).

Smoking and Tobacco regulations

Tobacco control began its ascent in 1964 following a U.S Surgeon General report, which highlighted the health dangers of tobacco consumption. Since then many regulations at the state and local level emerged with the aim of discouraging tobacco use.

The federal government as part of its actions in 1979 began to require health warnings on cigarette packages. Congress prohibited smoking on airline flights and cigarette advertising was banned from radio and television. Increasingly, state and local anti-tobacco activists were demanding prohibition of smoking in private and public environments. Legislation included clean indoor air acts and local smoking ordinances by city and county governments. By 1995, 41 states had restricted smoking in government offices, 26 in private work places, 32 in restaurants and 45 in other locations as malls, public transportation vehicles, and hospitals (Derthick 2001).

Between 1960 and 1990's, cigarette consumption and adult smoking rates halved. In 1992, Congress enacted the Synar Amendment, a law aimed at having and enforcing laws prohibiting the sale and consumption of tobacco to minors under the age of 18. By 1995, 32 states had imposed restrictions on cigarette-vending machines; 33 required a retail license for cigarette vendors with severe penalties in case on non-compliance. By 1997, 5 states passed laws containing penalties to minors in possession of tobacco products.

Attention towards taxing other forms of tobacco use has been increasing since the mid 1980's. In 1985, there was no federal tax on smokeless tobacco products, and only 21 states had an excise tax with low rates compared to cigarette excise tax. Between 1985 and 1992, 22 states raised this excise tax, and by 1993 there was a 2.8 cents tax per 1.2 oz can of snuff and 2.4 cents per 3oz pouch of chewing tobacco.

4. Economic considerations

In the producer and consumer sides of the cigarette industry cigarette taxes are believed to be perceived by both as taxes that affect the demand for the product, and one may expect that the policy actions are more likely to be contrary to industry desires. On the other hand, the moral argument of taxing "sin" offers a balanced pressure for legislators. Both the moral and the industry arguments rely on the assumption that demand for cigarettes is elastic for some segments of the population:⁴ as price increases demand will drop (Johnson and Meyer 1989). Hence, an increase in taxation will increase the product price, decreasing and discouraging consumption. However, cigarette and other tobacco products have been taxed mainly because of their relatively inelastic demand, making them an easy source for revenue increases.

⁴ These segments are mainly low income smokers and young smokers.

Thus, if individuals are highly loyal to their preferred brand of consumption, higher overall taxes might decrease consumption if demand for cigarettes is elastic. If demand is inelastic, then individuals will just pay higher prices for the brands they prefer. In the absence of high loyalty, higher overall taxes will just generate a shift in consumption preference from more expensive brands to generic or discount brands or to substitute products such as tobacco snuff or chewing tobacco. Some studies have found that an increase in cigarette taxes may increase smokeless tobacco use if the excise taxes on those substitutes remain low compared to cigarette excise taxes. This result appears to be particularly true for young males, a cohort that seems to be more responsive to change in tax rates than older cohorts (Ohsfeldt, Boyle and Capilouto, 1998).

Elasticity of demand: room for revenue rising?

Traditional models of demand using a variety of statistical approaches to analyze aggregate and individual data, including substantial variation across states and over time, and with different measures of cigarette consumption, have encountered that the short-term price elasticity for overall cigarette demand is around -0.3 to -0.5 (Chaloupka and Warner 1999). On the other hand, using rational addiction models to estimate cigarette demand leads to greater price responsiveness, -0.40 for short-term and -0.75 for long term (Evans, Ringel and Stech 1999). Further discussion of the assumptions of these models will follow in the next section.

Sissoko (2002) estimated the price and income cigarette demand elasticity of all 50 states and the District of Columbia; the author finds that demand is price inelastic for all states and D.C, ranging from -0.0004 to -0.8095⁵. Thus higher tax states with relatively less inelastic demand should experience a greater demand decline than lower tax states with a higher elasticity of demand.

Sung et al (1994) estimated a price elasticity of demand for California cigarette consumption of -0.40 in the short run and -0.48 in the long run, and a price elasticity with respect to the state tax of 0.18.

The demand for cigarettes appears to be income inelastic as well; the income elasticity ranges from 0.0109 to -0.00063⁶ for all 50 states and D.C. These results suggest that cigarettes tend to not be an inferior good; also, a low per capita income growth will not have an important impact on the tobacco industry growth (Sissoko, 2002)

Excise taxes are an imperfect tax to be considered a permanent revenue source. Because of the tax structure design, inflation tends to erode the base of the tax, decreasing its real value if the tax is not updated periodically. Further, because cigarette taxes are levied at all government levels, an increase in government taxes by one level will reduce revenues of another level by the reduction in consumption (Evans, Ringel and Stech 1999).

Also, raising the federal tax rate on cigarettes will have a heavier effect on high tax states than in low tax states, pricing smokers out of the market. A high federal tax rate may discourage young people and price-sensitive consumer from smoking, but will also imply a significant loss of tax revenues, since less consumption implies lower tax receipts. As a result, funds needed to implement health programs to cure and prevent related smoking diseases will decrease (Sissoko 2002).

⁵ Thirteen states had statistically insignificant coefficients, those states coincide to be the lowest tax states in there respective regions.

⁶ 13 states showed positive income elasticity and only 18 exhibit statistically significant coefficients.

Fully myopic agent?

In a less traditional approach to modeling consumption of cigarettes, researchers have adopted an alternative framework that models the dynamic behavior of the consumption of addictive goods literature.

Observed addictive behavior is naïve in the sense that an individual recognizes the dependence of current consumption decisions on past consumption, but then ignores the impact of current and past choices on future consumption decisions when maximizing his present utility. Myopic behavior implies an infinite discounting of the future. Several studies undertook an empirical examination of cigarette demand and found that the stock of past cigarette consumption has a negative impact on the production of commodities as health and satisfaction from current smoking, and that the price elasticity of demand was -0.47, concluding that cigarette smoking is an addictive behavior and that price has a significant impact on cigarette demand (Mullahy 1985, *in* Chaloupka and Warner 1999).

Rational addiction model

Becker and Murphy's (1988) "rational addiction" framework contemplates that individuals recognize both the monetary price and the costs as part of the full price of consuming addictive goods, in terms of future addiction. Hence, consumption of cigarettes today will depend not only on past consumption, but on future consumption and thus in future prices. This framework is consistent with the forward-looking addicts for whom the expectation of higher prices in the future will reduce consumption today.

Current consumption of an addictive good is inversely related to not only the current price of the good, but also to all past and future prices; as a consequence, the long-run effect of a permanent change in price will exceed the short-run effect. The authors predict that the effect of an anticipated price change will be greater than the effect of an unanticipated one, while a permanent price change will have a larger impact on demand than a temporary price change.

Chaloupka estimated the long-run price elasticity of demand to be around -0.27 to -0.48, larger than the conventional demand equations. He found consistent evidence that cigarette smoking is an addictive behavior and that smokers did not behave myopically (Chaloupka and Warner 1999).

Gruber and Koszegi (2000) argue that modeling smokers as time inconsistent is more accurate than using solely rational addiction model assumptions. This is particularly evident if one analyzes the intentions to quit smoking at future dates, and how many of those are effectively realized. A time consistent smoker will make the decision to stop smoking and then will follow through. However a time inconsistent one will want to quit in the future to be able to smoke today. As a result a time inconsistent smoker will most likely use commitment devices, such as treatments to stop smoking and use anti-smoking gum to fight against his own time-inconsistencies.

The use of rational addiction models will conclude that the optimal tax should depend only on the externalities their consumption generates on society. However, with time inconsistency, the optimal tax would be much higher to correct the internalities that smoking imposes on consumers. When incorporating time inconsistency into the rational addiction model, even not accounting for externalities, tax policy would act as a commitment device for time inconsistent

agents and would help to correct misperceptions among “naïve” agents about addictiveness and health impacts of smoking. Cigarette taxes will thus correct the internalities and externalities of smoking. The authors found two interesting results: the first one is that individuals are forward looking with respect to the decisions of future consumption on addictive goods. An announcement of a future tax increase will both increase sales and decrease consumption of cigarettes, a result consistent with forward-looking behavior.

The second one is an optimal tax policy implication. By including time inconsistency to the model, the optimal tax per pack of cigarette should be at least \$1 higher than in the rational addiction case, only accounting for the internalities caused by smoking (Gruber and Kozsegi 2000).

Smuggling and Bootlegging

As a practical matter the share of the tax in cigarette prices varies depending on the state. In the U.S, taxes account on average for 33% of the price, varying from 11.36% in South Carolina, to 50.99% in Rhode Island⁷. This difference generates an opportunity for cigarette smuggling and other types of tax evasion, generating a possible loophole for revenue-generating state taxes when neighboring states have lower tax rates.

With low transportation costs and the big variation of cigarette tax across states the cross-border problem can be a severe one. In 1977 the Advisory Commission on Intergovernmental Relations (ACIR) estimated that states lost up to a sixth of their potential revenue from cigarette taxes due to cross-border sales.

Coats (1995) found that on average, a 1 cent real increase in the state’s sales tax on cigarettes reduce states sales by 0.9 percent, and a 1 cent real increase in state’s cigarette excise tax results in a reduction of 2.1 percent of sales taxes. These results suggest that an increase in state’s cigarette tax leads to losses of in-state sales and out-of-state sales to buyers from neighboring states. This result, when analyzed to account for reduction in state sales, has to be carefully reviewed since the drop in state sales might be due more to switching states of purchase than actual reduction in smoking behavior.

Internet and Indian Reservation sales are another concern when analyzing the effectiveness of cigarette taxes to reduce consumption, since these providers are often exempt or do not charge federal and state taxes.

Equity and Efficiency Considerations

Corrective taxation could be imposed as an excise tax on the consumers of cigarettes as long as the market prices should fully reflect true production costs including external costs. However, imposing a greater share of society’s tax burdens on smokers on the basis of their consumption raises equity and efficiency issues. Such discrimination causes both horizontal and vertical inequities, thus leading to inefficient consumption decisions and resource allocations (Sissoko 2002).

In terms of horizontal equity cigarette taxation violates this principle, since one might think that people that are identical except for their smoking behavior should be called “equals”.

⁷ For the year 2008 the average retail price per pack was \$5.31 and the average state and federal tax was \$1.73.

However, the violation of this principle doesn't seem to be of high concern, as is the question of vertical equity.

The apparent regressivity of cigarette taxes is upheld by the fact that the tax would be a higher percentage of the expenses of low income consumers in comparison to more affluent ones. However this claim is only true if both types of consumers smoked at the same rate (Chaloupka and Warner 1999).

The Congressional Budget Office using data from the Consumer Expenditure Survey (1984-85) found that expenditures on tobacco products increased with income, except for the highest income quintile. However, as a percentage of post-tax income, tobacco spending is inversely related to income level. The CBO also established that younger families have higher tobacco consumption as a proportion of their income and as percentage of total expenditures.

Chaloupka (1991) concluded that less educated people had a higher price elasticity of demand than more educated ones; and Farelly et al (1998) found a more elastic cigarette demand among low income consumers than among high income ones (*in* Chaloupka and Warner 1999).

Even though concerns on vertical equity of cigarette taxes might be an issue to discuss, it has been known among analyst and policy-makers that the ultimate goal of fiscal policy should be that the overall impact of the tax and expenditure system be progressive or proportional, rather than regressive.

With regards to efficiency, optimal tax theory would suggest that the revenues generated should be equated with the net external costs produced by smoking. Such external costs include both negative externalities and private costs for smokers. The following sections will go over both types of costs taking in to account the addictive nature of cigarette consumption.

Externalities

A great deal of literature has measured the externalities associated with smoking. Manning et al. (1989, 1991) found that the net value of the externalities associated with smoking is about 16 cents per pack in 1986, a number that may seem low at first glance. Nonetheless, the increasing health costs associated with smoking-related diseases are offset by smokers' premature death, reducing Medicare health insurance expenses and Social Security payments (Gruber 2001).

Externalities associated with smoking have been evaluated by several authors. Health costs to second-hand smokers (Environmental Tobacco Smoking) have been calculated within the range of 19 cents per pack when only accounting for the cost of lung cancers (Manning et al. *in* Chaloupka and Warner 1999) to 70 cents per pack if adding the heart disease deaths (Glantz and Parmley 1995 *in* Chaloupka and Warner 1999). The effect of smoking while a woman is pregnant and its effects on low birth weight babies impose short-run costs of medical care and long-run costs on special education varying from 42 to 72 cents per pack (Evans, Ringel and Stech 1999). Loss of workplace productivity may increase number of sick days; however, since it is not reflected in wages it cannot be measured as an externality.

Those who support Pigovian excise taxation justify the levy of such a corrective tax based on the difference between marginal social cost and marginal private cost (Baumol, 1972 *in* Sissoko 2002). Unless the external costs of smoking are charged, either to producers or consumers, smokers will continue to have a high level of consumption generating an excessive production of cigarettes. Optimal taxation theory would suggest the application of a tax intended to reduce the negative externalities associated with cigarette smoking to a desired level. The burden of such a

tax would be shared by producers and consumers according to the price elasticities of supply and demand for cigarettes.

Supply side of the market: Tobacco producing areas

Incorporating the effects of increased smoking restrictions and cigarette taxes on farm policy making (effects on prices, quantities quota lease rates and revenues) provides information to minimize the impact of cigarette taxes on tobacco producing areas.

Production and prices of tobacco are controlled under the U.S. tobacco program through a combination of price support and marketing quotas. Price supports are calculated by a weighted average of changes in production costs and lagged market prices. National quotas are set yearly based on tobacco purchase intentions announced by the manufacturing industry, a three year average of exports adjusted by inventories held by tobacco cooperatives.

Brown (1995) used a smoking restriction index⁸ taken from Wasserman et al. (1991) to find the elasticity of U.S cigarette consumption with respect to smoking restrictions. An increase in smoking restrictions of the index by 0.5 will decrease the domestic quantity of cigarettes sold by 4%, while a 75 cents tax increase will decrease it by 19%. The results suggest that a 67% percent increase in the index was equivalent to a 67% increase in the federal excise tax at the current levels when the study was realized.

With regards to tobacco-farm policy, the optimal strategy to minimize the impact of cigarette taxes on farmers is to reduce tobacco price supports enough to maintain current production levels. On the other hand, offsetting a 45 cents tax implies a 5% reduction of the national quota levels or a 2% reduction in farm-level price of the price support program. This reduction in price would be offset by an increase in tobacco exports.

The struggle here for policy makers is that a policy lowering price support to maintain production levels decreases the revenues for tobacco producing states by 4.6%; in contrast a reduction in the quota to maintain prices results in a reduction of 9.6% in state's revenues. Nonetheless, the quota reduction has an impact on returns to quota (cartel rent that is a residual return in tobacco production). Therefore, a decrease of 9.6% in tobacco farmers' revenue has an increase of 9.6% in quota rental rates. Then the question becomes who to benefit: the quota owners or the actual rural growers.

Oligopolistic behavior of the cigarette industry

Under the rational addiction model, the most consistent finding from empirical research is the correlation between future and current consumption of cigarettes suggesting the existence of temporally-dependent demands. This fact should be a warning alert when analyzing the supply side of the market of the addictive good, since there is likely to be an interaction between current consumption and future profits or utility if one or both sides of the market are forward-looking agents (Showalter 1999).

⁸ The index is built as follows: if a state restricted smoking in work sites, the index is equal to 1. States with smoking restaurant restrictions but no private offices get 0.75. Restrictions in other four public places different than the private offices and restaurants received a score of 0.25.

Theoretically, in a market controlled by a monopolist or by oligopolistic firms, anticipated future events can affect current consumption of cigarettes through the forward looking optimization behavior of the firm, even in the presence of completely myopic consumers.

A firm with market power might optimally decide to price at or below its marginal cost during some period of time in order to engage consumers in the consumption of the addictive good, in this case cigarettes. This firm will be differentiated from competitive firms in its response to anticipated future events, and its capacity to manipulate prices based on future profitability expectations. If the firm is able to distinguish between different groups of consumers, “new” and “addicted” with different elasticities of demand, a decrease in new consumers or in expected future profits can lead to a higher price of the good (Showalter 1999).

When taxes are raised, cigarette manufacturers will raise prices by more to obtain maximum profit from current addicted smokers. These increased current profits will help offset future losses generated by the reduced consumption resulting from the price hike (Becker et al. 1994, *in* Chaloupka and Warner 1999).

For the period of 1960 to 1990, Keeler et al. (1996) estimated that a 1 cent increase in cigarette state taxes increased prices by 1.11 cents. They also found that federal increases in the tax rate will have a higher impact on prices than state tax hikes. From these findings they concluded that cigarette manufacturers price-discriminate by state in the sense that states with higher taxes and stronger anti-smoking laws are offset by states with lower prices. Evans, Ringel and Stech 1999 estimated that for every dollar raised in additional tax revenue, cigarette manufacturers would lose only 8 cents in pre-tax profits.

Optimal Tax Theory

In the tax literature there is a consensus that models of optimal tax theory rely on three basic assumptions⁹. First, models consider a set of feasible taxes for the government, and the government's revenue needs. In this regard, although lump-sum taxes are the first-best solution they are typically eliminated because of their implementation difficulties. Second, each model specifies how individuals and firms respond to taxes. Individuals have preferences about consumption of goods, and make decisions with the aim of maximizing their utility; firms have a given production technology and operate under the minimization of costs; this interaction of individuals and firms in a given market structure produces the market outcome. Third, the government too has an objective function for evaluating different types of tax structures. Some models set the government's objective to minimize the welfare implications generated by the tax system while raising a set amount of revenue. Other more sophisticated models balance efficiency considerations with equity concerns, as discussed in previous sections.

In light of optimal tax theory, the analysis of the excise cigarette tax can also be conducted under these three lenses. Excise taxation has the problem of an easily erodible tax base since it is a nominal value infrequently updated with inflation. Excise tax advocates find it easier to control by the government, since it is an additional cost that will be reflected in the final price the consumer pays and is not a percentage of the price of sale. Additionally, excise taxes do not discriminate against high price cigarettes versus low priced ones.

⁹ Slemrod, Joel (1990). Optimal Taxation and Optimal Tax Systems. *Journal of Economic Perspectives*, 4, Winter 1990, 157-78

On the demand side of the market, cigarettes as an addictive good have a relatively inelastic demand; since its consumption not only imposes external costs in society but generates health consequences to the individual, cigarettes become a good candidate for tax revenue rising. In this case the excise tax not only corrects the market failure but is an opportunity for the government to increase tax revenue while discouraging excessive consumption of a “bad.”

On the supply side, the cigarette industry differs from one in perfect competition; this structure introduces another market failure to our analysis. In this case the imposition of an excise tax, given the demand characteristics, will most likely increase cigarette prices while having very little effect on the profits of the firms, and playing against the regressivity of the tax system.

Finally, cigarette tax revenue, if used to fund the cure and prevention of cigarette consumption and ETC related diseases, will reinforce its corrective effect regarding externalities. A benevolent government will try to reduce the deadweight loss of a tax while balancing out the equity concerns and its revenue needs.

Revenue raising vs. reducing smoking

The use of cigarette taxes has proven to be moderately effective in reducing cigarette smoking; given that cigarette consumers are relatively unresponsive to price, all levels of government have used them as a way to raise revenues. However, if the tendency on smoking habits continues to decline, this policy action will attain a level at which its effectiveness will be undermined by the high taxes¹⁰. At the limit, the marginal benefit of the tax would decrease in terms of reducing cigarette prevalence and consumption. Better understanding of the behavioral factor altering cigarette consumption is needed to implement more effective anti-smoking strategies (Sheu et al. 2004).

Several studies have measured the effect of cigarette taxes on cigarette consumption, since this has been one of the goals in using this policy action. Some of the studies have even examined the effectiveness of state-versus-federal taxes in achieving this goal.

During the period from 1955 to 1994 federal taxes appeared to be more effective than state taxes reducing consumption. Depending on the equation specification, a 1 cent increase in state excise taxes per pack of cigarettes is associated with a 0.600 to 0.652 pack per capita reduction in consumption. In the meantime, a 1 cent increase in federal tax per pack drops consumption by 0.9032 to 1.15 packs per capita (Meier and Licari 1997).

There are several explanations for the fact that federal taxes are practically immune to the effect of “bootlegging.”¹¹ After a state tax increase, some cigarette consumers can go to nearby states with lower taxes to buy cigarettes, decreasing in-state purchases even more than consumption. The effectiveness of a tax deterrence program at the state level not only depends on particular state-policies, but on a cooperative action among adjacent states.

Another reason might be that states normally increase their cigarette taxes by a small amount, while the federal taxes increase by more salient amounts: 8 cents in 1991 and 4 cents in 1993. This fact, added to the increased campaign of public awareness of the health concerns of tobacco smoking since mid 1960’s, generated that after the adoption of warning labels, tobacco

¹⁰ Laffer Curve

¹¹ State cigarette purchases are used as the measure for state consumption.

consumption dropped by 1.65 packs per capita, holding everything else constant (Meier and Licari 1997).

However, another view is that these results have to be carefully revised given the anomalous response to the 1983 federal tax increase. It appears that firms aggressively raised prices starting the year before the tax increase, leading to a marked decline in sales and thus in consumption. Apparently nothing similar occurred during the 1991 and 1993 federal tax increases, resulting in a weaker decrease in sales (Showalter 1998). These results suggest that given the oligopolistic structure of the industry and as a result their ability to form a cartel and coordinate industry responses to policies, the effect of such policies might need to be carefully evaluated.

For the particular case of the state of California, Sung et al. (2005) calculated that the effects of federal tax increases in 1991 and 1993 had a stronger effect than the state tax increases, but that the 2000 and 2002 federal tax increases appear to have had no significant effect in reducing cigarette consumption in California. Also controlling for tax effects and other factors, several multivariate analysis showed that the increase in expenditure in tobacco control programs was effective to significantly reduce cigarette consumption in all states (Farrelly et al. 2003 *in* Sung et al., 2005).

Analyzing particular states over the past forty years, and the evolution of per capita sales of cigarettes and the average retail price and cigarette tax, the general trend is a decline in per capita sales and an increase in real cigarette prices, even though cigarette taxes have not necessarily increased in real terms in every state.

Kentucky, Missouri, South Carolina and Virginia show a decreasing trend of the tax in real terms. Despite that, the average retail price of cigarettes has almost doubled.

On the other hand, states like Michigan, Maine, New Jersey and Rhode Island, have kept the real value of the tax and even have had real increases, as a result, the price has spiked even higher than in those states with lower taxes.

5. State of the Art of Cigarette Taxation: International Evidence, the Colombian Case.

History of Cigarette taxes

Even though Colombia has a centralized tax system, the country has particular collection and spending rules for specific taxes on cigarettes, by which each region owns the tax receipts it collects and can use that money within its own regional boundaries. This system generates different incentives for the legislators of each state/region that mimics the dynamics of the United States' federal structure in this regard.

Cigarette taxes are specific taxes with a singular tax rate applied to the consumption of the good. The owner of the tax receipts is the central government but it is transferred completely to the departments (regions). Each department has to use the transferred resources to invest a specified proportion in health and sports promotion. The remaining amount can be spent at the discretion of the department.

This structure makes each department the ultimate proprietor of those specific tax receipts, thereby most likely generating different incentives for politicians and governors across regions.

In 1986 a tax of 100% of the price of the good was established. Later on 1994 the tax was reduced on domestically produced and imported cigarette consumption from 100% to 45%. Apparently, this measure was intended to halt the deterioration of the domestic tobacco industry, given the high level of smuggling that was occurring and which placed the domestic producer

under disadvantageous competitive conditions. However, the reduction of the rate implied a reduction of more than half of the tax received by departments and the Capital District.

However through a sentence in 1995, the Constitutional Court declared unenforceable the reduction of the tax rate, hence reestablishing it to 100%.

By December of 1995 a more detailed regulation on the matter, gave the cigarette excise tax the following characteristics:

- The taxable event for this tax is the consumption of cigarettes and tobacco snuff manufactured in the jurisdiction of the departments.
- The active subject is the respective department where consumption is effectuated.
- The taxpayers responsible for the tax are producers, importers and in solidarity with them, the distributors. Furthermore, transporters and retailers are directly responsible when they cannot justify the origin of products transported or sold.
- The tax due is at the time that the producer delivers the product in a factory or plant for distribution, sale or exchange in the country or for advertising, promotion, gift, commission or for self-consumption.
- In foreign products tax is due at the time of their introduction into the country, unless they are in transit to another country.
- The tax base of this tax consists of the retail price, as follows:
 - a) For domestic products, the retail price is defined as the price charged to dealers in the capital of the department where the plant is located, excluding excise tax, and;
 - b) For foreign products, the retail price is determined as the customs value of the goods, including tariff charges, plus a marketing margin of 30%.In no case the tax paid by foreign products should be below the average tax charged to a Colombian-made cigarette of the same or similar class.
- The rate is 55%.

In 2006, some changes were introduced in the tax base and in the tax rate. The changes were:

- Effective January 1, 2007 the tax base of excise taxes for domestic and foreign cigarettes and tobacco snuff is the biannually certified retail price by DANE (Bureau of National Statistic).
- Effective January 1, 2007 the consumption tax rates for cigarettes and tobacco snuff are as follows:
 - a) For cigarettes and cigars with retail prices up to COP 2,000 the tax is COP 400 per pack of 20 units or proportionally to its content.
 - b) For cigarettes and cigars whose retail price exceeds COP 2,000 pesos the tax will be COP 800 per pack of 20 units or proportionally to its content.
 - c) The tobacco snuff per gram is COP 30.

Within the above rates the tax designated for sports promotion, was incorporated as a percentage of 16% of the value of the consumption tax.

These rates were to be updated annually at the rate of growth of final consumer prices of these products, certified by the DANE.

Finally, in 2010 the rate was changed to:

- The consumption tax rates for cigarettes and tobacco snuff are as follows:
 - a) For cigarettes and cigars, effective February 10, 2010 the tax is COP 650 per pack of 20 units or proportionally to its content.

b) For cigarettes and cigars, effective January 10, 2011 the tax is COP 700 per pack of 20 units or proportionally to its content.

c) The tobacco snuff per gram is COP 36.

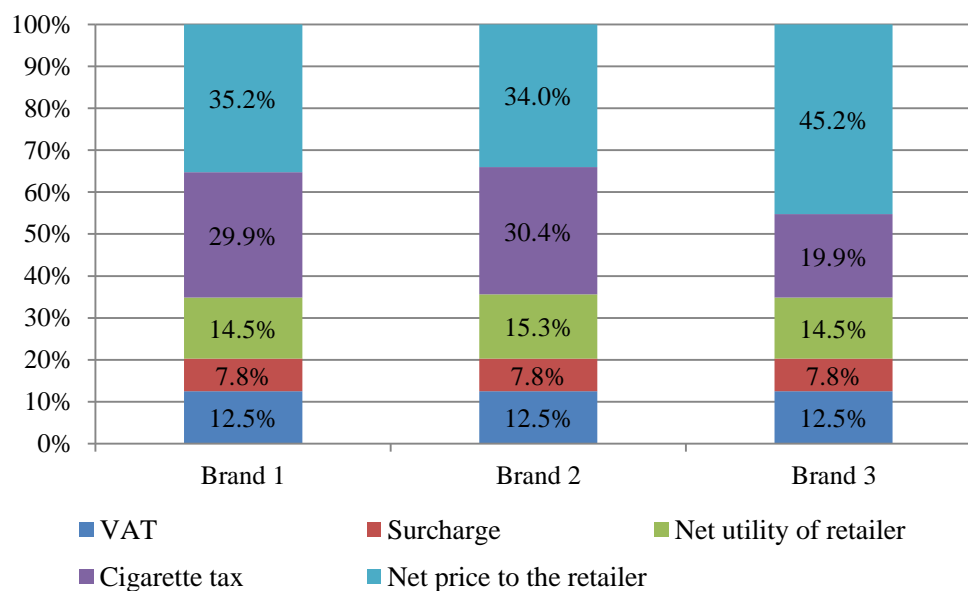
- 21% of the gross tax collection on cigarette and tobacco snuff should be spent on health and as of January 1, 2011 this percentage will be 24%.
- The value of the sports contribution covered is calculated as 16% of the 79% of the gross tax collection on cigarette and tobacco snuff; and as of January 1, 2011 will be over 76%.

All these changes show how the evolution of the tax went from an ad valorem tax to an excise tax, to study the reason for these changes and be able to identify what were the political, economic and social structures at the time of each change (production, lobbying, health sector needs, etc) may prove important to the determination of the current tax system and to be able to identify how distant it is from the optimal tax.

Demand

The real price of cigarettes in Colombia in the last decade shows no clear trend, but rather moderate fluctuations. In 2010, the price remains at levels below those at the beginning of the decade, which were already low. The comparison with other countries in the region indicates that the country had in 2000, a low price. In 2009, most countries have increased their prices through taxes, examples of these measures where Mexico, Panama, Uruguay and Brazil. On the contrary, price stability in Colombia led to an increase in the differential against other countries in the region. Per pack tax structure of three different brands is showed in Graph 3.

Graph 3
Per Pack Tax Structure - 2010



Source: CIET (2010)

In terms of price structure, Colombia has a low tax burden compared to other countries in the region and the world. Indeed, taxes represent over 60% of the price in EU countries, Australia, Canada, India, Brazil, Argentina, Mexico, Costa Rica, Chile and Ecuador. In contrast, the total tax burden in Colombia represents between 40 and 50% of final price.

This low burden does not reflect the recommendations of international organizations, such as the World Bank¹², on the optimal tax level. In middle-income countries like Colombia, the effective tax bracket to achieve results in public health goals should be 60% to 80% of the average retail price.

When analyzing the evolution of the tobacco tax regime, the effective rate charged today of the consumption tax is below the ad valorem tax of 55% charged in the decade of the nineties and of course, below the 100% which prevailed in previous decades.

According to WHO (2009), in Colombia the price of the best selling cigarette brand is \$0.80 dollars and taxes comprise 34% of the final selling price. The price in dollars in Colombia is lower than the average for the region (\$2.30 dollars), ranking fourth after countries such as Paraguay, Cuba and Bolivia and the portion of the price corresponding to taxes is lower than the average in the region (46%)

Elasticities of Demand

There have been a recent number of empirical studies in Latin America that account for current information on the behavior of the demand for cigarettes. Some of the studies are CIET (2010) for a sample of 5 countries; Jiménez et al. (2008) and Olivera et al. (2010), which made estimates for Mexico; Gonzalez (2006) for Argentina; Iglesias (2006) for Brazil; Debrott (2006) for Chile and Ramos (2006) for Uruguay. The price elasticity of demand estimated from these studies varies from -0.27 to -0.7.

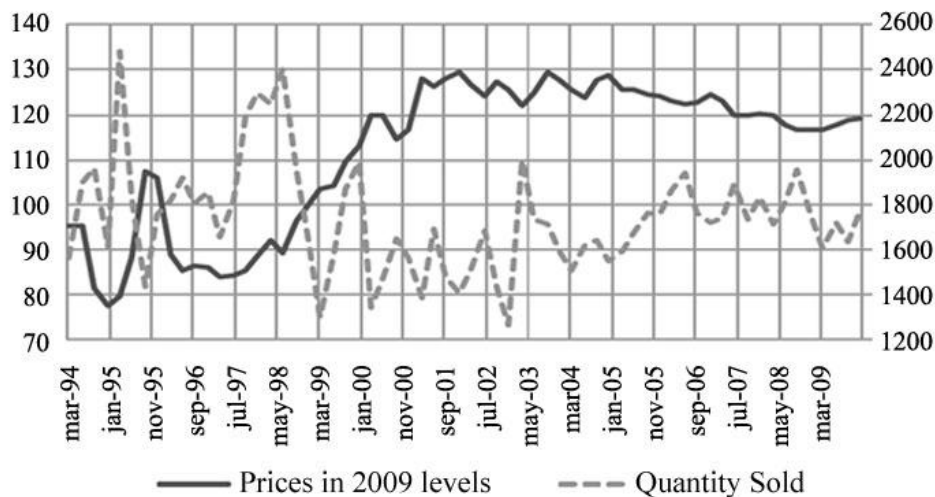
For the Colombian case, studies by Santamaría (2007); ICLS (2010), and MPS-OPS (2011), estimate elasticities that vary from -0.3 to -0.53 which would indicate a fall in consumption of 30% to 53%, when there is an increase in prices of 100%, holding everything else constant. Even with a wide range of estimates, the results confirm that cigarettes are inelastic to price. Graph 4.

Tax Revenue

The collection of cigarette tax in Colombia is characterized by irregular behavior dominated by four distinct periods. The first is between 1984 and 1990 in which revenue is kept constant. Between 1990 and 1996, collection falls vertically, followed by a small recovery in the four years prior to 2000 and then remains more or less constant until 2010.

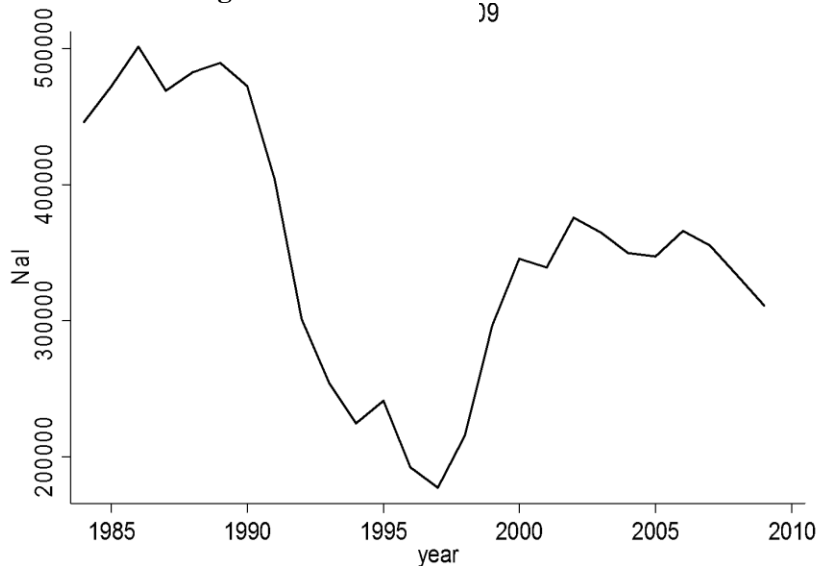
¹² World Bank. 1999. *Curbing the epidemic Governments and the Economics of Tobacco Control*. Washington D.C.

Graph 4
Price of 20 cigarette pack and quantities sold
(2009 prices)



Source: CIET (2010)

Graph 5
Cigarette Tax Revenue 1984 - 2010



Source: DIAN

6. The U.S Cigarette Tax Policy: Description of the data

The results presented in this paper are derived from a panel of data from the 50 states plus the District of Columbia from 1970 to 2010. The variables include different social, economic and political characteristics of the population in the states over the period of time. All the values are

converted to constant dollars of 2010, using the CPI deflator base 1982-1984 published by the BLS.

I first present a detailed analysis of the relevant variables in relation to tobacco taxes and then a series of regressions that highlight some of the determinants of tobacco taxes over the decades. After that, I move to a more qualitative analysis of the determinants in each state and how the different variables affect the tax determination in each case.

In the panel of the fifty states and Washington D.C. the correlates and determinants of the tax through the decades can be divided into three main categories. First, economic variables: beer tax, spirits tax, tax on other tobacco products, as correlates; cigarette taxes revenue dependence, production of tobacco, unit price of tobacco, per capita income, local and state per capita tax burden, per capita cigarette sales, smoker population and a dummy for smuggling based on tax differences.

The second category includes political variables: proportion of Democrats and Republicans in the lower and upper chambers of the state legislature and majority of Democrats in state legislature. Also, monetary campaign contributions from the tobacco industry to legislature members, governor and other state officials by political party are included in the panel with data available since 1992.

Thirdly, social variables: percentage of Catholic population, percentage of Protestant population discriminated by the three main Protestant traditions, Evangelical churches, Mainline churches and Historically Black churches; restrictions for public smoking and the ranking of smoking restrictions, air-free rank, a numeric score produced by The American Lung Association and presented annually in the State of Tobacco Control, complemented with the SLATI report produced by the ALA too. The ranking is based on the smoke-free air laws enacted by each state,¹³ and its enforcement and application.

Economic Variables:

Previous research suggested that some of these variables had an impact on the level of cigarette taxes for a given year. In an effort to confirm the effect of those variables thru the history of cigarette tax changes, I present a statistical analysis, followed by the OLS and state and time specific fixed effects estimations of a model of two simultaneous equations. The first equation is for the determinants of state cigarette taxes and the second explains cigarette consumption.

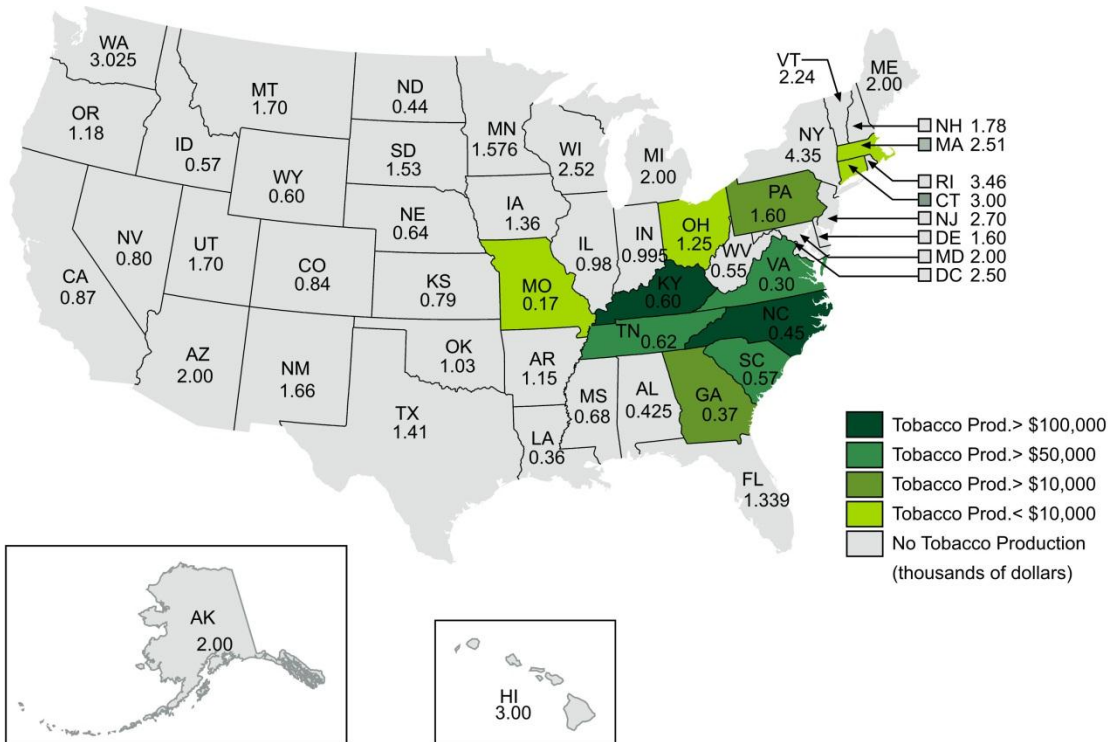
When comparing the difference in means in cigarette tax among tobacco producing and non-tobacco producing states, the difference is statistically significant from zero at the 99% level ($t=9.24$); that is, on average, tobacco-producing states have a lower tax than non-tobacco producing states. This makes sense since tobacco producing states would lobby to keep those taxes low in order to not affect the tobacco agro industry. Later, in the analysis of campaign

¹³ <http://www.stateoftobaccocontrol.org/2008/methodology-state-grades.html> “The smokefree air laws grading system is based on criteria developed by an advisory committee convened by the National Cancer Institute with some modification to reflect the current policy environment. The criteria were presented in the article, “Application of a Rating System to State Clean Indoor Air Laws (USA)” (J.F. Chriqui et al., Tobacco Control, 2002; 11:26-34). This approach provides scoring in nine categories: Government Workplaces, Private Workplaces, Schools, Child Care Facilities, Restaurants, Retail Stores, Recreational/Cultural Facilities, Penalties and Enforcement.”

contributions, it will be possible to identify if in fact the legislatures of those producing states are the ones receiving more contributions from the tobacco industry. Map 1.

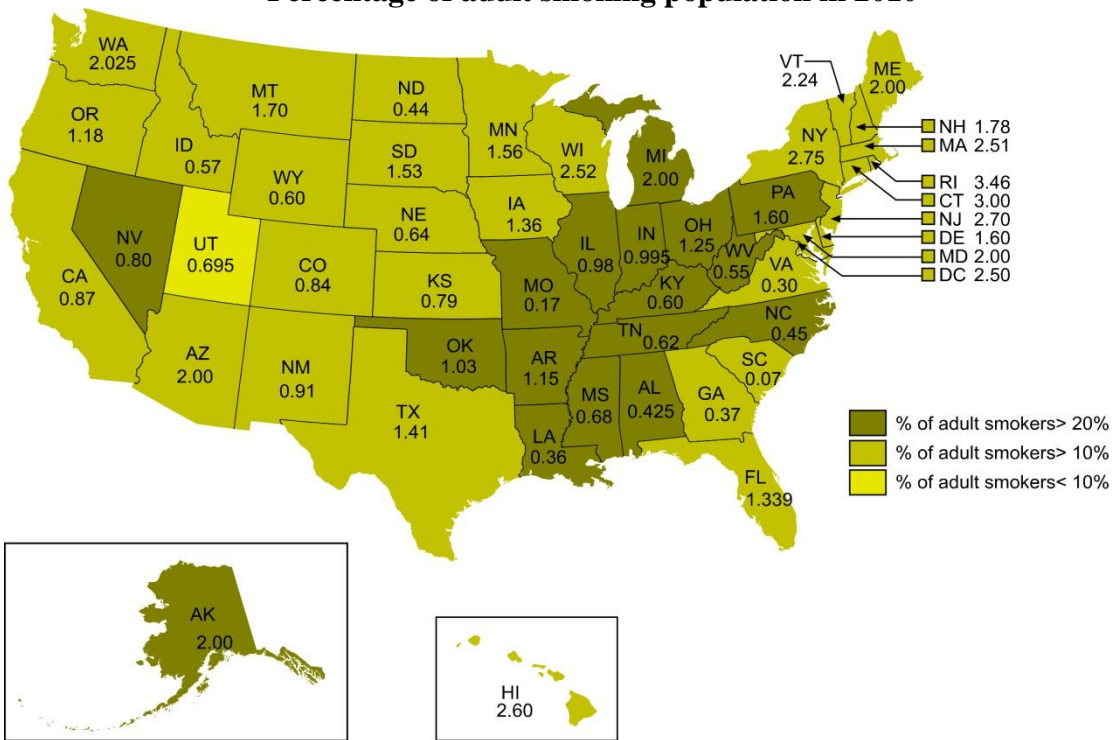
With regards to the adult smoking population and per capita cigarette pack sales the states with higher adult smoking population are concentrated around the south and mid-west of the country, overlapping with the producer states and with the higher concentration of Protestant population. Maps 2, 3 and 4.

**Map 1
Tobacco Production in 2010**



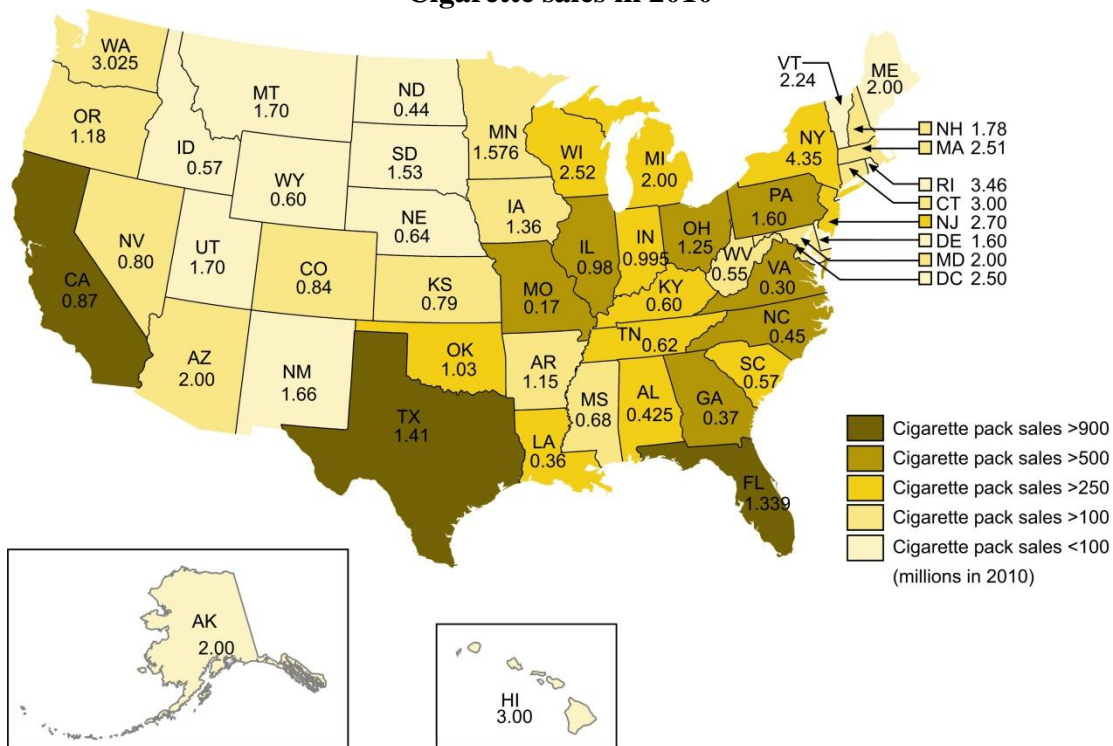
Source: <http://www.nass.usda.gov/QuickStats/index2.jsp#top>

Map 2
Percentage of adult smoking population in 2010



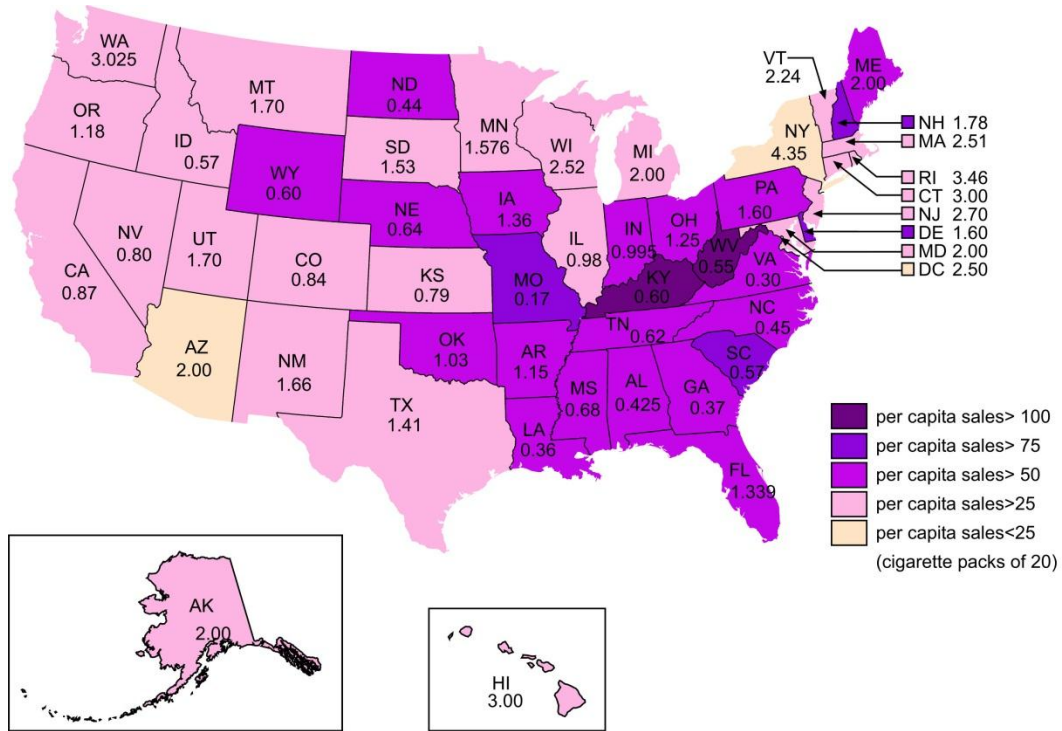
Source: CDC

Map 3
Cigarette sales in 2010



Source: Tax burden on tobacco 2010

Map 4
Per capita cigarette sales in 2010



Source: Tax burden on tobacco 2010

The map of cigarette sales highlights some interesting results: some states with relatively high tax rate compared to their neighbors experience lower cigarettes sales too (smuggling and bootlegging?). For the year 2010, Arkansas is a good example: having more than 20% of its adult population as smokers, it has the lowest amount of cigarette sales of the neighboring states. A similar situation occurs in Massachusetts, where Rhode Island and Connecticut have higher taxes and Massachusetts has higher sales; or in Delaware where the rest of the neighboring states have taxes that are between 0.40 and 1.10 dollars higher.

A dummy variable indicates a higher possibility of smuggling; the variable takes the value of 1 if a particular state has the higher tax among all the contiguous states, and 0 otherwise. The variable was built based on the predicted value of the cigarette tax, to eliminate the bias in the coefficient that may exist as a result of the smuggling variable being dependent on the cigarette tax itself.

I estimated the equation for cigarette taxes including all other independent variables without smuggling, and then predicted the value of the cigarette tax. Based on that predicted value I created the dummy variable as explained above. The idea behind such a variable is that if a state has the higher tax overall, it will be most likely subject to smuggling from neighboring states. However, if the tax is not the highest, residents and business of the state have no incentive to smuggle or bootleg cigarettes from neighboring states with lower taxes.

A test of the difference in means of per capita sales of the states that have 1 as a smuggling indicator and the ones that doesn't is significant at the 99% level ($t=5.20$). On average, states that have lower prices/cigarette taxes than its neighbors have higher per capita cigarette sales. This

result suggests that in fact having a higher price/ tax means lower sales independently of the consumer population that inhabits the state.

Also, the difference in means comparison of the smoking population by states among those who have the smuggling indicator and those who doesn't is statistically significant different from zero at the 99% level ($t=-6.10$). In other words, on average states with higher smoker population have higher price/tax. And since they also have lower sales, there would be some evidence to suggest that smuggling or bootlegging is going on to satisfy the consumption of a higher smoking population.

Table 1 illustrates how changes in the real tax rate and the frequency in tax changes over forty years have had an impact on reducing per capita cigarette sales. In general, all states had seen a reduction of per capita sales. However, analyzing by region, only in all the Northeastern and Western states taxes had increased in real terms from 1970 to 2010, and mostly in the South the real variation of the tax has been negative. In terms of times of rate changes, Northeastern and Western regions have the higher number of tax changes. Finally, the South is the region that has seen the smallest negative variation of per capita sales. This result was expected given that in the South is where the majority of tobacco production takes place, and where there is an intersection among other demographic characteristics I previously described.

Table 1
Changes in per capita sales and tax changes 1970-2010

	1970-2010				1970-2010		
	Var. sales percapita	# of tax changes	Variation tax real		Var. sales percapita	# of tax changes	Variation tax real
Northeast				DC	-88%	9	1012%
CT	-66%	10	234%	DE	-39%	5	159%
MA	-73%	6	272%	GA	-50%	2	-18%
ME	-59%	9	197%	KY	-29%	3	327%
NH	-63%	10	352%	LA	-36%	4	-20%
NJ	-74%	11	243%	MD	-72%	6	493%
NY	-80%	8	308%	MS	-25%	2	34%
PA	-47%	5	58%	NC	-64%	4	300%
RI	-70%	12	374%	OK	-34%	4	41%
VT	-61%	8	232%	SC	-18%	2	-79%
Midwest				TN	-27%	2	-15%
IA	-53%	7	142%	TX	-64%	5	62%
IL	-65%	5	45%	VA	-45%	2	114%
IN	-47%	4	195%	WV	-1%	2	40%
KS	-60%	5	76%	West			
MI	-62%	5	224%	AK	-64%	5	345%
MN	-55%	7	114%	AZ	-78%	6	256%
MO	-24%	2	-66%	CA	-79%	3	55%
ND	-26%	6	-29%	CO	-67%	6	199%
NE	-49%	6	42%	HI	-56%	29	478%
OH	-51%	5	122%	ID	-55%	4	45%
SD	-48%	7	127%	MT	-57%	6	278%
WI	-55%	10	220%	NM	-66%	4	35%
South				NV	-75%	4	42%
AL	-20%	3	-37%	OR	-72%	8	425%
AR	-37%	9	67%	UT	-59%	8	55%
FL	-60%	5	59%	WA	-74%	11	389%
				WY	-50%	3	78%

Source: author calculations

Political Variables:

Each political party has its ideological approach to taxes as a result of beliefs about how big the government should be and how much public goods and services it should provide to its citizens.

Tobacco taxes are one of many sources of revenue governments can use to finance their needs, and which they can invest in the provision of public goods, particularly to generate expenditure in areas such as smoking control and prevention, treatment of related diseases and campaigns to stop the use of tobacco. Throughout the last five decades each state's legislation has considered, debated and passed several laws pertaining tobacco taxes, most of them with the intention of increasing the amount of the tax.

Thus, the historical composition of the state's legislatures is of crucial importance when analyzing the political determinants of tobacco taxes. Some laws are generated in the House of Representatives and others in the Senate; therefore to have an individual count of the composition of each chamber is important when analyzing the result of individual laws and its votes.

This information was made available by 26 of the states, from 1970 to present date; others had information from later years; yet others rejected my petition for information.

Another variable considered in the analysis is the campaign contributions from the tobacco industry to government officials. Contributions are divided by political party and in three categories: state legislator, governor and other officials. This information is available since 1992 and covers all states.

The test for the difference in means for cigarette taxes among the group of states with democratic majority in both chambers (calculated by the weighted average) and the group with republican majority is statistically significant different from zero at the 95% level ($t=-1.60$). On average, states with a legislature that is in its majority Democratic, have higher cigarette taxes than states with a Republican majority in the state's legislature.

Campaign contributions from the tobacco industry are another political variable included in the analysis. The hypothesis is that tobacco producers would lobby at the state legislatures and its political campaigns in order to undermine the passing of tobacco legislation.

This information was collected in its original format from the website www.followthemoney.org; this website compiles all campaign contributions since 1992 made by tobacco companies and producers directly to government officials or through lobbyist. I collected the information for all the states that have had contributions until 2010 and categorized it by political party affiliation of the recipient and by nature of the public office held. In general, the main two political parties are the recipients of contributions, with some isolated minimum resources given to independents. The big three categories for public offices are: members of the House of Representatives or Senate, or specific committees; governor or lieutenant governor; and other offices like Attorney General.

A test of the difference in means in cigarette taxes between the states that have had campaign contributions from the tobacco industry at the state legislature level and those who had not is significant at the 99% level ($t=4.23$), meaning that on average, states whose legislators received some amount of monetary contribution have lower taxes than those where no contributions were made.

Analyzing the correlation of campaign contributions with political party affiliation of the state legislatures shows a very weak and insignificant correlation coefficient; this result suggests

that lobby does not depend per se on the political distribution of the state legislature or the political affiliation of the Governor or other government officials, it will depend on when the tobacco companies consider it necessary to contribute in order to influence the legislative process at a specific moment. Hence, political contributions are not as useful as other variables in this analysis. The correlation between tax changes and campaign contributions is also insignificant but shows a negative sign, which is to be expected, since one of the purposes of contributing is to coerce the legislative process of producing laws that result in tax changes.

Twenty states have had monetary contributions from tobacco companies, or its representatives, since 1992. Those states are: Alabama, Arkansas, California, Florida, Georgia, Iowa, Kentucky, Louisiana, Missouri, North Carolina, New Hampshire, New Mexico, New York, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia and Wisconsin.

From these, only Florida (104K), Georgia (51K), Kentucky (85K), North Carolina (396K), South Carolina (48K) and Virginia (128K) have had regular contributions over this period of time, total amount in real dollars in parenthesis. These states represent 96% of contributions since 1992. From all the contributions in these states on average 55% have been to campaigns from Democratic leaders, either legislators from both chambers (59%), governors or lieutenant governors (28%), Commissioners or the Attorneys General (13%). Focusing on individual cases of some states where the contributions were regular during the period of analysis, it is possible to find the following patterns.

Table 2 illustrates how the contributions are divided by categories of recipient in the six states. North Carolina concentrates by itself almost 50% of the total contributions over the period of available information. With regards to the distribution of the contributions by political party, in Georgia and South Carolina more than 80% are received by Democratic leaders, and only in Virginia almost 90% goes to Republican affiliated officials. By states, in Florida, almost 97% is given to legislators of both chambers and both political parties; in Georgia almost 60% is given to the Governor or his/her Lieutenant governor; in Kentucky 45% to Legislators; in North Carolina 68% to legislators; in South Carolina 52% to the Governor; and in Virginia 47% to legislators.

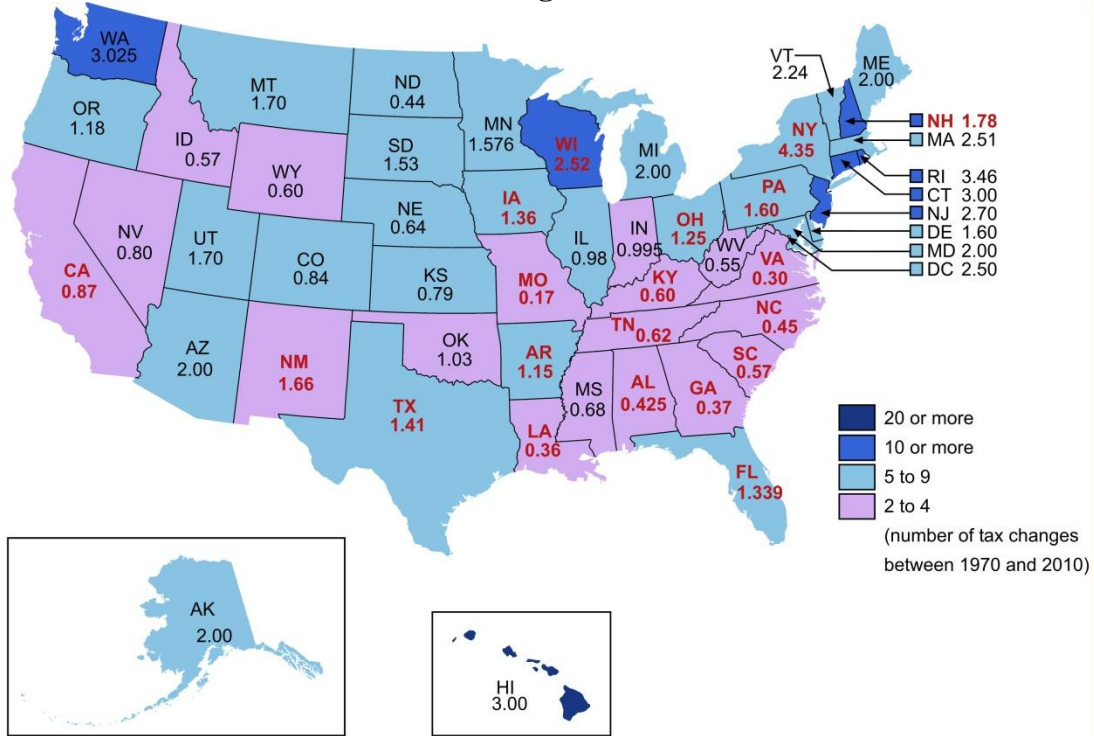
Table 2
Campaign contributions in the states with regular contributions from 1992 – 2010

States	Total Amount in \$ of 2010	% of the Total	% to Democrats	% to Legislators of both chambers	% to Governor or Lieutenant Gov.	% to Other
Florida	103,927	12.3%	69.8%	96.8%	1.7%	1.5%
Georgia	51,351	6.1%	84.0%	23.0%	58.7%	18.4%
Kentucky	85,276	10.1%	72.5%	45.4%	37.7%	16.8%
North Carolina	396,372	47.0%	52.1%	68.4%	25.7%	6.0%
South Carolina	47,998	5.7%	98.7%	27.5%	52.4%	20.1%
Virginia	127,853	15.1%	10.4%	47.0%	39.9%	13.1%
Total Selected	812,777	96.3%	54.7%	60.9%	29.8%	9.3%
Total	844,055	100.0%	53.6%	61.2%	29.5%	9.3%

Source: author calculation based on information from www.followthemoney.org

All six states had 5 or fewer tax changes from 1970 to 2010. Florida had 5 tax changes, 4 out of the period for which there is data on campaign contributions (71, 77, 86, 90, 09); Georgia had

Map 6
Number of tax changes from 1970 to 2010

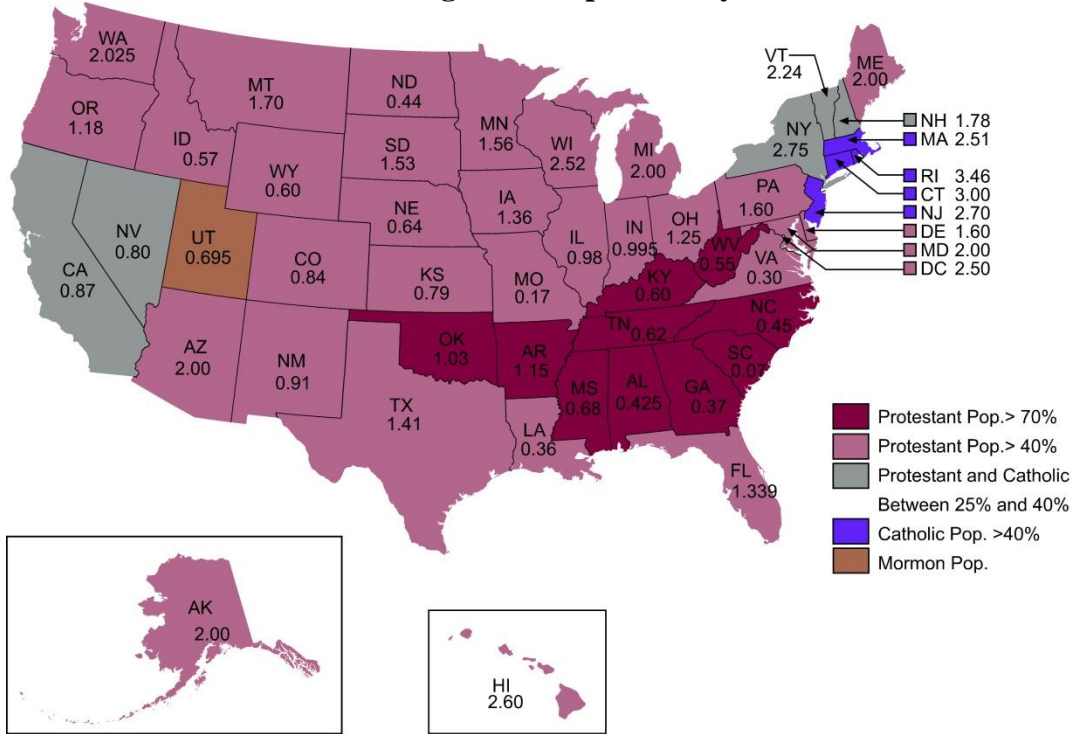


Social Variables

Religious Beliefs:

Affiliation to a political party and the political views of citizens differ across religious beliefs. Identifying these differences may help us understand the social attitudes towards tobacco taxes in different states, and how important these differences may have been through the decades in establishing a trend in tobacco taxes. Moreover, the interaction of this variable with other political and economical variables may offer a better approach to the matter in question. Map 7 illustrates the distribution of religious groups across the country.

Map 7
Religious Composition by States



Source: <http://religions.pewforum.org/maps#>.

According to the Pew Forum on religious and public life,¹⁴ 33% of Catholics identify themselves as Democrats, and 23% as Republican; from the remaining 44%, 10% lean towards Republican and 15% lean towards Democrat. Additionally, 51% of Catholics favor bigger government, providing more services, while 39% would rather have smaller government and fewer services. With regards to political ideology, 36% are conservative, 38% are moderate and 18% are liberal. This portrait suggests that the Catholic population would be more open to having higher taxes, thus the acceptance of a tobacco tax should be higher in predominantly Catholic states.

As can be seen in the religious composition map, the greater majority of Catholics is located in the Northeast with near 30% of believers, an area of the country where in fact higher taxes are imposed.

Earlier studies had suggested that the Catholic population would be more lenient and tolerant with such activities as smoking, drinking and gambling and therefore, they would probably not be too interested in taxing them. Nevertheless, the evidence presented here suggests otherwise.

With respect to the Protestant population, we can observe important differences among its major constituents. Within the Evangelical churches 38% declare themselves Republican and 24% Democrat. Of the remaining population, 12% lean towards Republican and 10% lean towards Democrat. With regards to the size of the government, 48% of Evangelicals prefer smaller governments and fewer services, against 41% that favor the opposite. In terms of political ideology, 52% are considered conservatives, while 30% moderate and 11% liberal.

¹⁴ <http://religions.pewforum.org/maps#>

The population of the Evangelical churches is concentrated in southern states. 50%, of the population affiliated with these churches live there. This area is where the main production of tobacco takes place.

For the mainline churches, 31% consider themselves Republican and 29% Democrat; however, from the independent, 10% lean towards Republican and 14% lean towards Democrat, which makes this a very even distribution of political affiliation identity among the two political parties. This is confirmed even more when following the political ideology distribution, where 36% are considered conservative, 41% moderate and only 18% liberal.

However, 51% of followers of mainline churches favor a smaller government with fewer services, against 37% preferring bigger government with more services. Geographically, the majority of the population of the mainline churches is located in the south with 34%; followed by the Midwest with 29% of the population of followers.

Finally, for the historically black churches, 66% declare themselves as Democrats, while only 7% are Republicans. From the remaining independents 12% lean towards Democrat while 3% lean towards Republican. As for the political ideology 35% are conservative, 36% moderate and 21% liberal.

In terms of the size of the government, 72% favor a bigger government, with more services, and 18% prefer otherwise. Location wise, 60% are located in the south. Table 2 summarizes.

Table 3
Religious and political composition

Religion	Political party affiliation				Political Ideology			Preferences on size of Gov.	
	Democrats	Republicans	Leaning Dem.	Leaning Rep.	Conservative	Moderate	Liberal	Bigger Gov.	Smaller Gov.
Catholicism	33%	44%	15%	10%	36%	38%	18%	51%	39%
Evangelical	24%	38%	10%	12%	52%	30%	11%	41%	48%
Mainline tradition	29%	31%	14%	10%	36%	41%	18%	37%	51%
Historically Black	66%	7%	12%	3%	35%	36%	21%	72%	18%

Source: <http://religions.pewforum.org>

Comparing these three traditions of Protestantism, it is possible to see not only that most of the population of these Churches is located in the south, but also that the population has a Republican bias. Evangelical and mainline churches combined account for the 44% of the population in the U.S, while historically black churches are only 7%. There is reason to believe then that according to the most predominant political views and party affiliation of this population they are resilient to heavy taxation, even if it is on products that can be consider sins, as cigarettes or alcohol.

One might think that the fact that geographically tobacco production is also located in this area is yet another reason to have small governments, providing fewer services and hence taxing less heavily.

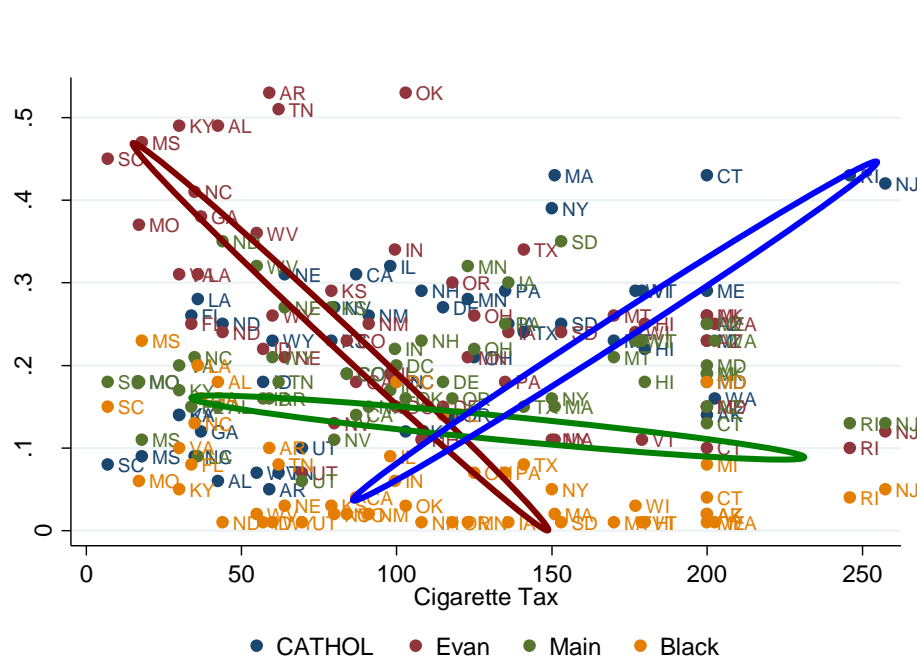
An overlaid scatter plot of the religious affiliation of the states and the cigarette tax in 2008 shows a relationship between the different religious affiliations and the amount of tax (Graph 6).

It is possible to see how the different color dots clustered in different areas of the graph signal the difference in the tax level. The red dots for evangelical churches cluster in the upper left corner and map down a negative relationship, meaning a high percentage of population affiliated with this religious tradition and a low cigarette tax.

The blue dots for the Catholic Church are clustered around the 45 degree line, meaning that the higher the Catholic composition, the higher the tax. The green dots for mainline tradition churches concentrated in the mid section of the graph are probably the ones with a less clear trend line. Finally, the yellow dots for historically black churches also show a negative relation, and are clustered in the lower part of the graph.

What is most interesting of this analysis is the fact that religious affiliation per se does not seem to be a determinant; instead, what matters the most is the political views to which each religious groups relates most predominantly.

Graph 6
Cigarette taxes and religious composition in 2010



Source: <http://religions.pewforum.org>

As we saw before, Evangelical and Mainline tradition churches lean more Republican in its political views. On the other hand, Historically Black Churches and Catholics are more biased towards the Democratic side. Looking at the graph, the first group would theoretically advocate for lower taxes, and the latter for higher taxes, but since the amount of Historically Black population tends to be very low in all the states, their political influence is likely to be insignificant compared to the one of their fellow Protestant churches and hence taxes remain low.

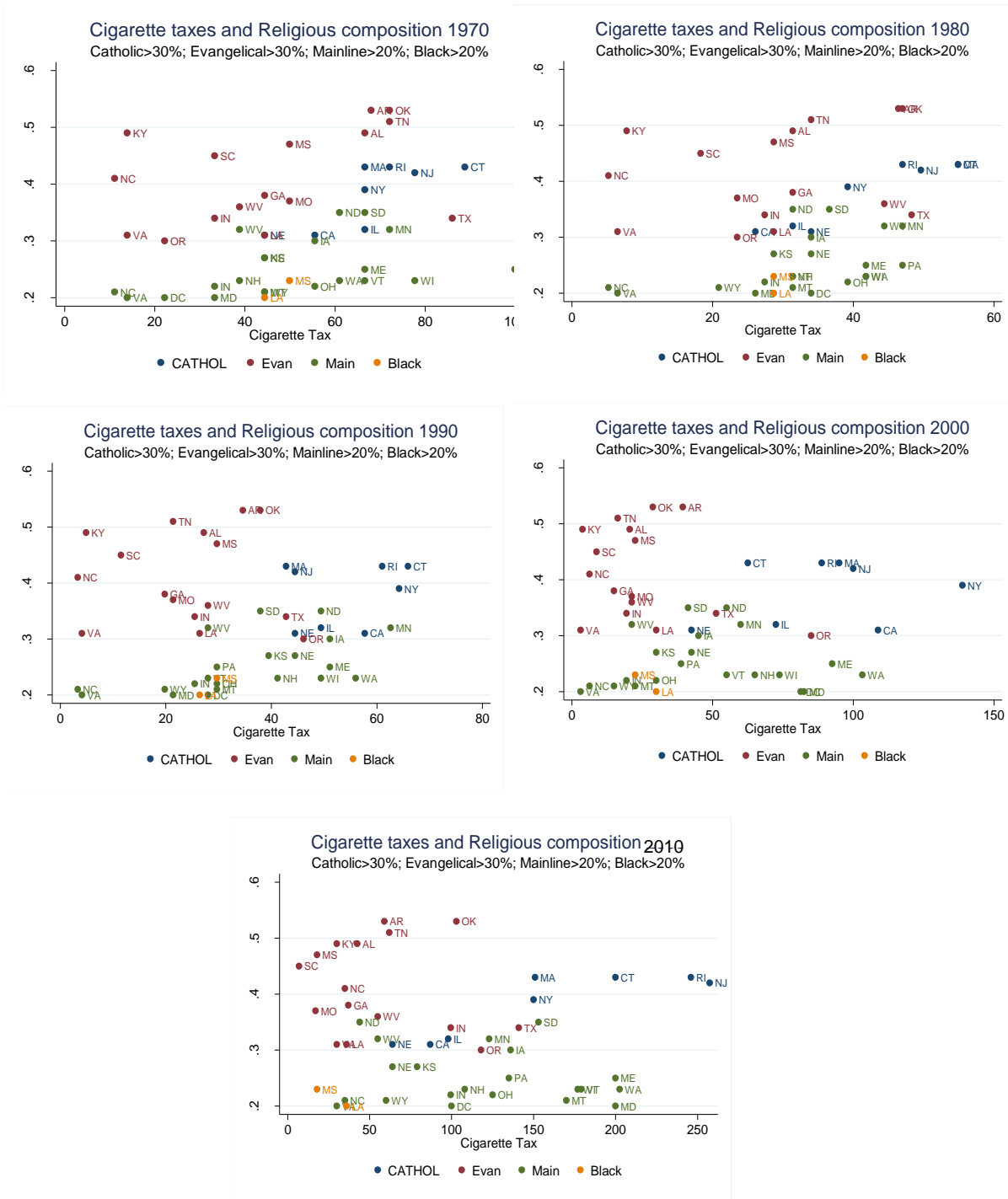
A group of five more graphs show the history of this relationship. In these graphs the sample was constrained to states with Catholic and Evangelical churches population larger than 30% and of Mainline and Historically Black greater than 20%. Each graph is a snapshot of taxes at the beginning of each decade over the 41 year period of this study; the cigarette tax is in 2010 dollars (Graph 7).

The picture shows that starting in 1970 there is a positive relation between each religious group and the cigarette tax; this situation starts receding in 1990 for the Evangelical church, and in 2000 for the Mainline and Historically Black churches. It is important to note that this religious composition has been assumed constant throughout the decades, since detailed information in this matter is not available since 1970. Nonetheless, it can be safely assumed that the religious composition of the states has not had a dramatic change over the past 40 years. However, the political composition of the states may have changed, and that is why the composition of the states' legislatures is vital in an integrated analysis.

By comparing the difference in means in cigarette tax by states with different religious affiliation we can corroborate the information provided by the scatter plot. The difference in means between states with more Protestants than Catholics is significant at the 99% level ($t=14.82$); that is, on average states with a larger Protestant religious affiliation as a whole have lower taxes than the rest of states. This result is also true at the 99% significance level ($t=11.13$) for states that on average have a larger Evangelical and Mainline tradition churches, more than 50%, compared to the sum of Historically Black and Catholics by state.

Once again, the importance of this analysis lies in the identification of the political affiliation of each religious group, more than in the beliefs or moral considerations associated to them.

Graph 7



Source: <http://religions.pewforum.org>

Later on, when discussing the econometric analysis, we will see how these social and political views interact with tax dependence, and how income per capita of each individual state and other economic variables affect the analysis.

Restrictions for public smoking and ranking of smoking restrictions:

Statewide restrictions and bans on cigarette consumption are also a social variable considered in the analysis of tobacco tax determinants. Not surprisingly, tobacco-producing states have lower or no restrictions to smoking, concentrated again in the mid to south-east of the country. One may have expected that if the intention of policy makers was to discourage smoking, lower tax states should have higher restrictions to protect revenue and still control consumption. However, the evidence shows a totally different picture: states with historically lower taxes are also the ones with fewest restrictions.

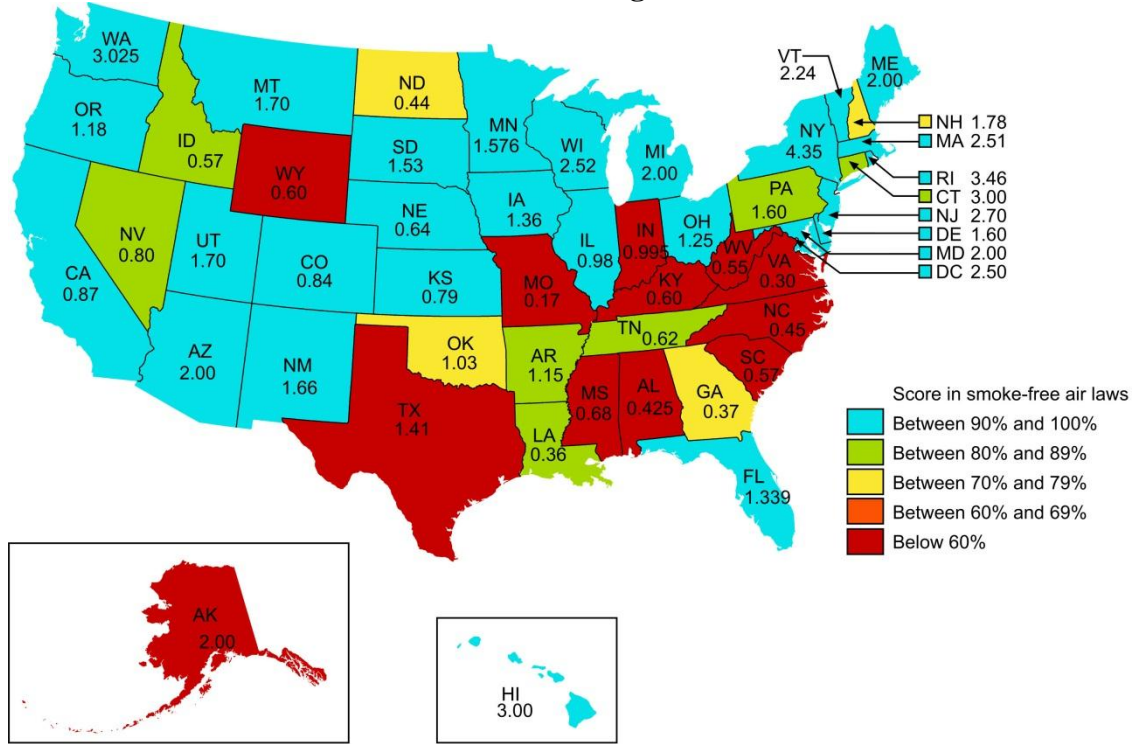
By using the score system presented in the State of Tobacco Control, it is possible to see that there is a positive relation between ranking in smoke-free air laws and cigarette tax. The higher the rank, the cleaner the state's air, not only because the existence of laws prohibiting, restricting or regulating smoking areas within private and public places but also because of the severity of penalties and enforcement.

In the database I create two variables to evaluate the impact of these air-free laws on the determination of tobacco taxes. The first one is a dummy variable that signals when the state enacted its first air free regulation; this one is only indicative of legislative action and does not account for the effectiveness of the measure. The second one is a percentage variable based on the actual rank number calculated in the report mentioned above. According to the methodology some states get more than 100% because they received bonus points in the ranking for better specified rules in some of the categories. The history of this variable was built with the ranking from reports since 1989, before that the numbers calculated for 2002 were used for the states, as each state was becoming active in the regulation of smoking and use of tobacco products.

The difference in means for cigarette taxes for the group with any restrictions on smoking to the one with none is statistically significant different from zero at the 99% level ($t=-12.66$). On average, states with some level of restrictions on smoking have a higher tax than states with none to very little smoking regulation.

Also, if we compare the difference in means for the group that has more than 60% of the grade in the air free ranking, the difference is statistically significant different from zero at the 99% level ($t=-7.40$), meaning that even the states with a low grade, C in the ranking, have on average higher cigarette taxes than the failing states. Map 6 illustrates the state of the ranking in 2010.

Map 6
Air free ranking 2010



Source: http://www.stateoftobaccocontrol.org/2010/ALA_SOTC_10_SFA_.pdf

7. Econometric Analysis

In this section a two equation model will be used to explain how political, social and economic variables may affect cigarette consumption through the determination of cigarette taxes. In this sense, all previous studies had tried explain the effect of cigarette taxes on cigarette consumption. Only a few studies (by political scientists) have attempted to take a step back in the process and tried to explain the economic factors which determine the tax, (Johnson and Meier, 1990). None has attempted both.

The two equation model layout is as follows:

Equation 1

$$\log CT_t = \alpha_0 + \alpha_1 \log BT_t + \alpha_2 \log LT_t + \alpha_3 DSm_t + \alpha_4 \log TB_t + \alpha_5 MD_t + \alpha_6 \log CC_t + \alpha_7 \log Q_t + \alpha_8 C_t + \alpha_9 PE_t + \alpha_{10} PM_t + \alpha_{11} PB_t + \alpha_{12} DPT_t + \varepsilon_t$$

Where:

CTt = Cigarette tax measured in real cents per package of 20 cigarettes,

BTt = Beer tax measured in real cents per gallon,

LTt = Spirits tax measured in real cents per gallon,

DSmt = Dummy to account for the possibility of smuggling based on tax differences across states, 1 if a particular state has the higher tax among all the neighboring states, and 0 otherwise.
 TBt = Local and State per capita taxes paid in real dollars,
 MDt = Weighted percentage of Democrat participation in both chambers of the State Legislature,
 CCt = Dummy for when there is a monetary contribution from a tobacco company to the state government or campaign contribution in real dollars,
 Qt = Cigarette sales per capita, packs of 20 cigarettes,
 Ct = Percentage of Catholic population,
 PEt = Percentage of Protestant Evangelic population,
 PMt = Percentage of Protestant Mainline population,
 PBt = Percentage of Protestant Historically Black population,
 DPTt = Dummy for tobacco production in the state or logarithm of the real value of production of tobacco, and,
 ϵt = error term.

With regards to beer and spirit taxes there is room for concern about possible endogeneity in the regression since beer, spirit and cigarette taxes may be jointly dependent variables, all of them depending upon religion, income and other economic, social and political characteristics of each state. To address this concern a series of regressions without these variables and a correlation matrix to support the results are presented after the original equation is estimated.

Equation 2

$$\log Q_t = \beta_0 + \beta_1 \log P_t + \beta_2 \log Y_t + \beta_3 DSmt + \beta_4 SR_t + \eta_t$$

Where:

Qt = Cigarette sales per capita, packs of 20 cigarettes,

Pt = Average cigarette retail price per pack of 20 cigarettes,

Yt = Per capita income,

DSmt = Dummy to account for the possibility of smuggling based on tax differences across the states,

SRt = Smoking restrictions, measure as an air free ranking depending on state regulatory laws on public smoking, and,

ηt = error term.

In the following pages I present a series of independent ordinary least squares (OLS) and simultaneous equation (2SLS) representations of the above equations followed by a discussion of the results and the coefficients. Later on the two equations model estimation is done using equation 2 as a variable for per capita sales in equation 1.

Additionally equation 2 is replicated in three different forms of demand for cigarettes: conventional demand, myopic demand and rational addiction demand.

Ordinary Least Squares

Equation 1

The first table, table 4, presents the estimation of Equation 1, using two different variables to account for the production of tobacco by the states and two different variables to account for the existence of campaign contributions from tobacco companies to members of the State Legislature, Governor or other State Officials.

Estimations 1, 3 and 5 use a dummy variable to indicate whether the state is an agricultural tobacco producer or not. Estimations 2, 4 and 6 use the real value of production in dollars to account for the production of tobacco.

The dependent variable is the logarithm of cigarette tax in real cents. The coefficients of the explanatory variables that are in logarithms are the elasticities of cigarette taxes with respect to the variable. In general terms the coefficient of beer taxes is highly statistically significant in all but estimation 6; the sign of the coefficient is negative and varies from 0.079 to 0.704; this is, holding everything else constant, an increase of 10% in beer taxes will lead to a decrease of 0.8% to 7% in cigarette taxes.

The coefficient for spirit taxes is significant in estimations 1-4 and has a positive sign, therefore a 10% increase in spirit taxes will be associated, *ceteris paribus*, with an increase of 2.9% to 6.9% in cigarette taxes.

The local and state per capita taxes paid coefficient is statistically significant only in estimations 1 and 3. The sign of the coefficient is negative meaning that an increase in 10% of the per capita tax burden will decrease cigarette taxes by 1.5% to 1.9%.

The dummy variable to account for the possibility of smuggling is statistically significant in all but estimations 5 and 6. This result indicates that a state that has the highest tax rate in cigarette among its contiguous neighboring states has 31% to 34% higher cigarette taxes, increasing the likelihood of lost of revenue.

The political variable that indicates the weighted percentage of democrats in both chambers of the State Legislature is statistically significant in all but the last two estimations. Therefore, holding everything else constant a one percentage point increase in the democratic power in the States Legislator is estimated to increase the cigarette tax by 70% to 84%.

Per capita cigarette sales are also significant in all but the last two estimations; the sign of the coefficient is negative. The coefficient shows a negative elasticity of 0.1 of cigarette taxes with respect to cigarette consumption. Therefore a 10% decrease in per capita sales is associated with a 10% increase in cigarette taxes. This result makes sense if we think in the need of the states to keep cigarette tax revenue stable, so taxes will go up in order to compensate for a decline in sales.

The set of religious composition variables reveals different information according to the specification used for the tobacco production variable. In estimations 1 and 3 all but the percentage of historically black protestant population are significant. Percentage of catholic population and mainline Protestant tradition are positive, a result that is consistent with the discussion about political affiliation of the religious traditions exposed in the previous section: one may expect that a stronger presence of these religious groups in the state would be associated with higher cigarette taxes. On the other hand, the presence of Evangelical protestant churches would be associated with a lower cigarette tax in the state.

For estimations 1 and 3 the coefficient of the dummy variable for tobacco production in the state is statistically significant and has a negative coefficient as expected. The presence of a tobacco agricultural production in the state will decrease cigarette taxes by 23% to 26%.

For estimations 2 and 4 the coefficient of the value of tobacco production is negative and statistically significant. A 10% increase in value of tobacco production is associated with a 1.2% decrease in cigarette taxes. What is most interesting about the inclusion of this variable is how it affects the internal mechanics of the model. The coefficient for the percentage of Catholic population becomes negative and loses statistical significance; however, the coefficients of the Evangelical and Mainline tradition variables are statistically significant and have the expected signs. Also, the inclusion of the value of production increases the explanatory power of the model from 68% to 77%.

One possible reason for this change in significance for the coefficient of Catholic population is the nature and value of tobacco production in states that are predominantly Catholic, which is the case of Massachusetts and Connecticut where the tobacco produced is not used for cigarette production but for cigar production. These states produce a lot less than the main tobacco producer states but since the price of the type of tobacco they produce is higher the values tend to be high. Given this difference in use of tobacco, one may expect that the tobacco industry in those states is not affected by the cigarette tax.

Finally, the inclusion of the variable to account for the existence of campaign contributions from the tobacco industry has a statistically significant coefficient when included as a dummy variable in the regression, estimations 3 and 4. However, when included as real dollars of contributions, the variable is no longer statistically significant and dramatically changes the significance of the other variables in the model. Nonetheless, the explanatory power of the model increases to 80%. A possible explanation for this is that campaign contributions are highly correlated with some of the variables in the model.

Tables 5 and 6 present the OLS estimation of equation 1 including state fixed effects, with and without campaign contributions and for the two different specifications of the tobacco production variable.

In general, the explanatory power of the model is higher with the real value of production than with the dummy for production, as in the case of OLS regressions without fixed effects. Campaign contributions are significant in all cases when using the dummy for tobacco production and have a negative coefficient as expected, therefore the existence of campaign contributions are associated with 14% - 20% lower cigarette taxes.

Beer and Spirit taxes and the smuggling dummy have positive and significant coefficients. Only the beer coefficient is not significant when year fixed effects are included. The coefficient of the Democratic percentage in state legislatures is positive and significant when year fixed effects are included and without any specific time trends of fixed effects, when using the value of tobacco production; if using the dummy for tobacco production the coefficient is always significant.

Table 4
Equation 1
Ordinary Least Squares
Log of cigarette tax determination based upon state data: real annual observations 1970 - 2010

	(1)	(2)	(3)	(4)	(5)	(6)
	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents
Log beer taxes in real cents	-0.085 (4.40)**	-0.110 (2.67)**	-0.079 (4.14)**	-0.111 (2.70)**	-0.704 (2.49)*	-0.745 (0.98)
Log spirit taxes in real cents	0.314 (11.90)**	0.689 (13.36)**	0.296 (11.35)**	0.674 (13.09)**	0.492 (1.48)	0.844 (0.66)
Dummy for smuggling	0.348 (12.03)**	0.317 (4.82)**	0.343 (12.06)**	0.314 (4.82)**	0.374 (0.97)	0.729 (1.27)
Log local and state per capita taxes paid	0.154 (3.28)**	-0.031 (0.30)	0.191 (4.10)**	0.027 (0.26)	-0.490 (0.47)	-0.351 (0.22)
Weighted percentage of democrats in both chambers	0.756 (10.62)**	0.839 (4.74)**	0.698 (9.88)**	0.740 (4.12)**	-1.647 (1.10)	-0.216 (0.07)
Log per capita cigarette sales	-1.002 (29.49)**	-0.946 (10.36)**	-0.998 (29.85)**	-0.937 (10.33)**	-1.333 (1.90)	-1.975 (1.37)
Percentage of Catholic population	0.724 (3.30)**	-1.178 (1.25)	0.765 (3.54)**	-0.996 (1.06)	-2.824 (0.42)	12.818 (0.45)
Percentage of Evangelical protestant population	-0.730 (4.18)**	-2.119 (3.56)**	-0.563 (3.24)**	-1.913 (3.21)**	-3.846 (0.59)	9.822 (0.44)
Percentage of Mainline protestant population	1.510 (7.00)**	3.470 (3.13)**	1.394 (6.55)**	3.215 (2.91)**	6.150 (1.00)	8.990 (0.86)
Percentage of Historically Black protestant population	0.367 (1.41)	-1.935 (1.62)	0.366 (1.43)	-1.677 (1.41)	7.000 (2.06)*	16.632 (0.52)
Dummy for tobacco producer	-0.259 (9.35)**		-0.235 (8.53)**		-0.835 (1.64)	
Log real value of production		-0.127 (7.51)**		-0.121 (7.15)**		-0.237 (0.70)
Dummy for campaign contributions			-0.454 (6.76)**	-0.203 (2.72)**		
Real dollars of campaign contributions					-0.052 (0.77)	0.000 (0.00)
Constant	4.802 (10.29)**	5.424 (4.47)**	4.601 (10.00)**	4.965 (4.09)**	14.450 (1.23)	5.970 (0.21)
Observations	1387	437	1387	437	44	35
R-squared	0.680	0.770	0.690	0.770	0.800	0.810

Absolute value of t statistics in parentheses
* significant at 5%, ** significant at 1%

Table 5
Equation 1
Ordinary Least Squares
State Fixed Effects
Log of cigarette tax determination based upon state data: real annual observations 1970 - 2010 +

	(1)	(2)	(3)	(4)	(5)	(6)
	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents
Log beer taxes in real cents	0.325 (7.89)**	0.727 (10.25)**	0.042 (0.70)	0.325 (7.93)**	0.727 (10.29)**	0.035 (0.59)
Log spirit taxes in real cents	0.156 (3.41)**	0.209 (3.67)**	0.121 (2.86)**	0.146 (3.21)**	0.191 (3.34)**	0.109 (2.61)**
Dummy for smuggling	0.277 (10.19)**	0.275 (10.59)**	0.283 (11.75)**	0.274 (10.14)**	0.274 (10.58)**	0.28 (11.69)**
Log local and state per capita taxes paid	0.19 (4.05)**	0.129 (2.33)*	-0.432 (6.60)**	0.212 (4.50)**	0.146 (2.64)**	-0.407 (6.24)**
Weighted percentage of democrats in both chambers	0.759 (7.97)**	0.432 (3.62)**	1.033 (11.09)**	0.7 (7.29)**	0.404 (3.39)**	0.974 (10.43)**
Log per capita cigarette sales	-1.328 (35.12)**	-0.99 (15.57)**	-0.918 (18.54)**	-1.323 (35.14)**	-0.995 (15.70)**	-0.921 (18.74)**
Dummy for tobacco producer	-0.303 (5.44)**	-0.185 (3.14)**	-0.129 (2.49)*	-0.293 (5.27)**	-0.177 (3.01)**	-0.124 (2.41)*
Dummy for campaign contributions						
Constant	6.722 (14.06)**	58.866 (0.44)	10.798 (16.35)**	6.603 (13.85)**	46.119 (0.34)	10.733 (16.36)**
State Specific Time Trends	No	Yes	No	No	Yes	No
Year Fixed Effects	No	No	Yes	No	No	Yes
Observations	1387	1387	1387	1387	1387	1387
R-squared	0.83	0.88	0.87	0.83	0.88	0.87

Absolute value of t statistics in parentheses

* significant at 5%; ** significant at 1%

+ using a Dummy variable for tobacco production

Table 6
Equation 1
Ordinary Least Squares
State Fixed Effects
Log of cigarette tax determination based upon state data: real annual observations 1970 - 2010 +

	(1)	(2)	(3)	(4)	(5)	(6)
	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents
Log beer taxes in real cents	0.247 (2.88)**	0.807 (5.69)**	0.275 (1.07)	0.245 (2.85)**	0.802 (5.66)**	0.223 (0.86)
Log spirit taxes in real cents	0.549 (6.53)**	0.867 (9.29)**	0.460 (4.27)**	0.541 (6.42)**	0.839 (8.84)**	0.451 (4.19)**
Dummy for smuggling	0.273 (4.58)**	0.198 (3.69)**	0.303 (4.92)**	0.268 (4.47)**	0.194 (3.63)**	0.295 (4.77)**
Log local and state per capita taxes paid	0.166 (1.67)	-0.244 (2.48)*	-0.025 (0.10)	0.184 (1.83)	-0.218 (2.19)*	0.022 (0.09)
Weighted percentage of democrats in both chambers	1.272 (6.32)**	-0.254 (0.90)	1.835 (8.18)**	1.223 (5.96)**	-0.323 (1.14)	1.764 (7.75)**
Log per capita cigarette sales	-0.722 (7.08)**	-0.267 (2.66)**	-0.641 (5.62)**	-0.719 (7.05)**	-0.268 (2.68)**	-0.644 (5.66)**
Log real value of production	-0.327 (7.83)**	-0.129 (2.89)**	-0.298 (5.88)**	-0.323 (7.69)**	-0.127 (2.85)**	-0.294 (5.80)**
Dummy for campaign contributions				-0.074 (1.18)	-0.084 (1.52)	-0.128 (1.68)
Constant	4.045 (3.76)**	128.515 (1.04)	4.980 (2.13)*	3.940 (3.65)**	146.308 (1.18)	5.847 (2.28)*
State Specific Time Trends	No	Yes	No	No	Yes	No
Year Fixed Effects	No	No	Yes	No	No	Yes
Observations	437	437	437	437	437	437
R-squared	0.86	0.90	0.88	0.86	0.90	0.88

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%
+ using the value of tobacco production

Summarizing, the inclusion of campaign contributions provides an important explanatory variable for the determination of the cigarette tax. Similarly, the sin taxes, the value of tobacco production and the majority of democrats in the State Legislature have significant effects on the determination of cigarette tax.

Equation 2

Table 7 presents the estimation of equation 2 with and without state fixed effects. The dependent variable is the logarithm of per capita sales as proxy for cigarette consumption. In the basic OLS estimation, the price elasticity of cigarette consumption is -0.7, which is the coefficient of the logarithm of the average real retail price. The coefficient of the logarithm of per capita real income is not statistically significant. The smuggling coefficient is negative and significant, meaning that the possibility of smuggling into a state is associated with a lower demand for cigarettes (or lower cigarette sales in the state) of 5.6%.

Finally, the existence of smoking restrictions and regulations, measured by the air free ranking, is associated with lower cigarette sales. A one percentage point increase in the air free ranking, this is, the state becomes more restrictive in public smoking, is associated with a decrease of 18% in cigarette sales.

With the inclusion of state fixed effects and state specific time trends and year specific fixed effects the explanatory power of the model increases from 63% to 95%. For the model with specific time trends all the coefficients are significant and with the expected signs.

A 10% increase in the average retail is associated with a 4.5% decrease in cigarette sales. A 10% increase in per capita income is associated with a 4.9% increase in cigarette sales. The existence of the possibility of smuggling in one's state is associated with a decrease in cigarette sales of 1.8%. Finally, one percentage point increase of the air free rank is associated with a decrease in cigarette sales of 9%.

Table 7
Equation 2
Ordinary Least Squares
State Fixed Effects (2)-(4)
Log of cigarette consumption. Model with conventional demand
Real annual observations 1970 - 2010 +

	(1) Log per capita cigarette sales	(2) Log per capita cigarette sales	(3) Log per capita cigarette sales	(4) Log per capita cigarette sales
Log average real retail price	-0.712 (34.34)**	-0.622 (42.51)**	-0.446 (34.78)**	-0.828 (23.86)**
Log per capita real income	-0.005 (0.18)	-0.107 (4.29)**	0.489 (12.13)**	-0.024 (0.4)
Dummy for smuggling	-0.056 (4.26)**	-0.006 (0.51)	-0.018 (2.17)*	0.007 (0.66)
Air free ranking	-0.181 (7.77)**	-0.209 (10.81)**	-0.099 (6.43)**	-0.145 (6.95)**
Constant	8.644 (34.04)**	9.205 (44.53)**	48.486 (15.37)**	9.327 (14.97)**
State Specific Time Trends		No	Yes	No
Year Fixed Effects		No	No	Yes
Observations	2089	2089	2089	2089
R-squared	0.63	0.87	0.95	0.89

Absolute value of t statistics in parentheses

* significant at 5%; ** significant at 1%

+ using airfree rank for smoking restrictions

Table 8 and 9 show the estimation of equation 2 with myopic demand and rational addiction demand forms. Estimation 3 of both tables presents the estimation with higher explanatory power, 95%. For the myopic demand equation, the coefficient of lagged per capita cigarette sales is positive and significant. A 10% increase in previous period per capita cigarette sales is associated with a 1.2% increase in current per capita sales. The coefficients for the other variables are very similar to those of the conventional model of demand.

Table 8
Equation 2
Ordinary Least Squares
State Fixed Effects (2)-(4)
Log of cigarette consumption. Model with myopic demand
Real annual observations 1970 - 2010 +

	(1) Log per capita cigarette sales	(2) Log per capita cigarette sales	(3) Log per capita cigarette sales	(4) Log per capita cigarette sales
Log average real retail price	-0.724 (31.08)**	-0.612 (35.57)**	-0.399 (26.84)**	-0.825 (23.78)**
Log per capita real income	-0.008 (0.27)	-0.104 (3.96)**	0.443 (10.90)**	-0.033 (0.56)
Dummy for smuggling	-0.052 (3.84)**	-0.006 (0.57)	-0.019 (2.37)*	0.007 (0.63)
Air free ranking	-0.184 (7.86)**	-0.207 (10.71)**	-0.091 (5.98)**	-0.144 (6.88)**
Lagged log per capita cigarette sales	-0.022 (1.23)	0.018 (0.95)	0.12 (6.13)**	-0.024 (1.23)
Constant	8.839 (30.18)**	8.944 (28.13)**	26.88 (7.57)**	9.666 (13.56)**
State Specific Time Trends		No	Yes	No
Year Fixed Effects		No	No	Yes
Observations	2088	2088	2088	2088
R-squared	0.63	0.87	0.95	0.89

Absolute value of t statistics in parentheses

* significant at 5%; ** significant at 1%

+ using airfree rank for smoking restrictions

For the rational addiction specification, the coefficients of both lagged consumption and future consumption of cigarettes are positive and statistically significant. A 10% increase in previous year cigarette consumption is associated with a 0.9% increase in per capita sales in current period and a 10% increase on expected future consumption is associated with a 1.1% increase in per capita sales in current period.

Table 9
Equation 2
Ordinary Least Squares
State Fixed Effects (2)-(4)
Log of cigarette consumption. Model with rational addiction demand
Real annual observations 1970 - 2010 +

	(1) Log per capita cigarette sales	(2) Log per capita cigarette sales	(3) Log per capita cigarette sales	(4) Log per capita cigarette sales
Log average real retail price	-0.734 (29.17)**	-0.604 (32.26)**	-0.366 (23.05)**	-0.824 (23.71)**
Log per capita real income	-0.009 (0.31)	-0.099 (3.72)**	0.423 (10.45)**	-0.03 (0.51)
Dummy for smuggling	-0.051 (3.76)**	-0.006 (0.57)	-0.019 (2.38)*	0.006 (0.59)
Air free ranking	-0.184 (7.87)**	-0.206 (10.64)**	-0.086 (5.67)**	-0.143 (6.81)**
Lagged log per capita cigarette sales	-0.02 (1.14)	0.013 (0.67)	0.091 (4.50)**	-0.022 (1.15)
Lead log per capita cigarette sales	-0.019 (1.09)	0.019 (1.01)	0.112 (5.65)**	-0.02 (1.03)
Constant	8.988 (27.81)**	8.795 (25.12)**	26.188 (7.42)**	9.514 (13.94)**
State Specific Time Trends		No	Yes	No
Year Fixed Effects		No	No	Yes
Observations	2087	2087	2087	2087
R-squared	0.63	0.87	0.95	0.89

Absolute value of t statistics in parentheses

* significant at 5%; ** significant at 1%

+ using airfree rank for smoking restrictions

Two Stage Least Squares

Equation 1

Using an instrumental variable approach Table 10 presents the estimation of equation 1 instrumenting using percentage of adult smoking population in the state as an instrument of per capita sales. . With the use of 2SLS the coefficients of the variables, the sign and statistical significance are very similar to those of the OLS regression.

Table 10
Equation 1
Two Stage Least Squares
Log cigarette tax based upon state data: real annual observations 1970 - 2010

	(1)	(2)	(3)	(4)
	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents
Log beer taxes in real cents	-0.085 (4.41)**	-0.11 (2.60)**	-0.079 (4.15)**	-0.112 (2.66)**
Log spirit taxes in real cents	0.316 (11.87)**	0.688 (12.06)**	0.297 (11.28)**	0.677 (11.93)**
Dummy for smuggling	0.346 (11.87)**	0.316 (4.55)**	0.342 (11.94)**	0.317 (4.61)**
Log local and state per capita taxes paid	0.141 (2.74)**	-0.035 (0.27)	0.184 (3.60)**	0.037 (0.28)
Weighted percentage of democrats in both chambers	0.759 (10.63)**	0.847 (3.72)**	0.699 (9.88)**	0.723 (3.13)**
Log per capita cigarette sales	-1.022 (21.29)**	-0.957 (4.61)**	-1.01 (21.37)**	-0.915 (4.42)**
Percentage of Catholic population	0.751 (3.36)**	-1.172 (1.24)	0.78 (3.54)**	-1.007 (1.07)
Percentage of Evangelical protestant population	-0.72 (4.10)**	-2.117 (3.55)**	-0.558 (3.20)**	-1.916 (3.21)**
Percentage of Mainline protestant population	1.516 (7.02)**	3.469 (3.12)**	1.398 (6.56)**	3.216 (2.91)**
Percentage of Historically Black protestant population	0.386 (1.47)	-1.961 (1.54)	0.376 (1.46)	-1.625 (1.28)
Dummy for tobacco producer	-0.255 (8.90)**		-0.232 (8.18)**	
Log real value of production		-0.127 (6.65)**		-0.122 (6.44)**
Dummy for campaign contributions			-0.453 (6.76)**	-0.204 (2.72)**
Constant	4.966 (9.19)**	5.509 (2.90)**	4.694 (8.81)**	4.794 (2.52)*
Observations	1387	437	1387	437
R-squared	0.68	0.77	0.69	0.77

Absolute value of t statistics in parentheses

* significant at 5%; ** significant at 1%

Variable instrumented: per capita sales. Instrument: percentage of adult smoker population

Equation 2

Table 11 presents the estimation of equation 2 with and without state fixed effects using an instrumental variable approach. The endogenous variable is average retail price and the instrument is real cigarette tax.

Without state fixed effects the price elasticity of cigarette consumption is now -1.16. The income elasticity of cigarette consumption is 0.38. The smuggling coefficient is negative and significant, meaning that the possibility of smuggling into a state is associated with a lower demand for cigarettes (or lower cigarette sales in the state) of 4.1%.

Finally, the coefficient of the variable that accounts for the existence of smoking restrictions in the state is not significant.

With the inclusion of state fixed effects and state specific time trends and year specific fixed effects the explanatory power of the model increases from 55% to 94%. For the model with specific time trends all but the smuggling coefficient are significant and with the expected signs. A 10% increase in the average retail price is associated with a 6.4% decrease in cigarette sales. A 10% increase in per capita income is associated with a 2.9% increase in cigarette sales. Finally, a one percentage point increase of the air free rank is associated with a decrease in cigarette sales of 7.5%

Table 11
Equation 2
Two Stage Least Squares
State Fixed Effects (2)-(4)
Log of cigarette consumption. Model with conventional demand
Real annual observations 1970 - 2010 +

	(1) Log per capita cigarette sales	(2) Log per capita cigarette sales	(3) Log per capita cigarette sales	(4) Log per capita cigarette sales
Log average real retail price	-1.166 (23.39)**	-0.908 (36.71)**	-0.646 (28.82)**	-1.741 (23.17)**
Log per capita real income	0.384 (7.64)**	0.21 (6.10)**	0.289 (6.25)**	-0.145 (2.08)*
Dummy for smuggling	-0.041 (2.78)**	0.021 (1.7)	-0.008 (0.9)	0.063 (4.87)**
Air free ranking	-0.021 (0.71)	-0.097 (4.34)**	-0.075 (4.54)**	-0.072 (2.88)**
Constant	7.077 (22.09)**	7.55 (30.14)**	20.398 (6.26)**	15.019 (18.22)**
State Specific Time Trends		No	Yes	No
Year Fixed Effects		No	No	Yes
Observations	2089	2089	2089	2089
R-squared	0.55	0.85	0.94	0.85

Absolute value of t statistics in parentheses

* significant at 5%; ** significant at 1%

+ using airfree rank for smoking restrictions

Instrumented Variable: Average retail price. Instrument: Real cigarette tax

Model estimation: 2SLS

Table 12 shows the simultaneous estimation of the 2 equations using a 2SLS approach. The estimation is presented both using the dummy for tobacco production and the real value of production. Also three different demand specifications are presented: conventional, myopic and rational addiction.

The first thing to note is that the coefficients are very similar across different demand specifications, if not exactly the same for most of the variables.

Table 12
 Two Equation Model: Cigarette tax determination and cigarette consumption
 Two Stage Least Squares
 State Fixed Effects
 Log of cigarette tax upon state data: real annual observations 1970 - 2010

	conventional demand			myopic demand			rational addiction		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents
Log beer taxes in real cents	0.497 (11.08)**	0.283 (3.06)**	0.496 (11.07)**	0.281 (3.06)**	0.496 (11.07)**	0.276 (3.05)**			
Log spirit taxes in real cents	0.115 (2.42)*	0.486 (5.34)**	0.115 (2.43)*	0.488 (5.39)**	0.115 (2.43)*	0.496 (5.57)**			
Dummy for smuggling	0.258 (9.18)**	0.232 (3.59)**	0.258 (9.18)**	0.233 (3.63)**	0.258 (9.18)**	0.238 (3.77)**			
Log local and state per capita taxes paid	0.01 (0.19)	-0.024 (0.20)	0.011 (0.21)	-0.016 (0.14)	0.011 (0.21)	0.013 (0.12)			
Weighted percentage of democrats in both chambers	0.62 (6.19)**	1.407 (6.30)**	0.62 (6.20)**	1.400 (6.31)**	0.62 (6.20)**	1.374 (6.30)**			
Log per capita cigarette sales	-1.716 (34.11)**	-1.509 (7.39)**	-1.714 (34.09)**	-1.479 (7.45)**	-1.714 (34.09)**	-1.367 (7.16)**			
Dummy for tobacco producer	-0.237 (4.09)**		-0.237 (4.09)**		-0.237 (4.09)**				
Log real value of production		-0.188 (3.51)**		-0.193 (3.66)**		-0.212 (4.12)**			
Dummy for campaign contributions	-0.182 (3.33)**	-0.062 (0.92)	-0.183 (3.34)**	-0.062 (0.93)	-0.183 (3.34)**	-0.064 (0.97)			
Constant	9.404 (17.27)**	7.475 (5.29)**	9.388 (17.25)**	6.248 (4.27)**	9.388 (17.25)**	6.865 (5.05)**			
Observations	1387	437	1387	437	1387	437			
R-squared	0.82	0.84	0.82	0.84	0.82	0.84			

Absolute value of t statistics in parentheses
 * significant at 5%; ** significant at 1%

Nonetheless, one first important difference between the OLS and 2SLS estimation of equation 1 is that the coefficient of beer tax is positive and significant varying from 0.27 to 0.5. The coefficient on spirit taxes is also positive and significant and is equal to 0.11 or 0.49, depending on the variable used for tobacco production. This result means that, *ceteris paribus*, a 10% increase in beer taxes will lead to a 2.7% to 5% increase in cigarette taxes and a 10% increase in spirit taxes will lead to a 1.1% to 4.9% increase in cigarette taxes.

A one percentage point increase in the Democrats in both chambers of the State Legislature is associated with 62% to 140% higher cigarette taxes.

The smuggling coefficient tells us that if a state has higher taxes than its neighboring states the cigarette taxes increase by 25%. Total state and local taxes per capita taxes paid are no longer statistically significant.

The price elasticity of demand is around -0.14 to -0.17, so holding everything every thing else constant a 10% decrease in per capita sales is associated with a 14% to 17% increase in cigarette taxes.

The coefficient on the dummy for tobacco production is statistically significant and negative; therefore the fact that a state is a producer of tobacco is associated with 24% lower taxes. If the real value of tobacco production is used, a 10% increase in the value of production is associated with around 1.9% decrease in cigarette taxes.

Finally, campaign contributions coefficients are statistically significant when the dummy for tobacco production is used, and associated with a 18% increase in cigarette taxes.

As noted in both the OLS and the 2SLS estimations, campaign contributions have a significant coefficient and the inclusion of the variable improves the explanatory power of the model. This offers an interesting approach for the political economy literature, since it opens the discussion on the effect of lobbying in the determination of particular taxes. The existence of those contributions is shown to have a significant negative effect on the level of cigarette taxes, and therefore should be considered whenever a tax discussion is in effect.

OLS and 2SLS without Beer and Spirit taxes

As discussed at the beginning of the previous section, one may think that beer and spirit taxes could be jointly determined by the economic, social and political variable in the model, generating a possible problem of endogeneity in the estimation of equation 1.

In this section, trying to address this valid concern, I present the same estimations but without including beer and spirit taxes as independent variables, and a correlation matrix among the three variables, to evaluate the possible problem.

The correlation matrix for cigarette taxes, beer and spirit taxes does not show enough evidence to confirm that there is a strong correlation among the variables. However, separate models are estimated and presented to test the specification.

	Cigarette tax	Beer tax	Spirit tax
Cigarette tax	1.000		
Beer tax	-0.127	1.000	
Spirit tax	0.174	0.187	1.000

Equation 1: OLS

Table 4A replicates table 4 but without including beer and spirit taxes. The dependent variable is the logarithm of cigarette tax in real cents. The first difference with respect to the original model is that the explanatory power of the model decreases.

The local and state per capita taxes paid coefficient is statistically significant only in estimations 1 to 4. The sign of the coefficient depends on the specification used for tobacco production and whether campaign contributions are used.

The dummy variable to account for the possibility of smuggling is statistically significant in all but estimations 5 and 6. This will indicate that a state that has the highest tax rate among its contiguous neighboring states has 35% to 44% higher cigarette taxes, increasing the likelihood of lost of revenue.

The political variable that indicates the weighted percentage of Democrats in both chambers of the State Legislature is statistically significant in all but the last two estimations. Therefore holding everything else constant a one percentage point increase in Democratic power in the States Legislator is estimated to increase the cigarette tax by 75% to 100%.

Per capita cigarette sales are significant in all estimations; the sign of the coefficient is negative. The coefficient shows a negative elasticity from 0.1 to 0.3 of cigarette taxes with respect to cigarette consumption. Therefore a 10% decrease in per capita sales is associated with a 10% to 30% increase in cigarette taxes.

For the set of religious composition variables, the percentage of Catholic population and mainline tradition population are significant and have positive signs in all but estimations 5 and 6. Historically black Protestant and Evangelical are significant and have negative signs in estimations 1 and 3.

For estimations 1 and 3 the coefficient of the Dummy for tobacco production in the state is statistically significant and has a negative coefficient as expected. The presence of tobacco agricultural production (in the state?) will decrease the cigarette taxes by 30%.

For estimations 2 and 4 the coefficient of the value of tobacco production is negative and statistically significant. A 10% increase in value of tobacco production is associated with a 1.1% decrease in cigarette taxes. In this case the inclusion of the real value of production does not significantly alter the predictive power of the model.

Table 4A
Equation 1
Ordinary Least Squares
Log of cigarette tax determination based upon state data: real annual observations 1970 - 2010

	(1)	(2)	(3)	(4)	(5)	(6)
	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents
Dummy for smuggling	0.359 (12.24)**	0.442 (4.89)**	0.354 (12.23)**	0.446 (4.99)**	0.178 (0.40)	0.549 (0.95)
Log local and state per capita taxes paid	0.189 (4.20)**	-0.442 (3.67)**	0.230 (5.15)**	-0.333 (2.74)**	-1.540 (1.67)	-0.895 (0.86)
Weighted percentage of democrats in both chambers	0.827 (11.80)**	1.073 (5.70)**	0.748 (10.71)**	0.939 (4.99)**	1.235 (0.86)	3.041 (1.62)
Log per capita cigarette sales	-0.902 (26.69)**	-1.327 (10.29)**	-0.899 (26.98)**	-1.317 (10.36)**	-2.251 (4.01)**	-2.997 (3.62)**
Percentage of Catholic population	1.577 (8.43)**	5.584 (5.80)**	1.610 (8.73)**	5.619 (5.91)**	6.484 (1.69)	12.265 (1.94)
Percentage of Evangelical protestant population	-0.451 (2.86)**	1.584 (2.23)*	-0.274 (1.74)	1.893 (2.68)**	1.270 (0.45)	7.428 (1.62)
Percentage of Mainline protestant population	1.507 (7.49)**	5.001 (4.12)**	1.405 (7.07)**	4.849 (4.05)**	9.139 (2.00)	11.733 (1.99)
Percentage of Historically Black protestant population	-0.605 (2.54)*	0.762 (0.75)	-0.554 (2.36)*	0.926 (0.92)	0.512 (0.17)	3.097 (0.51)
Dummy for tobacco producer	-0.328 (12.10)**		-0.301 (11.19)**		0.042 (0.11)	
Log real value of production		-0.117 (6.83)**		-0.115 (6.80)**		-0.185 (1.08)
Dummy for campaign contributions			-0.537 (7.79)**	-0.419 (4.26)**		
Real dollars of campaign contributions		10.988 (7.40)**	5.207 (12.04)**	10.104 (6.83)**	-0.105 (1.67)	-0.082 (1.15)
Constant	5.524 (12.65)**				22.170 (2.63)*	17.782 (1.77)
Observations	2039	619	2039	619	58	45
R-squared	0.58	0.57	0.59	0.58	0.69	0.75

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%

Finally, the inclusion of the variable to account for the existence of campaign contributions from the tobacco industry has a statistically significant coefficient when included as a dummy variable in the regression, estimations 3 and 4. The effect of having campaign contributions means, holding everything else constant, that the cigarette tax is between 40% and 50% lower.

However, when included as real dollars of contributions, the variable is no longer statistically significant and changes the significance of the other variables in the model. Still, this inclusion increases the explanatory power of the model to 75%.

Tables 5A and 6A replicate the tables with the OLS estimation of equation 1 including state fixed effects, with and without campaign contributions and for the two different specifications of the tobacco production variable.

In general, the explanatory power of the model is higher with the real value of production than with the dummy for production, as in the case of OLS regressions without fixed effects. Campaign contributions are significant in all cases when using the dummy for tobacco production and have a negative coefficient as expected, therefore the existence of campaign contributions are associated with 18% - 27% lower cigarette taxes.

The coefficient of the Democratic percentage in state legislatures is positive and significant when year fixed effects are included and with out any specific time trends of fixed effects, when using the value of tobacco production; if using the dummy for tobacco production the coefficient is always significant.

The explanatory power of the model decreases when beer and spirit taxes are not included. However the rest of the coefficients behave very similar as in the original model estimated.

Table 5A
Equation 1
Ordinary Least Squares
State Fixed Effects
Log of cigarette tax determination based upon state data: real annual observations 1970 - 2010 +

	(1)	(2)	(3)	(4)	(5)	(6)
	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents
Dummy for smuggling	0.369 (13.05)**	0.324 (11.71)**	0.321 (14.16)**	0.364 (12.94)**	0.322 (11.68)**	0.317 (14.06)**
Log local and state per capita taxes paid	0.417 (9.71)**	0.58 (13.55)**	-0.162 (3.23)**	0.44 (10.26)**	0.591 (13.83)**	-0.139 (2.78)**
Weighted percentage of democrats in both chambers	1.406 (16.48)**	0.567 (5.04)**	0.98 (12.21)**	1.319 (15.27)**	0.538 (4.79)**	0.926 (11.51)**
Log per capita cigarette sales	-0.984 (33.65)**	-1.493 (26.18)**	-1.035 (23.28)**	-0.987 (33.96)**	-1.488 (26.18)**	-1.035 (23.43)**
Dummy for tobacco producer	-0.083 (1.53)	-0.258 (4.34)**	-0.029 (0.64)	-0.074 (1.38)	-0.25 (4.21)**	-0.026 (0.59)
Dummy for campaign contributions						
Constant	4.16 (9.56)**	44.711 (2.19)*	7.945 (17.62)**	4.051 (9.36)**	44.754 (2.20)*	7.867 (17.55)**
State Specific Time Trends	No	Yes	No	No	Yes	No
Year Fixed Effects	No	No	Yes	No	No	Yes
Observations	2039	2039	2039	2039	2039	2039
R-squared	0.79	0.85	0.87	0.79	0.85	0.87

Absolute value of t statistics in parentheses

* significant at 5%, ** significant at 1%

+ using a Dummy variable for tobacco production

Table 6A
Equation 1
Ordinary Least Squares
State Fixed Effects
Log of cigarette tax determination based upon state data: real annual observations 1970 - 2010 +

	(1)	(2)	(3)	(4)	(5)	(6)
	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents
Dummy for smuggling	0.303 (3.65)**	0.243 (3.10)**	0.241 (3.83)**	0.288 (3.47)**	0.234 (3.00)**	0.237 (3.76)**
Log local and state per capita taxes paid	0.371 (3.36)**	0.241 (2.34)*	0.235 (1.95)	0.402 (3.64)**	0.267 (2.60)**	0.242 (2.00)*
Weighted percentage of democrats in both chambers	2.035 (8.46)**	0.433 (1.39)	2.011 (10.11)**	1.877 (7.62)**	0.309 (0.99)	1.967 (9.71)**
Log per capita cigarette sales	-1.138 (9.07)**	-1.230 (9.75)**	-0.902 (8.50)**	-1.133 (9.07)**	-1.211 (9.64)**	-0.908 (8.55)**
Log real value of production	0.032 (0.75)	-0.364 (6.88)**	-0.213 (4.67)**	0.033 (0.79)	-0.357 (6.77)**	-0.209 (4.58)**
Dummy for campaign contributions				-0.210 (2.71)**	-0.194 (2.76)**	-0.077 (1.16)
Constant	4.400 (3.76)**	113.266 (1.68)	5.552 (4.99)**	4.293 (3.69)**	109.652 (1.63)	5.547 (4.99)**
State Specific Time Trends	No	Yes	No	No	Yes	No
Year Fixed Effects	No	No	Yes	No	No	Yes
Observations	619	619	619	619	619	619
R-squared	0.77	0.83	0.88	0.77	0.83	0.88

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%
+ using the value of tobacco production

Equation 1: 2SLS

Using an instrumental variable approach Table 10A presents the estimation of equation 1 using the percentage of adult smoking population in the state as an instrument for per capita sales.. With the use of 2SLS the dummy for smuggling is significant in all the specifications and has a positive sign. The weighted percentage of Democrats is also positive and significant, meaning that on average cigarette taxes are 55% to 80% higher in states where there is a Democrat majority in both chambers of the state legislature.

The religious composition variables have a very similar behavior as the OLS ones. Both the dummy for tobacco production and the real value of production are statistically significant and with the expected negative sign.

Finally, the inclusion of campaign contributions increases the explanatory power of the model and is statistically significant, meaning that, holding everything else constant, states with campaign contributions have on average cigarette taxes that are 50% lower.

Model estimation: 2SLS

Table 12A shows the simultaneous estimation of the 2 equations using a 2SLS approach. The estimation is presented both using the dummy for tobacco production and the real value of production. Also three different demand specifications are presented: conventional, myopic and rational addiction.

As in the case of the original specification, the coefficients are very similar across different demand specifications; however, the explanatory power of the model decreases.

Table 10A
Equation 1
Two Stage Least Squares
Log cigarette tax based upon state data: real annual observations 1970 - 2010

	(1)	(2)	(3)	(4)
	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents
Dummy for smuggling	0.366 (12.38)**	0.535 (5.27)**	0.361 (12.37)**	0.55 (5.47)**
Log local and state per capita taxes paid	0.24 (4.65)**	-0.217 (1.36)	0.281 (5.49)**	-0.075 (0.47)
Weighted percentage of democrats in both chambers	0.808 (11.42)**	0.729 (2.93)**	0.729 (10.34)**	0.546 (2.19)*
Log per capita cigarette sales	-0.819 (15.53)**	-0.728 (2.38)*	-0.817 (15.70)**	-0.637 (2.10)*
Percentage of Catholic population	1.501 (7.86)**	5.126 (5.11)**	1.534 (8.15)**	5.1 (5.13)**
Percentage of Evangelical protestant population	-0.462 (2.92)**	1.447 (1.99)*	-0.284 (1.8)	1.745 (2.41)*
Percentage of Mainline protestant population	1.457 (7.18)**	5.142 (4.16)**	1.355 (6.75)**	5.006 (4.08)**
Percentage of Historically Black protestant population	-0.628 (2.63)**	1.605 (1.45)	-0.577 (2.45)*	1.886 (1.72)
Dummy for tobacco producer	-0.344 (12.17)**		-0.317 (11.31)**	
Log real value of production		-0.156 (6.21)**		-0.159 (6.39)**
Dummy for campaign contributions			-0.539 (7.81)**	-0.428 (4.25)**
Constant	4.795 (8.49)**	7.095 (3.02)**	4.482 (8.02)**	5.666 (2.42)*
Observations	2039	619	2039	619
R-squared	0.57	0.55	0.59	0.56

Absolute value of t statistics in parentheses

* significant at 5%; ** significant at 1%

Variable instrumented: per capita sales. Instrument: percentage of adult smoker population

The dummy for smuggling, the weighted percentage of democrats, the real value of tobacco production and the dummy for campaign contributions are the only variables that are significant across specifications. A one percentage point increase in the democrats in both chambers of the State Legislature is associated with 130% to 210% higher cigarette taxes.

The smuggling coefficient tells us that if a state has higher taxes than its neighboring states the cigarette taxes increase by 25% to 36%. Total state and local taxes per capita taxes paid are no longer statistically significant.

The price elasticity of demand is around -0.10 to -0.22, so holding everything every thing else constant a 10% decrease in per capita sales is associated with a 10% to 22% increase in cigarette taxes.

The dummy for tobacco production becomes insignificant when included. And if the real value of tobacco production is used, a 10% increase in the value of production is associated with around 2.2% increase in cigarette taxes. These results are the main difference with the original model when beer and spirit taxes are not included.

Finally, the campaign contributions coefficient is statistically significant and has a negative sign meaning that on average the existence of campaign contributions are associated with 20% to 27% lower cigarette taxes.

Table 12A
 Two Equation Model: Cigarette tax determination and cigarette consumption
 Two Stage Least Squares
 State Fixed Effects

Log of cigarette tax upon state data: real annual observations 1970 - 2010

	conventional demand		myopic demand		rational addiction	
	(1)	(2)	(3)	(4)	(5)	(6)
	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents	Log cigarette tax in real cents
Dummy for smuggling	0.36 (12.77)**	0.244 (2.77)**	0.36 (12.79)**	0.241 (2.73)**	0.36 (12.78)**	0.242 (2.75)**
Log local and state per capita taxes paid	0.389 (8.80)**	0.102 (0.81)	0.389 (8.81)**	0.085 (0.67)	0.389 (8.79)**	0.093 (0.74)
Weighted percentage of democrats in both chambers	1.348 (15.54)**	2.149 (8.13)**	1.345 (15.51)**	2.164 (8.14)**	1.345 (15.50)**	2.157 (8.14)**
Log per capita cigarette sales	-1.065 (32.31)**	-2.182 (10.08)**	-1.064 (32.24)**	-2.241 (10.58)**	-1.064 (32.24)**	-2.213 (10.52)**
Dummy for tobacco producer	-0.056 (1.04)		-0.063 (1.15)		-0.063 (1.15)	
Log real value of production		0.212 (3.97)**		0.222 (4.19)**		0.218 (4.12)**
Dummy for campaign contributions	-0.274 (5.26)**	-0.2 (2.44)*	-0.274 (5.26)**	-0.199 (2.41)*	-0.274 (5.26)**	-0.199 (2.42)*
Constant	5.524 (12.44)**	9.19 (5.81)**	5.511 (12.41)**	9.448 (5.99)**	5.516 (12.41)**	9.327 (5.94)**
Observations	2039	619	2038	618	2037	618
R-squared	0.79	0.74	0.79	0.74	0.79	0.74

Absolute value of t statistics in parentheses
 * significant at 5%; ** significant at 1%

8. A Note of Caution

For the previous analysis it is important to take into account that some variables may not be completely exogenous in the model, therefore the interpretation of the coefficients estimated under OLS and 2SLS has to be done carefully.

As mentioned before, variables like beer and spirit taxes may be jointly determined by the same social, political and economic conditions of each state, generating a problem of endogeneity in the model. The reason for this concern is that cigarette, beer and spirit taxes are part of the same set of consumption taxes, and for these reason share similar budgetary and behavioral implications, and it is likely that its determination depends on one another. However as shown in previous sections the statistical correlation did not seemed to be a problem.

Campaign contributions is yet another variable that generate reasons for concern, this variable is intended to measure lobby power at the state level, and the potential problem with this measure is that it is not clear whether the tobacco companies and lobbyist contribute only in the states where they think they may have a bigger impact on policy determination, or if it is in fact where they know for sure they will have an impact. This creates a problem of identification and may generate a self-selection bias in the interpretation of the coefficient. However, there is no way from the raw data to know exactly the motivation behind the contributions; therefore careful analysis should be made.

Similarly, the variable of local and state taxes paid, includes other tributes paid at the local level that might be an additional burden on tobacco products, this is likely to be influenced at the local level by how burdensome the state taxes are, generating a possible correlation problem among the variables. However the correlation coefficient did not seem to be large or significant.

Finally, the dummy variable created to account for the possibility of smuggling was calculated taking into account the predicted value of the tax, resulting from the OLS regression of estimating the tax as a function of the other explanatory variables, this was made with the aim to prevent a bias in the coefficient if the dummy was calculated taking into account the actual tax.

9. Concluding Remarks

The evidence suggests that a more integrated analysis of other variables, different to those considered traditionally by the optimal tax theory, invigorates the debate around the determinants of cigarette taxes.

Variables such as beer and alcohol taxes, even though would seem to be highly correlated with cigarette taxes are not, and its inclusion in the regressions increases the explanatory power of the model.

The most stunning result is shown by the inclusion of a measure of lobby from the tobacco industry to different levels of government, this measure are the campaign contributions by the industry to state legislators, governors or attorneys general.

Finally, it is important to mention that definitely social, economic and political variables have had an impact on the determination of the cigarette taxes at the state level in the United States, and that this type of analysis could be of great value for countries with different political systems, but with notorious regional differences, that could take advantage of those differences in order to develop a cigarette tax that can better correct the externality and generate a higher revenue for the local governments.

References

- Composition of States' Legislature*. (2009). Retrieved October 30, 2009 from National Conference of State Legislatures: <http://www.ncsl.org/?tabid=19051>.
- Brown, A. (1995). Cigarette Taxes and Smoking Restrictions: Impacts and Policy Implications. *American Journal of Agricultural Economics*, November, 946-951.
- Chaloupka, F. J., & Warner, K. E. (1999). The Economics of Smoking. *NBER, Working Paper 7047*, 1-67.
- Chetty, R., Looney, A., & Kroft, K. (2007). Salience and Taxation: Theory and Evidence. *NBER, Working Paper 13330*, 1-83.
- CIET (2010), Estudio de Demanda de Cigarrillos en Colombia, Recomendaciones para el sistema impositivo de los cigarrillos, Mimeo, Bogotá.
- Coats, R. (1995). A note on estimating cross-border effects of state cigarette taxes. *National Tax Journal*, 48, 573-584.
- Derthick, M. (2001). Federalism and the Politics of Tobacco. *The Journal of Federalism*, 31, 47-63.
- Evan, W. N., Ringel, J. S., & Stech, D. (1999). Tobacco Taxes and Public Policy to Discourage Smoking. In J. M. Poterba (Ed.). *Tax Policy and the Economy* (pp. 1-56.). Massachusetts: MIT Press.
- Gruber, J. (2001). Tobacco at the Crossroads: The Past and Future of Smoking Regulation in the United States. *Journal of Economic Perspectives*, 15(2), 193-212.
- Gruber, J., & Koszegi, B. (2000). Is Addiction "Rational"? Theory and Evidence. *NBER, Working Paper 7507*, 1-54.
- Johnson, C. M., & Meier, K. J. (1990). The Wages of Sin: Taxing America's Legal Vices. *The Western Political Quarterly*, 43(3), 577-595.
- Jha, P. y F. Chaloupka. 1999. Curbing the epidemic Governments and the Economics of Tobacco Control. Banco Mundial, Washington D.C.
- Meier, K. J., & Licari, M. J. (1997). The effects of Cigarette Taxes on Cigarette Consumption, 1955 through 1994. *American Journal of Public Health*, 87, 1126-1130.
- Ohsfeldt, R. L., Boyle, R. G., & Capilouto, E. I. (1998). Tobacco Taxes, Smoking Restrictions and Tobacco Use. *NBER, Working Paper 6486*, 1-17.

- Santamaría m. Rozo S. 2007. La reforma del impuesto al consume de Cigarrillo y Tabaco elaborado: Impacto sobre el recaudo. Fedesarrollo, Bogotá.
- Sheu, M., Hu, T., Keeler, T. E., Ong, M., & Sung, H. (2004). The effect of a major cigarette price change on smoking behavior in California: a zero-inflated negative binomial model. *Health Economics*, 13, 781-791.
- Showalter, M. H. (1998). The effect of Cigarette Taxes on Cigarette Consumption. *American Journal of Public Health*, 88, 1118-1119.
- Showalter, M. H. (1999). Firm behavior in a market with addiction: the case of cigarettes. *Journal of Health Economics*, 18, 409-427.
- Sissoko, M. (2002). Cigarette Consumption in Different U.S. States, 1955-1998: An Empirical Analysis of the Potential Use of Excise Taxation to Reduce Smoking. *Journal of Consumer Policy*, 25, 89-106.
- Slemrod, Joel (1990). Optimal Taxation and Optimal Tax Systems. *Journal of Economic Perspectives*, 4, Winter 1990, 157-78.
- State of tobacco control: Multiple years from Sate of TobaccoControl:*http://www.stateoftobaccocontrol.org/2008/ala_sotc_08_sfa_pdf.
- State-Specific Prevalence and Trends in Adult Cigarette Smoking --- United States, 1998--2007.* (2008). Retrieved October 30, 2009 from Centers for Disease Control and Prevention: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5809a1.htm>.
- State Tobacco Taxes/Research/Factsheets.* (2009). Retrieved October 30, 2009 from Campaign for Tobacco-free Kids: <http://www.tobaccofreekids.org/research/factsheets>.
- Statistics by Crop.* (2010). Retrieved August 23, 2010 from National Agricultural Statistics Service: <http://www.nass.usda.gov/quickstats/index2.jsp#top>.
- Sung, H., Hu, T., & Keeler, T. E. (1994). Cigarette Taxation and Demand: An Empirical Model. *Contemporary Economic Policy*, 12(3), 91-100.
- Talley, L. A. (2002). *Federal Excise Taxes on Tobacco Products: Rates and Revenues.* Retrieved October 30, 2009 from CRS Report for Congress: http://www.policyarchive.org/bitstream/handle/10207/3314/rs20343_20020110.pdf?sequence=1.
- U.S Religion Map and Religious Population.* (2008). Retrieved October 30, 2009 from Pew Forum on Religion and Public Life: <http://religions.pewforum.org/maps#>.
- World Health Organization. 2010. Technical manual on tobacco tax administration.